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ECONOMICS OF DAIRY FARMING IN TURKEY

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Abstract

In this study dairy farming activities in Turkey are employed to prove that small-scale agricultural production is disappearing rapidly due to costly investment and mechanization needs. For that purpose the cost structure and the investment needs in starting a dairy farm are analyzed. The results show that the capital requirements of building a dairy farm with optimal capacity are hard to reach for small farmers unless a system of marketing and production agricultural cooperatives and/or institutions are organized.

Keywords: *Dairy farming in Turkey, cost structure of a dairy farm, small farming*

1. Introduction

Farming is considered to be a whole environment of reciprocal relations and dependency, re-production and protection of social values (Bernstein, 2010). Within this concept, peasant family farming is the most widespread model in agricultural world. However, especially after 1980s a strong structural change is observed in the global agriculture, with a transformation of a production to a more market oriented system (Bor 2013). In this way, the agriculture has become industrialized, specialized and integrated. In many countries the production passes from the family based small scale farming to the industrial type agricultural establishments (McMichael, 2006; Hendrickson et. all 2001), and these establishments are bound to each other by production and distribution chains. This type of industrialized and capitalist agriculture defines intensive (large scale) farming that can be interpreted as costly investments, equipment and increasing farm size.

The food crisis in 2007-2008has been increasing the food security concerns and highlighted the strategic importance of food. It is obvious that not only the industrial model of farming itself is a unique solution to the increase in food demand. Small and middle-scale producers have also a major impact on food production. Furthermore, the majority of workers especially in the developing countries do not enter into formal wage employment, but engaged in unpaid family work or in self-employment such as in agriculture. Since the large share of the working population have been engaged in agriculture, protecting the existence of smallholders is vital in means of protecting environment, decreasing poverty and mostly for sustainable production of food.

But, as governments open their agricultural markets and reduce their role within the sector, the private sector enjoys opportunities for consolidation and concentration. Private firms directly or indirectly control the production process by manipulating the standards of production, production quantity and quality. With the inefficiency of cooperatives, farmers loss sovereignty over production. The only choice for them to survive is either to increase their size or leave the agriculture; but increasing the size is not a viable solution in many sub agricultural sectors. The economies of scale provide advantages but financing the suitable size creates important entry barriers.

In this study it is stated that small-scale agricultural production is not sustainable in the era of intensive farming. In order to support this statement, Turkish Dairy Sector is chosen to be the case study in this field. There are two important reasons of choosing the Dairy Sector; first of all, the sector receives a heavy investment in the last decade, and secondly, there is a positive price asymmetry in the farm-retail price transmission in the milk market implying significant market power. That is, the retail price tends to adjust more quickly to the increase in input price than to decrease (Bor et. all. 2014).

The paper is organized as follows. Section 2 provides an overview of the dairy sector in Turkey. Data on dairy investment is provided in Section 3. In section 4, the economics of a dairy farm is discussed. Finally, concluding remarks are given in Section 5.

2. Overview of the Turkish Dairy Sector

Dairy products have an important role in the Turkish diet. Consumption level of liquid milk is very low; the most common form of milk consumption is yoghurt, followed by white cheese (feta type) and ayran, a liquid salted milk drink. The annual per capita consumption of milk amounts to 37.3 kg of milk equivalence that is low compared to other developed countries. In 2012 in EU-27 it is 288.3 kg and in North America it is 274 kg of milk equivalence (FAO 2014).

In 2010, as a policy, the Turkish Agricultural Bank opened long-term credits with zero interest rates for dairy and feeding cow breeders in order to support the industry (USDA 2014; Resmi Gazete 2010). Dairy-processing industry received a considerable investment, and the number of modern milk processing plants has increased. Many investments on the dairy processing industry become equipped with high technology, and the result was indeed an increase in the production of milk, altering the price of raw milk. Also, the industry observed new labels entering the market, with most of the retail chains had producing their own brands and starting to compete with the others in the market.

Parallel to this increase in the number of processing firms, the amount of milk produced and processed has also increased. In this respect, there is eight dairy processing or affiliated companies among the top 500 Turkish companies[1]. Leading companies in this sector are primarily organized under two institutions; SETBİR (Union of Dairy, Beef, Food Industrialists and Producers of Turkey)and ASÜD (Association of Packed Milk and Milk Products Manufacturers). Cooperatives such as the Central Union for Animal Cooperatives, are supporting the producers. Cooperatives and the cooperative unions (this cooperatives and cooperative unions are mostly work regionally and have weak structures that make them inefficient) offer support for milk collection, provision of cooling tanks, milk quality control, and the sale of milk to other processors.

