Milk Supply Shortfall in Jima Town-An Option for Investment

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Abstract: This study was initiated with the objective of examining the existing production, consumption and marketing of milk, identify problems of milk supply shortfall and estimate the benefits that an investor can get from milk investment in Jima town. Descriptive statistics and chain ratio method were used to analyze the data. The result indicated that the existing annual supply of 1.3 million liter from 200 producers couldn't satisfy the huge demand from the large number of consumers. Shortage of feed, dairy cow disease, absence of improved production technologies and shortage of capital were the major constraints of dairy production in the town. Determination of TEPU and revenue indicated that a maximum per unit revenue of 175,000 Birr/10,294 USD can be achieved at an optimal price 7 Birr or 0.41 USD/liter and 100% of the consuming households are capable to subscribe to the supply at this optimal price. The result of demand projection also indicated that the current aggregate demand of 8.5 million liters of milk continues to grow and is expected to reach 9.4 million liter by 2016.Therefore, in addition to addressing the above constraints, it is imperative to invite private investors in the production of milk so as to satisfy this huge demand and enjoy the possible benefit from the investment.

Key words: Milk · Milk production · Milk marketing · Milk consumption · Supply shortfall · Market structure · Market conduct

INTRODUCTION

Background and Justification: The vital role that dairying could play in maintaining food self sufficiency is well acknowledged at both national and international level. Like many other countries, dairy production is largely undertaken in the different rural, urban and peri-urban areas of Ethiopia and is serving as a source of subsistence through household nutrition, supplementary income and generating employment opportunity. However the dairy industry in the country is constrained by several technical and economic factors [1] and the national milk production remains among the lowest in the world, even by African standards [2]

The national milk production remains among the lowest in the world, even by African standard. The total milk production is estimated at about 1.2 million tons per annum and increases at a rate of 1.2 % for milk produced from indigenous stock and 3.5 % for milk produced from the improved stock [3]. The per capita consumption of milk in Ethiopia is about 16 kg per person per year, which is much lower than the African and world per capita averages of 27 kg/year and 100 kg/year, respectively [4]. Hence, about 6 million tones of additional milk are required per annum to feed the population as per the world standard [4].This indicates the existence of a wide gap between potential demands of the growing population of Ethiopia. In order to meet the demand of the growing population of Ethiopia, milk production has to grow at least at a rate of 4% per annum [5]. The lag in domestic supply of milk relative to demand in the tropics has resulted from several factors and Ethiopia is no exception. On the demand side, rapid increase in person income; on the animal side, low animal productivity, inappropriate technologies, inadequate research and extension support, poor infrastructure and unfavorable external conditions have contributed to the poor performance of the livestock sector in general and of the dairy subsector in particular [6].

Given the considerable potential for smallholder income and employment generation from high-value dairy products [7], the development of the dairy sector in Ethiopia can contribute significantly to poverty alleviation and nutrition in the country. Dairy production is a

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biologically efficient system that converts large quantities of roughage, the most abundant feed in the tropics, to milk, the most nutritious food to man [8].

Jimma is also one of the area in which there is a significant amount of dairy production by a number of producers in and around the vicinity of Jimma town. However, due to the multiphase constraints of production and marketing, there is a supply shortfall of milk by more than 50% in the city and its neighboring areas. As a result, a large amount of processed and powdered milk and its products are transported from Addis Ababa to Jima to meet the excess demand in the area [9].

Therefore, by considering the role of dairying in the economy in general and the significance of dairy products in the Ethiopian diet in particular, it is rational to design strategies that are helpful to increase the production of these products in the city. However such an endeavor could only be facilitated with the knowledge of the existing production and marketing system of the products in the area. In this regard, this study could help to provide background information on the different production and marketing pitfalls that are considered to be hindrance to improve the system. The result of this study can also serve to invite/motivate private business institution to participate in dairy production and satisfy the excess demand through the provision of information on the future demand of milk and the corresponding benefit to be obtained by employing demand forecasting techniques. This study can also be used to provide back ground information for other economic studies on dairy and livestock products.

