Factors affecting milk production in dairy farming enterprises and effectiveness analysis: a case study in Konya Province of Turkey

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Abstract

The aim of this study to calculate milk production costs of milk producers both member and non-member of Eregli Milk Producers Union, to make an analysis of factors affecting milk production and finally to calculate the technical efficiency of the enterprises in Konya. The basic data has been obtained from voluntary 50 distinct dairy farms which were selected randomly through the face to face survey method, among which there are both union members and individual producers. The unit milk cost of member enterprises is estimated as 0,65 TL/kg and 0,67 TL/kg for non-member enterprises. Among the productions costs, the highest share belongs to the forage costs. Results of Cobb-Douglas production function analysis reveal that concentrate feed statistically affect the milk production of milk producers being member to the Eregli Milk Producers Union on a significant level. It is defined that the coarse feed and concentrate forage affected the milk production in non-member milk producers. Even though the technical efficiency is in good level in the research area, it is not in the desired level. Technical efficiency was analyzed using the Data Envelopment Analysis (DEA) method. While the technical efficiency of union member dairy farming enterprises is 0,83, for non-member enterprises is 0,86. Organization of Eregli milk producers, carrying out technical training and publications and increasing quality coarse feed production in the enterprises will contribute to the development of milk production activities.

Key words: Dairy farming. Technical Efficiency. Konya. Turkey
1. Introduction

In the dairy farming activities, dairy cattle breeding the most important situation due to economic, social and health conditions., family workforce potential is used, forage produced in the enterprise is recycled and sustainable profit is made by milk selling. In this aspect, there are various studies on the success of milk producers and their profitability levels (Kauffman and Tauer, 1986; Kauffman, J.B. and Tauer, L.W.1986).

In social aspect, producers increase the income in rural areas, hinder the migration from villages to the cities and create employment by providing raw material for the food industry. In terms of health, on the other hand, increasing the milk production and decreasing the costs will bring people acquiring habit of drinking milk and thus will contribute to the common health care.

One of the indicators used for determining the development levels of the countries is the production of animal products and the consuming level per individual (Sapdeniz, 1993). In order to have future generations healthier and keep them in balanced nutrition, sufficient consumption of animal sourced proteins is necessary.

Milk and meat products come first in the list of anima sourced products. For this reason, various studies on the costs, economic analysis, technical and economic efficiency analysis related with the milk production enterprises (Williams et al., 1987); (Mc Gilliard et al., 1990); Gloy et al. 82002); Jackson-Smith et al. 82004); Mishra and Morehart (2001); Tauer and Mishra ( 2006); Alvarez and Arias, (2003); Osta and Johnson (1998);Şahin et al. (2001); Semerci et al. (2015);Alvarez et al. (2014); Aktürk et al.( 2013);( Kelly et al. 2012); Dagıstan et al. (2009); Gul et al. (2009)

Throughout the world, milk production reached 512.708 tone’s in 2010 with an increase of %1,5 and cow milk production reached 440.332.000 tone’s with an increase of %1,1. And milk export in the world was about 335.000.000 tone’s in 2010 with an average increase of %25 (TEPGE, 2011). Of all the milk production, about %84 of it is obtained from cows, %12 is from buffalos %1 is from goats, %1 is from sheep and %0,2 is from camels (Anonymous, 2012). In Turkey, milk production in 2010 increased by %8,5 contrary to the common global slowing down and reached 13.605.600 tone’s.

Although the decline in the cow milk production worldwide is due to the change in the climate conditions, this factor is not an indicative one in Turkey since the meadow farming is not large-scale (ASÜD, 2010). Of all milk produced in Turkey, %92 is gained from cows, %6
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is from sheep and the rest is from buffalos and goats. Cows constitute the %61 of milking animal number and cattle constitute the %27 of it. Of all the cow stock, %41 of it is crossbred, %36 of it is cultured and %24 of it is native race (Anonymous, 2010).

