

DETERMINANTS OF MARKET SUPPLY OF VEGETABLES: A CASE OF AKAKI-KALITY SUB-CITY, ETHIOPIA

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ABSTRACT

Ethiopia has a variety of vegetable crops grown in different agro-ecological zones by small farmers, mainly as a source of income as well as for food. The production of vegetables varies from cultivating a few plants in the backyards for home consumption, to large-scale production for the domestic and home markets. To this end, the aim of this study was to empirically examine factors affecting marketable supply of potato and leafy vegetables in the study area. The analysis was made with the help of descriptive and econometric tools, both SPSS version 16 and stata11 software were employed. A total of 75 producer respondents drawn from Akaki-Kality sub-city were interviewed using structured questionnaires. Estimation of determinants of marketable supply with the help of logarithmic production function model revealed that out of 10 hypothesised explanatory variables for leafy vegetables, eight variables were found to determine marketable supply of leafy vegetables at farm level. Similar to leafy vegetables, 10 explanatory variables were hypothesised that were expected to affect marketable supply of potato. Only five variables were significant. In both cases except quantity produced, distance from the nearest market centre and sex of the respondent, all were not with expected signs as prior hypothesised. Capacity building for all actors in the value chain and strong extension service on product handling and marketing to producers should get focus.

Introduction

The current government of Ethiopia has developed a number of very comprehensive policies, strategies and programmes for accelerated and sustainable economic development as poverty eradication is Ethiopia's main development goal. Such policies and strategies consist of the Agricultural Development Led-Industrialisation (ADLI) Strategy, the Sustainable Development Programme to Reduce Poverty (SDPRP) and

the Plan for Accelerated and Sustained Development to End Poverty (PASDEP). In the preceding six to seven successive years, Ethiopia's economy in general and rural economy in particular obtained remarkable achievements; as a result of successful policies, strategies and programmes (MoARD. 2005). Yet, this has not been reflected in the area of urban agriculture to any great extent. The reasons were one of many including lack of consideration in research, lack of awareness by policy makers and urban

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planners, lack of appropriate extension packages and production technologies, inappropriate land use policies, and biased health and environment concerns. The cultivation of vegetables in the public and private open spaces of cities is common but has not yet attracted the research and extension attention it deserves. Still with others such as policy makers and city planners, it has been and still is somewhat of an unknown or unacknowledged phenomenon. Despite its proven benefits to the poor, urban agriculture in general, urban vegetables in particular has been seriously under-estimated and still is considered by many as a temporary and part-time activity informally exercised by citizens.

In Ethiopia, the cultivation of vegetables in the public and private open spaces of urban and pre-urban areas is very common but has not yet attracted the research attention it deserves. That means it has been somewhat of an unknown or unacknowledged phenomenon equally to researchers as it was to policy makers and city planners in general. Research institutes such as the Ethiopian Institute of Agricultural Research (EIAR), the Institute of Biodiversity Conservation and Research (IBCR), the Ethiopian Health and Nutrition Research Institute (EHNRI) and several other Agricultural Universities and Colleges are doing a lot of horticulture related research activities but none of them are so far known to be active in the urban areas. Based on these, the study is proposed to find answers to the following research questions: what are the determinants of marketing supply of vegetables by the producers in the study area? And what are the major actors of value chain analysis of vegetables in the study area? Therefore, this research activity will be initiated to bridge the above mentioned information gaps by focusing on the value chain analysis of vegetables at Akaki-Kality sub-city. Hence the specific objective of this study is to identify factors affecting marketable supply of vegetables in the study area.

Hypotheses

1. Market supplies of vegetables are positively

and significantly affected by quantity produced, access to credit, market information, labour availability, educational level and sex of the household.

2. Market supplies of vegetables are negatively and significantly affected by distance from the nearest market.

Research Methodology

Sampling Procedure: Akaki Kality sub-city was selected purposively due to extensive coverage and production of vegetables. Comprehensive fresh lists of producers were prepared from the study sub-city to identify both potato and leafy vegetables growers in collaboration with administrators, key informants and development agents of the respective sub-city; and these serve as the sampling frame. Out of the total 301 producers, 75 representative producers were selected using simple random sampling methods. The determination of sample size is resolved by means of Slovin's sampling formula with 90 per cent confidence level.

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

n= sample size for the research use

N= total number of household heads producing potato and leafy vegetables

e= margin of errors at 10%

In addition, key informants representing; local leaders in the producing sub-city, development agents for crop production in the elected sub-city, sub-city urban agricultural office, and other relevant stakeholders were identified purposively in the exploratory research stage.