Objectives of the Study:

- To examine the existing production / consumption and supply shortfall of milk in Jima
- To identify problems related with milk supply shortfall in the town
- To estimate the possible benefits that an interested private investor could get from investment on milk production

Methodology: This study was conducted from September, 2010 to June 2011 in the town of Jima, Ethiopia

Description of the Study Area: Jima is a town in southwestern Ethiopia, 220 miles (353 km) by road southwest of Addis Ababa, the capital of Ethiopia. It lies at an elevation of 5,740 feet (1,750 meters) in a forested region known for its coffee plantations. Jima serves as the commercial centre for Jima zone and southwest region, handling coffee and other products. Potassium and sodium nitrates are mined to the northeast. Based on the 2007 Census conducted by the Central Statistics Authority of Ethiopia (CSA), this town has a total population of 120,960, of whom 60,824 are men and 60,136 women. With an area of 50.52 square kilometers, Jimma has a population density of 2,394.30.

The Data: Both primary and secondary type of data were used

Method of Data Collection: Informal survey was first be undertaken using PRA tools such as group discussion, key informant interviews and observation to contact some of the urban producers and consumers and collect background information that are useful for the subsequent survey by using semi structured questionnaire.

A formal household survey was also conducted by the selection of 50 producers and 100 consumers. Purposive sampling has been employed to select the producers in the town. For selecting the consumers, the city was mapped into four sub-cities namely, Merkato, Ferenj Arada, Qochi and Awetu area. A random sampling was then used to select the consuming households and a structured questionnaire was used as a tool for collecting the required information from each of the respondents.

In addition, relevant secondary informations were also collected from the zonal office of agriculture and other concerned bodies.

Method of Data Analysis: Descriptive statistics were employed to analyze the production and marketing system. Calculation of Total Expenditure per Unit and maximum revenue were made to estimate the possible benefit that an interested private investor could get from milk investment and chain ratio method was used to forecast the demand.

RESULT AND DISCUSSION

Sociodemographic Characteristic of Households: The surveyed household producers and Consumers of milk in Jima Town have different sociodemograhic characteristics and is summarized by the following table.

As can be seen in Table 1, the mean age of producers' household head is 53 and the average number of family members within the age of 15 and 65 is greater

Table 1: Sociodemographic characteristics of households

Characteristics	Producers		Consumers	
	N	Mean	N	Mean
Age of the household head	47	53.16	92	37
Average family size	50	5	100	6
No of children with age ≤15	50	2	100	2
No. of adults with age between 15 and 65	48	3	100	4
No. of elders with age ≥65	50	-	100	-
	N	%	N	%
Sex of the household head	50		100	
-Male		74.4		51.1
-Female		25.6		48.9
Religions	50		100	
-Muslims		10.3		44.4
-orthodox		76.9		33.3
-Protestant		12.8		22.2
Educational status	50		100	
-illiterate		2.6		-
-Read and write		15.4		-
-1-6 years of formal education		10.3		5
-7-8 years of formal education		2.6		10
-9-12 years of formal education		12.8		20
-> 12 years of formal education		56.4		65

Source: - Survey Result, 2011

Table 2: Average Milk yield /day/ cow from each breed type (in liters)

Characteristics	N	At the time of good yield (in liter)	At the time of poor yield (in liter)	Average
-local milking pregnant cow	50	2	0.65	1.53
-local non- pregnant milking cow	50	3	0.93	2.5
-cross bred milking pregnant cow	37	8.95	3.68	6.4
-non-pregnant cross breed milking cow	33	12.4	5.4	8.75
pure breed milking pregnant cow	28	12.24	4.78	8.73
-non- pregnant pure breed milking cow	25	15.92	5.84	11.4

Source: - Survey Result, 2011

Table 3: Impact of dairy cow disease on milk yield

Breed type	Average milk yield / cow / day without the disease	Average milk yield /cow / day with the disease	Yield gap
Local	2.4 liter	0.65	1.75
Cross breed	8.75 liter	2.27	6.48
Pure breed	11.4 liter	1.71	9.69

