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# Economic analysis of sheep farming activities in Turkey

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In this study, economic analysis of agricultural farming that also involves sheep farming in Konya Province in Turkey was done and then the effective factors in sheep farming activities were determined. The average household size of farms was 3.97 people and the average size of farms was 137.95 ha. The value of the total assets was composed of 57.44% fixed capital and 42.56% operating capital in farms. The average gross production account was 44.71% of crop production value and 55.29% of animal production. 36.77% of animal production value belonged to the sheep farming. The biggest share, 63.47% of feed costs and second share, with 24.24% of labour costs contained in the variable costs belonged to sheep farming activities. According to the factor analysis, 27 of variables affecting sheep farming are gathered by 4 factors. These factors are: Income, volumetric, costs and labour factors.

**Key words:** Sheep farming activities, economic analysis, factor analysis, Konya.

## INTRODUCTION

Adequate and balanced nutrition of the growing population of Turkey which is used as raw material for the livestock industry in many areas has an important place. In addition, the animal husbandry sector, due to a lot of activities included in Turkey's economy, can bring solution to social problems. This sector helps to decrease unemployment in rural areas and urban migration, thereby avoiding unplanned urbanization and social functions like reducing the pressure of population. Livestock contribute to the balanced development of a country, increase national income and provide raw materials to other sectors. Sheep farming requires low capital and not much specialized machinery compared with most of the other agricultural production alternatives (Nix, 1988). The most important factor affecting the gross margin of sheep farms in Tonk, Rajastan region of India was labor expenses. The labor used was below the optimum level in small farms while it was around the optimal level in big farms (Sirohi and Rawat, 2000). A large number of the sheep farmers in Karnata Region of India had no land and more than half of the farmers were involved in blanket weaving activity and the yearly activities resulted in an Rs 13.000 net profit (Geeta et.al., 1999). According to the Turkish Statistical Institute (TurkStat) data, Konya Province has 31 districts. 15 districts train indigenous breed of sheep; 16 districts train indigenous sheep breeds and varieties and breeds of merino sheep. Konya Province has the most intensive sheep farming enterprises and agricultural technique, in geographic and economic situation (Anonymous, 2009).

## MATERIALS AND METHODS

An important part of the material used in the study includes the area of agricultural holdings engaged in sheep breeding from where the survey is done. Sample businesses were selected and questionnaires were filled by making personal interview. Information was collected from the agricultural enterprises in this survey from October to November 2009. In addition to the primary data obtained, which are related to the subject of previous research

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**Table 1.** Enterprises surveyed land nevis (also) and distribution (%).

| Business groups | Arable land | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Irrigated land | | Dry land | | Fallow | | Total arable land (irrigated land + dry land – fallow) | | Kitchen garden | | Fruit garden | | Total land | |
| | (da) | (%) | (da) | (%) | (da) | (%) | (da) | (%) | (da) | (%) | (da) | (%) | (da) | (%) |
| 1 | 10.33 | 12.21 | 73.61 | 87.03 | 1.23 | 1.46 | 82.71 | 97.78 | 0.29 | 0.34 | 1.58 | 1.87 | 84.58 | 100.00 |
| 2 | 35.73 | 21.39 | 130.53 | 78.16 | 0.00 | 0.00 | 166.25 | 99.55 | 0.48 | 0.28 | 0.28 | 0.16 | 167.00 | 100.00 |
| 3 | 125.18 | 28.50 | 364.91 | 83.07 | 51.09 | 11.63 | 439.00 | 99.94 | 0.00 | 0.00 | 0.27 | 0.06 | 439.27 | 100.00 |
| Mean of businesses | 27.36 | 19.83 | 115.37 | 83.63 | 6.27 | 4.54 | 136.46 | 98.92 | 0.30 | 0.21 | 1.19 | 0.86 | 137.95 | 100.00 |

findings, published records and secondary data were used by various organizations. Methods applied in the study are given as follows.