Data Types and Source: The research used both primary and secondary data of qualitative and quantitative in nature. Primary data were

collected from multiple types of respondents involving producers, key informants, participants and FGDs.

Secondary data were gathered from different documents, reports, papers of relevant stakeholders which were qualitative and quantitative in nature.

Methods of Data Collection : Due to the complex nature of the subject, market supply and to avoid biases, mixed methods such as surveys, focus group discussions, observations, informal discussion with other community members and key informant interview were used to collect the primary data. Primary quantitative data collected was through a survey conducted using structured interview. Firstly, the interview schedule was tested at the farm level on 10 randomly selected farm households. In the light of pre-testing, essential amendments were made on such things as ordering and wording of questions and coverage of the interview schedule. Furthermore, the pre-test enabled to know whether respondents had clearly understood the interview schedule. As a result, some questions were deleted but those found important were incorporated in the final version of the interview schedule. Enumerators who were familiar to the existing social settings were recruited. Training was organised to enumerators on the content and interview techniques. Finally, survey was conducted under close supervision of the researcher.

The qualitative data were generated through Key Informant interviews, FGD's, transect walks and observations and informal interviews with different actors. Key Informants were interviewed using check lists, and FGD guides were used to conduct focused group discussions. FGDs were conducted in the relevant location with producers, with 6-12 participants in each group.

Methods of Data Analysis : The quantitative data were analysed using descriptive statistics such as mean, standard deviation (SD),

frequencies, and percentages. In addition, to fulfill the objective of identifying the determinants of marketable supply of the producers, multiple linear regression model was employed.

RESULTS AND DISCUSSION

The General Characteristics of the Sampled Households

I. Age of the Respondents : The mean age of sample households was 42.64 years with standard deviation of 11.86. The maximum age for the sample producers was 78 years while the minimum was 22 years. The survey on this major demographic factor, measured in years, provided a clue on working ages of households. The overall result has thus indicated that household heads are prone to use resources with expected positive effect on market participation and marketable surplus.

II. Sex of the Respondents : Male respondents (76 per cent) take larger proportion than female respondents (24 per cent). In this study, majority of sample respondent households were found to be male. This clearly shows the existing gap between male headed and female headed households in terms of participation in vegetable production and value chain systems. Therefore, the result clearly shows that male headed households had high participation in vegetable production than female headed households.

III. Educational Level of the Respondents : According to the survey result, majority of the respondents attended primary cycle (36.0 per cent) followed by respondents' secondary cycle (30.7 per cent). This increased educational entitlement has supported the production and marketing of vegetables in the study area and has also improved the ability to acquire new idea in relation to market information and improved production of the households, due to that the educational background of the sample household head is believed to be an important feature that determines the readiness of household heads to accept new ideas and innovations.

Table 1 : Educational Background of the Respondents

Educational status of the Household Heads	Number of respondents	Per cent
No Education	18	24.0
Primary (1-6 grades)	27	36.0
Secondary (7-12 grades)	23	30.7
Higher	7	9.3
Total	75	100.0

Source : Own survey data (2012).

IV. Family Labour: Family labour was assumed to be the main source of labour required for farm operations such as land preparation, planting, weeding, and harvesting. Hence, information was

generated on labour availability of sample households in order to examine the influence of labour availability on vegetable production.

Table 2 : Labour Shortage Problems and Solutions

Labour shortage problem	N	%	Solution to labour shortage problem	N	%
No	66	88.0	No problem	66	88
Yes	9	12.0	Hiring	9	12
Total	75	100.0	Total	75	100

Source : Own survey data (2012).

The survey result presented in Table 2 reveals that 12 per cent of the respondents reported facing labour shortage during different farm operations. Moreover, it also shows that 12 per cent of respondents reported using hiring as solution to labour shortage problem.

The man equivalent (ME) family labour availability was calculated for the sample respondents. The survey result on labour availability in Table 5 shows that the average labour availability in terms of man equivalent for sample households was 2.72 with standard

deviation of 1.22 (Table 3). Larger family size requires larger amounts for consumption, reducing marketable surplus (Table 3). The size of labour force in the household is expected to have negative impact on market volume of vegetable sales.

V. Price of Vegetable : The result of this study indicated that price of potato of sample population ranges from 3.00 to 4.15 birr/quintal. The average price of potato of the sample population was 3.99 birr/quintal with standard deviation of 24.82 birr/quintal (Table 3).