Table 1. Total Raw Milk Production (Million tons)

Years	2005	2006	2007	2008	2009	2010	2011	2012	2013
Production	11,10	12,00	12,20	12,20	12,50	13,60	15,05	17.40	18.22

Source: Turkish Statistical Institute (2014)

Turkey is among the 10 largest milk producers in the world (FAO 2014). The total annual milk production exceeds 18 billion liters in 2013 (Table 1). In 2013 of the total production, the collected milk by the industry is around 8 million tons and the registered milk production is 46.66 % of the total production in 2012 (SIS 2014). It is forecasted that 3 billion liters are used by farm families for their own consumption or processing, 1 billion liters are handled by street vendors, over 2 billion liters are processed by *mandira*s (small, simple processing

establishments) and well over 3.5 billion liters are processed by medium and large-sized dairies (Dellal & Berkum, 2009).

Table 2. Cattle Milk Production (Million liters)

	2011		2012		2013	
Milk Production	15.0	100 %	17.4	100%	18.2	100%
Milk From Cattle	13.8	91,67 %	16.0	91.95%	16.7	91.75

Source: Turkish Statistical Institute (2014)

The production of raw milk is mainly from cows and accounts for an average of 91-92 % of the total production (Table 2). These numbers show that the number of dairy cows is unquestionably important for the milk production. There is a stable increase in the number of milking cows seen since 2010 (Table 3) that can be explained as the result of appropriate policies for dairy investments.

Table 3. Total Number of Milking Animals in Turkey (1,000 Head)

	Cattle	Sheep	Goat	Buffalo	Total
2005	3,998	10,166	2,427	38	16,629
2006	4,187	10,245	2,421	36	16,890
2007	4,229	10,110	2,264	30	16,633
2008	4,080	9,642	1,998	33	15,751
2009	4,133	9,408	1,831	32	15,404
2010	4,384	10,584	2,583	36	17,586
2011	4,761	11,561	3,033	40	19,395
2012	5,431	13,068	3,502	38	22,040
2013	5,607	14,287	3,943	52	23,889

Source: Turkish Statistical Institute (2014)

Since 2010 there is also a change in the breed stock. A stable shift to the culture breeds from domestic breeds is observed (Table 4). Low milk productivity domestic breeds are replaced by high productivity culture breeds and the average milk productivity is increased from 1,654 liters in 2000 to 2,970 liters in 2013.

Table 4. Cattle Numbers According to the Breeds (1,000 Head)

	Culture Breed		Cross Breed		Domestic Breed		Total
Years	Head	%	Head	%	Head	%	Head
2009	3,723	34.70	4,406	41.10	2,594	24.20	10,723
2010	4,198	36.90	4,707	41.40	2,464	21.70	11,369
2011	4,837	39.05	5,120	41.34	2,429	19.61	12,386
2012	5,679	40.80	5,776	41.50	2,459	17.70	13,914
2013	5,954	41.30	6,112	42.40	2,348	16.30	14,415

Source: Turkish Statistical Institute (2014)

A movement to larger farms in the dairy farm structures is observed in Turkey since 2011 but still the farm scales are smaller than the developed countries (Table 5). We can divide the dairy operations into four groups; small (fewer than 50 cows), medium (50-199 cows), large (200-499 cows), and industrial scale (500 or more cows). The micro scale farms (< 20

cows) are common in Turkey with 91.5 % of the total farms in 2013. Medium, large and industrial scale farms (50-199 heads) are still 1.55 %. Such farms, which frequently combine a very small dairy enterprise with other commodity enterprises or with off-farm work, are disappearing rapidly.

