

## **Economic analysis and honey production cost of beekeeping enterprises supported by IPARD program: case study of Van Province**

Recebimento dos originais: 26/05/2021  
Aceitação para publicação: 08/11/2021

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### **Abstract**

The main objective of the research is to set forth the current social and economic outcomes of the activities of beekeeping enterprises that receive support from the IPARD I program in Van, to determine the level of technology-use, and to specify the number of hives to be supported by determining what should be the minimum production capacity. The main material of the study consisted of data obtained from the beekeeping enterprises supported by IPARD in Van. 94 enterprises receiving IPARD support have been chosen in accordance to “complete inventory” method. Neyman Method, which is one of the stratified sampling methods, was used for determining the sizes of 94 enterprises receiving IPARD support in terms of number of hives. The sample volume was determined by the number of hives, and calculations were made with 95% confidence interval and 5% margin of error. According to number of hives used in production in 2016 production season, there are 17 enterprises of 0-100 colony size, 22 enterprises of 101-250 colony size, and 55 enterprises of 251 and above colony size. The average gross production value is \$45,931.08. As an average of enterprise, the honey production variable cost per hive has been determined as \$49.21. In the examined enterprises, annual total fixed cost has been as determined as \$28.07. Gross profit per enterprise has been determined as \$22,902.47. Net profit per enterprise has been determined as \$20,684.16. In cost matrix, the ratio of variable costs is 63.68%, the ratio of fixed costs is 36.32%. In the examined beekeeping enterprises, the cost of one kilogram of honey is determined as \$4.16 as an enterprise average. The examined beekeeping enterprises have earned \$1.82 in return of \$1 expense hence the relative profit was 1.82.

**Keywords:** Beekeeping. IPARD Program. Economic Performances.

### **1. Introduction**

Agricultural sector, due to the social, political, technical, and economic aspects, differs from other sectors and has a great importance. In addition to meeting basic needs of people, agriculture has also great impact on the economy due to its contributions to employment, agriculture-based enterprises, foreign trade and national income (Arisoy and Oğuz, 2005; AA *et al.*, 2010; Akgün, 2012).

The relative importance of agriculture on Turkey's economy has been decreasing. Along with this decrease, husbandry is vital for our country in terms of balanced and healthy nutrition, development of the industries which is dependent on husbandry, providing employment opportunities with the most appropriate and effective investment in a short time, supporting household systems and increasing rehabilitation practices in agriculture. Animal husbandry's negative impact on nature is minimal and under proper conditions, husbandry will become an important economic source for low-income producers living in rural areas. It is also important in terms of eliminating animal protein deficiency in our country and raising healthy future generations (Dağistan, 2002).

Beekeeping, which is defined as the art of using a plant, bees, and labor together, is one of the important agricultural production branches in developed and developing countries. Compared to other production sectors, thanks to its lower initial investment costs and less need of labor, beekeeping provides employment and healthy nutrition opportunities in developing rural areas (Uzundumlu *et al.*, 2011). Besides being an agricultural business branch carried out in economical scaled enterprises, beekeeping is considered as an important crop production input due to its important contribution to yield (Gençer and Karacaoğlu, 1999). In addition to these benefits, other remarkable benefits of beekeeping such as requiring a small capital, quick return of investment and no dependence on field, beekeeping is a preferred activity among other agricultural production activities (Burucu and Bal, 2017). Beekeeping activities initially focused on meeting the need of honey consumption, then it became a source of income and an essential agricultural activity in our country (Akpınar *et al.*, 2012). Beekeeping has grown rapidly in recent years due to the fact that it is an income opportunity for the farmers with no or little amount of land, and also due to beekeeping products providing good income (Şahinler and Şahinler, 1996).

