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Determination of Buffalo Milk Production Cost: The Case of Iğdır Province

Iğdır İlinde Manda Sütü Üretim Maliyetinin Belirlenmesi

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Anahtar Kelimeler:
Hayvancılık ekonomisi, manda sütü, maliyet analizi, ürertim, Iğdır.

ABSTRACT

Objective: The study aims to determine the production cost of buffalo milk in Iğdır Province.

Material and Methods: The questionnaires from 92 water buffalo farms obtained at 2016, determined by simple random sampling method were used. While calculating the milk cost, used the combined cost method was used.

Results: At the end of the study, it was determined that there were 3.04 female buffaloes in each farm and a total of 3064 kg of buffalo milk was produced. Fixed costs account for 60% of buffalo milk production costs and variable costs for 40%. While the foreign shepherd's expenses have the highest share in variable costs, the most share is received by family labor wage provisions among fixed costs. It was calculated that the selling price of per kilogram of buffalo milk is 1.67 $, the cost is 0.59 $ and the net profit is 1.08 $.

Conclusion: Buffalo breeders have completed the production period profitably by selling buffalo milk at a price above the cost. It can be suggested to increase the number of buffaloes in the region and continue production.

ÖZ

Amaç: Bu çalışmanın amacı Iğdır ilinde manda sütü üretim maliyetini belirlemektir.

Materyal ve Yöntem: Basit Tesadüfi Örnekleme Yöntemine göre belirlenen 92 adet manda üreticisi ile yüz yüze yapılan anketlerden elde edilen 2016 yılına ait veriler kullanılmıştır. Süt maliyeti hesaplanırken birleşik maliyet hesaplama yöntemi kullanılmıştır.

Bulgular: Çalışmada her işletmede ortalama 3.04 adet dişi manda bulunduğu ve 3064 kg manda sütü üretildiği belirlenmiştir. Manda sütü üretim masraflarının %60'ını sabit masraflar, % 40'ını ise değişken masraflar oluşturmaktadır. Değişken masraflar içinde en yüksek payı yabancı çobanın masrafları alırken, sabit masraflar içinde en fazla payı aile işçi ücret karşılıkları almaktadır. Kilogram başına manda sütü satış fiyatı 1.67 $, maliyet 0.59 $ ve net kâr 1.08 $ olarak hesaplanmıştır.

Sonuç: Manda üreticileri maliyetin üzerinde bir fiyatla manda sütünün satarak üretim periyodunu kârlı bir şekilde tamamlamışlardır. Bölgedeki manda sayısının artırılması ve üretime devam edilmesi önerilebilir.

INTRODUCTION

Water buffalo breeding, which is an important sub-sector of bovine breeding, is carried out for many important purposes. Water buffalo is an animal that adapts easily to all kinds of climatic conditions and can use roughage effectively. It has a higher productivity than cattle and buffaloes cause lower social and environmental problems (Sheikh et al., 2006; Atasever and Erdem, 2018; Karlı et al., 2018). Buffalo milk is rich in vitamins, minerals and protein and has a low cholesterol content (Salari et al., 2013; Akoz, 2017). Sausage, cream, etc. products can be made from buffalo meat, which is similar to beef in taste and content and superior to beef in terms of calories and

fat (Hekimoğlu and Altındeğer, 2009; Çetinkaya et al., 2011). In terms of world buffalo presence in 2019, India ranks first (53.7%-109851678 heads), while Turkey ranks 20th (0.16%-178397 heads) (FAO, 2019). World buffalo milk production amount in 2019 is 133752296 tons. India ranks first (92 million tons) in world buffalo milk production, while Turkey ranks 10th (79341 tons). Iran ranks first (2844 lt an^{-1}) in world buffalo milk yield per animal, while Turkey ranks 8th (993 lt an^{-1}) (FAO, 2019).

Although Turkey has a suitable climate and soil structure for animal production, sufficient amount of animal products cannot be obtained (Karli et al., 2018). Due to the place and importance of dairy products in terms of nutrition and public health, meeting the reliable raw milk supply to meet the demand has become one of the most important policy issues for policy makers. For this reason, the necessity of following the sector in stably (Şekerdil and Engindeniz, 2020). Turkey's buffalo milk yield is half of the world average, which causes insufficient production and low producer incomes. Increasing productivity leads to lower product costs and more profit to the producers. Profit is an important measure of success used to compare production activities in terms of the use of scarce production factors in the farm and shows the success of the farms (Rehber and Tipi, 2015). Product costs in buffalo farms, product prices determination and decisions about production, production planning, business continuity, sustainable profit, etc. are very important in terms of topics.