Table 5. Dairy Establishment Structures in Turkey

Number of Dairy Establishments						
	2011		2012		2013	
Capacity	Units	%	Units	%	Units	%
1-5 Heads	1,047,778	60.05	811,778	58.75	701,907	56.11
6-9 Heads	363,683	20.84	293,399	21.22	252,776	20.21
10-19 Heads	234,714	13.45	198,117	14.34	190,009	15.18
20-49 Heads	74,920	4.30	60,570	4.38	85,910	6.87
50-99 Heads	17,496	1.00	14,228	1.02	16,204	1.30
100-199 Heads	4,500	0.26	2,798	0.20	3,141	0.25
200-499 Heads	1,765	0.10	1,190	0.09	783	0.06
500 > Heads	1,744,859	100	1,382,080	100	217	0.02
Total					1,250,947	100

Source: Turkish Statistical Institute (2014)

3. Investing to a Dairy Farm[2]

The production costs of milk are high in Turkey and raw-milk producers work with low-profit margins due to costs mostly on feed and other services. The producer revenue primarily consists of the sales of the milk, and secondarily, the sales of the animal (most dairy farms sell the male calves born by their cows and heifers), naturally making the cost of production undoubtedly important[3].

In assessing dairy production costs, it is important to distinguish explicit and implicit costs. The explicit costs are, purchase feed expenses, hired labor and the implicit ones are home grown feed, capital equipment and structures (McDonald et. al 2007). These costs are aggregated as operating costs and ownership costs (Short 2004) or variable costs and fixed costs (Dairy Co2013). Operating costs consist of feed, veterinary and medicine, bedding and litter, marketing, custom services, fuel, lube and electricity, repairs, hired labor and interest on operating capital. Ownership costs that consist of capital recovery, housing facilities, milking facilities, feed storage facilities, manure handling facilities, machinery and breeding (Short 2004). Variable costs are feed and forage, herd health and replacement costs. Fixed costs are labor, power and machinery, depreciation, property and finance and overheads (Dairy Co 2013).

Above costs are for the established dairy farms. While starting to a new investment, the creation of a business plan and the cost structure are essentially important. Here, one can assume that the new investment can be divided into two stages. These are the start-up stage and pre-production stage. The start-up stage defines the initial investment needed for the farm and the pre-production stage defines the period that the new heifers start to calve and begin milking. In order to understand the cost of stating dairy farm, the estimated initial investment (start-up costs) and the pre-production costs should be analyzed separately.

Startup costs are the expenses incurred during the process of creating a new business. Business startup costs are typically considered as capital expenditures and especially in the beginning, startup costs require careful planning.

There are three main parts of the estimated initial investment;

- Cost of Purchase of Dairy Cows,
- Cost of the Construction,
- Cost of the Farm machinery.

As mentioned previously, the revenue depends on the milking levels but the milk productivity of the herd is related to the expenditures done for the herd. A good feeding, health surveillance and etc. determine the level of production of milk by the dairy cow. Therefore, there are two main parts of the production costs;

- Employee Costs
- Feeding and Health/Surveillance Costs.

3.1 Estimated Initial Investment

3.1.1 Cost of Purchase of Dairy Cows

Dairy cows average milking period is 305 days per year (365 days). Production levels peak at around 60 to 150 days after calving then declines steadily afterwards. At about 305 days after calving, the cow is dried off, and milking ceases[4]. The production costs should be calculated according to milking periods because most of the costs decline in the dry period.

The optimal economic size of a herd in Turkey is 240 milking and 60 dry, total 300 dairy cows with young stocks (male and female) totally equal to 750 animals[5]. The revenue primarily comes from the milk, secondarily from the sales of animals (mostly male calves and heifers). The female calves enter to the herd when they are big enough for insemination (18-24 months of age) and the reformed cows sold out.

Revenue from the sales of milk depends on the milk productivity of the herd. Different breeds produce within a range of around 4,000 to 11,000 liters of milk per lactation[6]. Here we assume that a cow gives milk for 305 days and for 60 days stay dry. Also one can assume that the average for a single dairy cow is 20-30 liters of milk per day for Simmental or Holstein breeds (disease free) that are common in the Turkish dairy cow stock.

There are two alternatives for the investor in starting the business. Either he can choose to begin with the full capacity (300 dairy cows of 240 cows average of 365 days milking) or to begin with 200 dairy cows and then reach to full capacity in 2 years with the new entrants to the herd from the own calves (the probability of getting a female calve is 50 % and 5 % of possible abortions and deaths should be considered). Here we assume that the herd size is enough big to get 365 days of milking to compensate the cows in the dry period.