Under the preliminary study, the characteristics that could represent the province as purposeful districts respectively were chosen. There are three districts within the scope of this research. In these districts in 2009, there was a total number of 334.795 heads of sheep in 28.58% of the province of Konya. There was careful selection of sample districts and villages so as to represent natural factors in terms of farming and sheep farming area.

This is the main material for the study of Cihanbeyli, Karatay and Karapınar districts of Konya province engaged in raising sheep. If sheep farming enterprises have at least 25 and more ewes mated, these enterprises were recorded. The criterion is based on the number of at least 25 and more ewes mated. Total population size is 392. The sample population was drawn by simple random sampling (SRS) method. Proportional method was the formula used for finding the value of n (Yamane, 1967). N value is founded by formula in the proportional method.

$$n = \frac{N \sum N_h S_h^2}{N^2 D^2 + \sum N_h S_h^2}$$

Businesses dealing with sheep are divided into 3 groups: 100 and below heads in the first group, enterprises with 101 to 200 heads in the second group and enterprises with 201 and over in the third group. According to the method of SRS, population, as a result of the withdrawal of the sample size, is 104. As a result of the sample based on the method of proportionate distribution of the first layer, $n_1 = 73$; second layer, $n_2 = 20$ and the third layer, $n_3 = 11$. In addition, reserve up to 25% of the sample volume of the business has been identified. Villages to do the survey sample survey were chosen by the operators in the absence of reserves.

Economic profitability was calculated by dividing the net return with the total assets. In order to calculate the financial profitability, interest on debt was subtracted from net return and the result was divided with net worth (Erkuş et al., 1995).

Family labour potential was calculated by using man-days (Aras and Çakır, 1975). The assets and liabilities in the balance sheet were organized according to the functional structure of agricultural enterprise (Hopkins and Heady, 1955).

The completed survey forms and data entry of information were made in a spreadsheet environment. The analysis was carried out using the SAS Enterprise Guide 3.0 program (Anonymous, 2004).

Factor analysis of the 27 variables is included in the high element of partnership, formed by the 4 factors obtained from these variables (Anonymous, 2004). Stages of factor analysis are as follows: Factor extraction methods, principal component analysis (PCA) method and Varimax method.

## RESULTS

At the first stage, factor analysis of the correlation matrix examined the correlation between variables. Variables that contain the common factors are expected to have high correlations. The common factor variance (CFV) for factor analysis of the feasibility test was considered.

## Economic analysis findings

As a result of the economic analysis of agricultural holdings, evidence obtained from the average farm size groups and businesses are summarized as follows. The average farm enterprises had 1 to 100 width and 84.58 acres of land; 101 to 200 groups had farm size of 167.00 acres and 201+ groups had 439.27 hectare farm size; while the average businesses had 137.95 acres. Mean of businesses is 83.63% dry land, 19.83% of irrigated agricultural land and 4.54% fallow land (Table 1).

In relation to average businesses, 85.21% of the total labour force presence in the family labor, and foreign labor force is calculated as a ratio of 14.79%. Business groups and the total labor force based on the presence of Male Labor Unit (MLU) ranged from 3.51 to 4.58. According to the size of enterprises, total labor force increases smoothly. Business average, calculated as the total labor force in the presence of MLU is 3.73. The family labor's numbers are increasing for business (Table 2). In enterprises surveyed, farm capital with business means of 57.44% and 42.56%

**Table 2.** Family labor and the presence of foreign workers in enterprises surveyed (MLU, %).

| Business groups | Family labor | % | Foreign labor | % | Total labor | % |
|---|---|---|---|---|---|---|
| 1 | 3.09 | 88.03 | 0.42 | 11.97 | 3.51 | 100.00 |
| 2 | 3.35 | 81.91 | 0.74 | 18.09 | 4.09 | 100.00 |
| 3 | 3.49 | 76.20 | 1.09 | 23.80 | 4.58 | 100.00 |
| Mean of businesses | 3.18 | 85.21 | 0.55 | 14.79 | 3.73 | 100.00 |