Source: - Survey Result, 2011

than those with the other age groups. This therefore clearly indicates that milk production by produces is not challenged by the prevalence of unproductive people (with age < 15 and >65) whose labor can't be effectively utilized in the production process. A relatively similar number of family members in the specified age group of the consuming households as compared with the other age groups could indicate the possibility of high level of consumption of milk in the households. Furthermore, the larger average age of producers as compared with that of the consumers can be an indicator that dairy production in the town is practiced as a means for supplementing the income of the household heads who are approaching to the pension age category (≥60 years). The larger proportion of producers (76.9%) being orthodox indicates that the natives (muslins) are largely involved in the non-agricultural business in the town. The larger proportion of consumers (44.4%) being muslim can be associated with the more frequent fasting periods of the orthodox which prohibits milk consumption and the regular feeding habits of muslims which incorporates milk as a sole or part of the inputs for preparing cultural foods. The fact that the majority (56.4%) of the producers is with twelve and more years of formal education also depicts that there is a great possibility of easy adoption of milk production technologies and practices by the producers. The larger

proportion of the consuming households (65%) with the same level of education with that of the majority of the producers shows that the knowledge and lifestyle change of people as a result of more urbanization resulted in a change of their dietary pattern from cereals to more nutritious animal products like milk. Even if the majority of the households (74.4%) engaged in milk production are male headed, there is also a relatively better involvement of Female headed households (25.6%) in the urban milk production which in fact calls for more attention to make the proportion equal.

Milk Production and Marketing

Milk Production: The level of milk production in Jimma town was found to be related with the type of breeds owned by the producers. Therefore, in order to have a clear picture about milk production in the town, it is better to see the level of milk production by breed type and is summarized by the following table.

As can be seen in Table 2, the average milk yield / day / cow from both pregnant (8.73 liter) and non-pregnant (11.4 liter) of pure breeds are larger as compared with the other two breed types. A similar level of milk yield was identified by a study in Somali region in Ethiopia. According to this study, milk yield/day/cow was found to be 18 and 3 liter in wet and dry season respectively [10]. However, this figure is very small as compared with the milk yield in the North West Ethiopian Highlands. Accordingly, 43 and 14.1 liter/day/cow are produced by the crossbreeds of urban and peri urban producers respectively in those areas of the country [11]. This yield difference can be attributed to the difference in the genetic makeup of the breeds, feed and dairy cow management. But of all these, the problem of feed was boldly reported to be the major hindrance for improving the productivity of dairy cows. The majority of the producers use grazing as the main and concentrates as a supplementary feed for their dairy cows. But these feed sources are costy and are not adequately available to the producers in the town. On the other hand, the milk yield/cow/day of Jima was found to be larger as compared with that of Meisso wereda of West Hararghe Zone. The study made in Meisso wereda indicated that the average cow milk yield/head/day in the wet and dry season was estimated at 3.26±0.07 and 1.63±0.04 liter respectively [12].

Other than feed and breed type, milk yield in Jima town is also largely influenced by diseases. The most common types of dairy cow diseases in the town are liverfluke, anthrax and foot and mouth disease.

The impacts of these diseases on milk yield also vary from breed to breed and are summarized by the following table.

As can be seen in Table 3, there is a significant decline in milk yield as a result of dairy cow diseases. The degree of impact of these diseases on milk yield was more pronounced for pure breeds with a yield gap of 9.69 liter /cow/ day. Therefore, the above result indicates that even if pure breeds are more productive, their ability to provide more milk under risky conditions like diseases is very low as compared with the local and crossbreeds under Jimma condition. Therefore, in addition to the veterinary service currently provided by Jimma University and the zonal office of Agriculture, this condition still calls for a more coordinated effort to efficiently and effectively provide the service for the complete avoidance/minimization of these major dairy cow diseases in the town.

Milk Marketing

Market Structure and Conduct: The larger proportion of milk produced by the urban dairy producers is used for sale. According to the result of the study, 71% of the producing households reported that they produce milk for sale only where as 29 % reported that they use milk for both sale and consumption. The investigation of the market structure indicated that the average volume of milk that can be provided to the market by a single producer is 18.21 liter / day. This figure could reach to 12 and 25 liter at the time of poor and good harvest respectively. A relatively different result was obtained by the study on milk production and market chain analysis in Dollo Ado and Dollo Bay of Afder and Liben Zone of Somali region in Ethiopia. According to the result of this study, 2 and 12 liter/household/day is supplied to the market in the dry and wet season respectively [10]. This difference can be attributed to the prevalence of better climate and access to resources in Jima than in the above mentioned districts of the Somali Region. The larger proportion of the producers reported that they sell their milk directly to consumers (38.2%) and to Hotels /Cafeterias (33.1 %) without any value addition, However, there are a significant number of producers organized in cooperative and supply their milk to their cooperatives. Therefore, the role of intermediaries to deliver the product to the end-users is minimal in this market chain. A relatively similar result was reported by a study on milk market in the North West highlands of Ethiopia in 2009. Accordingly, informal dairy marketing which involves direct delivery of milk by producers to consumers in the immediate neighborhood and sales to itinerant traders, milk cooperatives or

individuals in the nearby areas was the sole marketing system in the area [11]. The same type of milk sales outlets were also identified on milk marketing in Meisso wereda in 2008.According to the result of this investigation, two types of outlets namely, traditional milk association and individual sellers were identified as the main market outlets for milk in the wereda[12]

