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Impacts of Milk Production on Household Welfare: Evidence from Gulele Sub City, Addis Ababa, Ethiopia

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Abstract

Milk production practice is one sub-sector of urban agriculture that contributed to improve the urban food security status in the urban area. The food insecurity crisis matter in the urban area has given much attention at all levels: national, government, community, and even at household levels. The purpose of this paper is to examine the impacts of milk production on households' welfare through food security and nutritional status and the factors that influence the households to engage in this production sector in the Gulele sub-city of Addis Ababa. Thus, its impacts on food insecurity and nutritional status and the factors that influence households to engage in milk production activities have been examined. To do this study, the researcher gathered data at milk producers' households in every 10 weredas of Gulele sub-city. To gather the data from milk producers' households, 250 questionnaire distributions were applied as primary source to generate the data. To analyze, this data propensity score matching, household food insecurity access scales are used and order logistics regression model is used to categorize household food insecurity status. The acquired results from this analysis showed that households who engaged to milk production have a better capacity for asset holding, generated better income (7610.89) than non-producers, and in turn have improved food security status. And the finding also indicated that milk-producer households have better food consumption scores (916.7%) as compared to non-producers. In this paper, the main factors that influence the households to engaged to milk production activities are identified which are lack of employment (40.80%) and low income from another source (37.20%) which are the most influential factor than others in the Gulele sub-city. From different types of milk products, almost all households produce milk and many households produce yogurt than butter and cheese.

***Keywords*:** Milk production, propensity score matching, consumption score, households

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Introduction

In general, urban dairy production methods are mostly located in and around towns or cities and emphases mainly on production, sales, and consumption of fresh milk and other milk-related products without or with little land resources (Azage T. et al., 2013). Dairy is a universal agricultural production: people milk dairy animals in almost every country across the world, and up to one billion people live on dairy farms. It is a vital part of the global food system and it plays a key role in the sustainability of rural areas in particular (IDF, 2013). The dairy farming sub-sector is an essential source of consumption foods for households, and income for farmers to purchase farming materials and other assets. Milk from cows is an essential source of protein that is universally recognized and commonly used up by people around the world wherever cow milk is raised (Sylvester Lu., 2011).

Dairy production sectors are the main contributor to economic development, particularly for developing nations. It contributes to increase household income, creating employment opportunities, as a source of food and nutrition, and a source of foreign exchange (Kassa T. and Dekamo F., 2016). In Ethiopia, Dairy production constitutes an essential part of smallholder mixed farming methods. The country contains the largest cattle number in the African continent and it is one of the largest possible producers of milk and other milk products in Africa (Zelalem Y., Emmanuel G. and Ameha S., 2011). The dairy production sectors have a significant share in the cattle production sector. Smallholders that are engaged in market-oriented dairy farming sectors are merging industries and are becoming a main Providers of milk and other milk-related products to pre-urban and urban areas (Tadele T., Mulugeta T., Yosef D., Abebaw G., Karlien S., 2010).

Among the production systems of the livestock sector, the dairy production sub-sector is a vital issue in this country where milk cattle and milk products are the main source of food as well as a source of income, and dairy production has not yet been properly used and encouraged in Ethiopia; Even though there is large numbers, the dairy subsector production is at a low level in general and as compared with its huge livestock potential, its contribution to the Ethiopia economy is very limited (Sintayehu Y., Fekadu B., Azage T., Berhanu G., 2008).

There are two main types of milk production methods in Ethiopia and these are: profit-oriented production methods which is producing and supply to the market and the other one is subsistence

production methods mainly produced to satisfy the milk requirements of the households (Adebabay K., 2009). In Addis Ababa, dairy products are produced from fresh milk. This fresh milk is also divided into various uses: calf feeding, sale, family consumption, and changed to other processed dairy products (Tefere M., 2003). Hence, this study attempts to examine the impact of milk production on the welfare status of households' food security, nutrition, and the factors that influence joining milk production practices in the Gulele sub-city of Addis Ababa.

Population growth, urbanization, and industrialization are possibly making more demand for milk and other dairy products that brought more shortage of milk and other dairy products in the city. Therefore, the shortage is covered by importing milk and other milk products and that makes the market to be dominated by imported milk products. Ethiopia paid more money to imported milk and dairy products from various countries (FAO/SFE, 2011). The value of imported milk and dairy products increased from 48 billion ET birr in 2005 to 114 billion birrs in 2010 and this shows that the value of imported milk products doubled during five consecutive years. The main imported items are powdered milk and cream (USAID Ethiopia, 2010).

There are milk producers in Addis Ababa and its vicinities. There are issues that require intense assessment in this regard. This is associated with the nature of milk itself. It is a crystal-clear fact that milk has nutritional values on the one hand and generates income for the household on the other hand provided that there is huge demand for milk in Addis Ababa. In urban dairy farming practice, the cash income generating from sale of milk and other dairy products is used to purchase food items from the market for households. An increased income derived from dairy production enables households to buy variety foods that contribute for food security and improve nutritional status for the households (Tefere M., 2003, p 64).

Based on FAO (2013), Sub-Saharan Africa is the worst of all regions in the prevalence of undernourishment and food insecurity. Ethiopia (ranking number 1) is the worst of all other African counties around 33 million people are suffering from chronic undernourishment and food insecurity. This data show that Ethiopia has one of the highest levels of food insecurity in the world, in which more 35% of its total population I chronically undernourished. The reports of the different studies show that acute and chronic food insecurity is prevalent in Ethiopia. The study by UNICEF (2014) indicated that about 10% of the population in Ethiopia is chronically food insecure

and this number increased to more than 15% during frequent drought years. In Ethiopia, 2.7 million people will require emergency food assistance in 2014 and 238,761 children require treatment for severe acute malnutrition in 2014. The study conducted by Girma (2012) indicated that in Addis Ababa, the incidence, depth, and severity of food insecurity were 58%, 20%, and 9.4% respectively (Birara E., 2015).

Therefore, its impact on households is multi-dimensional. Hence, it is quite timely and relevant to assess the extent to which milk production affects the welfare statues of households through food security, nutrition, and the factors that influence to join milk production activities. There are few studies that have been conducted so far on the impact of milk production on food security and the nutritional status of households. Dawit, Biniam, Mahilet and Jan van, (2013) studied the development potential of the dairy value chain, input supply system, and milk collection, processing, and consumption in and around Addis Ababa. Azage T. (2004) studied the proportion of livestock production and gender in Addis Ababa city. USAID (2010) stated the relationship between the level of income and milk and milk product consumption in Addis Ababa. Unfortunately, the impacts of milk production on households' welfare status in the Gulele sub-city are not studied yet. Hence, the study is conducting to fill this research gap by examine the impact of milk production on the welfare status of households' food security, nutrition, and factors that influence joining in milk production practice in the Gulele sub-city of Addis Ababa, Ethiopia.

Literature Review

Urban agriculture (UA) is defined as the production, consumption, and marketing of foods and other animal and plant products in pre-urban and urban areas to supply and enhance household food security, and nutritional level, generate additional income, provide employment opportunities, and contribute to an environmentally sound urban area management (Gundel, 1999 as mention by Tefere M. 2003).