As shown in Table 3, the price of leafy vegetables of sample population ranges from 2.50 to 4.60 birr/quintal. The average price of leafy vegetables of the sample population was 4.28 birr/quintal with standard deviation of 88.83 birr/quintal (Table 3).

VI. Distance from Farm Area to Market Centre: This is a distance measured in kilometers to reach the nearest market. The study revealed that infrastructure is generally satisfactory and it is close to nearby vegetable markets (Table 3); which in turn has assisted farmers to lessen their transport cost and boost their market surplus and margins. The access has further assisted to increase vegetable production by the farming households. As provided in Table 3 the average distance travelled for sample households was 4.03 km.

VII. Quantity Produced : The survey result as provided in Table 5 illustrated that the average quantity produced of potato for sample households were 1.6168E6 quintal/year with a standard deviation of 8.93676E6 quintal/year. Producers who produce more are expected to supply more vegetable to the market than those who produce less. Similarly, the average quantity produced of leafy vegetables for sample households were 2.1686E6 quintal/year with a standard deviation of 7.70527E6 quintal/year.

VIII. Land Size: The survey results indicate that in the 2011/12 production year amount of land-holding ranged from 0.0067 to 21.60 with a mean land size of 0.72 ha (Table 3).

Table 3 : Respondents' Response to Situational and Socio-economic Variables

Variable	N	Minimum	Maximum	Mean	SD
Family labour	75	0.70	8.50	2.72	1.22
Land size	75	.0067	21.60	.73	2.77
Distance from farm area to market centre	75	1.00	20.00	4.03	2.95
Price of potato in birr per quintal	75	300.00	415.00	3.99 E2	24.82
Price of leafy vegetable in birr per quintal	75	250.00	460.00	4.27E2	88.83
Quantity produced of potato (quintal/ year)	75	19007.80	7.58E7	1.61E6	8.93E6
Quantity produced of leafy vegetable (quintal/ year)	75	14234.20	6.06E7	2.16E6	7.70E6

Source : Own survey data (2012).

IX. Contact with Extension Agent : The result on sampled producers' contact with extension agent presented in Table 4 illustrated that of the total 75 sample respondents, 62 (82.7 per cent) producers reported having contact with development agents while 13 (17.3 per cent) producers reported having no contact with development agents (Table 4). This (17.3 per

cent) has a serious implication with respect to management of development agents (existing monitoring and evaluation, reward and punishment), particularly having at least two development agents per each urban *Woreda*.

X. Access to Credit : Credit is important to facilitate the introduction of innovative technologies and for input and output marketing arrangements. Thus, the lack for the delivery has discouraged the financial capacity of producers to purchase the necessary input for the crops. For this reason informal credit system has come up as a prevailing feature where producers borrow money from wholesalers during slack seasons. And this condition affected farm gate prices since farmers are forced to sell their

produce at lower prices for their borrowers which ultimately triggered to lower returns. This study confirmed that 58 per cent of the respondents had access to credit while the rest had no access.

XI. Access to Market Information : The main sources of market information are traders and brokers. The survey result shows that the majority (65.3 per cent) of producers are aware of the price before their arrival at the market place (Table 4).

Table 4 : Respondents' Response to Situational and Socio-economic Variables

Variables	Responses	Number of respondents	Per cent
Access to Credit	Yes	39	52
	No	36	48
	Total	75	100
Market Information	Yes	49	65.3
	No	26	34.7
	Total	75	100
Extension Contact	Yes	62	82.7
	No	13	17.3
	Total	75	100

Source : Own survey data (2012).

ANALYSIS OF ECONOMETRIC RESULTS

The econometric analysis was planned to investigate factors affecting, volume of supply to the market. The analysis was undertaken for potato and leafy vegetables independently.

Determinants of market supply volume :

Sampled respondents indicated that 85.52 per cent potato and 97.04 per cent of leafy vegetables produced were marketed. Respondents also pointed out that the remaining percentage of total production was accounted for by spoilage and home consumption.

As observed from the econometric result in Table 7, out of 8 hypothesised explanatory variables for leafy vegetables, six were found to determine marketable supply of leafy vegetables at farm level. These are educational level, sex of the respondent, labour availability, quantity produced, access to market information and distance from the nearest market centre.