Table 6. Cost of Purchase of Dairy Cows[7]

Breed	Unit	Average Purchase Price (TL)*	Total Cost (TL)	Total Cost (USD)
Simmental	300	7,500-8,000	2,250,000-2,400,000	1,061,320-1,132,075
Simmental	200	7,500-8,000	1,500,000-1,600,000	707,547-754,716
Holstein	300	6,800-7,300	2,040,000-2,190,000	962,264-1,033,018
Holstein	200	6,800-7,300	1,360,000-1,460,000	641,509-688,676

Note:*These prices are the average price of importing pregnant heifers, received from some major importers. The domestic prices of dairy cows are 5-10 % higher so it is assumed that the new investor prefers to import dairy cows because first it is cheaper and secondly they have opportunities to choose heifers from a bigger population.

Although Simmental breeds have lower milking productivity than Holstein breeds, they are stronger therefore more suitable for regions with severe weather conditions. Also, their

milk contains more fat and protein and the meat quality is higher. Finally, the animal investment costs TL 2,040,000-2,400,000 (USD 962,264-1,132,075) for full capacity and TL 1,360,000-1,600,000 (USD 641,509-754,716) for 200 dairy cows (Table 6).

3.1.2 Construction Costs

Before starting to analyze the construction costs it is important to understand the organization of a dairy farm without cultivation[8]. A basic dairy farm should be constituted from 5 subdivisions of indoor barn system, feeding system, milking system, slurry handling system and infirmary. These subdivisions are explained below.

A. Indoor Barn System

a) Barn of Lactating Cows: It is a free stall barn where there is 5 cm thick grass soft bedding mats. The barn consists of automatic feeding lock panels that allows special feed to individual animals and eliminates feed stealing. The manure on the corridors' inside the barn is scraped by automatic manure scraper machines. There are also open paddocks that provide cows to the rest of the outside.

b) Barns for young stock 3–8 and 8-18 months: The system is basically same with the Barn of Lactating Cows. The barn consists of feeding lock panels and free feeding stalls with no headlock system.

c) Birth House and cages: This place consists of individual delivery cages. On both sides of the feeding way there are delivery cages and in each cage there are livestock waterers. The heifers are put inside these cages 10-15 days before the delivery.

B. Feeding system

It is a concentrated feed production unit with one grain feed crushing mill and half level feed mixer(20 m^3 feed mixer) with electronic weighing machine.

C. Milking System

There is a milking machine that can milk heifers at the same time. With the computerized herd management system, the records of each heifer is going to be kept, the milking quantity is recorded digitally, oestrus period is set with 99 % accuracy and the evidence of hidden mastitis is verified. The milk is cooled in the cooling tanks of capacity 10 tons (the investor can choose either 2x5 ton or 10 ton capacity cooling tank).

D. Slurry Handling System:

With the manure scraper systems that are going to be mounted to the manure scraping corridors of all the barns, the manure on the corridors will be scrapped on several times per day. In this way the relative moisture rate inside the barn will be decreased and the manure that contains ammonium will be collected inside the sealed reinforced concrete manure pits. These manure pits have a capacity to stock 30 days manure. The manure in these pits turned to liquid form by the manure mixers and in every 10 days it will be sent to manure silo by the manure pumps. The next step is adding manure separator to the system to divide the manure into liquid and dry form.

E. Infirmary

For the dairy cows' general check-ups and treatments, an infirmary outside the barn is needed. The sick and the quarantined cows are isolated in the infirmary.

Table 7. Construction Area[9]

Construction Type	Area (m^2)
Barn of Lactating Cows	3,000
Barn foryoung stock 3-8 months	1,000
Barn for young stock 8-18 months	1,000
Machinery Depot	500
Milking Parlor	650
Feed (Commodity) Storage	1,000
Silage Pit	3,000
Social facility	250
Security Cabin	50
Infirmary	500
Total	10,950

Source: Our own calculations

The total construction needed to start the farm equals an average of 10,950m^2(Table 7). Including the automatic feeding lock panels and bedding, the average cost[10] is TL 200 per m^2 (USD 94.34per m^2) for the construction. Therefore, average total investment expenditures for the construction equalTL2,190,000 or USD 1,033,018[11].

3.1.3 Farm Machinery Investment

Together with the labor work, machinery is needed to carry out the daily operations. The daily operations can be divided into a number of stages. These are, feeding stage, milking stage and slurry management. The feeding is organized as follows. Firstly, a variety of feed is loaded to the mixer. The bales are carried out by telehandlers and for the roughage a front loader is used. After the mixer stage is finished, the feed is distributed by a feed tractor.

