

# Socio-Economic Analysis of Dairy Cattle Enterprises in Urban Sprawl <sup>[1]</sup>

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## Abstract

Dairy cattle are an activity that provides sustainability in the livestock sector and consequently in the agricultural sector. Therefore, socio-economic structures of dairy cattle farms are important. On the other hand, the location of an enterprise is very important both in terms of proximity to raw materials and marketing opportunities, and urban sprawl have high potential in this respect. In this study, the socio-economic structures of 91 dairy cattle farms in the province of Konya are investigated. Since milk is a perishable product, the marketing process must be carried out in a healthy way and the importance of urban sprawl has been determined in the study. The most important feature of enterprises in urban sprawl is that their capital structures are different. As these areas are in the process of urbanization, land and building capital is perceived as non-agricultural investment. This situation has a negative effect on the rentability of agricultural enterprises and the unit cost of milk. In the calculation of unit cost of milk the amortization, interest of capital and repair and maintenance costs of the building capital are considered as fixed costs and the average unit cost of milk is \$0.33/kg. The cost of milk is determined as \$0.29/kg when the building capital is subtracted from the cost calculations by considering the structural characteristics of urban sprawl. This difference in unit cost of milk is interpreted as the location rent of the dairy enterprises in the urban sprawl. In addition, transportation costs are low due to being close to the market. And it is also because of location rent. In this case, the management of dairy in the urban sprawl is evaluated economically and it is recommended to plan the organized livestock regions in the regions close to the cities.

**Keywords:** Dairy cattle, Cost of milk, Location rent, Urban sprawl

## Kent Saçaklarında Süt Sığırcılığı Yapan İşletmelerin Sosyo-Ekonomik Analizi

### Öz

Süt sığırcılığı, hayvancılık sektöründe ve buna bağlı olarak tarım sektöründe sürdürülebilirliği sağlayan bir faaliyettir. Bundan dolayı süt sığırcılığı yapan işletmelerin sosyo-ekonomik yapıları önem arz etmektedir. Öte yandan bir işletmenin kuruluş yeri gerek hammaddeye yakınlık gerekse pazarlama olanakları açısından oldukça önemlidir ve kent saçakları bu açıdan potansiyeli yüksek alanlardır. Bu çalışmada, Konya ili örneğinde kent saçağında faaliyetlerini sürdüren 91 adet süt sığırcılığı işletmelerinin sosyo-ekonomik yapıları incelenmiştir. Süt çabuk bozulabilen bir ürün olmasından dolayı pazarlama sürecinin sağlıklı bir şekilde yürütülmesi gerekmekte olup, kent saçaklarının önemi çalışmada belirlenmiştir. Kent saçaklarındaki işletmelerin en önemli özelliği sermaye yapılarının farklı olmasıdır. Bu alanlar kentleşme sürecinde olduğundan, arazi ve bina sermayeleri tarım dışı yatırım olarak algılanmaktadır. Bu durum tarım işletmelerinin rantabilitesine ve birim süt maliyetine olumsuz yönde etki yapmaktadır. Birim süt maliyeti hesaplamasında sabit masraf olarak işletmenin bina sermayesinin amortismanı, sermaye faizi ve tamir-bakım masrafları ele alınmakta olup, birim süt maliyeti incelenen işletmeler için ortalama 0.33 \$/kg bulunmuştur. Kent saçağının yapısal özelliği dikkate alınarak konut sermayesi maliyet hesaplamalarından çıkarıldığında ise süt maliyeti 0.29 \$/kg olarak belirlenmiştir. Birim süt maliyetindeki bu farklılık, kent saçağındaki süt işletmelerinin mevki rantı olarak yorumlanmıştır. Ayrıca pazara yakın olmasından dolayı ulaşım masraflarının da düşük olması mevki rantı içerisinde yer almaktadır. Bu durumda kent saçaklarında süt işletmeciliğinin yapılması ekonomik olarak değerlendirilmekte ve kentlere yakın bölgelerde organize hayvancılık bölgelerinin planlanması önerilmektedir.