Milk and other milk product are one of the oldest known and most completed animal products used for food and in human history, cows were milked from 9000 B.C. onwards (Tefere M. 2003,). Milk is a liquid consisting of about 90 % of water which means it is a heavy and bulky commodity. Hence, milk requires that high transportation cost and there is a cost limit for the range cover that can be sold. Moreover, milk is kept for only a few days which has a limited time period during

which it must be processed or consumed and transformed into a more stable and longer-keeping form. Milk is highly perishable and also potentially subject to adulteration (Tefere M., 2003).

Milk and milk products are the only natural most important and complete source of food; their nutritional value is incomparable with other food items consumed by human beings (Tefere M. 2003). Milk offers the most crucial nutrients in substantial volumes than any other type of food (Tefere M. 2003). Poverty is a situation in which an individual is not able to afford an adequate standard of living. i.e. not able to buy clothing, food, or shelter (S.N. Chand, 2006).

A dairy production system is a naturally efficient production method that converts huge amounts of roughage; if not perhaps wasted, to milk which is the greatest nutritious food type known to man. Milk production is also a more labor-intensive production method that creates employment opportunities in production, processing, transporting, and marketing to shops. Dairy animals are milk-producing factory that converts nutrients derived from various dietary elements into highly nutritious, marketable, and consumption products (Tefere M., 2003).

Food security is defined as access to all people at all times to the food required for a healthy life and the ability to meet the minimum amount of food consumption that is sufficient for an active healthy life (Tefere M., 2003). 'Food Security' is achieved when it is ensured that "all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life".

Now a days, food security has become one of the hot topics of the world population. How to feed fast increasing global population is coming to be one of the burning discussion points of government officials and academicians (Tefere M., 2003).

Nutrition refers to the appropriate intake of nutritionally adequate food in relation to the body's dietary needs (WHO, 2012). Food and nutrition security is achieved if adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily used and utilized by all individuals at all times to live a healthy and active life.

In several parts of the world, milk and other dairy-related products are extremely valued and play a vital role for households' employment opportunity, income generating, poverty reduction, and healthy nutrition, special for life-time development of children. Milk and other dairy products play

a significant role for healthy human nutrition and physical and mental development of human being throughout their life-time, especially for infants and children. Because of its high source of macro and micro-nutrition, milk and other dairy-related products play a particularly essential role for human nutrition in developing countries where poor people regularly lack of variety diets. In different areas of the world, milk and dairy products have big valued and play an important role both for food security and income generation of households (FAO, 2013).

The dairy industry projects in developing countries often have the direct benefits for the households' health and nutrition, provide employment opportunities and generate income for the milk and other milk products is playing a significant role for Gross Domestic Product (GDP) in general and for employment opportunities, income generation, household nutrition in particular, even though the dairy products has less economic contribution as compared to Ethiopia's milk cows resource (Tadesse M., Fentahun M., Tadesse G., 2017).

Global dairy industries produce around Eight hundred billion liters of dairy products of nutrition, two hundred forty million jobs opportunities, one hundred fifty million farms, and the smallholders can directly generate income for one billion people. The dairy sub-sector makes significant economical contributions to the people both as a big dairy industry in the forms of intra and inter-nations trade relation for milk and dairy-related products, and now a day's global production of milk amount is around to Eight hundred billion liters and plays a significant role to provide and improve the livelihoods for hundreds of millions smallholder milk producers in many of developing countries. Around two hundred forty million people got direct and indirect employment opportunity from the dairy industries (J. P. Hill, 2017).

Most of the national dietary strategies and guidelines suggested that one to three times per day of dairy which is approximately the 500 ml of milk per person/day is necessary. An increasing of dairy consumption based on the recommendation of dietary guidelines helps to save billions of dollars in the country's annual health budget and also helps to maintain healthy body weight; to reduce hypertension, type 2 diabetes, cardiovascular disease rickets and stunting. Milk and dairy products have higher nutritional quality than the proteins in plant food items. Dairy products could be the source of the lowest-cost dietary food items such as riboflavin, calcium, and vitamin B12. It is also a more hydrating liquid than water and other many beverages (J. P. Hill, 2017).

Milk and dairy-related products are recommended to include in the national dietary lists because of its significant contribution to human food needs for the variety of micro and macro nutrients includes carbohydrate, proteins, minerals, and vitamins (J. P. Hill, 2017). Milk and dairy products per capita consumption level is influenced by different factors, mainly economic factors such as: relative prices of the products and income level of the households, cultural and social factors, and demographic factors such as age and urbanization. In most developing countries, economic growth and increasing income are driving forces to increase consumption of dairy products (FAO 2013). In most third-world countries, milk is produced by smallholders, and milk production contributes for the households' livelihoods, food security, and nutrition. Milk provides relatively quick returns for small-scale producers and is an important source of cash income (FAO, 2013).

Ethiopia contains the largest livestock population in Africa with an estimated 49.2 million cattle and cow cattle constitute about 55.48 percent of the total cattle population (USAID, 2010). Out of the total cow cattle animals milking and dairy cows are 16,941,361, and from these 20.1 % are milking cows and 14.24 % are dairy cows. About 83 % of total milk products in Ethiopia obtain from cow cattle and it was estimated that 2.76 billion liters of milk is produced from cow milk annually (USAID, 2010).

In Ethiopia, approximately 3.2 billion liters of milk is produced from ten million of milking cows, and an average of 1.54 liters of milk per cow in a day in one lactation period of 180 days (USAID, 2010). An estimated wastage and calf consumption of milk is about 32 percent of the total milk products; around 85 percent from collected milk is consumed, 7 percent is sold for cash income and 8 percent of milk is processed into other milk products. In Ethiopia, 98 percent of total milk and other milk-related products are produced by Smallholder milk producer farmers and pastoralists (USAID, 2010). Economic prospects for milk production industries development are good both on commercial and smallholder level.

In Ethiopia, dependency on imported milk and other milk-related products has been increasing in the past decade. To fulfill the gaps between the demand and supply of milk and other milk products, the amount of imported dairy products significantly increased partly because of increased food aid from the world food program (WFP), the primarily imported product are milk powder.

The highest number of imported milk products reached 994,657 kg in 2008 and the highest sales of imported milk powder are recorded in the markets of Addis Ababa (USAID, 2010).

The rapid population growth and high expansion rate of urbanization are creating a high demand for milk and other dairy-related products. High potential available land resource is over utilized/ intensively cultivated, and this makes a shortage of food supply for milk cows and bring environmental degradation because of inappropriate husbandry practice by the cattle owner. The low milk production amount, milk gathering methods, processing techniques, value chain approach, and marketing systems are not well developed (USAID, 2010).

The dairy sub-sector faces many problems that persisted for decades. The productivity of the dairy cows is low with an average of milk yield 1.3-1.5 liters per day for average lactation period of 108-210 days. The cross bred cows have the highest level of production an estimated at average of 10 Liters per day. Dairy producers also face high transaction costs because of poor infrastructure. The costs to collect a milk product which is in small amounts spread over a wide area may be high which limits access to improve the inputs, for example, better cows' genetics, and better cow health services.

The feed production and distribution system are not coordinated. High death rates occur for the poor nutrition which makes the cows vulnerable to the disease. There is a lack of information on the technologies because of the limited access to extension services that reduces the ability of the smallholder producers to be competitive. This lack of access to the information spills over to the lack of awareness about the market prices for their milk products. Collectors can exploit this condition. The milk production sub-sector lacks coherent regional and national dairy policies these factors made milk production not become commercialized as in other neighboring countries *(*USAID, 2010).

