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Do Market Linkages Play a Role in Improving Food Security Status of Rural Households? Evidence from Chencha Apple Production and Marketing Project, Southern Ethiopia

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Abstract
The objective of this paper is to assess the effect of improvement in production and marketing of Highland Fruits on rural household's food security status. The study carried out in Chencha District, Southern Ethiopia in May 2015 to assess the impact of the project designed and implemented by the World Vision (WV) Ethiopia. Systematic random sampling method followed to select both participant and non-participant households of the project. Food security assessed using Household Food Insecurity Access Scale (HFIAS), Months of Adequate Household Food Provisioning (MAHFP) and Household Dietary Diversity Score (HDDS). Totally, 418 households participated in the survey with a response rate of 95.87%. The result from HFIAS confirms significant variation in food insecurity based on participation status. Non-participants are relatively food insecured compared to their counter parts. Mean of MAHFP shows statistically significant difference with higher MAHFP for participated households. In addition, the mean HDDS also shows statistically significant variation between participant and non-participant households. Higher mean dietary diversity score and increased number in months of adequate household food provisioning among project participants signals positive contribution of the project in improving food security status. Thus, improving production and marketing of Highland Fruits can be an alternative in reducing food insecurity problem among rural communities.
Keywords: Apple production, Food security, HFIAS, MAHFP, HDDS

1. Introduction

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Maxwell and Frankenberger 1992; Coates *et al.* 2007). In 2011–13, 12% of the global populations are unable to meet their dietary energy requirements, the vast majority of hunger vulnerable population lives in developing countries (FAO 2013). Progress towards improved food security continues to be uneven across regions and in region like sub-Saharan Africa progress has been slow (FAO 2015). Some of the factors that enable progress towards food security are economic growth, agricultural productivity growth and improved functioning of markets. More than 80% of the world food produced by farms managed by an individual or a family and its workforce predominantly relay on family labour. Globally, 84% of family farms are smaller than 2 hectares, labour productivity is less and most small family farmers are poor and food-insecure (FAO 2014). Improved productivity of agricultural resources through sustainable intensification like diversified agricultural systems plays a key role in increasing food availability and improving food security and nutrition (FAO 2015).
Signifying the importance of market linkage, FAO (2017) pointed out that;
...the traditional agricultural assistance projects that concentrated on building up farmers' production capabilities are no longer sufficient to ensure sustainable income growth. There is now an increasing understanding that production support activities must be linked to market demand and that production activities must be looked at within the context of the whole supply chain and the linkages, or business relations, within that chain.

Apple is becoming one of the major cash crops grown in Chencha area where almost all producers sell rootstock, grafted seedling and apple fruit in the local market but rootstock and grafted seedling marketing will not long last due to its diminishing market demand. There are various actors of apple marketing. They include producers, consumers, primary cooperatives, retailers and wholesalers. Cooperatives play critical role in apple marketing and protect members from exploitation of selfish businessmen (Girmay et al. 2014). Several interventions were being made to increase the role of apple to improve income and food security of the households in the district through improving production and market linkage. Hence, the objective of this paper was to assess the effect of such initiatives on household food security status.

2. Materials and Methods

Study area and population – The study was carried out in Chencha district located in Gamo Gofa Zone of Southern Ethiopia. The district encompasses 50 Administrative Kebeles (the smallest administrative unit in Ethiopia). The agro-ecology of the district is generally suitable for highland fruit production and particularly for apple with an altitude ranging between 1600 – 3200m above sea level and having two major agro-ecological zones: high land (82%) and midland (18%). The mean annual rainfall ranges from 750mm- 1000mm and the district's area coverage is 37,650 hectares. The major means of livelihood in this area is subsistence agriculture followed by traditional weaving and causal labour employment. The major types of crops in the district include cereals (Barley & Wheat), pulses (Beans & peas), Irish potato, Enset, and some highland fruits & Vegetables (Girmay et al., 2014).