European Union (EU) offers the Instrument for Pre-accession Assistance (IPA) to prepare candidate and potential candidate countries for membership. Instrument for Pre-accession Assistance in Rural Development (IPARD) as a component of IPA provides financial supports for enterprises to make them perform adequate production to compete with enterprises located in EU member countries. In parallel to this purpose, IPARD I program has

been applied in the years 2007-2013 in Turkey with the EU support and IPARD II program covering the period 2014-2020 has been prepared. IPARD funds are implemented by the Ministry of Agriculture and Forestry and the Agriculture and Rural Development Support Institution (TKDK) for a total of 42 provinces. In January 2016, 1496 beekeeping enterprises from 42 provinces were supported by the IPARD program prepared in 2007-2013 (Anonymous, 2015). According to data from TSI, Van province has been ranked as 13th honey producer in Turkey (1652 tons in 2018). Van province has been ranked second regarding beekeeping support provided by the IPARD for eligible enterprises. In this study; we have examined the businesses that benefited from the support under 302-2 Beekeeping and Production, Processing and Packaging of Bee Products sub-sector within the scope of the IPARD program established in order to create a capacity for ensuring sustainable development by taking the pre-enrolment priorities of Turkish policies into account and to ensure harmonization of the businesses with EU Standards.

Within the scope of the study, the purpose of is to calculate the unit cost of honey comparing economic performances of beekeeping enterprises supported by IPARD in order to determine the effects of the IPARD program on modernization of beekeeping enterprises, the number of enterprises and Turkey's honey production volume in Van province that has an important role in Turkey's honey production.

## 2. Literature Review

To measure the economic performance of agricultural enterprises is one of the main topics of the agricultural economy. There are various economic indicators and financial ratios to measure the economic performance of agricultural enterprises. There are also different resources regarding calculating these economic indicators and financial ratios. General resources prepared for agricultural enterprises (Açıl and Demirci, 1984; Erkuş *et al.*, 1995; Karagölge, 1996; İnan, 1999; Acar, 2003; Anonymous, 2011; Çetin, 2013; Çelik, 2014; Oğuz and Bayramoğlu, 2015) and resources prepared for measuring economic performance of beekeeping enterprises (Hodges *et al.*, 2001; Barlović *et al.*, 2009; Saner *et al.*, 2011; Uzundumlu *et al.*, 2011; Emir, 2015) have been used in the calculations as part of this study.

There are many studies that have been conducted to determine the structures of beekeeping enterprises and to investigate beekeeping (Cakal; Ozbilgin *et al.*; Celik and Tatlıdil, 1995; Dogaroglu, 1999; Parlakay and Esengül, 2005; Saner *et al.*, 2005; Seven and

Seven, 2006; Günbey, 2007; Parlakay *et al.*, 2008; Pirim *et al.*, 2011; Uzundumlu *et al.*, 2011; Cakal, 2013; Erturk and Yılmaz, 2013; Ozturk, 2013; Yalcın, 2014).

Many studies have been conducted to assess the economic performances of beekeeping enterprises. When these studies are analyzed, it is seen that the basic indicators and ratios used to measure the economic performance of enterprises are: unit cost of honey, production costs, honey yield, productivity, profitability, gross product, net product, agricultural income, gross profit, business income, honey price, profit margin, net enterprise income per hive (Akdemir *et al.*, 1990; Dedej *et al.*, 2000; Tanrivermis, 2000; Chaudhary, 2001; Hodges *et al.*, 2001; Bayramoğlu, 2003; Saner *et al.*, 2004; Parlakay and Esengül, 2005; Saner *et al.*, 2005; Yahaya and Usman, 2008; Barlović *et al.*, 2009; Vural and Karaman, 2009; AA *et al.*, 2010; Sproesser *et al.*, 2010; Čejvanović *et al.*, 2011; Saner *et al.*, 2011; Tijani *et al.*, 2011; Pocol and Teselios, 2012; Gözener, 2013; Laate, 2013; Masuku, 2013; Masuku *et al.*, 2014; Emir, 2015; Makri *et al.*, 2015; da Rocha *et al.*, 2016; Oğuz and Yener, 2016; Ceyhan, 2017; Oğuz and Yener, 2017; Narjes and Lippert, 2019).