**Anahtar sözcükler:** Süt sığırcılığı, Süt maliyeti, Mevki rantı, Kent saçakları

## INTRODUCTION

Animal production has a significant share in the rural economy and contributes to the employment of the family labor

force <sup>[1,2]</sup>. However, there are some problems in the marketing of agricultural products because of small-scale family businesses of Turkish agricultural enterprises and the specific structural characteristics of the agricultural sector.



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Due to the organizational problems of producers, the high number of intermediaries in marketing agricultural products and the high marketing margin cause ineffective marketing organization<sup>[3]</sup>. The lack of a well-functioning market organization reveals marketing problems and hinders production increase especially in perishable products such as milk<sup>[4]</sup>. Increase in the milk production of Turkey largely depends on the elimination of marketing problems and the establishment of a well-functioning market organization in milk. With the organization, producers should put in an effective position in both input markets and product markets<sup>[5]</sup>. Structural reforms are needed to resolve the technical and economic problems of the livestock sector, and to realize the production and industry integration, an organization should be provided in marketing and production as in developed countries. It is also necessary to constitute input and price policies that will encourage the producer to produce quality products<sup>[6]</sup>. In addition, increasing the number of milking animals will contribute to the increase of animal capacity in enterprises<sup>[7]</sup>.

Although there is a great potential in Turkey for the development of animal husbandry and increasing the amount of animal products, it has not been developed at the desired level<sup>[8]</sup>. Approximately 40% of the milk produced is delivered to the consumer as raw milk, 18-20% is processed in modern enterprises and 40% is processed in enterprises that are not compatible with hygiene conditions<sup>[9,10]</sup>. Because milk is a perishable product, the marketing organization needs to be well planned. Especially in the marketing of raw milk, if the transportation and storage criteria are not taken into consideration, elements that threaten human health take place. In this context according to "raw milk supply" prepared by the Ministry of Agriculture and Forestry in 2017, the supply of raw milk to the final consumer must be carried out within 24 h after milking. For this reason, being located in areas close to the market is very important for dairy cattle farms. In addition to this, considering the rentability of the enterprise, and evaluating the principle of minimization of production cost, the importance of position rent is revealed.

According to the theory of location rent which build by Von Thunen, considering the fact that transportation expenditures have a significant share in production cost, it is determined that the products will be more economical to grow as they move away from the city center where the market is located. According to this theory, dairy products should be located in the closest region to the city center due to its perishable feature<sup>[11]</sup>. Dairy cattle farms in Turkey continue to operate as commercial or family business especially in areas close to large cities<sup>[12]</sup>. In the enterprises which are far from the city center, the income of the producer falls as far as transportation costs as it moves away from the market. Although it is close to the city center, the areas showing the characteristics of rural areas are defined as urban sprawl. Together with the increase

in population, the most important feature of the urban sprawl which formed by the acceleration of urbanization activities is the sustainability of agricultural activities despite the transition to urban area<sup>[13]</sup>. Since urban sprawl is transition areas to urban areas, in these zoning plan applications, ranch facilities are not allowed. These practices cause them not to be able to operate in areas close to the city and cannot benefit from location rent. In this case, the investment expectations of animal husbandry enterprises in urban sprawl are shifting to non-agricultural areas and this affects the livestock sector negatively. In fact, the product, price, location and promotion<sup>[14]</sup>, which are the marketing mix that is considered in marketing of a product, have great importance and urban sprawl have an important role in bringing these components together in marketing of milk. In this study, structural features and location problems of dairy cattle farms in urban sprawl have been analyzed. The effects of the location rent to the profit of enterprise and milk marketing were investigated.

## MATERIAL and METHODS

The main material of the study is the surveys conducted with the owners of agricultural enterprises in the neighborhoods which show urban sprawl characteristics in the province of Konya. In addition, previous studies on this subject were utilized.

The agricultural enterprises in the research area are determined as the main framework and the land widths of the agricultural enterprises in the research area are taken from the Farmer Registration System of the Provincial Directorate of Agriculture and Forestry. According to the stratified random sampling method, the number of samples is calculated using the following formula<sup>[15]</sup>. The method is used when the Coefficient of Variation is greater than 75%, and this coefficient has been great because of heterogenic data.

$$n = \frac{\sum (Nh \cdot Sh)^2}{N^2 \cdot D^2 + \sum (Nh \cdot Sh^2)} \quad D^2 = d^2 / z^2$$

In formula;

n: Number of samples, N: Number of enterprises in population, Nh: Number of enterprises in h category, Sh: The variance of h category, d: Allowed margin of error from population average, z: z value refers to the standard normal distribution table according to the error rate.