In the Konya Province, average daily milk production for the year of 2010 is 2.612 tones. Annual milk production is 940,584 tones. Milk production showed an increase from the year of 2007. There are 427,241 bovine animals in 825 residential units in 31 districts in the province of Konya and 147,519 of these are milking animals. On the basis of districts and in terms of milking bovine animals, Eregli takes the first place with a percentage of %10.64 (Anonymous, 2012).

Agriculture sector has a significant place in the nutrition of population and development of country. Determining the quantity of products in agriculture enterprises and the levels of production inputs and gathering the related data would contribute to taking measures necessary for better sourcing and increased productivity.

In this study, since milk production is important for both producers and consumers, it is aimed to plan real milk cost and enterprises and to estimate the factors affecting milk production in the resolution process and also the technical efficiency of the enterprises.

2. Materials and Method

Materials of the study consist of primary data collected via surveys conducted for the dairy cattle enterprises both member and non-member to the Milk Producers union in Eregli district of Konya province. The surveys were performed by the researcher personally in the 2011-December period. Besides, statistical data collected by the various institutions and organizations supporting the study and their publications have been utilized.

All enterprises, both member and non-member to the Milk Producers Union, do have cultured dairy cattle. These enterprises have been divided into four layers considering the dairy cattle frequency they had as 1-3 heads, 4-10 heads, 11-25 heads and 26-above heads respectively.

In determining the sample volume of these layers, stratified random sampling method has been used (Yamane, 2001). Sample number has been found as 50 enterprises by considering the %10 allowable error quantity of the average and %90 confidence interval (table 1).
Table 1: Number of interviewed farmers in 2011

<table>
<thead>
<tr>
<th>Farms size Group(head)</th>
<th>Nh</th>
<th>Sh</th>
<th>NhSh</th>
<th>Nh(Sh*Sh)</th>
<th>Average</th>
<th>Sample Size (n)</th>
<th>C.V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>341</td>
<td>0.74</td>
<td>254</td>
<td>188</td>
<td>2.22</td>
<td>6</td>
<td>33.54</td>
</tr>
<tr>
<td>4-10</td>
<td>511</td>
<td>1.69</td>
<td>864</td>
<td>1.460</td>
<td>5.65</td>
<td>22</td>
<td>29.94</td>
</tr>
<tr>
<td>11-25</td>
<td>80</td>
<td>3.75</td>
<td>300</td>
<td>1.123</td>
<td>13.79</td>
<td>8</td>
<td>27.17</td>
</tr>
<tr>
<td>26+</td>
<td>32</td>
<td>17.40</td>
<td>557</td>
<td>9.689</td>
<td>53.75</td>
<td>14</td>
<td>32.37</td>
</tr>
<tr>
<td>Total</td>
<td>964</td>
<td>24</td>
<td>1.974</td>
<td>12.460</td>
<td>6.465</td>
<td>50</td>
<td>33.54</td>
</tr>
</tbody>
</table>

Cost per unit milk is calculated according to the sales values method. For the share of milk in the total costs, in gross output value (GOV) belonging to the dairy cattle activities the share that milk takes is taken into consideration (Aktürk et al., 2010). The gross output value of dairy cattle production branch is consisted of main production (sold and domestically used milk) total value and side products (productive inventory stock value increase (PISVI), industrially produced feed and incentives). Productive inventory stock value increase has been calculated with the formula below (Kıral et al., 1993).

Productive Stock Value (PSV)= (Year end stock value+value of the sold + value of the stock slaughtered)- ( value of the stock at the beginning of year + value of the bought). In order to calculate the manure production value, in the enterprises for grown cattle 40 kg, 0-6 months and 1-year-old cattle 30 kg and for calves 15 kg manure have been accepted and for the regional market conditions, price for manure per kg has been taken as 0,125 TL. Forage costs have been estimated according to the daily forage consumption and regional prices. Relative profit and absolute profit are calculated according to the formula below.