These basic indicators and ratios were implemented in this study. The studies carried out in the province of Van, which is the research area of this study, were also used for interpreting the results. (Erkan and Aşkın, 2001; Günbey, 2007; Öztürk *et al.*, 2017). In the study, beekeeping enterprises supported by IPARD have been examined, and IPARD I program (Anonymous, 2011) and IPARD II program (Anonymous, 2015) have been used to present information related to the IPARD program.

### **3. Material and Method**

#### **3.1. Material**

The main material of the research was data collected through questionnaires from beekeeping enterprises receiving the IPARD I program support in Van province. In addition to this data, publications and web sites of relative public institutions in the research area and Ministries of Agriculture of Turkey and EU countries, Turkish Statistical Institute (TSI), the Food and Agriculture Organization (FAO), the World Bank (WB), European Union Statistical Institute (EuroStat), and previous research findings and published secondary data were used. The questionnaire forms were prepared in accordance with the objectives of the research, considering the characteristics of the beekeeping enterprises in the scope of research area. Questionnaire forms were populated by the researcher. The interviews were conducted through face to face interviews on different dates in September 2016. In addition to these data,

publications and web pages belonging to the relevant public institutions, previous research findings and published secondary data were used. For the study, the average exchange rate for a USD has been taken as 2.97 Turkish Lira, which was the average exchange rate when the field study was done.

### 3.2. Sampling method

Van province, the selected research area, claims nearly 3% of honey production in Turkey (TSI, 2018), and 4% of total hives. As it is one of the top three provinces receiving the largest beekeeping support from IPARD I, it was selected intentionally in line with the purpose of the research. Within the scope of the IPARD program, when the provinces benefiting from hive and machinery and equipment supports under the sub-measure 302-1 are ranked, the province of Ordu is the first with the highest number of 97,213 hives, while Van is the second with 32,600 hives. Research was conducted in beekeeping enterprises supported by IPARD. There are 94 beekeeping enterprises supported by IPARD in Van. Primary data (the number of hives of the enterprises) are listed from small to large, and the coefficient of variation is used to determine whether the population is homogeneous or not.

$$C.V = \frac{S}{\bar{X}} 100$$

In the formula:

C.V = Coefficient of Variation

S = Standard Deviation

X = Average

Coefficient of variation is important in terms of determining whether values of units belonging to a population or sample are homogeneous or heterogeneous (Çiçek and Erkan, 1996; Oguz and Karakayaci, 2017). In addition a sample with a coefficient of variation above 33% representing a normal population is deemed to be dubious (Duzgunes et al., 1983). In this study, coefficient of variation (C.V) is calculated as 74%. Therefore, the stratified sampling method has been used to increase the accuracy of the data collected from the enterprises and to ensure that the different sections in the population can be adequately represented in the study (Günes and Arıkan, 1988). In enterprises with significant volume and variation differences between stratum, Neyman Method has been used to increase

efficiency of the sampling. According to Neyman Method, the equation formula used to determine sample volume is as follows (Yamane, 1967; Karagolge and Peker, 2002):

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

In the formula:

n = Sample volume

N = Total number of units

S<sub>h</sub> = Standard deviation of stratum h

N<sub>h</sub> = Unit number of stratum h (frequency)

Z = Z value in the standard normal distribution table

D = d / Z

d = Error term of sample

**Table 1: Distribution of enterprises supported by IPARD per number of hives (sample volume (n)) in the research area**

Enterprises Size Groups (Colony)	Number of Enterprises per Stratum (N <sub>h</sub> )	Coefficient of Variation (%)	Sample Volume (n)
0-100	17	31.61	17
101-250	22	23.60	22
250+	55	24.62	55
Total	94	80.03	94

In consideration of the frequency distributions of enterprise sizes, it has been decided to create 3 stratum. Limits of these stratum have been determined as enterprises with 0-100 hives (Stratum 1), 101-250 hives (Stratum 2) and 251+ (Stratum 3) hives. As a result, 17 of 94 enterprises are in 101-250 Stratum, 22 of them are in Stratum 2 and 55 of them are in Stratum 3.