In the determination of the sample volume studied in a margin of error of 5% and within 99% confidence limits. The following formula is used to distribute the specified sample volume to the categories<sup>[15]</sup>. As a result of sampling, 91 sample enterprises are identified. It is determined as 1. group (0-30 decare) 16, 2. group (31-120 decare) 41 and 3. group (121+decare) 34. Taking into account the coefficient of variation, it was divided into layers to group the data homogeneously.

$$n = \frac{N_h S_h * n}{\sum N_h S_h}$$

In the analysis of the annual operating results of the enterprises; Indicators such as Gross Production Value (GPV), Gross Product (GP), operating costs, gross profit, agricultural income, and rentability are calculated. The gross production value in enterprises is determined by multiplying the amounts of plant and animal products obtained as a result of agricultural activity with product prices for farmers and then we added the increasing productive value of plant and animal capital to this value<sup>[16]</sup>. Financial rentability is obtained by dividing net profit into equity capital. In addition, the profitability of the investment capital is calculated and the profitability of the enterprises is determined. The profitability of investment capital is expressed by economic profitability. Conversion of cattle to the bovine unit (BBHB) is performed in order to examine the existing cattle on the same basis<sup>[17]</sup>.

## RESULTS

The average population per enterprise is determined as 4.76 in enterprises examined, 12.93% of the population is 0-6 years old, 12.01% was 7-14 years old, 21.48% is 50 years of age and 53.58% are active population between the ages of 15-49. The high rate of active population shows that labor force and income generating population are high.

In examined enterprises 52.41% of the population is identified as primary school graduates, 19.79% as secondary school graduates, 19.79% as high school graduates and 8.02% as university graduates. It is determined that 1.60% of the population is not literate. It has been determined that the rate of university graduates has grown as the scale of the examined enterprises grows.

The production pattern in the examined enterprises is concentrated in order to meet the feed requirement, which constitutes the most important expense item of animal

**Table 1.** Production pattern of examined agricultural enterprises

Product Groups	Products	Enterprise Groups							
		0-30		31-120		121+		Average	
		da	%	da	%	da	%	da	%
Field Crops	Wheat	4.38	34.83	13.49	16.73	116.87	31.98	50.51	25.61
	Silage corn	3.66	29.10	20.24	25.10	35.51	9.72	23.03	20.06
	Barley	0.00	0.00	18.90	23.44	60.44	16.54	31.10	16.74
	Grain corn	1.25	9.95	12.21	15.15	50.07	13.70	24.43	13.69
	Clover	2.06	16.42	5.68	7.05	15.59	4.27	8.75	7.66
	Sugar beet	0.00	0.00	4.91	6.09	34.43	9.42	15.08	6.27
	Sunflower	0.00	0.00	1.71	2.12	13.09	3.58	5.66	2.29
	Vetch	0.00	0.00	1.27	1.57	7.79	2.13	3.48	1.51
	Haricot bean	0.00	0.00	0.00	0.00	4.56	1.25	1.70	0.47
	Chickpea	0.00	0.00	0.00	0.00	4.26	1.17	1.59	0.44
	Fallow	0.00	0.00	0.00	0.00	5.88	1.61	2.20	0.60
	Total	11.35	90.3	78.41	97.25	348.49	95.37	167.53	95.34
Vegetable	Tomato	0.45	3.61	0.30	0.38	0.74	0.20	0.49	0.88
	Pepper	0.34	2.74	0.13	0.17	0.74	0.20	0.40	0.63
	Lettuce	0.00	0.00	0.00	0.00	5.88	1.61	2.20	0.60
	Carrot	0.00	0.00	0.00	0.00	4.41	1.21	1.65	0.45
	Green bean	0.09	0.75	0.29	0.36	1.47	0.40	0.70	0.45
	Eggplant	0.20	1.62	0.12	0.15	0.74	0.20	0.37	0.43
	Cabbage	0.00	0.00	0.00	0.00	2.94	0.80	1.10	0.30
	Cucumber	0.13	1.00	0.00	0.00	0.00	0.00	0.02	0.17
	Total	1.21	9.72	0.84	1.06	16.92	4.62	6.93	3.91
Fruit	Walnut	0.00	0.00	0.67	0.83	0.00	0.00	0.30	0.37
	Cherry	0.00	0.00	0.43	0.53	0.00	0.00	0.19	0.24
	Almond	0.00	0.00	0.20	0.24	0.00	0.00	0.09	0.11
	Apple	0.00	0.00	0.07	0.09	0.00	0.00	0.03	0.04
	Grape	0.00	0.00	0.00	0.00	0.07	0.02	0.03	0.01
	Total	0	0	1.37	1.69	0.07	0.02	0.64	0.77
TOTAL		12.56	100.00	80.63	100.00	365.49	100.00	175.09	100.00