**Table 3.** Examined in the presence of capital in enterprises.

| Class of capital | Business groups | | | | | | Mean of businesses | |
|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | | 3 | | | |
| | Turkish Lira | % | Turkish Lira | % | Turkish Lira | % | Turkish Lira | % |
| **I. Capital asset** | 127,337.60 | 100.00 | 274,195.53 | 100.00 | 556,715.65 | 100.00 | 200,994.49 | 100.00 |
| 1. Farm capital | 79,255.12 | 62.24 | 143,393.33 | 52.30 | 304,815.61 | 54.75 | 115,446.75 | 57.44 |
| a. Territorial capital | 37,023.52 | 29.08 | 75,505.47 | 27.54 | 209,854.95 | 37.70 | 62,704.14 | 31.20 |
| b. Building capital | 20,827.88 | 16.36 | 27,538.49 | 10.04 | 37,877.47 | 6.80 | 23,921.71 | 11.90 |
| c. Plant capital | 21,022.90 | 16.51 | 38,277.94 | 13.96 | 42,488.34 | 7.63 | 26,611.56 | 13.24 |
| d. Reclamation of land capital | 380.82 | 0.30 | 2,071.43 | 0.76 | 14,594.85 | 2.62 | 2,209.35 | 1.10 |
| 2. Business capital | 48,082.47 | 37.76 | 130,802.19 | 47.70 | 251,900.05 | 45.25 | 85,547.74 | 42.56 |
| a. Animals capital | 23,748.28 | 18.65 | 87,477.20 | 31.90 | 182,859.48 | 32.85 | 52,832.91 | 26.29 |
| b. Tool-machine capital | 16,728.58 | 13.14 | 23,635.43 | 8.62 | 32,653.04 | 5.87 | 19,741.14 | 9.82 |
| c. Material ammunition capital | 1,532.76 | 1.20 | 6,162.75 | 2.25 | 11,707.49 | 2.10 | 3,499.32 | 1.74 |
| d.Money capital | 6,072.85 | 4.77 | 13,526.81 | 4.93 | 24,680.03 | 4.43 | 9,474.37 | 4.71 |
| **II. Liabilities capital** | 127,337.60 | 100.00 | 274,195.53 | 100.00 | 556,715.65 | 100.00 | 200,994.49 | 100.00 |
| 1. Foreign capital | 6,694.14 | 5.26 | 11,774.42 | 4.29 | 11,271.81 | 2.02 | 8,155.30 | 4.06 |
| 2. Shareholder's equity | 120,643.45 | 94.74 | 262,421.11 | 95.71 | 545,443.84 | 97.98 | 192,839.20 | 95.94 |

**Table 4.** Examined distribution of enterprises, financial and economic profitability.

| Business groups | Financial profitability (%) | Economic profitability (%) |
|---|---|---|
| 1 | 3.64 | 4.65 |
| 2 | 4.15 | 4.72 |
| 3 | 5.06 | 5.29 |
| Mean of businesses | 4.20 | 4.73 |

constitutes the working capital. As seen, 31.20% is land capital; 26.29%, animal capital; 13.24%, plant capital; 11.90%, building capital and 9.82% consists of tool-machine capital.

The remaining portion is composed of the other elements of capital (Table 3). Yıldırım (1993) specified that the active capital in territorial capital ratio is 57.30%, while Arısoy (2004) found that it is 63.48%. Building an active share in the ratio of capital, Dellal et al. (2002) found it to be 9.91%; Bayaner (1995), 12.00%; Erkan et al. (1989), 10.42%; and Oğuz (1991), 12.48%. In the ratio of capital to capital assets in animals in Turkey, Işıklı et al. (1994) found this rate to be between 0.20 and 73.26%, while Oğuz and Mülayim (1997) found it as 4.64%. In the rate of active capital in the capital of the tool-machine,

Oğuz and Mülayim (1997) found it to be12.72%, while Dellal et al. (2002) found it to 4.62%.