Relative profit = GPV/production costs, Absolute profit=GPV-production costs

Econometric analysis of the factors affecting the milk production has been carried out with the help of Cobb-Douglas production function. Cobb-Douglas production function equations have been commonly used in the functional analysis of agricultural production (Gundogmus, 1998; Karkacıer, 2001). Cobb-Douglas is in the form of general demonstration $Y = a * X^B$ of the production function. By taking the logarithm of the variables, it can be converted to the linear form in the way of $log Y = loga * B log X$. Logarithmic values could ensure flexibility and make statistical tests easier and more reliable. Taking the logarithms of the data would also resolve the changing variance problem (Gujarati, 1995). Estimated production equation could provide knowledge on marginal yield provided by each input used in production and marginal rate of substitution reflecting the substitution condition between the factors. Cobb-Douglas production function is estimated by inter-factorial $MTLOX_2X_1= - B_2X_1/ B_1X_2$ (Karkacıer, 2001). $X_i$ is the geometrical mean belonging to the factors.
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Y = a + b₁X₁ + b₂X₂ + b₃X₃ + b₄X₄

Y = annual milk production
X₁ = number of dairy cattle
X₂ = milking with machinery
X₃ = annual coarse feed consumption
X₄ = annual concentrated forage consumption

Technical efficiency indicates the ability to reach the maximum production quantity with a particular amount of input. In today’s efficiency analysis studies, Data Envelopment Method (DEM) as a non-parametric method or Stochastic Limit Analysis (SLA) as a parametric method is commonly used. DEM is one of the linear programming techniques as a non-parametric approach and has been developed by Chames et al. (1978) and has been proposed by Farrell (1975) and Jan et al. (2010).

However, there are three main reasons for SLA being preferred more than DEM in calculating the measurements of the efficiency. First of these is that when DEM is used, a special production function is needed. Second, it is not necessary to predetermine the type of distribution belonging to the error term which is accepted as the measurement of the efficiency. The third reason is that where there is more than one input, DEM is more practical (Coelli et al., 1998; Kumbhakar and Lovel, 2000; Dagistan et al., 2009; Gul et al., 2009; Koc et al., 2011).

Since homogeneity is very important in DEM, efficiency measurements of the dairy cattle farming enterprises are estimated for each layer separately. In this study, Farrell’s efficiency measurements devoted to input have been preferred. In the present study, the input variables of each dairy cattle farming enterprises consist of (xᵢ) milking cow number, milk yield per animal, workforce used (hour), size of stable per animal (m²), coarse feed consumption per animal (kg), concentrated feed consumption (kg), milking machine or unit number.

However, output variable (Yᵢ) is annual milk production per animal (Table 2). Thus an efficiency model with 7 inputs and 1 output has been composed. For each farming enterprise, technical efficiency devoted to input is obtained by the resolution of the linear programming model below.

Minimum \( \theta_i \)

Limitations \( - y_i + Y_i \lambda \geq 0 \)
\[ \theta x^*_i - X\lambda \geq 0 \]
\[ \lambda \geq 0. \]

In the equation \( \theta \) expresses technical efficiency score for each farming enterprise, \( \lambda \) expresses constant number vector consisting of 1’s, \( X \) for input matrix and \( Y \) for output matrix respectively. This equation demonstrates the production efficiency in conditions of constant returns to scale (CRS). Constant returns to scale model is available only when the enterprises run in the optimum scale (Coelli et al., 1998).

Since the farming enterprises have unsatisfying capital and shortfall knowledge about the market, a limiter providing convexness (\( N1\lambda = 1 \)) is added to CRS model and it is changed to the variable returns to scale model (VRS). Since the addition of the limiter to the model hinders the calculation of the scale activity, it has been calculated by proportioning the technical efficiency in the conditions of CRS to the technical activity (pure technical efficiency) in the conditions of VRS (Banker et al., 1984).