**Table 2. Animal assets and capital**

Animal	Enterprise Groups							
	0-30		31-120		121-+		Average	
	N	\$	N	\$	N	\$	N	\$
Bull	1.00	2.096,27	0.12	378,73	0.03	97,43	0.24	575,61
Cow	5.06	10.623,71	10.83	26.021,31	5.41	12.714,65	7.79	18.342,32
Heifer	2.31	4.179,61	3.39	5.951,12	3.91	7.158,08	3.40	6.090,60
Bullock	1.94	3.325,57	2.49	4.413,47	5.59	10.004,87	3.55	6.311,29
Female steer	1.06	2.089,80	1.68	4.269,55	1.50	2.039,95	1.51	3.053,26
Male steer	0.75	834,63	2.73	3.572,69	1.97	2.706,73	2.10	2.767,73
Female calf	0.69	420,55	1.24	838,26	0.59	414,08	0.90	606,33
Male calf	0.75	446,43	1.20	813,01	0.62	423,21	0.90	602,92
Ram	0.00	0.00	0.39	95,94	0.71	179,03	0.44	110,12
Sheep	0.00	0.00	16.59	3.297,48	12.79	2.804,17	12.25	2.533,39
Lamb	1.44	178,57	3.76	580,22	6.47	954,51	4.36	649,44
Goat	0.00	0.00	0.12	25,25	4.82	1.164,29	1.86	446,39
Bee	0.00	0.00	0.00	0.00	3.38	598,28	1.26	223,53
Total cattle	13.56	24.016,56	23.68	46.258,14	19.62	35.559,01	20.38	38.350,06
Total small ruminant	1.44	178,57	20.85	3.998,89	24.79	5.102,00	18.91	3.739,34
Total	15.00	24.195,13	44.54	50.257,03	47.79	41.259,29	40.56	42.312,93

(1 USD = 4.83 Turkish Liras in the study time-July-2018)

**Table 3. Active capital of examined enterprises**

Capital Groups		Enterprise Groups (\$)							
		0-30		31-120		121-+		Average of Enterprises	
		\$	%	\$	%	\$	%	\$	%
Land capital	Land	126.294,00	58.67	826.559,11	83.12	3.546.918,77	93.21	1.719.833,69	90.15
	Land reclamation	9.937,89	4.62	16.992,37	1.71	44.336,87	1.17	25.968,65	1.36
	Building	41.304,35	19.19	67.873,55	6.83	88.150,04	2.32	70.777,88	3.71
	Plant	391,18	0.18	3.305,20	0.33	12.317,39	0.32	6.160,04	0.32
	Total	177.927,41	82.65	914.730,24	91.98	3.691.723,06	97.01	1.822.740,25	95.55
Fixed enterprise capital	Animal	24.195,13	11.24	50.257,03	5.05	41.259,29	1.08	42.312,93	2.22
	Machine tool	11.391,05	5.29	26.670,20	2.68	55.168,37	1.45	34.631,42	1.82
	Total	35.586,18	16.53	76.927,23	7.74	96.427,66	2.53	76.944,35	4.03
Revenue assets capital	Material and munitions capital	0.00	0.00	705,58	0.07	2.140,57	0.06	1.117,67	0.06
	Money capital	1.759,83	0.82	2.080,49	0.21	15.168,68	0.40	6.914,20	0.36
	Total	1.759,83	0.82	2.786,07	0.28	17.309,25	0.45	8.031,88	0.42
<b>Total enterprise capital</b>		<b>37.346,01</b>	<b>17.35</b>	<b>79.713,30</b>	<b>8.02</b>	<b>113.736,91</b>	<b>2.99</b>	<b>84.976,22</b>	<b>4.45</b>
<b>Total active capital</b>		<b>215.273,42</b>	<b>100.00</b>	<b>994.443,54</b>	<b>100.00</b>	<b>3.805.459,97</b>	<b>100.00</b>	<b>1.907.716,47</b>	<b>100.00</b>