Research Methodology

This study used a survey method that is applying sampling. Survey design is more useful to this study which uses a questionnaire and production area observation to collect information in the specified area of the study. Both qualitative and quantitative approaches were applied to collect the data for good analysis and understanding of the impacts of milk production on households'

welfare in the Gulele sub-city of Addis Ababa. In this study, descriptive statistics and the econometric analysis method such as logistic regression and Propensity Score Matching were used to examine the main objective of this study. According to Jackson (2009), descriptive research was used to collect information about the current status of households to describe the condition that existed and related with the variables included in the study. The qualitative approach was applied here to identify and describe the perception of the households, to obtain current and relevant information of the households, and to examine the state of the occurrences. Quantitative research was applied to examine the degree of the independent variables that influence the independent variable. The study applied simple random sampling to avoid bias and to ensure that each household had an equal probability of being selected and the purposive sampling technique was applied to select the respondents since the study was conducted to examine the impacts of milk production in the Gulele sub-city. The randomization is effective to create comparative representative units that are basically the same for all the important variables included in this study.

In this study, both secondary and primary sources of data were used. For the reliability of the data, the primary data was gathered by prepare questionnaires and Secondary sources of data were also from authenticated books, publish materials, official statistical sources, and accredited websites. There are ten weredas in the Gulele sub-city and all weredas are included in this study. The sample size is 250 folowing Yamane (1967).

Propensity Score Matching (PSM) is conditional probabilities of the participates that receive the treatment by using their observable characteristics and builds a statistically comparable group between treatment and control units by matching observation for the same value propensity score; PSM was proposed for the first time as a method to reduce the bias of estimation between treatment effect and observational characteristics (Rosenbaum and Rubin, 1983). Here either from the logical or ethical point of view, randomly assigned of treatment is not accepted.

PSM estimates the probability of involvement in treatment by using the observable characteristics and it uses to match milk producers (treated) with non-producers (non-treated) in PSM estimation, the main idea is known by the average food consumption score of the matched control group (Khandker et al., 2010). ATT is estimated by the calculated average difference of food score between matched non-treated and treated households. To match properly the households, the

assumption of the overlap condition assumption should be fulfilled: that means for each of the treated households there exist the non-treated households who have similar observable characteristics except engaged to milk production, in other words, has similar Propensity scores (PS) (Cameron and Trivedi 2005). Indirectly, PSM assumes that the selection of only observed characteristics of the households, so unobserved characteristics of the households do not affect the treatment program. This indicates that the expected food score from the treatment of control and treated households is the same when two households are compared to each other with similar propensity scores (PS) (Khand ker et al., 2010).

The average effect of engagement in milk production to evaluate a household's food score is the emphasis on propensity score matching, for households who are engaged to milk production which is all other things being constant which means observable characteristics both for control group households and the treatment group households.

The impacts of milk production on households' food insecurity status are expressed as follows:

$$E(Y_1\text{-}Y_0/Z, DV=1) = E(Y_1/Z, DV = 1) - E(Y_0/Z, DV = 0) \quad \text{Eq (1)}$$

Where: E (.) is the expected outcome, Y_1 is the participants' food score, and Z is the vector of the observable covariates that contain the household's demographic characteristics under the engagement of milk production, DV is the dummy variable that takes 1 when the household engaged to milk production and 0 for non-engaged households, Y_0 is food score of participants who could not be engaged in milk production. States of nature both for Y0 and Y1 are not observable here (Imbens & Angrist, 1994; Heckman, Ichimura, & Todd, 1997). Because either the households are participants or non-participants, $E(Y_0/Z, DV = 1)$ does not readily exist. Therefore, assumptions were made to generate the $E(Y_0/Z, DV = 1)$, the counterfactuals. The assumption to approximating $E(Y_0/Z, DV = 0)$ is to use the outside of the households not members of milk production. $E(Y_0/Z, DV = 1)$ which is the result of bias that is equal to the difference of $E(Y_0/Z, DV = 1) - E(Y_0/Z, DV = 0)$ (Mayen, Balagtas, & Alexander, 2010). Rubin and Rosenbaum (1983) indicate that propensity score is used to match participants' households to non-participant households. So the bias due to the identified characteristics is removed. The assumption is that food score is the outcome variable of observed covariates. So,

(E($Y_0/Z, DV = 1$) = $E\ (Y_0/p\ (Z), DV = 0)$ = $E\ (\frac{Y^0}{p}(Z),\ where\ P\ (.)$ is a propensity or the likelihood of the joining to the milk production activities based on households' characteristics. This allows an unbiased estimation of an average food score effect of ($E\,(Y_1$-Y_0/Z, DV= 1) of milk production activities (Imbens & Angrist, 1994).

The advantage of PSM estimation methods is that is an experimental way of study (.i e. the above non-experimental approaches) is able to create a control group that has the same observable characteristics as of the experimental group.

Thus, the effect of the experiment can be measured as the mean difference of the two results. In the case of non-experimental methods of studies, this is commonly self-selected which creates biases to treatment units. This means that the experiment and the control group vary with their involvement status but also with the other many characteristics. Including the other resource and observable characteristics biased the result of the treatment group on the mean average effect. The PSM estimation method of parametric specification is relatively important to estimate the average effect program (Tchernis and Millimet, 2009).

Furthermore, a PSM estimator indicates great robustness compared to all parametric specifications of the average causal effect. This paper focuses on the propensity score matching estimation method with the order logistic regression model. An advantage of PSM is that its best estimation method allows having clear separation among different estimation methods. This clear separation helps the researcher to entirely focus on modeling the PSM estimation method. Hence, the HH's observable characteristics (Z) conditional distributions are similar both for treatment households (Producers) and the control (non-producers) group. This conditional distribution helps to have a covariate balance in parametric estimation and to pay attention for an outcome of the average effect.

In the variable definition, Food Consumption Score (FCS): It is an outcome variable that is used to estimate the impacts of milk production on household welfare. FCS is an average score of the households' food security for both milk producers (treated) households and non-milk producers (controls) households. The reason of using this test was to examine both groups and to be standardized. Thus, FCS is applied to measure the food insecurity level of the households. FCS is

a tool to measure or capture diversity, quality, and quantity of the food or it is based on the weighted score of food frequency, dietary diversity, and nutritional significance of the food groups that are consumed (WFP 2009 and Vatilla et al., 2013). The data is gathered within the last seven (7) days of HH ate frequency for particular food items such as Rice, Cereals, Milk, Meat, poultry, eggs, fish, potato, vegetable, Sugar, fruits, and oil (WFP 2011). FCS is calculated by multiplying the frequency of the foods consumed within the last 7 days with each weight of the food group. The weight for each food group is determined by the WFP based on the nutrition density of food groups (WFP, 2011).

Table 1

Weights for Each Food Group

Food item	Food group	Weight
Rice	Cereals and tubers	2
Wheat/other cereals		2
Potato(includes sweet potato)		2
Beans/Pulses/Nuts	Pulses	3
Milk or Milk products	Milk	4
Meat	Fish and meat	4
Poultry		4
Eggs		4
Seafood and fish(Dried/fresh)		4
Vegetable(Dark vegetable/leafy)	Vegetable	1
Sugar/honey	Sugar	0.5
Fruits	Fruits	1
Oil	Oil	0.5

Source: World Food Program Technical Guidance 2011

The total weight of each food item is 32 and the sum of each food score is used to determine household FCS. FCS has 112 maximum values that would be attained if the HH ate all food groups daily during the last seven days. Then the total FCS scores are compared with pre-established the following thresholds: The total score from 0-28: poor food consumption; the total score from 28.5-42: Borderline food consumption, and the total score from > 42 Acceptable food consumption

Milk producers' households: is the treatment variable that is assumed to have impacts on the dependent variable which is the food security status of the households. Participation is a dummy

variable that takes the value 1 if the households participated in milk production and 0 if the households do not participate in milk production activities.