The cows create huge amounts of manure every day and handling this manure is vital for the health of the herd, which is also obligatory by law. With the manure scraper systems mounted to the manure scraping corridors of all the barns, the manure on the corridors will be scraped on an average of 4 times per day. At this point the slurry handling system enters to the process. This manure is collected inside the sealed reinforced concrete manure pits. The manure in these pits turned to liquid form by the manure mixers and sends to manure silo by the manure pumps. Then, a manure separator divides the manure into liquid and dry form.

Modern dairy farmers use milking machines and sophisticated plumbing systems to harvest and store the milk from the cows. The dairy cows are milked an average of two times a day and without a milking system it is a difficult and time consuming process when 240 dairy cows are considered (even with a milking system it takes the average cow three to five minutes to give her milk. Total time of the milking process- starting with the cows entering to milking parlor, milking and exiting- is around 10-15 minutes). Therefore a milking system that milks 24 cows simultaneously is needed in order to get milk fast and clean. These systems use a great amount of electricity; therefore a transformer, a generator and a power supply are needed in case of power failure. At least 60 cages are needed for the new born.

Because the farms are located outside the cities a service bus is needed to carry the personnel on a daily basis.

Table 8. Farm Machinery Costs

	Qt	Average Prices (Each)	Cost (Total)
Feed Tractor minimum 90 hp*	1	TL126,000 USD59,433)***	TL126,000 (USD59,433)
Telehandler*	1	TL 150,000 (USD70,754)	TL 150,000 (USD70,754)
Small Tractor 40-50 hp*	1	TL 56-70,000 (USD26,500-33,000)	TL56-70,000 (USD26,500-33,000)
Cages**	60	TL 600 (USD 283)	TL 36,000 (USD 16,980)
Loader*	1	TL 140-150,000 (USD66,000-70,700)	TL 140-150,000 (USD66,000-70,700)
Mixer Feeder (20 m^3)*	1	TL 80,000 (USD37,735)	TL 80,000 (USD37,735)
Minibus (Service) **	1	TL 80,000 (USD37,735)	TL 80,000 (USD37,735)
Milking System 2x12 cows **	1	TL 300,000 (USD141,509)	TL 300,000 (USD141,509)
Transformer min. 250 kw**	1	TL 15-17,000 (USD7,075-8,018)	TL 15-17,000 (USD7,075-8,018)
Generator min. 150 kw**	1	TL 15-17,000 (USD7,075-8,018)	TL 15-17,000 (USD7,075-8,018)
Scale**	1	TL 25,000 (USD11,792)	TL 25,000 (USD11,792)
Slurry Handling System (including manure scraper machines)**	1	TL 120,000 (USD56,602)	TL 120,000 (USD56,602)
Cooling Tank (10 tons)**	1	TL 80.000 (USD 37,735)	TL 80.000 (USD 37,735)
Uninterruptible Power Supply (UPS)**	1	TL35.000 (USD 16,510)	TL 35.000 (USD 16,510)

Source: Our Own Calculations

Note:*These prices are the VAT included sales prices of the New Holland Farm Equipments(http://www.newholland.com.tr/Fiyatlar.aspx), ** Averages prices of major suppliers

Farm machinery is such a large investment and it is important to evaluate whether a farm's machinery costs are too high. Farm size and the options of owning, leasing or hiring should be considered by the farm. For our sample farm of 240 dairy cows, the average total cost of the farm machinery investment equals TL 1,278-1,306,000 (USD 602,868-615,954).

Table 9. Total Initial Investment Costs (1,000)

	200 Dairy Cows	300 Dairy Cows
Purchase of Animals	TL 1,360-1,600 (USD 641-754)	TL 2,040-2,400 (USD 962-1,132)
Construction Costs	TL2,190 (USD1,033)	TL2,190(USD1,033)
Farm Machinery Costs	TL1,278-1,306 (USD602-615)	TL1,278-1,306 (USD602-615)
Total	TL4,828-5,096 (USD2,277-2,403)	TL 5,508-5,896 (USD2,598-2,780)

Source: Our own calculations from above tables.

3.1.4 Total Initial Investment costs

As it is explained above, when starting to business, total initial investment is the start up cost for a farmer. In our case total initial investment costs are equal to TL 4,828,000-5,896,000 or USD 2,277-2,780,000 (Table 9).