production. While silage corn (20.06%), barley (16.74%), alfalfa (7.66%) and vetch (1.51%) are produced directly from animal feed, by-products of wheat and grain are also used, 85% of the production pattern contributes to animal production (Table 1).

As a matter of fact, in the study conducted by Boz<sup>[12]</sup>, it has been determined that the enterprises that produce feed in their own land are more resistant to the risk of instability in feed prices. In addition, in the study conducted by Aktürk et al.<sup>[8]</sup> it is found that silage corn and barley showed the highest effect on milk yield.

In examined enterprises; 20.38 head of cattle and 18.91 head of small cattle are determined per enterprise (Table 2). The animal potential of urban sprawl is located in the cattle farms that want to benefit from retail milk sales at high prices by using urban proximity. In addition, small animal husbandry is carried out in the urban sprawl in order to meet the needs such as sacrifice. As a matter of fact, it is possible to say that the urban sprawl is more advantageous in terms of rural areas for both milk and meat marketing.

Animal capital in the examined enterprises is given in table

**Table 4.** Annual activity results of examined enterprises

Economic Success Criteria	Enterprise Groups			
	0-30	31-120	121++	Average
Animal production value	14.480,36	28.599,96	19.512,85	22.722,21
Plant production value	3.788,69	19.404,16	96.961,38	45.636,01
Gross production value	18.269,05	48.004,13	116.474,23	68.358,22
Variable cost value	15.672,87	31.863,70	51.767,10	36.453,40
Gross profit	2.596,18	16.737,27	65.405,89	32.434,80
Operating costs	22.420,08	44.370,57	73.325,89	51.329,62
Gross income	20.584,46	52.323,64	125.193,63	73.969,27
Net income	-1.835,63	7.953,06	51.867,74	22.639,66
Production costs	25.434,01	51.088,78	85.252,92	59.342,68
Net profit	-4.849,55	1.234,85	39.940,71	14.626,59
Agricultural revenue	466,72	10.816,39	55.649,86	25.747,64
Financial rantability	-8.05	0.94	17.12	9.32
Economic rantability	-3.02	5.93	20.94	13.84

2 and total animal capital is determined as \$42.312,93. \$38.350,06 of this capital is from cattle and \$3.739,34 of this capital is from small ruminant per enterprise. Cows get the highest share in animal capital. Although animal capital varies according to the size of the enterprise, cattle capital is the highest in medium-sized enterprises, while small animal capital is much more in large-scale enterprises. Dairy cattle are the key to sustainable production from cattle <sup>[4]</sup>. Therefore, for the development of the livestock sector and consequently agricultural sector, the success of dairy cattle breeding enterprises is very important.

The land capital gets the highest share in the active capital with 90.15%, land reclamation capital is 1.36%, the building capital is 3.71%, the plant capital is 0.32%, the animal capital is 2.22%, the instrument machinery capital is 1.82%, material ammunition capital is 0.06% and money capital is determined is 0.36% (Table 3). The active capital asset is effective on enterprise success both qualitatively and quantitatively. As a matter of fact, the asset capital includes the whole capital asset of the enterprise and its high value affects the business success although it varies according to the enterprise income. The lack of sufficient income compared to the value of the active capital in the enterprise composes a risk for the sustainability of the enterprise. Animal production is an important activity for the sustainability of enterprises.

It is determined that the value of decare vegetative production and the value of animal production per animal are high in urban sprawl agricultural enterprises compared to rural agricultural enterprises. This can be explained by rent theory. As a matter of fact, location rent can be defined as, getting high income because of the location of the land, production and marketing facilities. 66.76% of the gross production value per enterprise is realized in crop production and 33.24% in animal production. Dairy cattle breeding is not common in urban sprawl, although animal production marketing opportunities and advantages in

urban sprawl agricultural enterprises are high. As a matter of fact, dairy cattle shelters require high investment and modern animal shelters cannot be allowed in urban sprawls in metropolitan areas such as Konya. This is one of the most important factors in the non-prevalence of dairy cattle production activity.

