

## **Comparison of economic Analysis of dairy farms supported and non-supported by IPARD program: a case study of Konya Province, Turkey**

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### **Abstract**

The aim of this study was to compare the economic analysis of dairy farms, supported and non-supported by The Instrument for Pre-Accession Assistance-Rural Development (IPARD) program in Konya where has an important place in milk production in Turkey. The primary data of the study were obtained from dairy farms supported and non-supported by the IPARD program by using a questionnaire filled during the face-to-face interviews. Full count method was used to determine the 50 dairy farms supported by IPARD Program (SDF) while Neyman allocation sampling method was used to determine the 100 dairy farms non-supported by IPARD program (NSDF). As a result of the study, the average gross production value (GPV) was found as \$154,618.59 per farm in NSDF while it was found as \$624,334.06 in SDF. The average GPV per Large Animal Unit (LAU) was \$3,104.98 in NSDF while it was \$3,909.29 in SDF. As expected, for both groups, most of the costs constituted from feed costs. In NSDF, 48.65% of the variable costs were concentrated feed and 42.09% was roughage in NSDF, while these rates were 46.40% and 38.51% in SDF, respectively. Total production costs in NSDF were \$129,624.43 while it was \$461,403.75 in SDF. Total production costs per large animal unit (LAU) were \$2,603.06 in NSDF while it was \$2,889.10 in SDF. The average unit milk cost was determined as 0.37 \$ / Kg and average milk selling price was determined as 0.38 \$ / Kg in NSDF. The average unit milk cost was determined as 0.33 \$ / Kg and average milk selling price was determined as 0.40 \$ / Kg in SDF. When milk support was taken into account, the cost of unit milk in NSDF falls to 0.32 \$ / Kg and in SDF to 0.28 \$ / Kg. The average gross profit value for NSDF was \$719.45 per LAU, while it was \$1,397.53 per LAU for SDF. When the average gross profit values per LAU were evaluated, it was seen that dairy farms supported by IPARD program were much more profitable.

**Keywords:** Dairy Farms. IPARD Program. Economic Analysis. Turkey.

## 1. Introduction

The agricultural sector, with its economic, social, political and technical aspects, has different characteristics from other sectors and has an indispensable importance. The fact that agricultural products are the main necessities has given them a strategic importance. All the countries in the world are trying to be self-sufficient in basic agricultural products such as grains, sugar, milk, meat and vegetable oil and they direct agricultural policies towards this objective. In our age where the population of World and Turkey increased steadily, agricultural production continues to maintain its importance and value. Agriculture has important functions in the national economy due to its contribution to national income, employment, foreign trade, agriculture and agriculture-based industries as well as meeting the absolute requirements of human nutrition (Arsoy and Oğuz 2005). Agriculture and agriculture's sub-sector livestock farming, whose relative importance in Turkey's economy although reduced, had vital importance for Turkey due to the healthy and balanced nutrition of the society, the development of the livestock-dependent industry, the creation of employment in the short term and with the most efficient investment, supporting the family economy, development of priority regions in agriculture, increasing the profitability in agriculture and ensuring the balance of foreign trade (Bayramoğlu 2003).

In the EU membership process of Turkey, about agriculture and animal husbandry, especially the agricultural population, plant and animal health conditions, business scale, efficiency, organization, support, institutional organization, use of technology, competitiveness, product quality and standards are needed to ensure compliance issues. The European Union (EU) uses the Instrument for Pre-Accession Assistance (IPA) to prepare candidate and potential candidate countries for membership. Main components of the IPA are Transition Assistance and Institution Building, Cross-Border Cooperation, Regional Development, Human Resources Development and Rural Development. The supports provided by the Instrument for Pre-Accession Assistance on Rural Development (IPARD) are providing finance to enable enterprises to achieve production that complies with standards that can compete with enterprises in EU member states. For this purpose, in Turkey IPARD I programme was applied between 2007 and 2013 and IPARD II programme was prepared to apply from 2014 to 2020. IPARD programme has been implementing in 42 provinces by the

Ministry of Agriculture and Forestry and Agriculture and Rural Development Support Institution (ARDSI).

Two sectors have been identified as the priority for IPARD program as regards investment in agricultural holdings to restructure and to upgrade to Community standards: Milk and Meat (both red meat and poultry). The objectives of supporting these sectors are to improve agricultural holdings sustainability and overall analysis in the production of primary agricultural products; while at the same time upgrading to the relevant Community standards and generally speaking Good Agricultural Practices; contribute to correct regional rural development imbalances and current depopulation of less developed areas. The specific objective of supporting milk agricultural holdings is to improve the overall analysis of dairy farms and to increase their competitiveness, including marketing competencies (Anonymous 2011, Kaya and Örs 2017). Within the scope of the IPARD I program which prepared for implementation between 2007 and 2013, 1,088 dairy cattle projects with a total support amount of €402,551,554 were supported in 42 cities in which the program was implemented (Anonymous 2018). Konya which had the highest number of cattle (740.148 head) and highest amount of milk production (1.018.917 tonnes) in Turkey according to Turkish Statistical Institute's data of 2015, was one of the top three provinces, supported by IPARD program.