Businesses surveyed in relation average, 95.94% and 4.06% of the shareholder's equity consists of foreign capital. Businesses are made on the basis of shareholder's equity production (Table 3). Oğuz and Mülayim (1997) found 98.89% shareholder's equity capital to be passive. Business average rates of economic and financial profitability (4.73 and 4.20%) were identified (Table 4).

**Factor analysis findings**

Total unit, average per unit values and proportion were

**Table 5.** Used variables in factor analysis and common factor variance values.

| Variable numbers | Variable names | Common factor variance |
|---|---|---|
| 1 | Working Capital (Turkish Lira) | 0.94341913 |
| 2 | Active Capital (Turkish Lira) | 0.98105887 |
| 3 | Gross Domestic Product (Turkish Lira) | 0.98949828 |
| 4 | Total Operating Costs (Turkish Lira) | 0.98051855 |
| 5 | Pure Product (Turkish Lira) | 0.85793021 |
| 6 | Gross Profit (Turkish Lira) | 0.98258853 |
| 7 | Agricultural Income (Turkish Lira) | 0.98703055 |
| 8 | Existence of Sheep (BAU) | 0.94129765 |
| 9 | Feed Cost (Turkish Lira) | 0.95896263 |
| 10 | Gross Profit / BAU | 0.99379614 |
| 11 | Agricultural Income / BAU | 0.99527129 |
| 12 | Gross Profit / BAU | 0.96427262 |
| 13 | Gross Domestic Product / BAU | 0.99506889 |
| 14 | Business Land (Da) | 0.89182875 |
| 15 | Total Arable Land (Da) | 0.92375122 |
| 16 | Property Land (Da) | 0.94840909 |
| 17 | Irrigated Land (Da) | 0.61705438 |
| 18 | Total Operating Costs / BAU | 0.99413989 |
| 19 | Total Variable Costs / BAU | 0.99590038 |
| 20 | Fixed Charges / BAU | 0.98350249 |
| 21 | Cost of feed / BAU | 0.86271240 |
| 22 | Labor Costs / BAU | 0.84780237 |
| 23 | Family Labor Wage Provisions (Turkish Lira) | 0.90149066 |
| 24 | Labor Used (MLU) | 0.94013131 |
| 25 | BAU / MLU | 0.85187833 |
| 26 | Gross Profit / MLU | 0.91308359 |
| 27 | Pure Product / MLU | 0.78936204 |
| **Mean** | | **0.927102** |

used. The common factor variance and variables in determining the ability of the variables are represented. The common factor variance (CFV) that shows the amount of variance explained by each variable is included in the analysis. CFV of all variables with values is quite large. It was concluded that the variables showed a good fit with the factor solution.