Determining the amount and value of the inputs used in the production of agricultural products is necessary to reach the optimum cost that can achieve with the cost and the most appropriate input use (Çetin and Bahşi, 2019). Inflation-related increases in agricultural input prices in countries with inflation affect product costs and profit levels. Therefore, it is important for farms need to recalculate the costs of agricultural products every year. Due to the increase in input prices increasing cost raise product prices and adversely affect consumers' product consumption.

On the other hand, low product prices reduce the amount of production and cause imports. It is necessary to determine the costs of agricultural products and collect them in the database to create more realistic agricultural policies and sustainable production. The fact that there has not been any study on the production cost of buffalo milk in the region reveals the necessity of the study. It is important for sustainability to determine the input levels used in buffalo milk production and the profitability of the product. Although there are many studies on buffalo breeding and buffalo milk characteristics, (Aksel et al., 2013; Cruz-Cruz et al., 2014; Ozdemir and Ozdemir, 2016; Presicce, 2017; Catozzi et al., 2019; Yılmaz and Kara, 2019; Ermetin, 2020) studies on the cost of buffalo milk are very limited (Suresh et al., 2009; Aujla and Hussain, 2015; Kaygisiz et al., 2018). This study aims to determine the amount and prices of the inputs used in buffalo milk production and to reveal the product cost and profitability.

MATERIALS and METHOD

The research material is the data obtained from 92 buffalo breeding businesses registered to the Iğdır Directorate of Provincial Agriculture and Forestry. Iğdır province, located on the eastern border of Turkey, is located between 39° 55' north latitude and 44° 02' east longitude and is at an altitude of 850 m. There is Armenia on the northern and northeastern border of Iğdır, Nakhchivan and Iran in the southeast and east (SERKA, 2021).

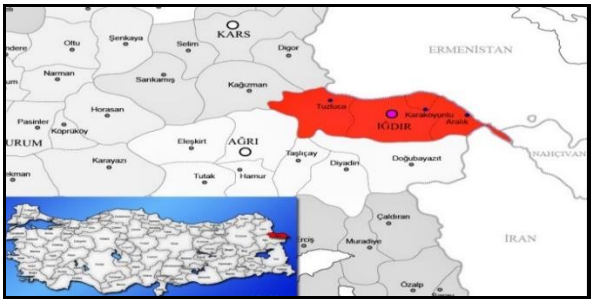

Figure 1. Iğdır map

Şekil 1. *Iğdır haritası*

The following sampling formula, which is included in the Simple Random Sampling Method, was used to determine the number of questionnaires used in the research (Arıkan, 2007; Yamane, 2010). In calculating the sample size, the number of buffalo-breeding farms in the region was taken into account. The research conducted at the agricultural production period of 2016. The survey was carried out between September and October 2016.

$$n = \frac{\mathrm{N.t^2.pq}}{(\mathrm{N}-1)\mathrm{D^2} + \mathrm{t^2pq}}$$

n= Number of samples

N= Number of registered farms

D= Sampling error

t= Table value

p= The rate to be calculated

q= 1-p

$$n = \frac{270\mathrm{x}1.96^2\mathrm{x}0.1\mathrm{x}0.9}{(270-1)\mathrm{x}0.05^2 + 1.96^2\mathrm{x}0.1\mathrm{x}0.9} = 91.68$$

The distribution of the survey numbers to the districts is given in Table 1.

Fixed costs do not change depending on the volume of production. On the other hand, variable costs increase or decrease proportionally depending on the volume of production. Variable costs are feed, salt, water, labor, veterinary, marketing, artificial insemination etc. contains. Fixed costs consist of general administrative expenses, depreciation and family labor wages (Chaudhry and Ahmad, 1987). 3% of the total of variable costs were taken as general administrative expenses. When calculating the average number of female buffaloes, number of buffaloes beginning of term – number of sold + number of buffaloes end of term /2. The average number of female buffaloes in each farm was multiplied by the milk yield and milking time and the total amount of milk per farm was found. The milk value was found by multiplying the total amount of milk by the milk price. The cost of one litre of milk was found by dividing the remaining value by the amount of milk after deducting the buffalo manure value, inventory value increase and incentives from the total costs. While determining the unit price of production inputs, it is taken the prices in the period when the producer used the mentioned input into account. While the calculated cost values were determined in dollars, the average dollar exchange rate for 2016 was taken as 3.01798 TL (TCMB, 2016). The coefficients used in calculating the buffalo existence in Bovine Units (BBHB) are taken as male buffalo: 0.90, female buffalo as 0.75 and buffalo calf as 0.20 BBHB (Yüksek et al., 2003; Armagan et al., 2004).