Education of the Respondent: As hypothesised, the multiple linear regression result shows that, marketed surplus significantly affected leafy

vegetables quantity supplied at 5 per cent level. The negative and significant relation between the variables indicates that, when leafy vegetables producer gets educated by one per cent, the elasticity of leafy vegetables supplied to the market decreased by 0.83 per cent. This is contradicting to the hypothesis so; the probable reason might be when producers are getting educated they probably tend to shift to another business.

The finding of this study is congruent with the findings of Gizachew (2006) who found a negative relationship of household education with dairy supply.

Sex of the Household Head : This variable was found to influence the marketable supply positively and significantly, confirming the hypothesis at less than 5 per cent significant level towards maleness. The positive sign indicates that male-headed households were more likely to supply more than female-headed household heads. The result from this test in the model shows that, maleness was found to increase the elasticity of marketable supply of leafy vegetables by 1.14 per cent. The possible explanation might be that male-headed households have better access to information, agricultural inputs and resource endowments.

Family Size : The result in Table 5 revealed that, labour availability was negatively related with marketable supply of leafy vegetables. And it was statistically significant at less than 5 per cent probability level. The negative and significant relation between the variables indicates that increase in one per cent of labour, decreases the elasticity of marketable supply of leafy vegetables by 0.369 per cent (Table 5) or as number of labour increase by one unit, elasticity of marketable supply of leafy vegetables changes by 0.369 factors. This result is well supported by Singh and Rai (1998) who found marketed surplus of buffalo milk to be negatively affected by family size. Similarly, a study conducted by Wolday (1994) showed that household size had negative

effect on quantity of maize marketed. Harris (1982) also verified empirically the relationship between marketed surplus and output and income. She obtained negative relationship between marketed surplus and variables like family size.

Access to Market Information : As the multiple linear regression result indicates, access to market information had negative and significant influence on marketable supply of leafy vegetables at less than 5 per cent significant level. The negative association suggests that, the better information producers have, the more likely they decrease supply of leafy vegetables to the market. Hence, the variable indicates that, access to market information increased by one per cent, decreases the elasticity of marketable supply of leafy vegetables by 1.303 per cent (Table 5). The probable reason might be dynamic information such as consumer needs and market trends. This requires due attention to new market opportunities, changing needs of the consumer and how market trends influence buying.

Distance from the Nearest Market Centre : Distance from nearest market centre was assumed to influence marketable supply of leafy vegetables. The finding in Table 5 agrees with the hypothesis that farm distance to the nearest market is negatively and significantly associated with the probability of marketable supply of leafy vegetables at less than 1 per cent significant level. As number of distance increased by one unit, elasticity of marketable supply of leafy vegetables changed by 0.182 factors.

Quantity of Leafy Vegetables Produced : Quantity produced was expected to adversely affect the volume of total sales. As hypothesised, this variable is positively related to marketable surplus of leafy vegetables. The result shows that quantity produced significantly and positively affected marketable surplus at less than 1 per cent probability level. The result indicated that, quantity produced increased by one per cent

elasticity of marketable supply of leafy vegetables increased by 3.39e-07 per cent. This is in line with the hypothesis that households who produce more, likely to supply more. R^2 value of the model is 0.64 and adjusted R^2 value is 0.59 (Table 5). It was observed that the adjusted

coefficient of determination was almost 60 per cent in the marketable supply function. This implies that, near to 60 per cent of the variations in marketable supply of leafy vegetables were explained by the explanatory variables.

Table 5 : Logarithmic Estimation of Factors Affecting Farm Level Marketable Supply of Leafy Vegetables

INLEAFSUP	Estimated Coefficients	Standard Error	t-ratio	P-value
AGEHHSQ	0 .0002219	.0001794	1.24	0.221
INEDUCAHH	-0.83060691	.3793566	-2.19**	0.032
SEXHH	.140262	.4308995	2.65**	0.010
FAMILYLAB	- 0.368909	.1631235	-2.26**	0.027
EXTENSIONC	-0.0026913	.4670894	-0.01	.0995
MARETINFO	-1.3038	.5027363	-2.59**	0.012
DIATANT	-.1820444	0708045	-2.57**	0.012
QUANLEAY	3.39e-07	1.15e-07	2.95***	0.004
Constant	22.95702	2.867317	8.01	0.000

Source : Model output ***, **, represents 1% and 5% level of significance, respectively.