3.2 Production Costs:

Dairy production yields a joint product-milk and livestock. Therefore the gross value of production for the dairy enterprise includes milk and cattle sales. The investors purchase heifers that are in condition of several months of pregnancy. After the calving ends, the heifers start giving milk. Therefore it is assumed that getting revenue from the sales of milk starts after 6 months of starting the operations. So, it is not wrong to assume that a working capital is needed in order to finance the production costs for this time period.

3.2.1. Feeding:

Cereal grains as the main contributors of starch to diets are important in meeting the energy needs of dairy cattle. Silage (mostly corn) is fermented; high moisture fodder is used to feed cattle. Alfalfa is important for the milk productivity and the factory (ready) feed is used as a protein source for the dairy cows.

Table 10 Feed Cost for One Dairy Cow[12]

Item	Quantity(kg per day)	Price per ton (Turkish Lira)
Corn Silage	20	200
Alfalfa	7	700
Grass	3	300
Factory Feed	8-10	1,100
Feed Mix	0.5	4,500

Source: Our own calculations. The feeding ratios are not constant. The feeds used in this table are the easiest accessible ones.

In order to reach an average of 20-30 liters of milk from a dairy cow, an average of 20 kilos of corn silage, 7 kilos of alfalfa, 3 kilos of grass (hay, vetch, and triticale) and 8-10 kilos of factory feed are used per day for each milking cow. The cost is TL200 tone for corn silage, TL700 tone for alfalfa, TL300 tone for grass,aboutTL1,100 tone for high quality factory feed and TL 4-5,000 tone for feed mix (Table 10). In daily terms, the feeding cost for each dairy cow equalsTL 19.9-22.9(USD9.40 – 10.80) per day and TL7,263.5-8,358.5(USD3,426-3,943) per year (365 days are calculated).

3.2.2. Animal Health and Surveillance Costs

Some major health problems of the dairy cows are mastitis, food and mouth disease and lameness. Mastitis is a persistent and potentially fatal mammary gland infection, leading to high somatic cell counts and loss of production. Food and mouth disease is a highly contagious viral and acute condition prevalent among livestock. It negatively affects the commerce of livestock's and related products and causes important economic losses to producers. Lameness is a persistent foot infection or leg problems causing infertility and loss of production.

The identification and traceability of livestock are integral to disease control, whilst good welfare practices help protect the health and wellbeing on livestock's and importantly help maintain consumer confidence in farm produce. So it is important to prevent and control feasible eradicate notifiable diseases from entering both to the herd and the human food chain.

Table 11. Animal Health and Surveillance Costs

Item	Cost for Each Milking Cow for one lactation period
Preventive Medicine Vaccines	TL150
Animal Care (Vitamins, Nails, Foot)	TL100
Artificial Insemination(an average of 2 times)	TL150
Veterinarian	TL250
Others	TL50
Total	TL700

Source: These costs are calculated from the financial reports of BCM Agro (A dairy company in Turkey)

Because most farms keep no bull, artificial insemination is used at most dairy farms. It provides an economical means for a livestock breeder to improve their herds utilizing males having very desirable traits. The average is two times of performing insemination for each cow for one lactation period and equalsTL75(top bull sperma) for one insemination. Although health technicians are common in the farms, veterinarians are a major need. Mostly they serve part time and veterinarian costs (pregnancy checks, blood tests, vaccinations and health checks) are one of the major operating cost items. Total health and surveillance costs for a single dairy cow amount toTL700 (USD 330.20) for each year (Table 11).

3.2.3 Cost of Employee

Each dairy farm should have different tasks depending on the region and farm structure but one can standardize the tasks for a general farm with 300 dairy cows and others with a constant personnel numbers. In order to carry out the routine, an average of 3 personnel is needed for the milking process. Together with the veterinarian, minimum 2 health technicians are needed (one for the night shift) to carry out the standard health control surveillance during and after milking process. Because the dairy cows have to be fed after milking process, 3employees are needed for the feeding of the milked cows (preparing the feed and distribution). Also another employee is needed for the calves and other young stocks. Because the farm operates 24 hours a day a security and a general purpose staff has to stay in the farm. In order to organize the work schedule a manager is also needed.

Table 12.Employee Tasks and Numbers

Tasks	Quantity of Staff
Milking	3
Health Technician	2
Feeding	3
General Purposes	1
Security	1
Birth House and Calf Caring	1
Manager	1

Source: Own Calculations.