RESULTS and DISCUSSION

Change (number-N) and value ($) in buffalo capacity in farms during the year were evaluated (Table 2). At the end of the production period, it was determined (BBHB) that there were 1.25 male buffaloes, 2.45 female buffaloes and 0.46 buffalo calfs with a total value of 5316 $ in each farm.

It is seen that an average of 10 water buffaloes is found in the farms that raise water buffaloes in the province of Muş-Turkey (Işık, 2015), Aujla and Hussain (2015) reported that there are 2-4.8 buffaloes in each farm in the Kundhi zone in Pakistan, and between 2.3-14.5 buffaloes in each farm in the Nili-Ravi zone. Kaygisiz et al. (2018) determined that there are 44 buffaloes in average in each farms that raises water buffalo in the Çatalca district of Istanbul-Turkey.

Total production costs (C) (A+B) 2181 + 3271 = 5452 $

Variable and fixed cost elements in buffalo milk production were evaluated and total production costs were calculated as 5452 $. While foreign shepherd's expense (Temporary + Permanent labor wage) with the higest share of 19.35% (422 $) in variable costs, salt has the lowest percentage with 0.17% (4 $). Among the fixed expenses, the family labor wages have the highest share for with 37.34% (1222 $), while the least share is the capital interest expenses of the Equipment-Machine with 0.03% (1 $). 60.00% of the total production costs are fixed and 40.00% are variable costs (Table 3-4).

There is an average of 3.04 milking buffaloes in each farm. The average milk yield is 4.78 kg day^{-1} and the milking period is 212.95 days. The total milk production amount per farm was calculated as 3094.42 kg and the yield per buffalo was calculated as 1017 kg (Table 5.). Producers stated that buffalo milk yield is low due to insufficient care and feeding conditions. It was also determined that buffaloes had low milk yield. Işık (2015) stated in her study of the economic analysis of water buffalo breeding activity in Muş province that the average number of milked buffaloes per farm is 4.56 heads and the average daily milk yield per milked buffalo is 4.51 kg. In addition, in the same study, the average milk yield per buffalo was determined as 954.42 kg and the average annual milk production per farm was reported to be 4355.80 kg. Aujla and Hussain (2015) stated that the milk yield of buffalo in different ecological zones of Pakistan varied between 2289-2375 liters throughout per annum. Turan (2019) determined the daily milk yield of buffaloes in Diyarbakır as 3.63 kg and their lactation period as 7.1 months. Koyuncu et al. (2021) determined the lactation period as 240 days, the lactation yield as 1000-1200 kg and the yield as 5 kg in the buffalo milk production in Bursa Mustafa Kemalpaşa district.

Milk sales price ($ kg^{-1}): 1.67 (**E**)

Total Value of Produced Milk ($): 5157 (**F**)

Inventory Change (IC): (end of year inventory + sales during the year + consumed during the year) – (beginning of year inventory + purchases during the year)

IC: (9771 + 4317 + 0) - (10138 + 928) = 3022 $ **(G)**

The increase in inventory value was positive due to the large number of animals sold during the year and the low number of animals purchased.

Incentives:132$head^{-1} buffalo incentive3.04$= 403$ **(H)**

While the Gross Production Value in the buffalo farms was calculated as 8787 $, the cost of 1 kg of milk was found to be 0.589 $, and a profit of 1.67 - 0.589 = 1.08 $ is obtained from 1 kg of milk production. Proportional profit was found to be 0.533 $. Producers earn 0.533 $ profit for their 0.331 $ expense to produce milk (Table 6). In other words, $1.61 profit was obtained for $1 cost. Surehs et al. (2009) reported that the net income from buffalo production (720 $) in Haryana is greater than that from cow production (385 $). Kaygisiz et al. (2018) stated that farms that raise buffaloes in Istanbul make an average of 0.47 $ profit from the sale of one kg of buffalo milk.