The purpose of this study was; In Konya, which has an important place in Turkey in milk production, to compare the economic analysis and unit milk costs of NSDF and SDF for determining the impact of the IPARD program on competitiveness.

## 2. Literature Review

One of the main topics of the agricultural economy is the measurement of the economic analysis of agricultural enterprises. Various economic indicators and financial ratios are used to measure the economic analysis of agricultural holdings. There are various literatures on the calculation of these economic indicators and financial ratios. Within the scope of this study, the literature about the agricultural holdings (Açıl and Demirci 1984, Erkuş, Bülbül et al. 1995, Karagölge 1996, İnan 1999, Acar 2003, Anonymous 2011, Çetin 2013, Çelik 2014, Oğuz and Bayramoğlu 2015) and the literature about measuring the economic analysis of dairy farms (Tranel and Gary 2002, Shoemaker, Eastridge et al. 2008) were used in the calculations.

A lot of studies have been done to measure the economic analysis of dairy farms. when these studies are examined, the main indicators and ratios used to measure the economic analysis of enterprises are; milk unit cost, production costs, milk yield, profitability, gross production value, agricultural income, gross profit, milk price, return on assets, profit margin and net farm income per cow. (Günlü 1997, Heinrich and Hinrichs 2000, Tauer 2001, Staal 2002, Bayramoğlu 2003, Isermeyer, Hemme et al. 2003, İçöz 2004, Mahmood, Saha et al. 2004, Thorne and Fingleton 2006, Benson 2007, Tümer and Kumbasaroğlu 2008, Tokmak 2009, Hemme and Otte 2010, Donnellan, Hennessy et al. 2011, Özüdoğru and Tatlıdil 2012, Yener 2013, Masuku, Masuku et al. 2014, Mitrovic, Knezevic et al. 2015, Aşkan and Dağdemir 2016, Oğuz and Yener 2017, Yener 2017, Oguz and Yener 2018). In this study, these basic indicators and ratios were used. The studies carried out in the province of Konya which was the research area of this study, were also used in the interpretation of the results (Günlü 1997, Bayramoğlu 2003, Murat 2011, Yener 2013, Oğuz and Yener 2017, Yener 2017, Oguz and Yener 2018). In this study dairy farms supported and non-supported by IPARD program were compared. IPARD I program (Anonymous 2011), IPARD II program (Anonymous 2015) and study of Kaya and Örs (2017) were used as a literature for IPARD.

### **3. Material and Methods**

#### **3.1. Material**

As a research area, Konya province was selected according to “judgment sampling method”. By the presence of cattle and milk production, Konya is the first province in Turkey. In Konya the cattle number was 740.148 head and milk production was 1.018.917 tons, according to the Turkish Statistical Institute’s (TSI) data of 2015. It is also one of the top three provinces, supported by IPARD program. The main material of the study is dairy farms supported and not supported by the IPARD program in Konya. Dairy farm data’s were obtained through interviews. The interviews were conducted by face to face interview between dates May and November 2017. In addition to these data’s, publications and web pages belonging to the relevant public institutions, previous research findings and published secondary data were used. In this study, \$1 = 3.58 Turkish Liras calculated that was the average exchange rate of the dates of the field study was done.

### 3.2. Sampling method

During the study, there were 50 dairy farms supported by IPARD program and operating in Konya. Because the population was small and it was easy to reach the desired information, the full count method was used to determine the SDF. The simple random sampling method was used to determine the NSDF.

According to IPARD program, milking cow number criteria for dairy farms is minimum 10 milking cows and maximum 120 milking cows. In accordance with this criterion; the main frame of NSDF was determined as 4.209 establishments in 16 districts of Konya which had milking cows between 10 to 120 head. Neyman method from the stratified sampling method was used in the calculation of sample volume. According to the Neyman method, the equation that determines the sample volume was formulated as follows (Yamane 1967).

$$n = \frac{[\sum(N_h S_h)]^2}{N^2 D^2 + \sum[N_h (S_h)^2]}$$

In formula; n = sample volume, N = total unit number belonging to the sampling frame, D = d / t, d = derivation from the average, t = standard normal distribution value.

The sample volume was determined by using the number of milking cows. The sample size was calculated as 100 for a confidence interval of 95% and an error margin of 5%. As a result, 150 dairy farms were determined as total sample volume.