The net wages are equal to an average of TL 22,600 (USD 10,660) per month[13]. In order to calculate the real cost we have to multiply this number by 1.5 (the social security and other taxes, nourishment and service costs etc) so this will equal TL 33,900 (USD 15,990) per month. Also an attorney, a bookkeeper and an occupational safety and health specialist are obligatory (mostly part time) and their total cost (part time is calculated) is around TL 3,000 (USD 1,415) per month. All of these equal an average of TL 36,900 (USD 17,405) monthly[14] (Table 12).

4. Economies of a Dairy Farm Investment

Starting to business of a dairy farm needs a careful planning. Choosing the breed type, land and weather properties, water resources, the farm machinery needs, appropriate construction according to the region, finding the staff with proper specialization are important decisions that have to be planned before the implementation. Farmers typically grow their own feed for their cattle by cultivating crops in huge lands. This opens another cost page for the agriculture side with its own machinery and other needs. But in our case we assume that there is no cultivation and the farmer purchases the feed from the market. Total initial investment is analyzed in section 3.1 and the production costs[15] are calculated in section 3.2.

Table 13. Monthly (30 Days) Average Production Expenses for Single Dairy Cow

	Employee	Feeding	Health/Surveillance	Total Expenses
Herd with 200 Dairy Cows	TL184.5 (USD 87.03)	TL597-687 (USD282-324)	TL58.33 (USD 27.52)	TL839.9-929.8 (USD 396.6-438.6)
Herd with 300 Dairy Cows	TL123 (USD 58.01)	TL597-687 (USD282-324)	TL58.33 (USD 27.52)	TL778.3-868.3 (USD 367.5-409.5)

Source: Our own calculations from above tables**.**

The production starts with the purchase of the cattle's after investment for construction and farm machinery is ended. At this point, it is not wrong to assume that getting revenue from the sales of milk starts after 6 months of starting the operations. The purchased cows have to be pregnant and the calving period of these cows ends in 6 months (assuming no empty cows). Therefore, 6 months of extra production costs have to be added to the initial investment.

Based on the figures from Table 13, total of 6 months production expenses are equal to 1,007,880-TL 1,140,560 or USD 475,920-526,320 if the herd size is 200 cows and TL 1,400,940-1,562,940 or USD 661,500-737,100 if the herd size is 300 cows. This figure implies that an investor needs an extra working capital to finance the dairy farms production costs for 6 months.

The investor's primary objective is to add value through farming and business capabilities. The financial viability and sustainability of the investment is important. Therefore, costs before interest and depreciation are very important to consider before starting investment. Estimated overall capital needs of building a dairy farm are given below (Table 14).

Table 14. Estimated Average Capital Needs (1,000)

	Herd with 200 cows	Herd with 300 cows
Start-up capital	TL 4,828-5,096 (USD 2,278-2,404)	TL 5,508-5,896 (USD 2,598-2,781)
Working capital	TL 1,008-1,141 (USD 476-526)	TL 1,401-1,563 (USD 662-737)
Total	TL 5,836-6,237 (USD 2,754-2,930)	TL 6,909-7,459 (USD 3,260-3,518)

Source: Our own calculations from above tables.

For a farmer to start a dairy farm it requires TL 5,836,000-7,459,000 or USD 2,754,000-3,518,000 to finance the business. These figures are averages and actual amount could be higher when possible expenses not included in this analysis are considered.

5. Conclusion

The agriculture has become industrialized, specialized and integrated. The production passes from the family based small-scale farming to the industrial type agricultural establishments. The analysis in section 4 exhibits the financing needs of starting a dairy farm business in Turkey and presents that small farming is not viable in this context. The farming at present is far away from just producing the milk. Complex farming equipments and integrated construction requirements change the traditional farming practises.

The deregulation of the agriculture industry and closure of cooperatives, unions and marketing boards increased the role of self regulating markets but well-functioning marketing systems necessitate a strong private sector together with the appropriate and efficient government policies. If markets are not well functioned and the policies are not well designed, promoting market orientation in agriculture would not provide sustainable opportunities to the rural poor and small farmers to benefit from agriculture markets.