Hechman et al (1997) stated that there is no general rule as to which variables are incorporated as the covariates of the households. However, the economic theory and the empirical studies are used as the guideline to identify which explanatory variables (observable variables) that affect both the participants and outcome interest (Bryson et al., 2002). Based on this idea, different explanatory variables are included based on the available literature as the main determinants to engaged in milk production activities to control the observed differences between the producers (treatment group) and non-producers (control groups).

In this paper, Household Food Insecurity Assess Scale (HFIAS) is applied to examine the households' food insecurity level within the past four weeks recall period. HFIAS is an adaptation method used to estimate the prevalence of food insecurity of households within the past four weeks. This approach assumes of the experience of household food access (insecurity) which causes the predictable response and reactions that could be collected and calculated through a survey method and summarized in the scale. HFIAS captures both physiological and sufficiency factors (Vatilla et al., 2012).

HFIAS was developed by Coates et al (2007) and focuses on the 3 dimensions of HH food access that are: anxiety about not being able to obtain sufficient food, inability to secure the adequate quality of food, and the experience of insufficient quantity of food intake. These 3 dimensions contain 9 questions that are used to calculate the total score that ranges from 0-27 and the higher score shows the greater food insecurity of the HH.

HFIAS involves two related questions; one is an occurrence of the questions that includes 9 occurrences of the questions (i.e. Q1=Worry about food, Q2= Unable to eat preferred foods, 3Q= Eat just a few kinds of foods, 4Q=Eat foods they really do not want eat, 5Q=Eat a smaller meal, 6Q=Eat fewer meals in a day, 7Q=No food of any kind in the household, 8Q=Go to sleep hungry, 9Q=Go a whole day and night without eating) which ask the households whether the specific conditions that related with an experience of the food insecurity always occurred during the past four weeks. Each of the severity questions has the frequency of occurrence questions that asks how

often the conditions happened within the past four weeks. Each of the occurrence questions involves the stem or time frame for the recall period, the body of questions or specific attitude or behavior and the two response choices.i.e. (1=yes and 0=no). There is also another skip code following each no-response question choice. This code directed the researcher to skip the associated frequency of the occurrence of the follow-up question whenever the answer of the respondent is "no" for the occurrence question.

In HFIAS method, first asked the respondent occurrence questions that are whether the condition for the asked questions happened or not within the past one month (yes or no response). If the answer of the households for the occurrence question is yes, HFIAS has three response choices. These three answer options are used to know the extent and severity of the frequencies (i.e. 1= rarely, 2= sometimes, and 3= often) of food insecurity level of the households within the past one month (four weeks). Based on the extent or severity of the frequency occurrence, the HFIAS food insecurity indicator method ordered the households by four food insecurity or access categories. These are: 1= food secure, 2= mildly food secured, 3= moderately food secured and 4= severely in secured. The Four levels of food insecurity analyze should be made sequentially.

Results and Discussion

Logistic Regression for holding the permanent asset

Table 2 shows that milk production is a statistically significant variable at 1% level of significance for asset holding and it has strong positive association with asset holding. When the HHs engaged to milk production, the holding of the asset is increased by: house increase by 224%, car by 219%, bed by 259%, TV by 246%, 223%, and 350%. This indicated that the milk producer households have better asset holding than non-producer households.

Table 2

Logistic Regression for Holding the Permanent Asset

Asset	House	Car	Bed	TV	Sofa	Fridge
Age	.9293998* .(3585533)	.5515752 * (.2865799)	.0967252 (.4264382)	.3839066 (.4222206)	.8715526* (.3072926)	1.033271* (.3305366)
Marital Status	.2163854 (.3175921)	-.2167453 (.2358854)	1.626456* (.5295741)	1.162259* (.415526)	.2938732 (.2288218)	.3538677 (.2668526)
Education	.7725688* (.3471318)	.1953997 (.2526683)	.4693541 (.4458187)	.5536954 (.3923899)	.2308405 (.2389308)	-.159159 (.2855376)
Place of origin	2.896847* (1.095626)	-1.789421* (.487168)	1.231935* (.6144344)	.7974373 (.5619564)	.2745482 (.4218194)	1.254368* (.5097852)
Family Size	.4903714 (.5400079)	.2871346 (.4219694)	.8991321 (.9035994)	.9308492 (.815825)	.4446125 (.475786)	.1532023* (.5322282)
Milk Pron.	2.236593* (.6653617)	2.188949* (.4919075)	2.59098* (.5774174)	2.467759* (.5026089)	2.233787* (.3640269)	3.500412* (.4420433)

Sources: HHs survey data, 2018
Numbers in brackets are standard errors
At level of significance 1%=*, 5%=** and 10%=***

The table indicated the association between food security households and their covariates**.** Based on this information, there are positive association between the foods secured status category of the households and their characteristics: sex, age, and education level are statistically significant at a 5% level of significance that is when the age of the household is increased by 1 unit (year), the food security status of the households are increased by 7.7% (0.0779532**)** and when the education level of the households increased by 1, the food secured status of the household improved by 22.2% (0.2220284). There is also a strong positive association between the engagements of milk production activities and the food-secured status category of the households at 1% level of significance. In the case of milk production, when the households engaged to milk production business practices, their food security status is improved by 36.7% **(**0.3666876 Coeff.). Marital status has a positive association with the engagement of milk production, however, the relationship is not statistically significant since the z-statistics p-value is greater than 10 levels of significance. Even if the Family size is not a statistical significance variable for food secured status category, it

has a negative relationship with the food-secured status category of the households. This means that when the family size of the HH increases, food secured level of the HH decrease and food insecurity is increase.

Table 3

Marginal Effects of Order Logistic Regression for Food Insecurity Status

Food insecurity status(fss)	**Marginal effect (food secure)**	**Marginal effect (mildly food secure)**	**Marginal effect (moderately food secure)**	**Marginal effect (Severely food secure)**
Sex	.0736542***	.0063069	-.0175814	-.0623796***
	(.0442337)	(.004305)	(.0112539)	(.0379611)
Age	.0779532**	.0066751***	-.0186076***	-.0660206**
	(.0364554)	(0037371)	(.0101025)	(.0309448)
Marital status	.0167231	.001432	-.0039919	-.0141633
	(.0278834)	(.0024285)	(.0066888)	(.0236778)
Education level	.2220284**	.0190121***	-.0529988***	-.1880415***
	(.1135121)	(.0109815)	(.0304241)	(.0963093)
Max. education	-.2037662***	-.0174483***	.0486395***	.1725748***
	(.1090063)	(0104298)	(.029245)	(.0921274)
Place of origin	-.019269	-.00165	.0045996	.0163194
	(.0540387)	(.0046458)	(.0129101)	(.0458118)
Family size	-.020954	-.0017943	.0050018	.0177465
	(.0576907)	(.004963)	(.0138274)	(.0488683)
Engage to milk pro.	.3666876*	.0313991*	-.0875293**	-.3105571*
	(.0479973)	(.0094943)	(.0282835)	(.0352622)