Also in the efficiency analysis, enterprises with technical efficiency coefficient between 0.95 and 1 are classified as efficient, those ranging between 0.90 and 0.95 as less efficient and others with coefficient lower than 0.90 are classified as inefficient (Charnes et al., 1978).

### Table 2: Variables used in the technical efficiency in respect of enterprise size

<table>
<thead>
<tr>
<th>Layer size</th>
<th>Num. of enterprises</th>
<th>Annual milk production (kg/head)</th>
<th>Milking cow number</th>
<th>Milk yield (kg/head)</th>
<th>Milking machine / unit number</th>
<th>Stable size (m²/head)</th>
<th>Coarse feed consumption (kg/head)</th>
<th>Concentrated forage consumption (kg/head)</th>
<th>Workforce (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>6</td>
<td>5789.03</td>
<td>3.00</td>
<td>16.50</td>
<td>1.00</td>
<td>83.89</td>
<td>13491.08</td>
<td>6468.61</td>
<td>2920.00</td>
</tr>
<tr>
<td>4-10</td>
<td>22</td>
<td>6282.16</td>
<td>8.00</td>
<td>18.00</td>
<td>1.23</td>
<td>39.81</td>
<td>9326.88</td>
<td>4974.34</td>
<td>2920.00</td>
</tr>
<tr>
<td>11-25</td>
<td>8</td>
<td>6684.63</td>
<td>21.00</td>
<td>21.50</td>
<td>2.13</td>
<td>104.84</td>
<td>12036.67</td>
<td>4760.71</td>
<td>2920.00</td>
</tr>
<tr>
<td>26+</td>
<td>14</td>
<td>6898.73</td>
<td>48.00</td>
<td>19.50</td>
<td>1.86</td>
<td>72.43</td>
<td>11312.72</td>
<td>4686.16</td>
<td>4171.43</td>
</tr>
<tr>
<td>Avg.</td>
<td>50</td>
<td>6636.98</td>
<td>20.68</td>
<td>18.81</td>
<td>1.52</td>
<td>64.64</td>
<td>10960.65</td>
<td>4705.54</td>
<td>3270.40</td>
</tr>
</tbody>
</table>

### 3. Research Findings

Some information about the enterprises are compiled and given in Table 2. Enterprises being member to the Eregli Milk Producers Union do have an average of 31 milking cows and obtain approximately 20.57 kg/head of milk (daily) from milking cows in 285 days per year. In the enterprises who are not members to the union on the other hand, there are 11 head milking cows on average and they obtain 16.73 kg/head of milk (daily) from milking cows in 300 days per year.
According to the relative sale values method, unit milk cost has been found as 0.65 TL for dairy cattle farming enterprises being member to the Eregli Milk Producers Union. Relative profit of these enterprises is 1.31. In other words, for each capital worth of 1 TL for milk production, a revenue of 1.31 TL is gained. Absolute profit of milk production in an enterprise is 43698.13 TL (table 3).

Table 3: Unit milk cost according to relative sale values method (enterprises member to the milk producers union)

<table>
<thead>
<tr>
<th>Amount of Production</th>
<th>GVP</th>
<th>Production cost</th>
<th>(% share of Unit Cost)</th>
<th>Relative Profit</th>
<th>Absolute Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>219787.00</td>
<td>186355.50</td>
<td>142657.37</td>
<td>50.52</td>
<td>0.65</td>
</tr>
<tr>
<td>PSK</td>
<td>---</td>
<td>73196.67</td>
<td>56047.32</td>
<td>19.85</td>
<td>---</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>850045.00</td>
<td>109291.50</td>
<td>83661.56</td>
<td>29.63</td>
<td>0.10</td>
</tr>
<tr>
<td>Total</td>
<td>---</td>
<td>368843.67</td>
<td>282354.25</td>
<td>100.00</td>
<td>1.31</td>
</tr>
</tbody>
</table>

Unit milk cost of dairy cattle farming enterprises, which are not member to the union, is found as 0.67 TL according to the relative sale values method. Relative profit of these enterprises is 1.04 TL. For each capital worth of 1 TL for milk production, a revenue of 1.31 TL is gained. Absolute profit of milk production in an enterprise is 1452.72 TL (table 4).