### 3.3. The method used in calculating economic analysis results and unit cost of honey

Total production costs of the beekeeping enterprises have been calculated separately as variable and fixed operating costs. The gross production value for beekeeping enterprises was calculated by adding up the value of total honey, which was the main product (Oğuz and

Bayramoğlu, 2015; Aşkan and Dağdemir, 2016). Gross profit was calculated by subtracting the variable costs from gross production value (Açıl and Demirci, 1984; Demircan *et al.*, 2006; Örs and Oguz, 2019). For comparison, gross and profit values have also been appointed per hive.

- Gross Production Value (GPV) = Product amount obtained as a result of production \* Fee earned by beekeeper
- Gross Product (GP) = GPV + Non-enterprise agricultural income + Residential rental for family members in the enterprise
- Pure Product=GP-Total Costs
- Net profit (NP) = GPV – Total Production Costs
- Gross profit (GP) = GPV - Total Variable Costs
- Relative profit (RP) = GPV / Production Costs
- Agricultural income (AI) = Pure Product - (Rental and Partner Shares + Debit Interest) + Family Labor Force
- Active capital interest = foreign capital interest + equity investment interest
- Production costs = Enterprise costs + active capital interest
- Total Enterprise Costs = Total Variable Costs + Total Fixed Costs
- Unit Honey Cost = Honey Production Cost (\$) / Total Honey Production Amount (kg) (Ceyhan, 2017)

## 4. Results and Discussion

### 4.1. Economic analysis of beekeeping enterprises

Gross production value in the enterprises has been calculated for beekeeping activity performed in the enterprises and value per hive has been determined. The calculation of non-enterprise agricultural income has been based on the statements of the enterprise owners. Non-enterprise agricultural income consists of income earned by workforce within the family when they work in other agricultural activities apart from enterprises and with enterprise-owned machinery and tools. In each enterprise group, due to lack of non-business agricultural income, GP equals to GPV.

**Table 2: Gross production value in enterprises**

	Enterprises Size Groups (Colony)							
	0-100		101-250		251-+		Entrp. Avg.	
	\$	%	\$	%	\$	%	\$	%
Beekeeping Production Value	6,331.75	100	24,318.95	100	66,815.73	100	45,931.08	100
GPV	6,331.75	100	24,318.95	100	66,815.73	100	45,931.08	100
GPV per Hive	98.30		141.61		158.81		154.12	

GPV of examined enterprises is shown in Table 2. Sum of these values is comprised of livestock (beekeeping) production. GPV per hive is determined as \$154.12. In this study, the costs that are decreasing or increasing depending on the size and volume of production have been determined as variable costs while the costs that are not related to the production quantity and volume are considered as fixed costs (Gunes, 2004).

**Table 3: Variable costs in enterprises**

Variable Costs	Enterprises Size Groups (Colony)							
	0-100		101-250		251-+		Entrp. Avg.	
	\$	%	\$	%	\$	%	\$	%
Nutrition	565.26	14.55	1,736.84	18.49	4,078.11	20.29	2,894.85	19.74
Fuel and Transportation	306.99	7.9	1,092.74	11.63	2,286.50	11.37	1,649.11	11.25
Temporary Employment	641.71	16.51	1,157.02	12.32	2,047.75	10.19	1,585.00	10.81
Hives (Field Rental)	247.57	6.37	574.69	6.12	1,249.46	6.22	910.34	6.21
Beekeeper Accommodation	310.95	8	831.04	8.85	1,303.95	6.49	1,013.68	6.91
Marketing	173.72	4.47	575.39	6.12	1,559.87	7.76	1,078.77	7.36
Colony purchase	320.16	8.24	524.33	5.58	1,413.19	7.03	1,007.48	6.87
Queen bee	513.87	13.22	1,059.07	11.27	1,818.24	9.04	1,404.67	9.58
Honeycomb	355.62	9.15	571.93	6.09	1,051.36	5.23	813.33	5.55
Frame	162.66	4.19	568.62	6.05	1,772.27	8.82	1,199.46	8.18
Medicine, Vitamin	78.43	2.02	181.36	1.93	431.28	2.15	308.98	2.11
Transportation Document Expense	6.52	0.17	31.37	0.33	42.45	0.21	33.36	0.23
Interest cost of circulating capital	202.59	5.21	489.74	5.21	1,047.99	5.21	764.45	5.21
Total	3,886.05	100.00	9,394.16	100.00	20,102.44	100.00	14,663.50	100.00
Per hive	60.33		54.70		47.78		49.21	