Sources: my own households survey data 2018
Numbers in brackets are standard errors
At level of significance 1%=*, 5%=** and 10%=***

Table 3 shows the association between mildly food insecure households and their covariates**.** Based on this information, age and education level are statistically significant variables since their

z-statistics p-values 0.074, and 0.083 respectively are less than 10%, level of significance and they have a positive association with mildly food insecure status category of the households. When the age and the education level of the household are increased by 1-unit (year), the mild food insecure (access) status of the households is improved by 0.67% (0066751**)** and 1.9% (0190121) respectively. The engagement of milk production is a statistically significant variable since z-statistics p-value (0.001) is less than a 1% level of significance. It has a strong positive association with mild food insecure status category of the households. In this case, when the households engaged to milk production, their mildly food insecure status is enhanced by 3.1% **(**0313991.). There is a positive relation between mildly food insecure status and the marital status of the household however marital status is not a statistically significance variable since the z-statistics p-value (0.555) is greater than10 level of significance. Even if the Family size is not statistically significance variable for the mild food insecure status of the household, it has a negative relationship with the households under the mild food insecure status category. That is when if the family size is increased by 1 unit, the HH food insecurity increased.

Table 3 also shows the relationship between moderately food insecure households and their covariates**.** Based on the above results, age and education of the HH are statistically significance variables since their z-statistics p-values 0.065, 0.082 are less than 10%, significance respectively and they have a negative relationship with the moderately food insecure status of the households. As age and the education level of the household are increased by 1 unit (year/level), the moderately food insecure (access) status of the households are decreased by -1.8% (-.0186076 **)** and -5.3% (-.0529988) respectively. The engagement of milk production is a statistically significant variable since its z-statistics p-value (0.002) is less than a 5% level of significance.

It has a negative association with the moderately food insecure status of the households. In this case, when the households engaged to milk production, their moderately food insecure status is decreased by -8.7% **(**-.0875293). In this case as the age and education level of the HH increased and the HH is engaged to milk production their moderately food insecurity level is decreased i.e. their food security level is improved and insecurity is decreased. There is a negative relation between moderately food insecure status and marital status of the household however marital status is not statistically significance variable since z-statistics p-value (0.551) is greater than the 10 level

of significance. Even if the Family size is not statistically significance variable for moderately food insecure status of the household, it has a positive relationship with the households under moderately food insecure status category. The means as the family size is increased, food insecurity also increase.

The Table also describes the association of the severely food insecure status of households and their covariates**.** Based on the description of Table4.17, age, and education of the HH are statistically significance variables because their z-statistics p-values 0.033, and 0.051 are less than 5% and 10%, significance level respectively and they have a negative relationship with the severely foods insecure status of the HHs. If the age and education level of the household are increased by 1-unit (year), the severely food insecure (access) status of the households are decreased by -6.6% (-.0660206**)** and -18.8% (-.1880415) respectively. In this case as the age and education level of the HH increased their severely food insecurity level is decreased i.e. their food secure level is improved and insecurity is decreased.

The engagement to milk production is a statistically significant variable since its z-statistics p-value (0.000) is zero level of significance. It has a strong negative relationship with severely food insecure status of the households. Thus, when the households engaged to milk production, their severely food insecure status is decreased by -31% **(**-.3105571). Here, as the HH is engaged to milk production practice, their severely food insecurity level is decreased i.e. their food secure level is highly enhanced and food insecurity is decreased. The marital status of the HH has a negative association with the severely food insecure status off HH however it is not statistically significance variable since the z-statistics p-value (0.550) is greater than10% level of significance. The Family size of the HH has a positive relation with the severely food insecure status off HH though it is not statistically significance since the z-statistics p-value (0.716) is greater than10% level of significance.

PSM of the FCS of the HH with the engagement to milk production

The treatment effect on treated

The PS, P(x) is the predicted probability aimed at each HHs that she or he obtains the treatment. Using two groups that have similar characteristics except for the treatment mean of the consumption score or (conscore) the outcome variable of the treatment groups are compared with the control groups to identify/ observed a treatment effect on the treated. This observed effect on the treated is called an average treatment effect on the treated HHs (ATT). Then ATT should be well-defined as a mean of treatment effect for the treated HHs who is within a predefined common support area.

Table 4

Average Treatment Effect on The Treated Household Consumption Score

Variable	Sample	Treated	Control	Difference	S.E	T-stat
Conscore	Unmatched	38.686747	29.1666667	9.52008032	.8040837	11.84
	ATT	38.7393939	29.5715803	9.16781368	1.05098391	8.72

Sources: my own households survey data, 2018

As we have seen from the above table results, the matching property or condition is satisfied. To estimate ATT that measures the impacts of engagement to milk production given the assigned impact indicator, matching observation based on their propensity score is analyzed. In this case, the analysis on the average treatment effect on treated HHs indicated that milk producer HHs have a better consumption score than non-producers by 916.7% and it is also statistically significant at T-stat is 8.72 level.

Defining Common Support Region (CSR)

In Table 5, the common support region is presented. In this case, when trying to evaluate the PSM, it is expected that an individual HH may be found not matched within the treatment units (.i.e. there is no HHs within the treatment unit who has the same PS with that single HH). This is called a common support problem. In the below result, HHs are not on the common support area and

discarded from the treated group. Each treated unit is matched with only the control group whose propensity scores are available within the common support area.

Table 5

Common Support Area

Assignment	Off support	On support	Total
Untreated	0	84	84
Treated	1	165	166
Total	1	249	250

Source: My own survey data 2018

The below graph shows the identified region of common support area for PSM determination. On the other hand, it indicates each treated group is matched with only a control group their PS is available in the predefined CSR of the PSM. It increases the quality of matched since it omitted off support distribution by discarding off support samples. Though, the use of CSR results in loss of a substantial part of the treated drop.

The upper parts of the graph show the distribution of propensity score for treated households (milk producer households) and the bottom part of the graph also shows the distribution propensity score of non-producer households (control households). In this graph, treated off-support is represented by green color shows and it is excluded from treatment HHs since they are discarded from CSR. For these discarded HHs, the effect of the program could not be estimated. In the below graph, there is a good overlap of propensity score of density distribution for producers (treated) and non-producers (control) and indicated that the common support condition is fulfilled.

Figure 1

CSR Condition

Source: my own survey data, 2018

The test of balanced propensity score with the covariance

The main purpose of this matching is to have a balance between the treated group and the control group with regard to their observable characteristics (Bryson et al, 2002). After the matching estimator is chosen, the propensity score balancing and the covariance could be checked to balance the relevant variable distribution between both groups.