The total variable cost of the examined enterprises is determined as \$36.453,40 per enterprise and varies according to the enterprise groups (Table 4). 52.33% of enterprise expenses are determined as animal production changing cost and 47.57% as plant production changing cost.

It is observed that agricultural income is lower in agricultural enterprises in urban sprawl compared to agricultural enterprises in rural areas per decare. It can be shown as a reason that agricultural enterprises in the urban sprawl get more income from non-agricultural activities than rural areas, so they get less agricultural income.

Financial and economic rantability shows the success of the capital used by the enterprise in its production activities. Financial rantability shows the success of the enterprise's own capital, while economic rantability shows the success of total capital <sup>[18]</sup>. The rates of financial and economic rantability in dairy farms in the urban sprawl were higher (2.02% and 2.04%) <sup>[19]</sup> than the rates of dairy cattle farms in the rural areas of Konya province. The high demand for non-agricultural capital for building and land capital in urban sprawl agricultural enterprises give these capital components the ability to be an investment tool. As a matter of fact, the reasons for long-term possession by the owners of the agricultural lands located in the urban sprawl are for the income that will be derived from the value increase which will realize in the future not for agricultural activity, whether it is the renter or the owner. It would be more appropriate not to include land capital and building capital in the total capital in the balance sheet

Table 5. Distribution of production costs					
Costs		Enterprises Groups			
		0-30	31-120	121-+	Average
Compound feed	\$	8.043,51	13.464,00	10.035,32	11.229,90
	%	58.06	57.10	62.32	59.22
Barley grits	\$	633,09	1.942,48	602,85	1.211,74
	%	4.57	8.24	3.74	5.91
Bran	\$	204,35	142,65	157,53	159,06
	%	1.48	0.61	0.98	0.90
Grain corn	\$	67,29	65,14	265,80	140,49
	%	0.49	0.28	1.65	0.83
Cornflakes	\$	0,00	45,90	91,34	54,81
	%	0.00	0.19	0.57	0.30
Beet pulp	\$	232,32	1.249,31	351,72	735,13
	%	1.68	5.30	2.18	3.50
Straw	\$	854,13	1.869,05	993,79	1.363,58
	%	6.17	7.93	6.17	6.96
Roughage	\$	562,96	93,19	146,14	195,57
	%	4.06	0.40	0.91	1.23
Clover	\$	778,34	511,88	837,60	680,43
	%	5.62	2.17	5.20	3.91
Silage corn	\$	1.887,58	3.029,01	2.282,00	2.549,22
	%	13.63	12.85	14.17	13.48
Non-permanent workers	\$	0,00	64,64	0,00	29,12
	%	0.00	0.27	0.00	0.12
Veterinary and drug costs	\$	333,85	304,50	337,66	322,05
	%	2.41	1.29	2.10	1.79
Artificial insemination	\$	256,21	796,24	0,00	403,80
	%	1.85	3.38	0.00	1.85
Total of variable costs	\$	13.853,63	23.577,99	16.101,75	19.074,89
	%	100.00	100.00	100.00	100.00
Share in total cost	%	74.62	73.32	64.71	71.57
Interest of cow capital	\$	265,59	650,53	317,87	458,56
	%	5.64	7.58	3.62	6.05
Cow capital amortization	\$	589,42	1.094,17	153,53	433,34
	%	12.51	12.75	1.75	5.72
Instrument machinery amortization	\$	902,86	1.602,08	951,65	1.168,81
	%	19.16	18.67	10.84	15.43
Interest of instrument machinery	\$	284,78	666,76	1.379,21	865,78
	%	6.04	7.77	15.71	11.43
Building amortization	\$	982,13	1.495,06	919,98	1.124,50
	%	20.84	17.43	10.48	14.84
Interest of building capital	\$	1.032,61	2.074,05	4.444,34	2.776,54
	%	21.91	24.17	50.62	36.64
Building repair maintenance costs	\$	654,76	996,71	613,32	749,67
	%	13.90	11.62	6.99	9.89
Total fixed costs	\$	4.712,15	8.579,36	8.779,90	7.577,20
	%	100.00	100.00	100.00	100.00
Share in total cost	%	25.38	26.68	35.29	28.43
Total production cost	\$	18.565,78	32.157,35	24.881,65	26.652,10
	%	100.00	100.00	100.00	100.00

analysis and production cost analysis carried out in urban sprawl agricultural enterprises.