The market conduct analysis showed that the price setting mechanism in the producers' market is largely dictated by the existing demand and supply. There are no collusions and illegal act of intermediaries to influence the price setting. According to the result of the investigation, the current average milk selling price by the producers ranges between 6.44 and 8.32 Birr/ liter (0.38 and 0.49 USD) at the time of low and high price respectively making the average to be 7.38 Birr or 0.43 USD/ liter. This makes the average gross sale/month of a single producer to be 3985.2 Birr or 234.42 USD. An increase in the price trend was also observed in the last few years due to the high rate of increment of demand over the supply. However a different level of producers' price was reported in the northwest highlands of Ethiopia. Accordingly, the producers' price was found to be 2.4 and 2 Birr/liter or 0.14 and 0.12 USD/liter in the urban and peri-urban areas respectively. Similar lower prices were also observed in Dollo Ado and Dollo Bay of Afder and Liben Zone of Somali Region in Ethiopia. The study made in these areas indicated that the average producers' milk prices are 1.5br and 2.25Birr/liter or 0.09 and 0.13 USD/litre in wet and dry season respectively [10]. These small producers' price in the two areas emanated from the low level of demand and purchasing power of consumers. So the larger producers' price in Jima can be taken as an incentive for further investment in the sector and satisfy the excess demand in the town.

Transportation is the major marketing cost incurred by the producers. According to the result obtained, a single producer incurs a transportation cost which ranges between 90 and 300 Birr (5.29-17.65 USD) in a month depending on his / her distance from the target market.

Problems Related with Milk Market Supply in Jima Town: Addressing the exiting constraints of milk production is one of the strategies for minimizing the existing milk supply shortfall in the town. For this purpose, the result of this study pointed out the following major bottlenecks of milk production by the smallholder urban dairy producers in the town.

Shortage of Feed: The majority of dairy producers in the town use grazing as the main and concentrates as a supplementary feed for their dairy cows. But these sources of feed are costy and are not available in adequate amount for usage.

Disease: The common dairy cow diseases namely anthrax,liverfluke and foot and mouth disease were found to have a significant impact on milk yield

Domination of Local Breeds in the Dairy Cow Population: The productivity of cross and pure breeds is by far better than those of the local breeds. However the number of these improved breeds is few and most of the breeds on the hands of urban smallholders are local.

Absence of Improved Dairy Production Technology and Technical Advices: The activity of the research center and some NGOs in the town are largely related with the production of crops such as coffee and cereals. Therefore technology generation and dissemination activities in the area of livestock sector in general and dairy sub-sector in particular have been given less attention in the last few years

Shortage of Resource and Capital: Even if there are some efforts by some producers to improve and expand production, their endeavor is challenged by shortage of capital. There are no credit providing institutions which support the dairy producers in the town. The private and government banks in the town prefer to give credit for coffee growers than to the dairy producers since the officials of these institutions have a perception on dairy as one of the immature, unreliable and non-promising business.

Milk Consumption
Level of Consumption and Consumers' Purchase Practice: In the current marketing system of milk in Jimma milk shed, the amount of demand is by far greater than the level of supply. An integrated effort is therefore required to minimize this discrepancy in demand and supply. But in order to facilitate this endeavor, the existing level of consumption and consumers' purchase practice have to be understood in advance and are summarized by the following tables.