Study design and period – The survey was conducted in May 2015 to assess the impact of the project entitled "Increased household income to provide well for participants' children by creating market linkage to apple production'' designed and implemented by the World Vision (WV) Ethiopia Chencha area program from 2012 to 2015. The comparison was made between participants (beneficiary) and non-participants (non- beneficiary) of the project. Interventions has been undertaking by providing improved seedling, improved farm tools, trainings and creating market linkage to improve apple yield and its marketability. The project has also been building the capacity of apple farmers through the formation and strengthening of cooperatives and the establishment of an apple producers union. Additionally the project has been providing business development services training for cooperatives and the union.

Sample size, study Population and Sampling – The sample size were calculated based on published table of sample determination based on Yemane T.(1967). Based on the sampling table, 198 HH heads with 7% precision and 93% confidence interval is representative. With the consideration of 10% non-response rate, 218 beneficiary sample respondents were calculated. For the assessment of the impact of the project, totally 436 samples were calculated (218 for project participant households and 218 non-participant households, which are used as comparison group). The study population is farmers of Chencha district who grow apple trees in their home gardens. Those households who are cultivating apple tree were included in the study. Form 50 Kebeles (lower administrative unit of Ethiopia) of the district, 14 Kebeles were selected randomly using lottery method for the survey. In order to select each sample households, systematic sampling method has followed. For the participants, household who have been participating in the project were selected, where as for non-participants, household who have not been registered as beneficiaries of the project but who has similar characteristics are included in this study Based on proportional sample size assigned to each Kebele, each k^{th} household of the Kebele was included in the survey**.** During non-beneficiary household selection, if the household is non-apple cultivating household, the next household who grow apple at his/her garden is selected.

Data collection tools and quality control – Questionnaire was developed to collect the socio-demographic and food security status of the household. Food security was assessed using Household Food Insecurity Access Scale (HFIAS), Months of Adequate Household Food Provisioning (MAHFP) and Household Dietary Diversity Score (HDDS). All the three tools adopted from Food and Nutrition Technical Assistance project funded by the US Agency for International Development. For HFIAS, the scale contains nine questions. These questions cover a broad spectrum of experiences related to food security. Subsequently, the scores on the nine questions are summed to calculate the index. This results in a continuous food insecurity indicator that ranges from 0 (food secure) to 27 (severely food insecure) as presented in the works of (Coates et al. 2007; Deitchler et al. 2010). The MAHFP is particularly useful in agricultural populations as it captures changes in the household's ability to meet its food needs over the course of a year. The MAHFP was calculated by summing the number of months within a 12-month period that each household was unable to meet its food needs and subtracting the sum from 12; thus a higher score represents a household that has more consistent food access (Bilinsky and Swindale 2010). The HDDS is a continuous score that can range from 0 to 12 based on whether the household consumed each of the following 12 food groups: cereals; roots and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses/legumes/nuts; milk and milk products; oil/fats; sugar/honey; and miscellaneous (Swindale and Bilinsky 2006). All the questionnaires was translated from English to Amharic and then re-translated back to English to check their consistencies. Data collectors with a minimum of diploma were recruited and training given on the data collection tools and techniques. The questionnaires pretested at three Kebele of the district and these Kebeles are excluded from the study Kebeles.

Data processing and analysis – The data was coded, entered and analyzed using SPSS for Window (Version 20.0). The significant level was set at $P<0.05$. Descriptive statistics were used to summarize the background characteristics of the surveyed households. The difference between participant and non-participant households were determined using Chi-square test for categorical variables and independent t-test for continuous variables.

3. Results

Four hundred eighteen households were participated in the survey with a response rate of 95.87%. Form the total

households included in the survey, 204 (48.80%) are participants of the project. Almost all (98.56%) of the head of the households are from Gamo ethnic group and majority of them are males (80.14%) and married (79.19%). The mean (SD) age of the participant and non-participant household heads were 48.05 (12.650) and 47.1934 (13.744), respectively. In addition, family size of the participant and non- participant households were 6.42 (2.521) and 6.03 (5.409). There is no significant difference between participating and non-participating group household head age (P= 0.491), sex (P=0.268), marital status (P= 0.984), educational status (P=0.083), occupation other than farming (0.706) and family size (P=0.706). Only significant difference was observed among in the two group in their religion (P<0.001). Characteristics of surveyed households are shown in Table 1 based on their participation in the project.