Factor analysis of the applicability test used in making an element of partnership and the partnership element of the variables were obtained as the average of 0.927102. This average is applied to the variables for indicating factor analysis (Table 5). Eigenvalue of the factor analysis, difference, ratio and the cumulative values are given in Table 6. The eigenvalues of these factors are going down. After the properties of the other explanatory factors, factor 4 is reduced. According to Kaiser, Eigen values ≥ 1 criteria were applied to a large variable (Kaiser, 1960).
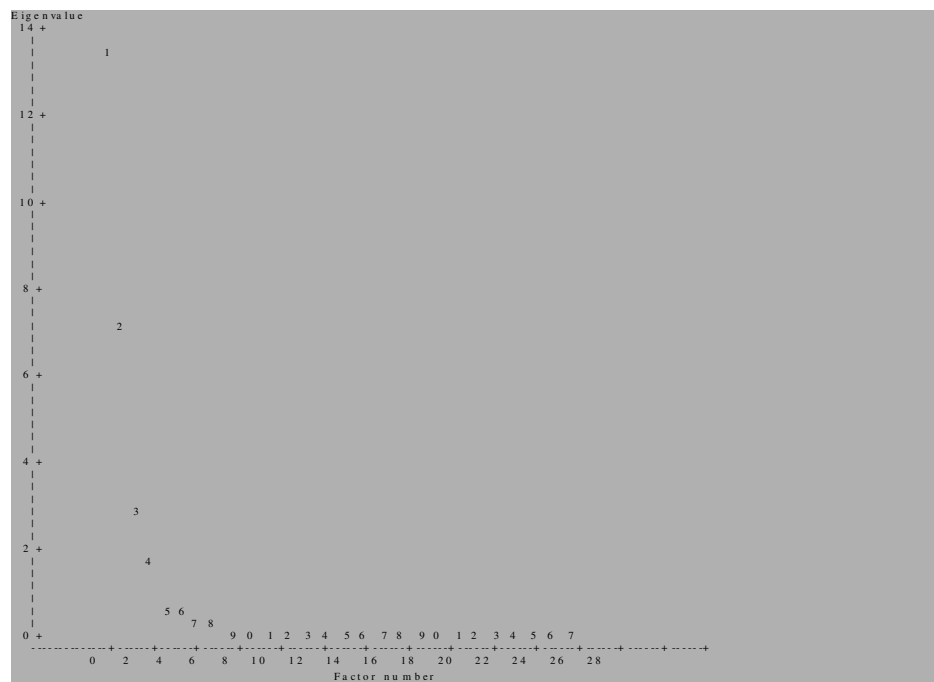
The sum of the eigenvalues of factors and the number of variables were found to be equal to 27. Factors and the value of the difference are the difference between two eigenvalues. Ratio value of each factor indicates the ratio

of the eigenvalues of the total eigenvalue. The value of this ratio also gives the percentage of variance of that factor. Cumulative value and the cumulative sum of the rates can be obtained, which shows the cumulative variance. In general, the cumulative distribution is expected to be above 70%. The resulting 4-factor variance is 0.9271, that is, the sum of the percentages of 92.71 is 92.71 of the variation in percent value that is quite high. This can be explained by the 4 factors (Table 6).

Factor in determining the number of factors can be given by the graphics. Factor is used to determine the number of the graph and the horizontal axis factor number, while the eigenvalues are on the vertical axis. This is the first break point on the graph by determining the factors seen in that point (Figure 1). Designations and associated factors of the eigenvalues, variance and cumulative percentage of variance values are given in Table 7. Accordingly, 49.99% of the first factor, 26.55% of the second factor, 10.06% of the third factor and 6.11% of the fourth factor of the total variance are described. The 4 factors determined the percentage of the total