The costs of the examined enterprises for animal production are given in Table 5. According to the average of enterprises, 71.57% of total production costs compose from changing costs and 28.43% compose from fixed costs. Among the changing cost the highest share is compound feed with 59.22% and the highest share of fixed cost is interest of building capital with 36.64%. The reason for the high rate for amortization, interest and maintenance costs of the building capital in fixed costs is that the construction capital is much more in agricultural enterprises in the urban sprawl. As a matter of fact, the houses in the urban sprawl are similar to the ones in the urban area in terms of quality, and the house values are different from the houses in rural areas because of the proximity to the city. Therefore, houses in the urban sprawl should not be considered as an agricultural investment status.

The livestock production activity is determined in the examined urban sprawl agricultural enterprises and 84.88% of the animal production value is from milk sales, 10.30% is from the PSVI (Productive Stock Value Increase) and 4.82% is from the fertilizer (Table 6). In Turkey sales of milk continues by milk marketing channels from producers to consumer known as the open sale of milk. This situation is more advantageous for urban sprawl agricultural enterprises. As a matter of fact, the province of Konya is the province where milk production is the most realized and therefore milk factories are concentrated. In addition, intensive population provides open milk marketing opportunities. This situation provides high market flexibility in terms of dairy cattle breeding in urban sprawl and positively affects producer income. Also, it has significant advantages in input procurement and in terms of finding, running and providing labour welfare.

In the case of where more than one product is produced at the end of production and the proportional share of the product in gross production value is close to each other, proportional cost calculation method is used to calculate the unit product costs. This method is based on the principle that the products obtained at the end of the production activity should take a share from the production cost as well as the share of the gross production value<sup>[18]</sup>. Proportional cost calculation method is used to calculate animal production costs in the examined enterprises. In order to find the total production cost of each product, the ratio of the animal production value is taken into consideration. In this case, the cost of milk production is calculated as \$22.904,81 according to the average of enterprises. And it is seen that 85.94% of the production costs belong to milk, 9.44% to PSVI and 4.62% to fertilizer (Table 6). In the study conducted by Aktürk et al.<sup>[8]</sup> in the rural area of Çanakkale province, production costs are distributed as 76.31% milk, 20.99% PSVI and 2.7% fertilizer.

**Table 6.** Animal production value and production costs

Enterprise Groups (da)	Milk		PSVI		Fertilizer		Total	
	\$	%	\$	%	\$	%	\$	%
0-30	12.291,02	84.88	1.491,37	10.30	697,97	4.82	14.480,36	100.00
31-120	24.701,18	86.37	2.588,97	9.05	1.309,82	4.58	28.599,96	100.00
121+	16.702,20	85.54	1.918,16	9.83	903,67	4.63	19.512,85	100.00
Average of Enterprises	19.526,37	85.94	2.145,35	9.44	1.050,49	4.62	22.722,21	100.00
Distribution of Animal Production Costs According to Products								
0-30	15.758,63	84.88	1.912,28	10.3	894,87	4.82	18.565,78	100.00
31-120	27.774,31	86.37	2.910,24	9.05	1.472,81	4.58	32.157,35	100.00
121+	21.283,77	85.54	2.445,87	9.83	1.152,02	4.63	24.881,65	100.00
Average of Enterprises	22.904,81	85.94	2.515,96	9.44	1.231,33	4.62	26.652,10	100.00

**Table 7.** Unit milk cost

Enterprise Groups (da)	Milk Production Costs (\$)		Milk Yield (kg)	Unit Milk Costs (\$/kg)	
0-30	15.758,63	14.207,59*	37.400,00	0.42	0.38*
31-120	27.774,31	25.448,39*	86.797,62	0.32	0.29*
121+	21.283,77	18.395,58*	69.500,00	0.31	0.27*
Average of Enterprises	22.904,81	20.582,37*	70.398,94	0.33	0.29*