The mean (SD) farmland is 0.82 (2.22) hectare among the total sampled households. The mean (SD) farmland of participant and non-participant household were 0.94 (2.47) and 0.71 (1.95) hectares, respectively. Significant difference between participants and non-participants in mean size of their farmland is not confirmed (P=0.294).

Table 1- Socio-demographic characteristics of sample respondents based on their participation in the apple market linkage project

Characteristics		Participant		Non –participant	
		Yes	%	No	%
Sex of the household head	Male	168	82.35	167	78.04
	Female	36	17.65	47	21.96
Marital status of the household head	Single	22	10.78	26	12.15
	Married	166	78.92	172	79.44
	Divorced	1	0.49	1	0.47
	Widowed	15	7.35	15	7.01
Religion	Orthodox	70	34.31	131	61.21
	Protestant	134	65.2	83	38.79
Educational status	Illiterate	84	41.18	90	42.06
	Read and Write	34	16.67	50	23.36
	Formal Education	79	38.73	64	29.91
Occupation of the household head other than farming	Self-employed	172	84.31	185	86.45
	Government employee	23	11.27	22	10.28
	Private employee	6	2.94	3	1.4
	Pension	3	1.47	4	1.87

3.1 Household Food Insecurity Access Scale (HFIAS)

The result from measurement of food access scale shows that from the total population that participated in the study, 19.86% of households fall in the severely food insecure (access) category. Table 2 shows the prevalence of categories of food insecurity (access) between participant and non-participant household. There is significant variation in households between participant and non-participants (X^2= 12.15, 3; *P*=0.007) on the prevalence of categories of food insecurity (access) of in the households. The fact that participant household better-off in food security could be the benefits that gained through participation in terms of higher price for his/her produce and market access. Evidence shows that markets are necessary to boost productivity and availability. Improved access to agricultural input markets—such as seed and fertilizer—is crucial for productivity growth. Moreover, farmers will only increase production if they have access to viable markets for their agricultural outputs (Charlotte H. and Kristin W,, 2010). Thus, increased production and productivity could possibly enhanced food security status of participant households.

Table 2: Food security status of the households using HFIA scale based on their participation status in the apple market linkage project

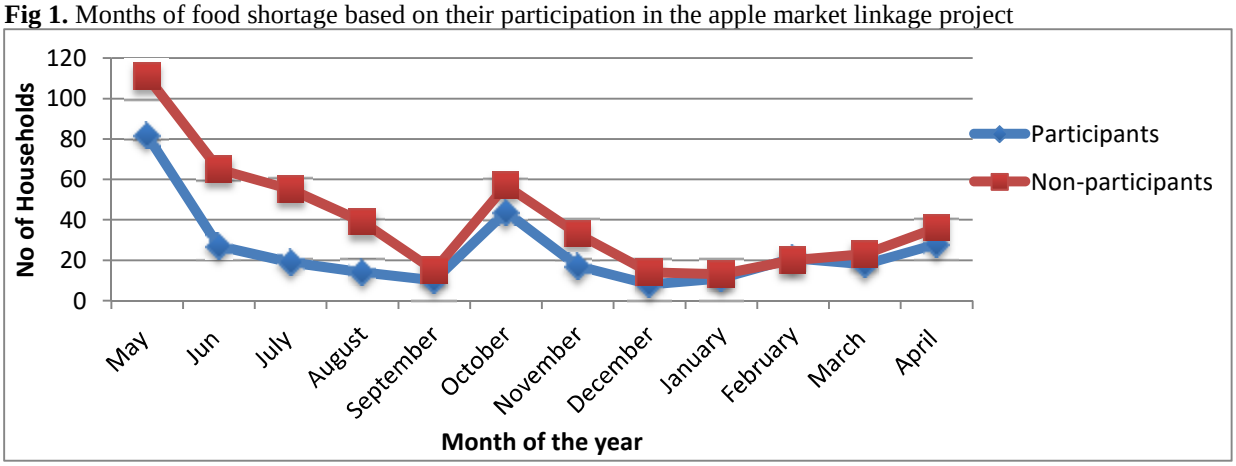
HFIA Category	Participant		None- Participant		Total	
	Freq	%	Freq	%	Freq	%
Food Secure	120	58.82	90	42.06	210	50.24
Mildly Food Insecure	14	6.86	25	11.68	39	9.33
Moderately Food Insecure	36	17.65	50	23.36	86	20.57
Severely Food Insecure	34	16.67	49	22.90	83	19.86
Total	204	48.80	214	51.20	418	100.00