**Table 6.** Eigenvalue of the factor analysis, difference, ratio, and the cumulative values.

| Factors | Eigenvalue | Difference | Percentage of variance | Cumulative percentage |
|---|---|---|---|---|
| 1 | 13.4963264 | 6.3274906 | 0.4999 | 0.4999 |
| 2 | 7.1688359 | 4.4521997 | 0.2655 | 0.7654 |
| 3 | 2.7166362 | 1.0666743 | 0.1006 | 0.8660 |
| 4 | 1.6499618 | 1.0342142 | 0.0611 | 0.9271 |
| 5 | 0.6157476 | 0.1103278 | 0.0228 | 0.9499 |
| 6 | 0.5054199 | 0.1556322 | 0.0187 | 0.9686 |
| 7 | 0.3497876 | 0.1493598 | 0.0130 | 0.9816 |
| 8 | 0.2004278 | 0.1193226 | 0.0074 | 0.9890 |
| 9 | 0.0811052 | 0.0187263 | 0.0030 | 0.9920 |
| 10 | 0.0623789 | 0.0097576 | 0.0023 | 0.9943 |
| 11 | 0.0526213 | 0.0198991 | 0.0019 | 0.9963 |
| 12 | 0.0327223 | 0.0074745 | 0.0012 | 0.9975 |
| 13 | 0.0252478 | 0.0066142 | 0.0009 | 0.9984 |
| 14 | 0.0186336 | 0.0054969 | 0.0007 | 0.9991 |
| 15 | 0.0131367 | 0.0078915 | 0.0005 | 0.9996 |
| 16 | 0.0052452 | 0.0025090 | 0.0002 | 0.9998 |
| 17 | 0.0027362 | 0.0006049 | 0.0001 | 0.9999 |
| 18 | 0.0021313 | 0.0017987 | 0.0001 | 1.0000 |
| 19 | 0.0003327 | 0.0000511 | 0.0000 | 1.0000 |
| 20 | 0.0002815 | 0.0000897 | 0.0000 | 1.0000 |
| 21 | 0.0001919 | 0.0001143 | 0.0000 | 1.0000 |
| 22 | 0.0000775 | 0.0000650 | 0.0000 | 1.0000 |
| 23 | 0.0000125 | 0.0000104 | 0.0000 | 1.0000 |
| 24 | 0.0000021 | 0.0000021 | 0.0000 | 1.0000 |
| 25 | 0.0000000 | 0.0000000 | 0.0000 | 1.0000 |
| 26 | 0.0000000 | 0.0000000 | 0.0000 | 1.0000 |
| 27 | 0.0000000 | | 0.0000 | 1.0000 |



**Figure 1.** Factors and eigenvalue distribution.

**Table 7.** According to the analysis of factors related to these factors, the naming and the Eigenvalues, variance and cumulative variance values.

| Factor No. | Factor names | Eigenvalue | Percentage of variance | Cumulative percentage |
|---|---|---|---|---|
| 1 | Income factor | 13.4963264 | 0.4999 | 0.4999 |
| 2 | Volumetric factor | 7.1688359 | 0.2655 | 0.7654 |
| 3 | Costs factor | 2.7166362 | 0.1006 | 0.8660 |
| 4 | Labor factor | 1.6499618 | 0.0611 | 0.9271 |

**Table 8.** Factor loading matrix.

| Variable | Factors | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Working capital (Turkish Lira) | 0.69612 | -0.06567 | 0.44392 | 0.19972 |
| Active capital (Turkish Lira) | 0.89339 | 0.03688 | 0.38616 | 0.18012 |
| Gross domestic product (Turkish Lira) | 0.85261 | 0.01634 | 0.48357 | 0.16866 |
| Total operating costs (Turkish Lira) | 0.83927 | 0.00696 | 0.47603 | 0.22249 |
| Pure product (Turkish Lira) | 0.80461 | 0.03595 | 0.45629 | 0.03219 |
| Gross profit (Turkish Lira) | 0.89686 | 0.04404 | 0.39256 | 0.14896 |
| Agricultural income (Turkish Lira) | 0.86204 | 0.01292 | 0.46460 | 0.16699 |
| Existence of sheep (BAU) | 0.48840 | -0.16315 | 0.81088 | 0.13645 |
| Feed cost (Turkish Lira) | 0.47236 | -0.13151 | 0.83385 | 0.15247 |
| Gross profit / BAU | 0.06342 | 0.99438 | 0.02624 | -0.0173 |
| Agricultural income / BAU | 0.06939 | 0.99476 | 0.02904 | -0.0087 |
| Gross profit / BAU | 0.05386 | 0.97486 | 0.09179 | -0.0509 |
| Gross domestic product / BAU | 0.06762 | 0.99445 | 0.03792 | -0.0116 |
| Business land (Da) | 0.91132 | 0.17086 | -0.03328 | 0.17611 |
| Total arable land (Da) | 0.92301 | 0.17893 | -0.00619 | 0.19937 |
| Property land (Da) | 0.94204 | 0.16818 | 0.02927 | 0.17838 |
| Irrigated land (Da) | 0.77749 | -0.03658 | -0.03039 | 0.10151 |
| Total operating costs / BAU | 0.07338 | 0.99426 | 0.01257 | 0.00678 |
| Total variable costs / BAU | 0.07226 | 0.99253 | 0.07453 | -0.0024 |
| Fixed charges / BAU | 0.07374 | 0.98810 | -0.03894 | 0.01434 |
| Cost of feed / BAU | 0.10957 | 0.40888 | 0.81321 | 0.14904 |
| Labor costs / BAU | 0.08475 | 0.42070 | 0.80033 | 0.15201 |
| Family labor wage provisions (Turkish Lira) | 0.26392 | -0.00356 | 0.08359 | 0.90821 |
| Labor used (MLU) | 0.41856 | -0.07069 | 0.11492 | 0.86414 |
| BAU / MLU | 0.23451 | -0.16106 | 0.82261 | -0.307 |
| Gross profit / MLU | 0.77269 | 0.16428 | 0.46105 | -0.2765 |
| Pure product / MLU | 0.70291 | 0.15982 | 0.49304 | -0.1633 |