**Table 1: Distribution of dairy farm numbers by farm size groups (sample size)**

Farm Size Groups (milking cow)	Number of NSDF	Number of SDF	Total number of dairy farms
1-25	63	2	65
26 - 50	20	2	22
51 - +	17	46	63
Total	<b>100</b>	<b>50</b>	<b>150</b>

The sizes of the dairy farms were examined by arranging various strata and 3 strata were considered suitable considering the frequency distributions. These strata were determined as dairy farms which had 10 to 25 head, 26 to 50 head and 51 to 120 head milking cows (Table 1).

### 3.3. The method used in the calculation of economic analysis criteria's

- Productive Stock Value (PSV) = (year end stock value + value of the sold stock + value of the stock slaughtered) – (value of the stock at the beginning of year + value of the stock bought)
- Animal Production Value (APV)= (Milk Production Amount \* Milk Price Paid to the Farmer) + Productive Stock Value (PSV) + Animal Manure Income
- Plant Production Value (PPV) = Plant Production Value (sold and used product values) + Productive Stock Value (PSV)
- Gross Production Value (GPV) = APV + PPV
- Total Production Costs (TPC) = Total Variables Costs (TVC) + Total Fixed Costs (TFC)
- Gross Profit = GPV – TVC
- Agricultural Income = Gross Revenue – (Debit Interests and Rental) + Family Labor Cost
- Unit Milk Cost = Milk Production Cost / Milk Production Amount

## 4. Results and Discussion

### 4.1. Comparison of economic analysis of dairy farms

The gross production value is one of the important indicators to measure economic analysis. For the calculation of the gross production value, the animal production value was calculated first and given in Table 2.

**Table 2: Animal production values (\$) and rates (%).**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Milk Production Value	41,870.49	75.47	101,712.69	79.06	240,295.24	79.40	87,571.14	78.10
	PSV	11,616.35	20.94	22,887.13	17.79	52,908.01	17.48	20,890.09	18.63
	Farm Fertilizer Value	1,992.77	3.59	4,047.11	3.15	9,437.25	3.12	3,669.20	3.27
	Total	55,479.61	100.00	128,646.93	100.00	302,640.50	100.00	112,130.42	100.00

	per LAU	2,066.44		2,407.36		2,318.04		2,251.75	
SDF	Milk Production Value	63,896.39	78.37	161,184.56	83.44	443,651.02	82.58	417,162.18	82.57
	PSV	15,072.01	18.49	27,632.02	14.30	80,605.53	15.00	75,865.25	15.02
	Farm Fertilizer Value	2,567.82	3.15	4,354.14	2.25	12,972.61	2.41	12,211.68	2.42
	Total	81,536.23	100.00	193,170.72	100.00	537,229.15	100.00	505,239.10	100.00
	per LAU	2,300.68		4,164.06		3,159.53		3,163.57	

The average value of animal production in NSDF was \$112,130.42 per farm and \$2,251.75 per LAU while it was \$505,239.10 and \$3,163.57 in SDF, respectively. Animal production value consisted of 78.10% milk production value, 18.63% PSV and 3.27% farm manure value in NSDF while it was 82.04% milk production value, 15.47% PSV and 2.49% farm manure value in SDF. As the milk yield per milking cow in SDF was higher than in NSDF, the rate of milk production value was higher in animal production value.

Gross production value was calculated by the sum of animal production value and plant production value (Table 3). While the average of gross production value in NSDF was \$154,618.59 per farm, it was \$624,334.06 in SDF. In NSDF gross production value were \$3,104.98 per LAU and \$614.98 per decares. In SDF gross production value were \$3,909.29 per LAU and \$1,171.12 per decares.

**Table 3: Gross production value (GPV) (\$) and rates (%) in the dairy farms included in the study**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Plant Production Value	27,956.18	33.51	53,322.10	29.30	83,596.20	21.64	42,488.17	27.48
	Animal Production Value	55,479.61	66.49	128,646.93	70.70	302,640.50	78.36	112,130.42	72.52
	Total GPV	83,435.79	100.00	181,969.03	100.00	386,236.70	100.00	154,618.59	100.00
	per LAU	3,107.72		3,405.17		2,958.33		3,104.98	
	per decares	455.00		537.87		962.34		614.98	
SDF	Plant Production Value	35,329.91	30.23	58,473.82	23.24	125,372.62	18.92	119,094.96	19.08
	Animal Production Value	81,536.23	69.77	193,170.72	76.76	537,229.15	81.08	505,239.10	80.92
	Total GPV	116,866.14	100.00	251,644.54	100.00	662,601.77	100.00	624,334.06	100.00
	per LAU	3,297.58		5,424.54		3,896.86		3,909.29	
	per decares	524.06		1,433.87		1,178.71		1,171.12	

According to Table 3, GPV consisted of %72.52 APV and %27.48 PPV in NSDF while it was %80.92 and %19.08 in SDF, respectively. When the studies in the literature were examined, the distribution of GPV was: %83.11 APV and %16.89 PPV in Oguz and Yener

(2018)'s study; %80.43 APV and %19.57 PPV in Yener (2017) 's study. Animal production variable costs were presented in Table 4 according to dairy farm groups.