Table 1. Number of surveys by district
Çizelge 1. *İlçelere göre anket sayısı*

Region	Number of members	%	Number of surveys
Iğdır Center	130	48	44
Aralık	84	31	29
Karakoyunlu	56	21	19
Total	270	100	92

Table 2. Change (number-N) and value ($) in buffalo capacity in farms during the year
Çizelge 2. *İşletmelerde yıl içinde manda kapasitesindeki değişim (sayı-BBHB) ve değeri ($)*

Group	Beginning of term	Born	Dying	Sold	Purchased	End of term	Value
Male Buffalo	1.29	-	-	0.14	0.12	1.25	2074
Female Buffalo	3.06	2.71	-	0.89	0.28	2.45	2393
Buffalo Calf	0.09	0.72	0.02	0.35	0.01	0.46	849
Total	4.43	3.43	0.02	1.38	0.40	4.16	5316

Table 3. Variable costs in buffalo milk production
Çizelge 3. *Manda sütü üretiminde değişen masraflar*

	Amount (Kg)	Price ($ kg^{-1})	Total ($)	%
Factory feed	222	0.39	87	3.98
Clover	3261	0.12	400	18.33
Bran	248	0.32	81	3.70
Corn silage	432	0.04	171	7.84
Cracked wheet	178	0.26	46	2.11
Creacked barley	575	0.22	126	5.77
Straw	836	0.13	111	5.08
Hay	222	0.11	25	1.15
Sweet corn	43	0.21	9	0.42
Salt	23	0.16	4	0.17
Foreign shepherds cost	-	-	422	19.35
Veterinerian-vacine-medicine	-	-	178	8.18
Electric	-	-	66	3.04
Water	-	-	38	1.72
Marketing	-	-	10	0.47
Barn disinfection	-	-	45	2.05
Milker cost	-	-	259	11.89
Device machine variable costs	-	-	51	2.32
Artificial ınsemination costs	-	-	53	2.43
Total variable cost (A)			2181	40.00

Table 4. Fixed costs in buffalo milk production
Çizelge 4. *Manda sütü üretiminde sabit masraflar*

	Amount (Kg)	Price ($ kg^{-1})	Total ($)	%
General administrative costs (Ax3/100)	-	-	64	1.97
Family labor costs	-	-	1222	37.34
Building capital depreciation	-	-	816	24.95
Building capital interest	-	-	663	20.28
Building repair and maintenance cost	-	-	51	1.55
Buffalo depreciation	-	-	250	7.64
Buffalo capital interest	-	-	99	3.03
Equipment machinery depreciation	-	-	4	0.12
Equipment machine interest	-	-	1	0.03
Total fixed costs (B)			3271	60.00

Table 5. Average number of milked animals, milk yield, lactation period and total milk produced per farm
Çizelge 5. *Ortalama sağılan hayvan sayısı, süt verimi, laktasyon süresi ve işletme başına üretilen toplam süt miktarı*

Milked animal (head)	Milk yield (kg/day)	Lactation period (day)	Milk production (kg/farm)
3.04	4.78	212.95	3094.42 (D)

Table 6. Average gross production value and proportional profitability of farms
Çizelge 6. *İşletmelerin ortalama gayrisafi üretim değeri ve oransal kârlılığı*

Gross production value	(TL)
Milk value	5157(F)
Manure value	205 (G)
Inventory change	3022 (H)
Incentives	403 (I)
Total	8787 (K) (F+G+H+I)
Unit cost	0,589 [C - (G+H+I) / D]
Proportional profit (gross production value / Total production costs)	0.533 (K / C)

CONCLUSION

Water Buffalo breeding continues as an important activity for agricultural producers in the province of Iğdır, which is located on the eastern border of Turkey, as it is all over the world. Although the producers gain from buffalo breeding due to the high price of buffalo milk, support and positive stock changes, the yield of buffalo milk in Iğdır province is well below the world average, although it is above the Turkey average. Care, feeding and rearing conditions in buffalo breeding directly affects milk yield and producer income. For the regional water buffalo producers to increase the buffalo milk yield and reach the world average buffalo milk yield, trainings should be given to the producers by the relevant units on the issues of water buffalo breeding, care and feeding. In order to meet the increasing demand for buffalo milk, it is expected that more water buffalo will be raised and the easier marketing of the greater amount of water buffalo milk and its products will increase the income of the producers. Furthermore, in addition to the fact that buffalo breeding contributes to the regional economy, consumers will be able to consume sufficient amounts of buffalo milk and products.

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