variance as 92.71%. As we can see, 92.71% of the total variance can be explained by these factors (Table 7).

Factors obtained by factor analysis and factor loadings are given in Table 8. According to the significance level of 5% for 200 observations, 0.180 and larger values were used for the determination of factor loadings (Joseph et al., 1992). Factors were taken into account when interpreting the vertical and horizontal values. First, each factor is evaluated in itself, followed by the variables that described the dependence of factors. Then, the factors and relationships of each variable were evaluated separately. Factor loadings are perpendicular to the original variables; dependent and independent variables are factors in which the multiple regression equation represents the standardized regression coefficients. According to Table 8, Agricultural Income/BAU variable has the highest loading factor in these variables. For this variable, the first factor $(0.06939)^2$, the second factor $(0.99438)^2$, the third factor $(0.02624)^2$ and the fourth factor $(-0.0173)^2$ describe a variance. Explanation rate of

the total variance of this variable is found to be,
$(0.06939)^2+(0.99438)^2+(0.02624)^2+(-0.0173)^2 = 0.99459.$

## DISCUSSION

In the average of businesses surveyed, the total gross production value of 44.72% is for crop production value, while 55.28% consists of the value of animal production. Animal production value consists of 36.77% active sheep, 17.59% of active cattle and 0.92% consists of other livestock operations.

Emphasis on crop production enterprises, as well as the emphasis on farming and animal husbandry enterprises through development will significantly increase their revenues. Average farm size group of enterprises surveyed both in the gross production value of animal production and sheep farming has an important place.

Economic and financial profitability ratios of 4.20 and 4.73% respectively, compared to the average of businesses have been identified. Annual real returns on financial investment instruments, Producer Price Index (PPI) and Consumer Price Index (CPI) were calculated from the purified. Profitability ratios are evaluated according to the CPI, the economic profitability rate of the European Currency Unit (Euro) and the United States of America Currency (Dollars). Deposit Interest, Stock Index and gold bullion have low rate. Calculating these profitability ratios using Euro and the Dollar, business owners and sheep farming enterprises did not have loss in their labor and efforts.

According to the results of the feasibility analysis for the whole enterprises, enterprise size increased, increasing rates of both fiscal and economic profitability. In this situation, more efficient use of capital is in large enterprises. In addition, businesses that are working effectively are revealed. Small businesses cannot be used quite efficiently and economically in factors of production.

Factors are interpreted, evaluated and variables within each independent factor are described. In addition to the factors set relations were evaluated separately for each variable. There are four factors: income (factor 1), volumetric (factor 2), cost (factor 3) and labor factors (factor 4).

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