**Table 4: Animal Production Variable costs (\$) and rates (%) of animal production**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Concentrate Feed	19,391.91	48.42	41,621.18	48.58	97,547.82	48.86	37,124.27	48.65
	Roughage	16,630.99	41.53	36,955.92	43.13	83,817.14	41.99	32,117.62	42.09
	Water-Salt-Vitamin	438.83	1.10	669.87	0.78	1,719.00	0.86	702.66	0.92
	Electricity-Heating	367.28	0.92	470.30	0.55	1,631.16	0.82	602.74	0.79
	Veterinary-Pharmaceutical-Vaccination	1,124.95	2.81	1,550.81	1.81	4,621.75	2.32	1,804.58	2.36
	Artificial Insemination	671.95	1.68	1,175.06	1.37	3,236.05	1.62	1,208.47	1.58
	Animal Insurance	177.44	0.44	202.36	0.24	131.35	0.07	174.58	0.23
	Oil-Fuel-Maintance	1,245.15	3.11	3,035.34	3.54	6,927.21	3.47	2,569.14	3.37
	Total	40,048.48	100.00	85,680.84	100.00	199,631.48	100.00	76,304.06	100.00
	per LAU	1,491.68		1,603.34		1,529.05		1,532.30	
SDF	Concentrate Feed	19,659.90	44.87	46,112.68	42.73	139,383.01	46.46	130,863.27	46.40
	Roughage	20,541.20	46.88	44,165.88	40.93	115,244.36	38.42	108,613.10	38.51
	Water-Salt-Vitamin	547.06	1.25	1,395.56	1.29	6,762.38	2.25	6,299.10	2.23
	Electricity-Heating	1,395.56	3.18	5,358.94	4.97	9,114.20	3.04	8,655.24	3.07
	Veterinary-Pharmaceutical-Vaccination	348.89	0.80	4,396.00	4.07	8,930.96	2.98	8,406.27	2.98
	Artificial Insemination	279.11	0.64	1,046.67	0.97	6,381.33	2.13	5,923.86	2.10
	Animal Insurance	0.00	0.00	964.61	0.89	5,090.04	1.70	4,721.42	1.67
	Oil-Fuel-Maintance	1,046.67	2.39	4,465.78	4.14	9,069.78	3.02	8,564.70	3.04
	Total	43,818.38	100.00	107,906.11	100.00	299,976.07	100.00	282,046.96	100.00
	per LAU	1,236.41		2,326.06		1,764.20		1,766.05	

While the average of animal production variable costs in NSDF was \$76,304.06 per farm, it was \$282,046.96 in SDF. In NSDF gross production value was \$1,532.30 per LAU and close to this value, in SDF gross production value was \$1,766.05 per LAU. While 90.74% of the variable costs were concentrated feed and roughage in NSDF, this ratio was 84.91% in SDF. When the studies in the literature were examined, the percentage of concentrated feed and rough feed costs in the variable costs of animal production: In Oguz and Yener (2018)'s study, %83.25; In Yener (2017)'s study, %85.00; In Bayramoğlu (2003)'s study, %81.68; In Aşkan and Dağdemir (2016)'s study %75.63.

Total variable costs were calculated by the sum of animal production variable costs and plant production variable costs (Table 5).

**Table 5: Total of the variables costs (\$) and rates (%)**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Animal Production Variable Costs	40,048.48	77.63	85,680.84	79.50	199,631.48	85.53	76,304.06	81.41
	Plant Production Variable Costs	11,540.10	22.37	22,089.84	20.50	33,764.49	14.47	17,428.20	18.59
	Total Variable Costs	51,588.58	100.00	107,770.68	100.00	233,395.97	100.00	93,732.26	100.00
	per LAU	1,921.51		2,016.70		1,787.67		1,882.29	
	per decares	281.33		318.55		581.52		372.81	
SDF	Animal Production Variable Costs	43,818.38	78.15	107,906.11	79.72	299,976.07	86.56	282,046.96	86.39
	Plant Production Variable Costs	12,250.20	21.85	27,445.71	20.28	46,577.22	13.44	44,438.88	13.61
	Total Variable Costs	56,068.58	100.00	135,351.82	100.00	346,553.29	100.00	326,485.84	100.00
	per LAU	1,582.07		2,917.69		2,038.13		2,044.30	
	per decares	251.43		771.24		616.49		612.42	

The average of total variable costs in NSDF was \$93,732.26 per farm, \$1,882.29 per LAU and \$372.81 per decares, while it was \$326,485.84 per farm, \$2,044.30 per LAU and \$612.42 per decares in SDF. When the distribution of total variable costs was examined, it consisted of 81.41% animal production costs and 18.59% plant production variable costs in NSDF, while it was 86.39% and 13.61% in SDF, respectively. Even though the distributions of total variable costs were close to each other in both groups, in SDF animal production costs were slightly higher than in NSDF. Fixed costs were presented in Table 6 by dairy farm groups.