Table 6

Balance Between Covariant and Propensity Score

Variable	Unmatched matched	Mean		%reduct		t-test		V(T)/ V(C)
		Treated	Control	%bias	|bias|	t	p>|t|	
Age	U	1.5904	1.9762	-42.3		-3.34	0.001	0.50*
	M	1.5879	1.5642	2.6	93.9	0.28	0.782	0.87
Marital status	U	1.7831	1.9643	-19.6		-1.47	0.142	0.94
	M	1.7818	1.8244	-4.6	76.5	-0.41	0.684	0.85
Education	U	1.512	1.369	20.9		1.53	0.128	1.31
	M	1.5152	1.4888	3.9	81.6	0.33	0.738	1.08
Family size	U	1.3253	1.3452	-3.9		-0.29	0.769	1.02
	M	1.3152	1.2842	6.1	-55.2	0.58	0.560	1.09
Place of origin	U	.54217	.38095	32.6		2.43	0.016	-
	M	.53939	.56667	5-.5	83.1	-0.50	0.620	-
Other Urban agri	U	.40964	.57143	-32.6		-2.44	0.015	-
	M	.41212	.42886	-3.4	89.7	-0.31	0.759	-

Source: Stata Result

The different testing techniques like the reduction in mean standardized bias between matched HHs and unmatched HHs, the quality of means by using t-test and chi2 tests are used to joint significance variables used to confirm the matching power of estimation methods. The 5th column on the above table indicated standardized bias before and after the matched. The 6th column of the above table also shows the total bias reductions obtained by the applied matching procedure. Before matching, the standardized differences among covariates lies between the 3.9% and 42.3% range in the absolute value. After matching, the standardized differences among the covariates lie within the range of 2.6 and 6.1% in the absolute value term. So, after matching, the standardized difference is below 20% critical level. Thus, this matching process creates a high degree of covariance matching within treatment HHs and control HHs which are applied to use for the estimation procedure. Furthermore, the T- value for all covariate's variable is less than 2 and they have statistically insignificant mean difference within treated and control HHs after matching but 2 covariates: Other Urban agriculture and place of origin were significant before the matching process.

Test for join significance

As showed the test results in above Table 7, the psedo-R2 test value (0.003) is very low. This low value psedo-R2 result and insignificant likelihood ratio tests can support the hypothesis both for groups to have a similar distribution in all covariates after the matching process. Based on Rubin and Rosenbaum (1985), both standardized biases before and after the matching and the mean bias need to be less than e 5%.

Table 7

Test for Join Significance

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.063	20.22	0.003	25.3	26.8	60.6*	0.69	25
Matched	0.003	1.29	0.972	4.3	4.2	12.5	1.11	0

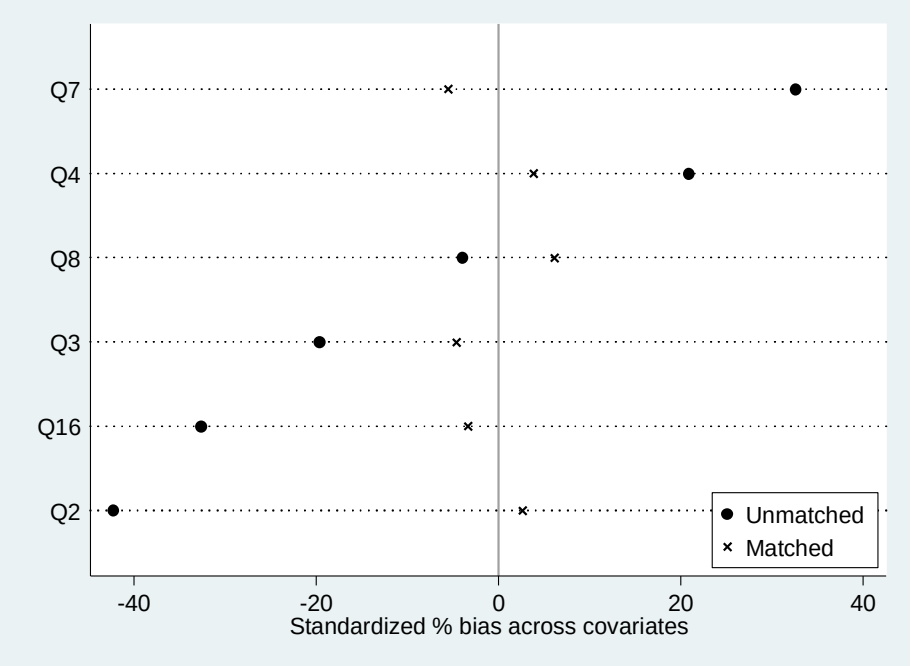
Sources: Stata Result

The result of this analysis implies that the mean differences within two groups are statistically insignificant as indicated in the table 7 mean bias is 4.3. This mean bias result shows that matching method is able to balance the HHs characteristics in treated and the matched comparison units. All test results depicted proposed that ATT are estimated based on collected data set and matching algorism chosen by the researcher.

Below graph shows the kernel estimation density distribution of the HHs covariates with respect to the estimated propensity score of total income as they engaged to milk production. Before the matching, the PS for the treated are concentrated on linear straight line and they were significant. However, after matching the PS is concentrated on the vertical line and they are not a significant variable. So, the producers HHs have better total income than non-producers.

Figure 2

Kernel Density Distributions of The Propensity Score



Sources: Stata Result

Regression for a total income of the HHs with the engagement of MP

Table 8

Regression for a Total Income of The Household with the Engagement of MP

Milk Pron.	Coef.	Std. Err.	z	P>|z|
Age	-1.371729	.3190613	-4.30	0.000
Marital Status	.2233798	.1976823	1.13	0.258
Education	-.1435765	.2421466	-0.59	0.553
Place of origin	.7006755	.3728064	1.88	0.060
Family Size	.8486193	.4381807	1.94	0.053
Total Income	.0002214	.0000418	5.30	0.000

Sources: Stata Result

At level of significance 1%=*, 5%=** and 10%=***

As indicated on the above table.15, the total income of the HHs is a statistically significant variable for the engagement of MP since the z-statistics p-value (0.000) is statistically significant at a 1% level of significance and it has a positive relationship with the engagement of MP. That is as the HHs engaged to MP their total income is increased by 0.022%.

The treatment effect on treated for HHs total income

The PS, P(x) is the predicted probability aimed at each HHs that she or he obtains the treatment. Using two groups that have similar characteristics except for the treatment mean of the total income (the outcome variable) of the treatment groups are compared with the control groups to identify/ observed a treatment effect on the treated. This observed effect on the treated is called an average treatment effect on the treated HHs (ATT). Then ATT should be well-defined as a mean of treatment effect for the treated HHs who is within a predefined common support area.

Table 9

The Treatment Effect on Treated for Household Total Income

Variable	Sample	Treated	Control	Difference	S. E	T-stat
Total income	Unmatched	14149.6988	7276.2381	6873.4607	1437.50207	4.78
	ATT	14223.3333	6612.43522	7610.89811	1168.66711	6.51

Sources: Stata Result

As we have seen from the above table results, the matching property or condition is satisfied. To estimate ATT that measures the impacts of engagement to milk production given the assigned impact indicator, matching observation based on their propensity score is analyzed. In this case, the analysis on the average treatment effect on treated HHs indicated that milk producer HHs have higher total income than non-producers by 7610.89 amount of income and it is also statistically significant at T-stat is 6.5 levels.

Defining Common Support Region (CSR)

In Table 10 the common support region is presented. In this case, when trying to evaluate the PSM, it is expected that an individual HH may be found not matched within the treatment units (. i.e. there is no HHs within the treatment unit who has the same PS with that single HH). This is called the common support problem. In the below result, 1 HHs are not on the common support area and discarded from the treated groups. Each treated unit is matched with only the control group whose propensity scores available within the common support area.