According to the result in Table 7, the average monthly consumption of milk by a household is estimated to be 28.32 liter with a purchase price of 7.87 Birr or 0.46 USD /liter. This therefore makes the monthly milk expenditure of a household to be 222.88 Birr (13.11 USD) and this expenditure accounts for 13.85% of the average

Table: 4: Average level of milk consumption & consumers purchase practice

Characteristics	N	Mean
-Average amount of milk consumption in a month (in liter)	100	28.32
-Average purchase price per liter (in Birr)	100	7.87
	N	%
-Source of milk purchase	100	
Urban producers organized in cooperation		28.89
Neighboring small dairy producers		51.1
Hotels / Cafeterias		20
-Reason for the specified source of supply	100	
Low price		11
Nearness		53.3
Better quality		28.9
Better scale / quantity		6.8
Preferred source of supply	100	
Dairy cooperative in the towns		53.3
Neighboring small produces		42.2
Former dairy development enterprise		4.4
	N	%
-Reason for preference	100	
Nearness		31.1
Better quality		68.9

Source:- Survey result , 2011

Table 5: Frequency distribution and total expenditure per unit of households for milk

Interval unit for expenditure on milk (Birr /liter)	Sampled % of households spending within the interval	Total No. of households in Jimma in each interval	MEPU (intervals Midpoint)	TEPU (in br)
6 < X < 8	42.2	10,550	7	73,850
8 < X < 10	46.6	11,600	9	104,400
10 < X	2.2	2,750	10	27,500
				205,750 (Total)

Source: - Calculated from Survey Result, 2011 Note; - 1 dollar=17 birr

Table 6: Estimation of maximum Revenue

% of Households at each MEPU	% of households capable to consume milk at the specified MEPU	Total no of households capable to consume milk at each MEPU	MEPU (birr /liter)	Expected Revenue (in birr)
42.2	100	25,000	7	175,000
46.6	57.8	14,450	9	130,000
11.1	11.2	2,800	10	28,000

Source: - Calculated from Survey Result, 2011 Note; - 1 dollar =17 birr

Table 7: Milk demand projection

Year	Total Population	Total No. of households	Average annual consumption / HH (in liter)	Total Demand (in liter)
2011	150,000	25,000	340	8,500,000
2012	153,000	25,500	340	8,670,000
2013	156.06	26,010	340	8,843,800
2014	159,181	26,530	340	9,020,200
2015	162,346	27,061	340	9,200,740
2016	165,612	27,602	340	9,384,680

Source:- Calculated from survey result 2011

monthly income (1,609 Birr or 94.65 USD) of the consuming households. However, the amount of consumers' purchase per day per household in Dollo Ado and Dollo Bay of Afder and Liben Zone of Somali region in Ethiopia is only 1 liter [10].

Neighboring small dairy producers and dairy cooperatives are currently serving as sources of milk for 51.1 % and 28.9 % of the sampled consuming households respectively while the remaining (20 %) households use hotels / cafeteria as their sources. However 53.3 and 42.2 % of the consuming households prefer dairy cooperatives and neighboring small producers to be their sources of milk supply respectively with reasons related to quality and nearness.

Estimation of Total Expenditure per Unit (TEPU) and Revenue: In addition to identifying the determinants of milk supply shortfall in the town for planning & and intervention , attracting of private investment by showing the possible benefit from the sector also plays a far from residual role in satisfying the existing demand gap of milk in the town. For this purpose, information obtained from the consuming households can better be used for estimating the total expenditure per unit and revenue if it is expressed using frequency distribution. Total expenditure per unit is an indicator of the total economic benefit of a business / project providing milk supply since it shows the consumers ability as well as willingness to spend on milk. The total expenditure per unit can be calculated by using the following general formula.

$$\text{TEPU (Total expenditure per unit)} = \sum_{j=1}^{m} \left(MEPU \frac{n}{N} \right)$$

(Total No. of household)

Where

MEPUs = Mean expenditure per unit of interval j where j is 1 through m. (m is the largest range of EPU, in our case, m = 10

n = Number of households spending MEPU;

N = Total No of sample households considered for the study

More specifically, the total expenditure per unit of the consumers for acquiring milk can be calculated by using the following two steps

- To get the estimated number of households in each expenditure per unit interval, we multiply the % of the households in each interval by the total number of households.

- Assuming the mid- point of each expenditure per unit (EPU) interval as the mean EPU, we multiply the number of households by this MEPU to estimate the total expenditure per unit.

The overall calculation of the total expenditure per unit can be summarized by the following table

According to the result in Table 7, if a project / business providing milk supply is implemented, the total payment that it can receive from a liter of milk consumption by the overall households in Jimma town is estimated to be 205,750 birr (12,103 USD). However the survey result indicated that the average milk consumption of a household was 340 liter / annum and this makes the total receipt of the project to be 69,955,000 birr (4,115,000 USD) per annum or 5,829,583.3 birr (342,916.67 USD) per month.