**Table 6: Fixed cost (\$) and relevant rates (%)**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Depreciation Expenses	7,667.17	31.80	14,882.34	37.04	32,827.65	44.06	13,387.48	37.30
	Building Repair-Maintenance Expenses	1,706.63	7.08	2,491.49	6.20	4,423.09	5.94	2,325.40	6.48
	Permanent Labor Force	998.55	4.14	4,112.57	10.23	5,666.94	7.61	2,414.98	6.73
	Family Labor Force	8,070.19	33.47	7,815.12	19.45	8,409.87	11.29	8,076.92	22.50

	Tax and Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Interest Rate Of Fixed Capital	4,120.38	17.09	7,649.62	19.04	16,174.40	21.71	6,875.41	19.16
	General Management Costs (%3)	1,547.66	6.42	3,233.12	8.05	7,001.88	9.40	2,811.97	7.83
	Total	24,110.59	100.00	40,184.25	100.00	74,503.84	100.00	35,892.17	100.00
	per LAU	898.04		751.96		570.65		720.77	
	per decares	131.48		118.78		185.63		142.76	
NSDF	Depreciation Expenses	16,248.18	38.22	34,597.84	42.08	58,193.14	41.21	55,571.53	41.19
	Building Repair-Maintenance Expenses	5,968.27	14.04	11,192.77	13.61	15,454.43	10.94	14,904.52	11.05
	Permanent Labor Force	4,959.81	11.67	12,399.52	15.08	24,998.00	17.70	23,692.53	17.56
	Family Labor Force	2,930.67	6.89	2,198.00	2.67	1,693.63	1.20	1,763.29	1.31
	Tax and Insurance	355.10	0.84	773.96	0.94	844.22	0.60	821.84	0.61
	Interest Rate Of Fixed Capital	10,368.84	24.39	17,284.17	21.02	30,291.24	21.45	28,974.06	21.48
	General Management Costs (%3)	1,682.06	3.96	3,772.72	4.59	9,752.12	6.91	9,190.14	6.81
	Total	42,512.91	100.00	82,218.99	100.00	141,226.77	100.00	134,917.90	100.00
	per LAU	1,199.57		1,772.34		830.58		844.79	
	per decares	190.64		468.48		251.23		253.08	

Table 6 shows that the average of total fixed costs in NSDF was \$35,892.17 per farm, \$720.77 per LAU and \$142.76 per decares, while it was \$134,917.90 per farm, \$844.79 per LAU and \$253.08 per decares in SDF. The first three fixed costs that were the highest ratio in NSDF were depreciation expenses (37.30%), family labor force (22.50%) and the interest rate of fixed capital (19.16%). The first three fixed costs that were the highest ratio in SDF were depreciation expenses (41.19%), the interest rate of fixed capital (21.48%) and permanent labor force (17.56%). In addition to the interest rate of fixed capital and depreciation expenses, one of the three fixed cost in NSDF was family labor force cost, while in SDF it was permanent labor force cost. This was due to the fact that almost all of the NSDF were family dairy farms, while the SDF were professional dairy farms. Total production costs were given in Table 7 by dairy farm groups.

**Table 7: Total production costs (\$) and relevant rates (%) in the research area**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Variables Costs	51,588.58	68.15	107,770.68	72.84	233,395.97	75.80	93,732.26	72.31
	Fixed Costs	24,110.59	31.85	40,184.25	27.16	74,503.84	24.20	35,892.17	27.69

	Total Production Costs	75,699.17	100.00	147,954.93	100.00	307,899.81	100.00	129,624.43	100.00
	per LAU	2,819.55		2,768.67		2,358.32		2,603.06	
	per decares	412.81		437.33		767.15		515.57	
	Rate to Active Capital (%)	19.47		20.85		24.80		21.68	
SDF	Variables Costs	56,068.58	56.88	135,351.82	62.21	346,553.29	71.05	326,485.84	70.76
	Fixed Costs	42,512.91	43.12	82,218.99	37.79	141,226.77	28.95	134,917.90	29.24
	Total Production Costs	98,581.49	100.00	217,570.81	100.00	487,780.06	100.00	461,403.75	100.00
	per LAU	2,781.64		4,690.04		2,868.71		2,889.10	
	per decares	442.07		1,239.72		867.72		865.49	
	Rate to Active Capital (%)	11.45		20.07		20.53		20.39	

The average of total production costs in NSDF was \$129,624.43 per farm, \$2,603.06 per LAU and \$515.57 per decares, while it was \$461,403.75 per farm, \$2,889.10 per LAU and \$865.49 per decares in SDF. Although the average total production costs in NSDF was almost 4 times higher than in SDF, there was not much difference between the average total production costs per LAU and per decares. The average total production cost in SDF was slightly higher when compared with it in NSDF.