In case of dairy farming in Turkey, the rural assembly markets are not located in production areas. A few number of big processors of fluid milk, send their own trucks with cooling tanks to collect fluid milk from the producers. Because the numbers of processors are low and collecting milk has transaction costs, processors choose to work with farms supplying high amounts of fluid milk. Producers keep their raw milk in the cooling tanks, where it stays fresh for only a few days before collection by the processor. Therefore, only the producers producing certain level of raw milk have the opportunity to work under contracts and, inevitably, have little bargaining power over the processors.

In the absence of cooperatives or similar organizations, regulations, and policies, the gradual integration of food markets makes it difficult for average producer of raw milk to enter goods and input markets. So, small dairy farms and producers of fluid milk have the difficulty to reach to the big processors and are forced to work with mandiras or intermediate buyers and they face with the risk of low marketing price and longer payment periods.

Finally, it is not wrong to state that the capital requirements of building a dairy farm with optimal capacity are hard to reach for small farmers unless a system of marketing and production agricultural cooperatives and/or institutions are organized.

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End Notes

[1]Turkey's top 500 industrial enterprises. http://www.iso.org.tr/Sites/1/content/500-buyuk-liste.html?j=6493030

[2]Inthisstudy,thedairyfarmdefinestheconventional (nonorganic) farmwithoutcultivation.

[3] In U.K it is also found that, the key determinant of profit is total cost of production, not milk price (DairyCo 2012).

[4]365 days are the ideal time for calving. It should be calculated on 385 days on average (105 days empty and 280 days pregnancy). Therefore production levels peak at around 100-150 days.

[5] This assumption is based on the fact that the processors are willing to collect liquid milk from the producers producing enough volume of milk in order to avoid transaction costs. So 240 dairy cows capacity is around 4-6,000 liters of milk per day that is enough to compensate the cost of sending the truck to the producer. The economies of scale and the gross revenue of production are also important factors in determining the optimal capacity but the scope of the analysis is not involving these concepts.

[6]In Turkey the average is around 3,000 liters in 2014 (SIS-Turkey)

[7]In this study the Exchange rate is taken as 1 USD equals 2.12 TL on July 2014.

[8]Some barn designs are available at http://www.westfalia.com/us/en/bu/milking_cooling/farm-design/housing_concepts/default.aspx, http://www.cowtime.com.au/technical/Guidelines/J_CHAPTER_9_Design Considerations.pdf, http://www.agriculture.gov.sk.ca/Farm_Structuresandalsothe minimum official construction measures of a barn in Turkey can be found in Agriculture and Rural Development Support Institution-TKDK (http://www.tkdk.gov.tr/BasvuruFiles/BasvuruPaketiHazirlamaDokumanlari/ABveTCStandartlari/101-1.pdf)

[9]Agriculture and Rural Development Support Institutions official minimum requirements are 7 m^2area per cow in the barn if the cow is over 18 months of age, 6 m^2 if the cow is between 12-18 months of age and 4 m^2 if the cow is 6-18 months of age (http://www.tkdk.gov.tr/BasvuruFiles/BasvuruPaketiHazirlamaDokumanlari /ABveTCStandartlari/101-1.pdf). But established dairy farms prefer to build a barn that has 10 m^2area per cow if the cow is over 18 months of age. So for a herd of 300 dairy cows the above construction area is calculated.

[10]Turkish Ministry of Environment and Urbanizations announces annual construction unit costs printed in Turkish Official Gazette. Barns are defined in group B buildings and the official unit cost of construction is 160 TL per m^2 (Resmi Gazete 2014). Average cost is calculated by adding the cost of automatic feeding lock panels and bedding.

[11]The cost of a water depot of minimum 100 tons capacity should be added to this amount.

[12]The official average prices of National Milk Council for the period June/July 2014 are TL 940 per ton for factory feed, TL 282 per ton for corn silage, TL 650 per ton for alfalfa and TL 360 per ton for grass (http://www.ulusalsutkonseyi.org.tr/ana/fiyat.asp?uid=47). But in this table, the prices used are the averages of some dairy farms.

[13]These costs are calculated from the financial reports of BCM Agro (a dairy company). The variation of the salaries between different regions and enterprises would be maximum 10 %.

[14] The veterinarian cost is included in section 3.2.2. Also a zoo technician is needed for planning the feed ratios. But if one cooperates with a good feed company (purchase of factory feed) this service is provided without a cost.

[15]Monthly electricity needs amounts an average of TL 10,000 (USD 4,716) but for practical uses it is excluded from the analysis.