Table 4: Unit milk cost according to relative sale values method (enterprises which are not member to the union).

<table>
<thead>
<tr>
<th>Amount of Production</th>
<th>GVP</th>
<th>Production cost</th>
<th>(% share of Unit Cost)</th>
<th>Relative Profit</th>
<th>Absolute Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>58988.00</td>
<td>40853.87</td>
<td>39401.15</td>
<td>37.72</td>
<td>0.67</td>
</tr>
<tr>
<td>PSK</td>
<td>---</td>
<td>44241.67</td>
<td>42668.48</td>
<td>40.85</td>
<td>---</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>232080.00</td>
<td>23208.00</td>
<td>22382.75</td>
<td>21.43</td>
<td>0.10</td>
</tr>
<tr>
<td>Total</td>
<td>---</td>
<td>108303.53</td>
<td>104452.38</td>
<td>100.00</td>
<td>1.04</td>
</tr>
</tbody>
</table>

Table 5: Regression analysis results of the milk producers being member to the Eregli Milk Producers Union.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard error</th>
<th>T value</th>
<th>The value</th>
<th>The significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>7.191</td>
<td>0.661</td>
<td>10.880</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Number of cows</td>
<td>0.007</td>
<td>0.026</td>
<td>0.259</td>
<td>0.797</td>
<td></td>
</tr>
<tr>
<td>Machine</td>
<td>0.050</td>
<td>0.116</td>
<td>0.434</td>
<td>0.668</td>
<td></td>
</tr>
<tr>
<td>Concentrate feed</td>
<td>-0.055</td>
<td>0.043</td>
<td>-1.280</td>
<td>0.212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.234</td>
<td>0.1081</td>
<td>2.886</td>
<td>0.008</td>
<td></td>
</tr>
</tbody>
</table>

R² value 0.580
F value 2.755
Durbin Watson d 1.264
Although concentrate feed, which is one of the exponent variables of the model in Eregli Milk Producers Union member enterprises, is solely found statistically meaningful (p=0.008<0.05), the other exponent is not found meaningful (table 5). The certainty coefficient (R²) of the production function is estimated as 0.850 and independent variables explain the milk production amount as %58. According to the regression analysis results, production function is found as 
\[ Y = 7.191 \times X_1^{0.807} \times X_2^{0.050} \times X_3^{-0.055} \times X_4^{0.234}. \]
Beta coefficients give the flexibility.

According to this, in case of a %1 increase in concentrate feed consumption (X₄), daily milk production (Y) will increase %0.234. As it can be clearly understood, there are not any problems related with coarse feed producing and feeding the animals in the enterprises being member Producers’ Union. However, it is useful to increase the concentrate feed amount in preparing ration in order to increase milk production more.

### Table 6: Average and marginal values of factors belonging to milk production of the dairy cattle farming enterprises being member to Eregli Milk Producers Union.

<table>
<thead>
<tr>
<th></th>
<th>Number of squeezing cows (X₁)</th>
<th>Management of squeezing (X₂)</th>
<th>of production (X₃)</th>
<th>Concentrate feed of production (X₄)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric Average</td>
<td>31.20</td>
<td>0.97</td>
<td>12665.00</td>
<td>4969.47</td>
</tr>
<tr>
<td>Marginal Productivity</td>
<td>390.15</td>
<td>333.14</td>
<td>-7.55</td>
<td>81.88</td>
</tr>
<tr>
<td>Average of production</td>
<td>6440.64</td>
<td>6662.73</td>
<td>137.7</td>
<td>351</td>
</tr>
</tbody>
</table>