Total production cost consisted of %72 variable costs and %28 fixed costs in NSDF, against %71 and %29 in SDF. When the studies in the literature were examined, total production cost consisted of: %70.69 variable costs and %29.31 fixed costs in Oguz and Yener (2018)'s study; %69.68 variable costs and %30.32 fixed costs in Yener (2017)'s study; %50.60 variable costs and %49.40 fixed costs in Bayramoğlu (2003)'s study. When the rate of the total production costs to active capital was examined, it was 21.68% in NSDF while it was 20.39% in SDF. The rate of the total production costs of the two groups to the active capital was close to each other.

Gross profit was calculated by the subtraction of total variable costs from gross production value (Table 8).

**Table 8: Gross profit (\$) and relevant rates (%).**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	GPV	83,435.79	100.00	181,969.03	100.00	386,236.70	100.00	154,618.59	100.00
	Total Variable Costs	51,588.58	61.83	107,770.68	59.22	233,395.97	60.43	93,732.26	60.62
	Gross Profit	31,847.20	38.17	74,198.34	40.78	152,840.73	39.57	60,886.33	39.38
	per LAU	1,186.21		1,388.47		1,170.67		1,222.69	
	per Decares	173.67		219.32		380.81		242.17	
SD F	GPV	116,866.14	100.00	251,644.54	100.00	662,601.77	100.00	624,334.06	100.00

Total Variable Costs	56,068.58	47.98	135,351.82	53.79	346,553.29	52.30	326,485.84	52.29
Gross Profit	60,797.56	52.02	116,292.72	46.21	316,048.48	47.70	297,848.21	47.71
per LAU	1,715.51		2,506.85		1,858.73		1,864.99	
per Decares	272.63		662.64		562.22		558.70	

The average of gross profit in NSDF was \$60,886.33 per farm, \$1,222.69 per LAU and \$242.17 per decares, while it was \$297,848.21 per farm, \$1,864.99 per LAU and \$558.70 per decares in SDF. The average of gross profit per LAU and per decares was higher in SDF and this was an indicator that they were more competitive and more successful in terms of business organization.

**Table 9: Agricultural Income (\$)**

		Dairy Farm Groups (head milking cows)			
		10-25	26-50	51-+	Dairy Farms Average
		\$	\$	\$	\$
NSDF	Gross Revenue	10,497.60	36,822.65	80,824.27	27,718.14
	Debit Interests and Rental	3,057.93	3,967.57	5,817.01	3,708.90
	Family Labor Cost	8,070.19	7,815.12	8,409.87	8,076.92
	Agricultural Income	15,509.86	40,670.20	83,417.13	32,086.17
	per family population	2,791.78	7,601.91	13,378.22	5,699.14
SDF	Gross Revenue	19,331.32	35,120.40	175,455.78	163,597.39
	Debit Interests and Rental	1,311.82	1,709.56	5,777.91	5,436.53
	Family Labor Cost	2,930.67	2,198.00	1,693.63	1,763.29
	Agricultural Income	20,950.16	35,608.84	171,371.50	159,924.14
	per family population	3,491.69	35,608.84	22,633.97	22,644.13

When Table 9 was examined, the average of agricultural income was \$32,086.17 in NSDF while it was \$159,924.14 in SDF. The average of agricultural income per family population was \$5,699.14 in NSDF and it was \$22,644.13 in SDF. Milk production costs were presented in Table 10 as the sum of animal production variable costs and fixed costs.

**Table 10: Milk production costs (\$) and rates (%).**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Animal Production Variable Costs	40,048.48	62.42	85,680.84	68.07	199,631.48	72.82	76,304.06	68.01
	Fixed Costs	24,110.59	37.58	40,184.25	31.93	74,503.84	27.18	35,892.17	31.99

	Total Milk Production Costs	64,159.07	100.00	125,865.09	100.00	274,135.32	100.00	112,196.24	100.00
SDF	Animal Production Variable Costs	43,818.38	50.76	107,906.11	56.76	299,976.07	67.99	282,046.96	67.64
	Fixed Costs	42,512.91	49.24	82,218.99	43.24	141,226.77	32.01	134,917.90	32.36
	Total Milk Production Costs	86,331.29	100.00	190,125.09	100.00	441,202.84	100.00	416,964.87	100.00

The average of milk production costs in NSDF was \$112,196.24 and it was \$416,964.87 in SDF. When the distribution of milk production costs was examined, it consisted of 68.01% animal production variable costs and 31.99% fixed costs in NSDF, while it was 67.64% and 32.36% in SDF, respectively. The animal production value and its proportional distribution were presented in Table 11 in order to distribute the production costs to each product in proportion to the dairy farming gross production value.