N=75 $R^2 = 0.6443$, $^2 = 0.5887$

The Influence of Explanatory Variables on the Marketable Supply of Potato

Similar to leafy vegetables, eight explanatory variables, were hypothesised that were expected to affect marketable supply of potato. Only three variables were significant, that is, sex of the respondent, quantity of produce, and distance from the nearest market centre.

Sex of the Respondent : This variable came up with positive sign as it did for marketable supply of leafy vegetables at 5 per cent probability level. The same logic explained for marketable supply of leafy vegetables also holds true here. As observed from Table 6, maleness was found to

increase the elasticity of marketable supply of potato by 0.971 per cent.

Distance from the Nearest Market Centre : Distance from the nearest market centre was also another variable found significant to influence the marketable supply of potato at 10 per cent probability level. It came up with negative sign and it was as expected. As the distance from the nearest market centre increased by one per cent, elasticity of marketable supply of potato decreased by 0.113 per cent (Table 6).

Quantity Potato Produced : The result showed significant effect at 1 per cent significant level for marketable supply of potato with the

expected positive sign. Thus, the result implied that, quantity produced increased by one per cent, elasticity of marketable supply of potato increased by 2.48e-07 per cent.

The result of this study is in agreement with the findings of Ayelech, 2011 who reported

that households who had produced more amount of mango and Avocado had also supplied more amount of mango and Avocado to market than those who had produced less amount of mango and Avocado.

Conclusion

Table 6 : Logarithmic Estimation of Factors Affecting Farm Level Marketable Supply of Potato

INPOTASUP	Estimated Coefficients	Standard Error	t-ratio	P-value
AGEHHSQ	-.0002328	.0001822	-1.28	0.206
INEDUCAHH	-.2827945	.3604895	-0.78	0.436
SEXHH	.9715697	.4042085	2.40 **	0.019
FAMILYLAB	-.2034955	.1480472	-1.37	0.174
EXTENSIONC	.3661333	.4418876	0.83	0.410
MARETINFO	-.5744419	.4630075	-1.24	0.219
DIATANT	-.1127067	.0667197	1.69*	0.096
QUANPOTA	2.48e-07	1.09e-07	2.27**	0.027
Constant	31.55391	4.076212	-7.74	0.000

Source: Model output ***, **, * represents 1%, 5% and 10% level of significance, respectively. N=75
R² = 0.6388, ρ^2 = 0.5823

Survey result indicated that an estimated volume of 85.52 per cent potato and 97.04 per cent of leafy vegetables produced were marketed. Respondents also pointed out that the remaining percentage of total production was accounted for by spoilage and home consumption. Producers' average selling price for a kilogram of leafy vegetables was 4.28 Ethiopian birr and 3.99 Ethiopian birr (ETB) for potato.

Generally, vegetable production has great contribution to households' nutrition, income and food security is very high. It also provides

job opportunities particularly for youth, women and the landless poor. Regardless of its contribution, however, the emphasis given nationally to the sector is relatively low compared to other food crops. As a result of this, institutional support provided to this sector, such as research and extension was not to the expected level. These factors together with several household personal, demographic and socio-economic, communication and situational factors greatly affected the marketable supply of vegetables (potato and leafy vegetables).

Policy Implications

Based on the results of this study, the following recommendations are given so as to be considered in the future intervention strategies which are aimed at the promotion of vegetable market chain in the study area.

Result of this study indicated that, marketable supply of potato and leafy vegetables of households was found to be influenced by different factors, among these sex differences is one of the prevailing factors. As a result, female-headed household heads supply less volume of the product than males. This might be due to lack of access to information sources. Accordingly, opportunities for equal access of women producers should be provided through provision of empowerment intervention.

To this end, promotion of participatory research that helps address site-specific conditions, producers' preferences and priorities should be given due attention. Similarly, extension service provision has to be strengthened so as to improve producers' access to information and extension advices.

Education of the household was associated with marketable supply of leafy vegetables negatively. From the result of this study, it was realised that producers were not in a position to obtain better income as a result of exploitation by traders and middlemen due to poor bargaining power. As a result of this, they tend to shift to other business. Therefore, much emphasis has to be given to improvement of market and marketing system.

Group organisations like producer cooperatives are assumed to play a significant role in improving the bargaining power of the producers and creating employment opportunities. During key informant interview, producers' cooperative was under-structured so it has to be strengthened.

Finally, further studies on market supply of vegetables in the urban and pre-urban should be conducted in all vegetable growing areas other than Akaki Kality sub-city so that a well organised regional and national vegetable production and marketing can be implemented.

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