Since estimation values of Cobb-Douglas type production functions are logarithmic, by taking the antilogarithm of these mean and marginal values are obtained. Considering these values, providing that the other factors are stable, one-unit increase in the number of milking cows will increase the total annual milk production as 390.15 per animal. One kg increase in the coarse feed consumption will decrease annual milk production as 7.55 kg per animal. One kg increase in the concentrate feed will increase annual milk production as 81.88 kg per animal. If enterprise increases the concentrate feed usage with this much, milk yield will be positively affected. An increase of one unit in the machine usage for milking cow, will increase annual milk production as 333.14 kg per animal (table 6).
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Marginal rate of technical substitution (MRTS) could be calculated between the factors having the coefficient mark in the same direction (Karkaci 2001). For this reason, MRTS between coarse feed consumption and concentrate feed consumption could not be calculated.

Table 7: Regression analysis results of non-member milk producers

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard error</th>
<th>T value</th>
<th>The significance value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>4,832</td>
<td>0,629</td>
<td>7,683</td>
<td>0,001</td>
</tr>
<tr>
<td>Number of cows</td>
<td>0,047</td>
<td>0,045</td>
<td>1,054</td>
<td>0,302</td>
</tr>
<tr>
<td>Machine</td>
<td>0,227</td>
<td>0,197</td>
<td>1,154</td>
<td>0,259</td>
</tr>
<tr>
<td>Concentrate feed</td>
<td>0,140</td>
<td>0,070</td>
<td>2,012</td>
<td>0,055</td>
</tr>
<tr>
<td>Concentrate feed</td>
<td>0,261</td>
<td>0,101</td>
<td>2,591</td>
<td>0,016</td>
</tr>
</tbody>
</table>

- R² value: 0,593
- F value: 9,101
- Durbin Watson d: 1,832

The fact that concentrate feed, as one of the exponent variables of the model in enterprises (non-member to the milk producer’s union), is effective in milk producing is statistically meaningful (p= 0,016<0,05). Although the statistically meaningful level is on the limit (p=0,055 > 0,05), coarse feed usage as one of the exponent variables is statistically meaningful.

The certainty coefficient (R²) of the production function is estimated as 0,59 and independent variables are strong enough to explain the milk production amount as %59 (table 7). Production function is found as $Y = 4,832 \times X_1^{0.047} \times X_2^{0.227} \times X_3^{0.140} \times X_4^{0.251}$ according to the regression analysis results. Considering the beta coefficients, an increase of %1 in coarse feed ($X_3$) will increase milk production ($Y$) with %0,140 and an increase in concentrate feed ($X_4$) will increase milk production with %0,261.

Table 8: Average and marginal values of the milk production factors of the milk producing enterprises being non-member to the union.

<table>
<thead>
<tr>
<th></th>
<th>Number of squeezing cows ($X_1$)</th>
<th>Management of squeezing ($X_2$)</th>
<th>of production ($X_3$)</th>
<th>Concentrate feed of production ($X_4$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric Average</td>
<td>10,50</td>
<td>0,97</td>
<td>9265,96</td>
<td>4441,51</td>
</tr>
<tr>
<td>Marginal Productivity</td>
<td>6396,13</td>
<td>1242,78</td>
<td>21,59</td>
<td>83,97</td>
</tr>
<tr>
<td>Average of production</td>
<td>5293,31</td>
<td>5474,80</td>
<td>154,21</td>
<td>321,72</td>
</tr>
</tbody>
</table>

Considering these values, provided that the other factors are stable, an increase of one unit in the number of milking cows will increase total annual milk production as 6396, 13 kg
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per animal. An increase of 1 kg in the consumption of coarse feed will increase annual milk production as 21.59 kg and an increase of 1 kg in the consumption of concentrate feed will increase annual milk production as 83.97 kg.