\* Housing capital fixed costs, unprocessed production costs and unit milk cost

While the cost of unit milk is determined as \$0.33/kg in the examined enterprises, the net profit per unit is determined as \$0.02/kg as the milk sales price is \$0.35/kg (Table 7). The cost of one kg of milk varies according to the enterprise groups and the cost decreases as the size of the enterprise increases. As a matter of fact, as the enterprise grows, the amount of input used and the amount of product obtained increase and the fixed cost per unit decreases as the amount of production increases. This situation causes the unit milk cost to be lower in large agricultural enterprises.

The cost of milk production includes building amortization, interest of building capital and repair-maintenance costs as a fixed cost. Due to the expectation of non-agricultural future, it is possible to qualify land and building capital as non-agricultural investment in agricultural enterprises. Therefore, it would be a more rational approach not to include the value of housing in the building capital in the calculation of unit milk cost. By subtracting the housing capital from the active capital the production costs are calculated again and as a result unit milk cost is determined. By subtracting the housing capital the average milk production cost decreased to \$22.904,81 and the unit milk cost is calculated as \$0.29/kg in the enterprise average. In this case, the unit cost is less than \$0.04/kg and net profit per unit is increased to \$0.06/kg. If housing capital costs are included in the production costs in the urban sprawl, unit milk costs are determined as higher.

## DISCUSSION

In this study, the structural characteristics and location rent of the agricultural enterprises which carry out their

activities in the urban sprawl and deal with dairy cattle breeding are examined. The capital structure of enterprises in this area shows discrepancy due to the evaluation of land and building capital as non-agricultural investment. Therefore, it is stated that these two capital elements should not be taken in the determination of the rentability of the enterprises in this field.

In the field of research, it is determined that feed production is realized in order to support animal husbandry activities and it is determined that feed needs, which are the biggest cost factor, are supplied. The average production costs of enterprises determined as \$26.652,10 and animal production value is \$22.722,21. Production cost for milk is calculated as \$22.904,81 by applying the proportional cost method in total production cost of milk. The unit milk cost is determined as \$0.33/kg, and Housing Capital is subtracted due to the assessment of non-agricultural investment in urban sprawl and milk cost is determined as \$0.29/kg for urban sprawl. Within the scope of this study, the housing capital in the urban sprawl is considered as the location rent for enterprises deal with dairy cattle breeding.

Long-term investment planning is not possible in agricultural activities, as urban rents are expected in the future for urban sprawl [20,21]. Macroeconomic variables in the national and international context and microeconomic variables closely related to local supply and demand are effective in the evolution of land rents in urban sprawl [22]. With the effect of the agricultural policies, agricultural lands are shifting to non-agricultural uses which are able to obtain rent in the short term [23]. Because of the high cost of urban infrastructure, agriculture is neglected availability factor [24].

Because the agricultural lands in this area are expected to turn into land and the sustainability of agricultural production is at risk. However, dairy cattle breeding is a long-term activity and it is very difficult to convert this production activity into another investment. Although the input prices are high or the milk price is low, it is observed that the activity continues. Temel<sup>[25]</sup> examined the structure of enterprises producing ornamental plants and found that it was established close to the city centers and this provides a location rent.

In livestock enterprises, it has been seen some problems such as odor, waste into the water, disease outbreak, etc., and these are problems for urban sprawl. In the research area, some enterprises have a system in which solid wastes are converted into fertilizers by liquefied for agricultural land. This system should be used in all enterprises. Besides, it is recommended to establish organized livestock areas close to the cities for the sustainability of urban sprawl livestock activities in return for the conversion of agricultural land in urban sprawl into non-agricultural activities. Arrangements should be applied for these areas to continue their activities which do not harm the environment.

On the other hand, because milk is a product that can be quickly spoiled, it is a matter that needs to be close to the market, the urban sprawl is suitable for this. It is also important in terms of reducing urban sprawl transportation costs. The presence of potential consumers in these areas is seen as an advantage in milk marketing. This is an advantage for the consumer in terms of the availability of fresh milk. A cold chain system must be established in order to deliver the milk to the consumers in a healthy way.

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