Table 10

Common Support Area for HH Total Income

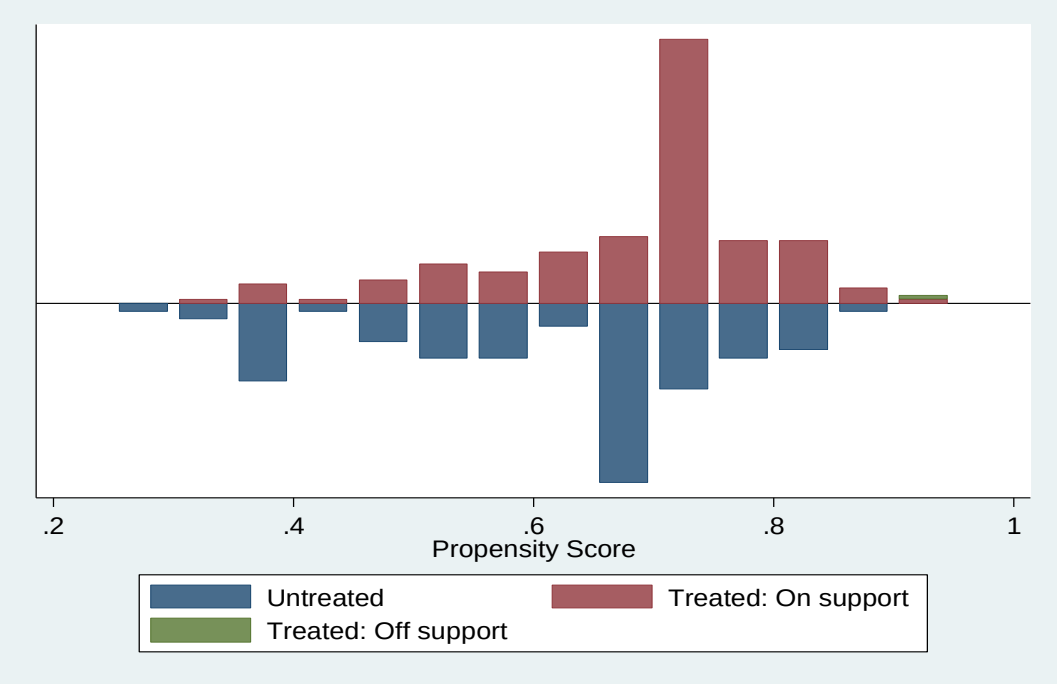
Assignment	Off support	On support	Total
Untreated	0	84	84
Treated	1	165	166
Total	1	249	250

Sources: Stata Result

Figure three shows that identified region of common support area for PSM determination. On the other hand, it indicates each treated group is matched with only the control group their PS is available in the predefined CSR of the PSM. It increases the quality of matched since it omitted off support distribution by discarding off support samples. Though, the use of CSR results in loss of a substantial part of the treated drop.

Figure 3

Common Support Areas for Household Total Income

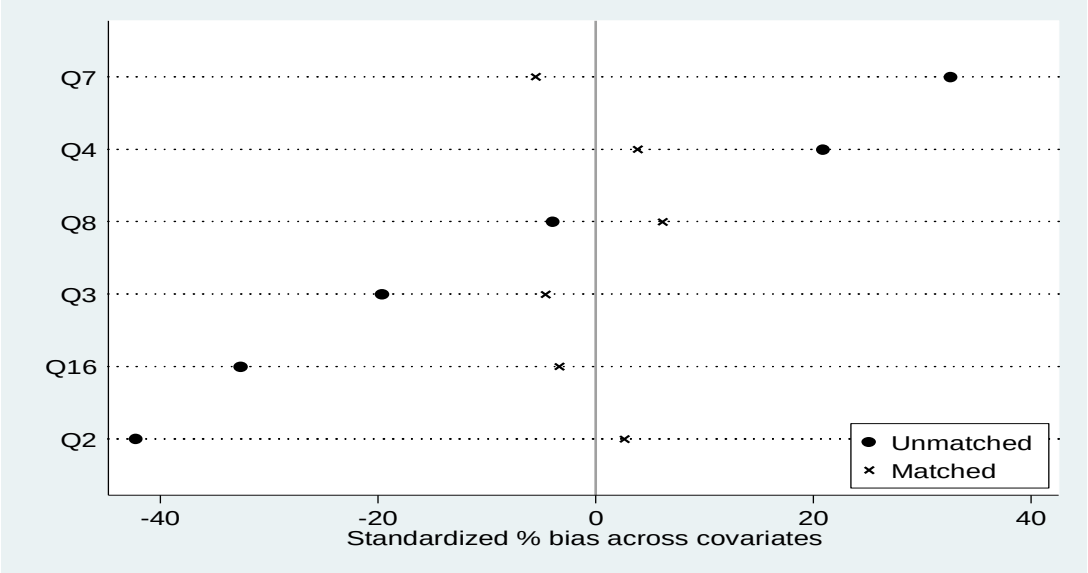


Sources: Stata Result

In figure 3, the upper parts of the graph show the distribution of propensity score for treated households (milk producer households) and the bottom part of the graph also shows the distribution propensity score of non-producer households (control households). In this graph, treated off support is represented by green color shows and it is excluded from treatment HHs since they are discarded from CSR. For these discarded HHs, the effect of the program could not be estimated. In the below graph, there is a good overlap of propensity score of density distribution for producers (treated) and non-producers (control) and indicated that the common support condition is fulfilled.

Figure 4

Kernel Density Distributions of The Propensity Score for Total Income



Sources: Stata Result

The above graph shows the kernel estimation density distribution of the HHs covariates with respect to the estimated propensity score of total income as they engaged to the milk production. Before the matching, the PS for the treated are concentrated on linear straight line and they were significant. However, after matching the PS is concentrated on the vertical line and they are not a significant variable. So, the producer household have better total income than non-producers.

Conclusion and Policy Implications

Of the total milk producer households, 68% (85 households) are females and 64% (81 households) are males, so female households are relatively more engaged to milk production and this study shows that female respondents HHs became unemployed for long time after completed their education. When we saw the marital status of the respondents, 76 (71.03%) are single. This indicated that the young part of the population is more engaged to milk production activities this is because there is an increased urban population and urban unemployment. When we saw the place of origin for milk producers, 90(73.77%) respondents of milk producers are in Addis Ababa and

the rest 76 (59.38%) of producers are out of Addis this is because of high numbers of unemployment in city and availability of milk sheds which are built by the government for dairy industries.

The mean age of the household head for milk producers 32.86 is less than the mean age of non-milk producers 36.65 this indicates that the younger part of the population is mostly engaged in milk production business activities. Lack of employment from an increasing urban younger population is the main reason that influences the younger and unemployed population to join in milk production.

Initial capital is a very necessary condition for milk production activities because this business activity requires enough initial capital to fulfill different materials such as refrigerators, electric power, pick-up car, and cash for working area rent. Milk and other dairy products are by nature very perishable because of this reason refrigerators and electric power are mandatory from the beginning of the production period. The highest distribution of milk producer households are found in Wereda 10, 2, and 8 respectively why because in this Wereda government had prepared many milk production areas or milk sheds.

Because of the perishable nature of milk and dairy products, refrigerators is mandatory for milk production business owners that is why from 166 milk producers 154 (81.91%) of producers have refrigerators. From the total asset holding: 87.88% of house owner, 86.67% car owners, 71.75% bed owners, 72.48% TV holders, 78.03% sofa owners, and 81.91% are Refrigerator owners are milk producers. This indicates that milk-producer households have a better capacity to hold permanent assets than non-producer households. The results of this study show that the engagement of households to milk production decreases their food insecurity level at all categories of insecurity status. In other words, when the households engaged to milk production practice their well-being: food security and nutritional status has been improved.