**Table 11: Dairy farming gross production value (\$) and rates (%).**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Milk Production Value	41,870.49	75.47	101,712.69	79.06	240,295.24	79.40	87,571.14	78.10
	PSV	11,616.35	20.94	22,887.13	17.79	52,908.01	17.48	20,890.09	18.63
	Farm Fertilizer Value	1,992.77	3.59	4,047.11	3.15	9,437.25	3.12	3,669.20	3.27
	Total	55,479.61	100.00	128,646.93	100.00	302,640.50	100.00	112,130.42	100.00
SDF	Milk Production Value	63,896.39	78.37	161,184.56	83.44	443,651.02	82.58	417,162.18	82.57
	PSV	15,072.01	18.49	27,632.02	14.30	80,605.53	15.00	75,865.25	15.02
	Farm Fertilizer Value	2,567.82	3.15	4,354.14	2.25	12,972.61	2.41	12,211.68	2.42
	Total	81,536.23	100.00	193,170.72	100.00	537,229.15	100.00	505,239.10	100.00

The average of dairy farming gross production value in NSDF was \$112,130.42 it was \$505,239.10 in SDF. When the distribution of dairy farming gross production values was examined, it consisted of 78.10% milk production value, 18.63% PSV and 3.27% farm fertilizer value in NSDF, while it was 82.57%, 15.02% and 2.42% in SDF, respectively.

In order to calculate the milk cost according to the relative sales method, the distribution of the production costs according to products obtained was presented in Table 12.

**Table 12: Distribution of the production costs according to products obtained (\$) and rates (%)**

		Dairy Farm Groups (head milking cows)							
		10-25		26-50		51-+		Dairy Farms Average	
		\$	%	\$	%	\$	%	\$	%
NSDF	Milk Production Cost	48,420.89	75.47	99,513.27	79.06	217,662.25	79.40	87,622.54	78.10
	PSV Cost	13,433.66	20.94	22,392.22	17.79	47,924.70	17.48	20,902.35	18.63
	Farm Fertilizer Cost	2,304.52	3.59	3,959.60	3.15	8,548.37	3.12	3,671.35	3.27
	Total	64,159.07	100.00	125,865.09	100.00	274,135.32	100.00	112,196.24	100.00
SDF	Milk Production Cost	67,654.08	78.37	158,643.25	83.44	364,351.20	82.58	344,276.54	82.57
	PSV Cost	15,958.38	18.49	27,196.36	14.30	66,197.80	15.00	62,610.24	15.02
	Farm Fertilizer Cost	2,718.84	3.15	4,285.49	2.25	10,653.84	2.41	10,078.08	2.42
	Total	86,331.29	100.00	190,125.09	100.00	441,202.84	100.00	416,964.87	100.00

According to Table 12, the average of milk production cost in NSDF was \$87,622.54 while it was \$344,276.54 in SDF. The unit milk cost was obtained by dividing the milk production costs to the milk production amounts (Table 13). In this respect, the average unit milk cost was computed as \$0.37 per kg and milk sales price was \$0.38 per kg in NSDF. In SDF, the average unit milk cost was computed as \$0.33 per kg and milk sales price was \$0.40 per kg. In NSDF, the difference between the unit milk cost and milk sales price was \$ 0.01 per kg, while the difference in SDF was \$ 0.07 per kg.

When milk support was taken into account, the average unit milk cost was falling to \$0.32 per kg in NSDF and \$0.28 per kg in SDF. By milk support, the difference between the unit milk cost and milk sales price became \$ 0.06 per kg in NSDF while the difference in SDF became \$ 0.12 per kg.

**Table 13: Unit milk cost (\$/kg).**

		Dairy Farm Groups (head milking cows)			
		10-25	26-50	51-+	Dairy Farms Average
		\$	\$	\$	\$
NSDF	Milk Production Cost (\$)	48,420.89	99,513.27	217,662.25	87,622.54
	Milk Production Amount (Kg)	113,712.40	274,191.04	644,310.88	236,009.87
	Unit Milk Cost (\$/Kg)	0.43	0.36	0.34	0.37
	Milk Sales Price (\$/Kg)	0.38	0.37	0.37	0.38

	Variable Costs per Unit Production (\$/Kg)	0.35	0.31	0.31	0.32
	Unit Milk Cost by Milk Support (\$/Kg)	0.38	0.31	0.29	0.32
SDF	Milk Production Cost (\$)	67,654.08	158,643.25	364,351.20	344,276.54
	Milk Production Amount (Kg)	163,520.00	406,792.50	1,104,060.73	1,038,548.37
	Unit Milk Cost (\$/Kg)	0.41	0.39	0.33	0.33
	Milk Sales Price (\$/Kg)	0.39	0.40	0.40	0.40
	Variable Costs per Unit Production (\$/Kg)	0.27	0.27	0.27	0.27
	Unit Milk Cost by Milk Support (\$/Kg)	0.36	0.32	0.28	0.28

Dairy farming gross profit was calculated by the subtraction of total animal production variable costs from dairy farming gross production value (milk production value, PSV value, farm fertilizer value) and presented in Table 14.