An increase of one unit in the machinery usage for milking will cause an annual increase of 1247.78 kg in milk production per animal (table 8). MRTS has been calculated between and concentrate feed and found to be as -0.257. According to the estimated results, whereas the other factors of the production function is used in the same level, in order to similar level, a decrease of 0.26 kg in concentrate feed is needed in return of one kg increase of coarse feed.

The technical efficiency coefficient in the examined enterprises varies between 0.33 and 1 and is 0.85 on average. This coefficient shows that non-efficient enterprises would decrease their inputs by %15 without decreasing in their production. Technical efficiency coefficients vary in terms of enterprises’ size (Table 9). According to the data envelopment model, among the enterprises examined, %34 of the enterprises is efficient, %8 of them is less efficient and %58 of them is inefficient.

The main reason for not being able to ensure technical efficiency for research area is pure technical inefficiency. Although most of the examined enterprises are in the suitable size, they cannot run activities technically. In the milk enterprises of the research area, pure technical efficiency and scale efficiency are measured as 0, 88 and 0, 96 respectively (Table 8). Also, whereas the technical efficiency of the dairy cattle farming enterprises (union members) is 0, 83, the technical efficiency of non-members is 0, 86.

### Table 9: Average technical efficiency as of enterprise size groups

<table>
<thead>
<tr>
<th>Layer size</th>
<th>Number of enterprises</th>
<th>Technical efficiency</th>
<th>Pure technical efficiency</th>
<th>Scale activity</th>
<th>The number of active enterprises</th>
<th>The number of little active enterprises</th>
<th>The number of inactive enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>6</td>
<td>0.926</td>
<td>0.927</td>
<td>0.999</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4-10</td>
<td>22</td>
<td>0.881</td>
<td>0.920</td>
<td>0.960</td>
<td>12</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>11-25</td>
<td>8</td>
<td>0.862</td>
<td>0.869</td>
<td>0.993</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>26+</td>
<td>14</td>
<td>0.753</td>
<td>0.816</td>
<td>0.935</td>
<td>2</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Avg.</td>
<td>50</td>
<td>0.848</td>
<td>0.884</td>
<td>0.963</td>
<td>17</td>
<td>4</td>
<td>29</td>
</tr>
</tbody>
</table>

The reason for this again is that while the scale of the enterprises is sufficient, pure efficiency is weak. While the pure efficiency and scale efficiency of the member enterprises are 0, 87 and 0, 97 respectively, pure efficiency and scale efficiency of the non-member enterprises are 0, 90 and 0, 96 respectively.
4. Conclusions and Recommendations

Milk production is one of the most significant areas of the agriculture sector. Rise of feed prices and decline of milk sale prices in milk production are the most significant factors affecting the dairy cattle farming enterprises negatively. Of all the milk production costs of all enterprises, feed costs take the biggest share. In order to prevent the enterprises being affected by the feed prices and to decrease the production costs, it is necessary to increase the production.

In the research area, while the dairy cattle enterprises benefit from the use of the modern technology, the traditional production form is continued and the enterprises are small scaled. For this reason, technical efficiency in the research area is not in the expected level. Production is not sufficient. Enterprises buy the concentrate feed from outside.

This makes an effect of cost increase on milk production. One of the reasons of the low level for technical efficiency in the examined enterprises is that, while the dairy farming enterprises work in the suitable scale, there is the matter of technical knowledge defect and the insufficiency business manager. The knowledge of preparing the self-feed ratio for each enterprise is not sufficient in terms of business management. The fact that more than %70 of the stables is in the form of roped and lined barns affects the health of the animals negatively and decreases the milk yield. In order to reverse these negative conditions in the area, the balance of producer-publisher-researcher should be well-formed and rural participatory approaches should be adopted in the practices. Also, in order to put the producers in a more powerful condition against the market and increase their competitiveness, organizations such as cooperatives and producer unions should be encouraged.

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