This paper found that milk producer's households have better food access (>70%0 in all access indicator variables than non-producers (<30%), this is because milk production creates job opportunities and helps the households to generate enough amount of income for their household members to fulfill the food access requirement of the family members.

All above describe figures indicated that households who engaged in milk production activities have better dietary diversity level (> 80%) and the dietary diversity level of non-producers have less diversity (<20%). This dietary diversity difference indicated that milk producers have a better dietary diversity level than non-producers. This is because the income earns from milk and other dairy products helps the households to fulfill and consume different food items. Milk and dairy products are most completed food types than other food items, so households who engaged in milk production have better access for milk and other dairy products than non-producers. This shows that milk producers have improved nutritional status as compared to non-producers.

The result of this study showed that on average milk Producers have (>80%) big consumption score than non-producers (<20%) within 7 days recall period of consumption that is because milk production has fast income return business activities and it has high demand from the society. Better consumption score of milk producers' households within 7 days indicated that these milk producer households are food secured and have an improved nutritional status for their family members than non-milk producer households. Milk producer HHs has higher total income than non-producers by 7610.89 amount of income Unemployment is the highest factors (40.80%) that influences the households to engage in milk production business activities to generate income for their households. Low income from other jobs is the second highest (37.20%), the reason for Households to join in milk production activities. From other low-income earning jobs such as employed in government organizations shifted to participate in milk production activities.

Availability of milk cow and production area, good government policies and strategies for dairy industries and high demand for milk products are the third, fourth, and fifth factors for households to participate in milk production activities.

Based on this result, some of the policy implications are suggested for the government and other concern bodies to consider during the preparation of policy and strategies for milk production, employment opportunities, food security and nutritional status, particularly in Addis Ababa and generally in Ethiopia. Age is the relevant variable to engage in milk production activities, the concerned urban agriculture office gives special attention for milk production to create job for the young unemployed labor force. Initial capital is also a relevant variable to start the milk production

business activities to fulfill refrigerator and initial costs so preparing credit supply from the concerned office is a motivation to the households to engage to milk production.

Milk production sub is a relevant variable that plays an important role for food security and improves the nutritional status of the households in the sub-city. The relevant (indicator) variables for household food security and improve nutritional status such as HFIAS, Dietary Diversity and Food Consumption Score have a positive relationship (impact) with milk producer households. The result of this paper shows that milk producers have better: food access, dietary diversity and consumption score than non-producers. So, to secure food requirements and have improved nutritional status for the households, the concern bodies or office support /subsidize the milk production sector by supply milk cows, availability of credit, prepare production area, give advice and training for producers. Milk production creates employment opportunities for the unemployed labor force and generates better income than other sources in the sub-city. As we have seen the total income impacts of milk production, Milk producers' households have a higher amount of total of income than non-producers. Lack of employment (40.80%) and income from other business activities (37.20%) households are the relevant variable to influence the households to engage in milk production.

References

Adebabay K. (2009), "Characteristics of Milk Production Systems, Marketing and On-Farm Evaluation of the Effect of Supplementary on Milk Yield and Milk Composition of Cows" Bahir Dar University.

Azage T., Berhanu G., Dirk H., Berhanu B. and Yoseph M. (2013), ''Smallholder dairy production and marketing systems in Ethiopia", International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia.

Azage T. (2004), "Urban Livestock Production and Gender" in Addis Ababa, Ethiopia; International Livestock Research Institute (ILRI), Addis Ababa.

Birara E. (2015), State of Household Food Insecurity in Ethiopia: Review Journal, Bahir Dar University College of Agriculture and Environmental Sciences.

Daniel M., Jennifer C., Bapu V. (2013), "How do different indicators of household food security compare? Empirical evidence from tigray, Feinstein International Center.

S.N. Chand (2006). Dictionary of Economics. Atlantic Publishers and Distributors.

FAO (2013), ''Milk and Dairy products in human nutrition'', Food and Agriculture Organization of United Nations.

Girma, G. (2012). Determinants of Food Insecurity Among Households in Addis Ababa City, Ethiopia, Aksum University, Shire Campus Investment potentials of Ethiopia, Addis Ababa, 10(2): 159-173.

Heckman, J., J. Smith, and N. Clements, (1997). "Making The Most Out Of Programme Evaluations and Social Experiments: Accounting For Heterogeneity in Programme Impacts", Review of Economic Studies, Vol 64, 487-535

IDF (2013), Economic Importance of dairying.

Imbens, Guido W., and Joshua D. Angrist1(994). "Identification and Estimation of Local Average Treatment Effects." Econometrica 62 (2):467-475. doi: 10.2307/2951620

Jennifer C., Anne S., Paula B. (2007), "Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guid Version 3.

J. P. Hill (2017), "Assessing the overall impact of the dairy sector", Fonterra Cooperative Group, New Zealand

Kassa T. Dekamo F. (2016), "Dairy Production and Marketing Systems in Kaffa and Sheka Zones, Southern Ethiopia" Southern Agricultural Research Institute, Bonga Research Center.

Khandker, S.R., Koolwal, G.B., Samad, H.A. (2010). Handbook on Impact Evaluation: Quantitative Methods and Practices. The World Bank, Washington, DC.

Millimet, D., and R. Tchernis, (2009), "On the Specification of Propensity Scores, With Applications to the Analysis of Trade Policies,"Journal of Business and Economic Statistics, 397-415.

S.L. Jackson (2009). Research methods and statistics: a critical thinking approach (3rd edition). Belmont, CA: Wadsworth.

Sintayyehu Y.,Fikadu B., Azage T. and Berhanu G.(2008) \"Dairy production, processing, and marketing system of Shashemene-Dilla area" International Livestock Research Institution, Addis Ababa.

Sylvester L. (2011), Impacts of dairy cattle farming on household socio-economic status**,** Sokoine University of Agriculture.

Tadele T., Mulugeta T., Yosef D., Abebaw G.,Karlien Supréand S.(2010), "Milk Production and Marketing system in Jimma Town, " , Jimma University, College of Agriculture and Veterinary Medicine, Department of Microbiology and Veterinary Public Health.

Tadesse M., Fentahun M. and Tadesse G. (2017)," Dairy Farming and its Economics Importance in Ethiopia: Review", University of Gondar Veterinary Medicine.

Tefere M. (2003), Urban Agriculture: The Case of Small-Scale Urban Dairy Farming in selected areas of Addis Ababa

UNICEF (2014). Ethiopia humanitarian situation report.
http://www.unicef.org/ethiopia/UNICEF_Ethiopia_SitRep_3_May_and_June_2014_.pdf.

USAID (2010), "Dairy value chain, End market, and Food Security". The next Stage Dairy Development for Ethiopia.

Vaitla, B., Tesfay, G., Rounseville,M., Maxwell, D. (2012). Resilience and Livelihoods Change in Tigray, Ethiopia. Somerville, MA: Feinstein International Center, Tufts University

Yamane, Taro (1967). Statistics, An Introductory Analysis, 2nd Ed., New York: Harper and Row

Zelalem Y., Emmannuelle G., Ameha S.(2011), "Review of the Ethiopian Dairy Sector", Edited by Rudolf Fombad, FAO Sub Regional Office for Eastern Africa (FAO/SFE).