3.2 Months of Adequate Household Food Provisioning (MAHFP)

Mean (SD) of MAHFP of the preceding year for participants and non-participants is10.55 (2.069) and 9.77 (2.44) months, respectively. The independent *t*-test shows statistically significant (t (416) =3.523; *P*<0.001)

difference in the mean of MAHFP of participant households than non-participant households, with an increase in MAHFP for participated households. The most frequently mentioned month of food shortage in the household is May (192 households) followed by October (101 households) and June (92 households). Period from April – June covers 'Belg' season and 'Meher' season starting mid September until December. The reason more households reported May as food shortage month is that stocks from previous harvest depleted and Belg crops not mature. December (22 households), January (24 households) and September (25 households) was less frequently mentioned months of food shortage in the households. Figure 1 shows months of years with food shortage in both groups.

Fig 1. Months of food shortage based on their participation in the apple market linkage project



3.3 Household Dietary Diversity Score (HDDS)

HDDS is calculated based on 12 food groups. The mean (SD) of HDDS is 5.93 (0.11) for total sample. The mean (SD) of HDDS for participant and non-participant household is 6.37 (2.162) and 5.58 (2.260), respectively. There was statistically significant [t (416) = 3.618; P<0.001] difference between participant and non-participant households in mean HDDS. Participant households has higher HDDS than that of non- participants' households.

4. Discussion

Nutritional sensitive programmes address the underlying determinant on nutrition; they are often implemented at larger scale and can be effective at reaching poor population. These programmes draw on complementary sectors like agriculture to affect the underlying determinants of nutrition, including poverty and food insecurity (Ruel et al. 2013). According to the UNICEF frame work for malnutrition, household food security is one of the underlying causes for the development of malnutrition (UNICEF 1998). Based on HFIAS, the 19.86% of the households were food insecure. It was lower compared to the study done in Southwest Ethiopia, which was 24.7% of the sample (El-Sayed et al. 2010); in Northwest part of Ethiopia, which was 70.7% (Endale et al. 2014) and in Addis Ababa 75% of households were food insecure (Birhane et al. 2014). This may be explained due to data collection period and difference in the study area. In addition, the intervention made by non-governmental organization (NGO) like World Vision Ethiopia to enhance production of apple and marketability of the product via created market linkage may have contributed to the increased number of food secured household in the study area. The result reveled that there is reduction in food insecure household among participants. Months of food provision by the participated household in the program throughout the year is higher than those household which did not get such a chance of participation in the project. In addition, the participant households diversified their food consumption better than it is among non-participant households.

5. Conclusion

There is lower prevalence of food insecurity among project participants than non-participant households with higher mean dietary diversity. In addition, the project participants able to provide food for their household for more months compared to their counter parts. The finding of this paper imply importance of creating and strengthening market linkage for improved production and productivity of apple and related highland fruits and thus for improved food security status. To sum up, integrated technical and institutional support as well as scaling up of the best practices is recommended taking into account more farm households in Chencha and other areas with similar agro-ecological potentials so that income from apple and related highland fruits would reduce household food insecurity.

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