The information on the above table can also be used to roughly estimate the maximum revenue that can be obtained from supplying milk to households at a specified price and can be illustrated by the following table.

According to the result in the above table, a maximum per unit revenue of 175,000birr (10,294 USD) from milk supply can be achieved at an optimal price of 7 birr /liter (0.41 USD/liter) and 100 % the consuming households are capable to subscribe to the supply at the specified optimal price.

Therefore the above findings on TEPU and maximum revenue can be used as an input / incentive for private investment on milk supply in Jimma town and contribute for the overall effort to minimize the existing supply shortfall in the town.

Demand Projection: In addition to determining TEPU, maximum revenue and optimal price for the existing demand, projection of demand / consumption is also essential for justifying the need of investment in milk production and attracts the private sector to participate in the supply of milk in Jimma town. Accordingly, a chain ratio method was used to forecast demand and the projection was made on the basis of population growth rate of 2% per annum in Jimma town, family size of 6 people per household, average annual per household consumption of 340 liter of milk and current population number of 150,000. The overall result of milk demand projection for the coming five years can be summarized by the following table.

As can be seen in the above table, the total demand of milk in the town during 2011 was estimated to be 8,500,000 liter. This figure continues to grow and is expected to reach 9,384,680 liter by 2016.

Therefore, one can conclude that this huge growing amount of demand can't solely be satisfied by a few small holder milk suppliers in the town who are largely constrained with shortage of capital and technology for their production. Rather, Government and private investors should strive to involve in the production and supply of milk in the town and enjoy the possible large benefit from this investment.

CONCLUSION

The results of the study revealed that the average milk yield/cow/day from the local, cross and pure breeds were 2.5, 8.75 and 11.4 liter respectively. An average amount of 18.21 liter/day is provided for sale by a single producer and an average amount of 28.32 liter/month is consumed by a single household in the town. However the existing annual supply of 1.3 million liter from 200 producers couldn't satisfy the huge demand from the large number of consumers. Shortage of feed, dairy cow disease, absence of improved dairy production technologies and shortage of capital were the major constraining factors of dairy production in the town. The result of the determination of TEPU and revenue indicated that a maximum per unit revenue of 175,000 Birr (10,294 USD) can be achieved at an optimal price of 7 Birr or 0.41 USD/liter and 100% of the consuming households are capable to subscribe to the supply at the specified optimal price. The result of demand projection also indicated that the current aggregate demand of 8.5 million liters of milk continues to grow and is expected to reach 9.4 million liter by 2016.Therefore, in addition to addressing the multiphase constraints of the existing smallholder dairy producers, private investors should be invited in the production and supply of milk so as to satisfy this huge demand and enjoy the possible benefit from the investment.

Recommendation: In order to satisfy the huge amount of milk demand which by far exceeds from the existing supply, the following two major areas of intervention should be designed and implemented.

- Increasing the productivity of the existing dairy cows; - The productivity of dairy cows in Jima town are mainly challenged by the problem of feed and disease.
- Feed; - Grazing and concentrates are the major source of feed used by urban dairy producers in the town. But these two sources are expensive and are not adequately available for the producers. So the nearby research center, University and office of agriculture should help the producers in producing cheap and nutritious dairy cow feed such as Alfa- alfa by their own capacity
- Disease; - Dairy cow disease such as liverfluke, anthrax and foot and mouth disease are significantly affecting the production of milk in the town. So in addition to the existing effort by the office of Agriculture and the nearby University, a coordinated effort which include the NGOs and Research centers should be in place so as to at least minimize the threat on the supply.
- The nearby research center and university in collaboration with other NGOs and the Zonal office of Agriculture should give more attention to the development of dairy production technologies and provision of technical advices to increase the production and productivity
- Credit services should be provided in adequate amount so as to support the effort of producers to expand their dairy business.

Inviting of Private Investors in the Sector: Currently, the huge demand of milk in Jima town is largely met by the existing small urban dairy producers in the town who are constrained by the shortage of capital and technology. However satisfying of this huge demand can't solely be achieved in a realistic and sustainable way by improving the productivity of the existing smallholders in the town. Rather, a private investment that uses an improved capital intensive technology should be invited to the sector to minimize the existing demand gap.

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