The average of dairy farming gross profit in NSDF was \$35,826.36 per farm and \$719.45 per LAU, while it was \$223,192.13 per farm and \$1,397.53 in SDF. When the dairy farming gross profit values per LAU were evaluated, it was seen that the NSDF were much more profitable.

**Table 14: Dairy farming gross profit (\$)**

		Dairy Farm Groups (head milking cows)			
		10-25	26-50	51-+	Dairy Farms Average
		\$	\$	\$	\$
NSDF	Dairy farming GPV	55,479.61	128,646.93	302,640.50	112,130.42
	Animal Production Variable Costs	40,048.48	85,680.84	199,631.48	76,304.06
	Dairy farming Gross Profit	15,431.12	42,966.09	103,009.02	35,826.36
	per LAU	574.76	804.02	788.99	719.45
SDF	Dairy farming GPV	81,536.23	193,170.72	537,229.15	505,239.10
	Animal Production Variable Costs	43,818.38	107,906.11	299,976.07	282,046.96
	Dairy farming Gross Profit	37,717.85	85,264.61	237,253.08	223,192.13

per LAU	1,064.27	1,838.00	1,395.32	1,397.53
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## 5. Conclusions and Recommendations

When the economic analysis of NSDF and SDF were compared; it seems that animal production value and gross production value of SDF was four times higher than NSDF. However, the difference between the two groups was not high when the value of animal production per LAU and GPV per LAU was observed. The average of animal production value was \$2,251.75 per LAU and the average of gross production value was \$3,104.98 per LAU in NSDF, while it was \$3,163.57 and \$3,909.29 in SDF, respectively. The value of animal production per LAU and GPV per LAU was a little higher in SDF. In NSDF, the first three costs with the highest ratio in the animal production variable costs were concentrated feed (%31.66), roughage (%27.37) and oil - fuel - maintenance (%2.53) costs while in SDF, the first three costs were concentrated feed (%30.81), roughage (%25.86) and electricity-heating (%2.53) costs. While 90.74% of the variable costs were concentrated feed and roughage in NSDF, this ratio was 84.91% in SDF. When the distribution of fixed costs was examined; The first three fixed costs that were the highest ratio in NSDF were depreciation expenses (37.30%), family labor force (22.50%) and the interest rate of fixed capital (19.16%). The first three fixed costs that were the highest ratio in SDF were depreciation expenses (41.19%), the interest rate of fixed capital (21.48%) and permanent labor force (17.56%). In addition to the interest rate of fixed capital and depreciation expenses, one of the three fixed cost in NSDF was family labor force cost, while in SDF it was permanent labor force cost. This was due to the fact that almost all of the NSDF were family dairy farms, while the SDF were professional dairy farms. The average unit milk cost was computed as \$0.37 per kg and milk sales price was \$0.38 per kg in NSDF. In SDF, the average unit milk cost was computed as \$0.33 per kg and milk sales price was \$0.40 per kg. In NSDF, the difference between the unit milk cost and milk sales price was \$ 0.01 per kg, while the difference in SDF was \$ 0.07 per kg. When milk support was taken into account, the average unit milk cost was falling to \$0.32 per kg in NSDF and \$0.28 per kg in SDF. By milk support, the difference between the unit milk cost and milk sales price became \$ 0.06 per kg in NSDF while the difference in SDF became \$ 0.12 per kg. Considering milk support, per kg of milk,

SDF earned 6 cents more than NSDF. In both cases before and after support, the gain they derived from a unit of milk in SDF was higher than that in NSDF.

The average of gross profit in NSDF was \$60,886.33 per farm, \$1,222.69 per LAU and \$242.17 per decares, while it was \$297,848.21 per farm, \$1,864.99 per LAU and \$558.70 per decares in SDF. The average of gross profit per LAU and per decares was higher in SDF. In terms of agriculture income, the average of agricultural income per family population was \$5,699.14 in NSDF and it was \$22,644.13 in SDF. In terms of GPV, unit milk cost, gross profit value and agricultural income; it was clear that the economic analysis of SDF was more successful than that of NSDF. This was an indication that the SDF was more competitive and more successful in terms of business organization. The economic and financial results obtained in this paper show that supports were given by IPARD program make dairy farms more competitive and more successful in terms of economic analysis and business organization. When considering the dairy farm groups which were generated according to the number of milking cows, as the number of milking cows increased; animal production value, GPV, gross profit and agricultural income increased. However, considering the values per LAU; dairy farm group which had milking cows between 26 and 50 head, got the highest animal production value, GPV and gross profit. This was an indicator that dairy farm group which had milking cows between 26 and 50 head, became more successful in economic analysis than other dairy farm groups.

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