Total cost incurred in order to obtain gross product equals to business costs and it is an important criterion of assessing the success of an enterprise. Enterprise costs are categorized in two groups: variable costs and fixed costs. In table 3, it is shown that variable costs of honey production per enterprise is determined as \$14,633.50. The biggest share in the variable



costs of honey production belongs to nutrition cost by 19.74%. It is followed by the fuel and transportation cost with a share of 11.25%. The enterprise average of honey production variable cost per hive has been determined as \$49.21. It is determined that depreciation ratio is 20% and depreciation period is 5 years for bee colonies. In depreciation calculations, the 10% is determined as a value to be taken into account for beekeeper hut, and tools and equipment, 10%, instead of 2.5%, has been taken for hives which is based on a 10 years period indicated by the research results (Akgun, 2012). In the depreciation calculation of the vehicle used by the enterprises in the beekeeping business, first half of the value of the vehicle was counted (activity period is 6 months), and then the calculation was made with a depreciation rate of 20%.

**Table 4: Depreciation costs in examined enterprises**

Depreciation	Enterprise Size Groups (Colony)							
	0-100		101-250		251-+		Average of enterprises	
	\$	%	\$	%	\$	%	\$	%
Tools, machinery	78.90	6.00	242.70	11.40	401.28	11.14	305.86	10.76
Depreciation of colony	347.00	26.41	925.13	43.47	2,266.55	62.93	1,605.44	56.47
Hive	888.30	67.59	960.53	45.13	933.70	25.93	931.77	32.77
Total	1,314.20	100	2,128.36	100	3,601.52	100	2,843.07	100

The depreciation costs calculated for the examined enterprises are shown in Table 4. Depreciation per enterprise has been calculated as \$2,843.07. 56.47% of this value is colony (Bee-Colony) capital depreciation, 32.77% is hive depreciation and 10.76% is tool and machine depreciation.

**Table 5: Fixed costs in examined enterprises**

Fixed Costs	Enterprise Size Groups (Colony)							
	0-100		101-250		251-+		Entrp. Avg.	
	\$	%	\$	%	\$	%	\$	%
Beekeeping Insurance	145.47	6.31	149.83	2.65	178.26	1.57	165.67	1.98
Union Fee	40.40	1.75	40.40	0.72	40.40	0.36	40.40	0.48
Permanent Labor	475.34	20.62	2,464.03	43.62	5,567.80	49.16	3,920.41	46.87

General Administrative Cost	116.58	5.06	281.82	4.99	603.07	5.33	439.91	5.26
Repair and Maintenance	0.00	0	0.00	0	0.00	0	0.00	0
Interest Expense of Bee Capital	173.50	7.53	462.57	8.19	1,133.27	10.01	802.72	9.6
Interest Expense of Tools, Machinery Capital	39.45	1.71	121.35	2.15	200.64	1.77	152.93	1.83
Depreciation	1,314.20	57.02	2,128.36	37.68	3,601.52	31.8	2,843.07	33.99
Total	2,304.96	100	5,648.37	100	11,324.96	100	8,365.12	100
Fixed Cost per Hive	35.78		32.89		26.92		28.07	

The annual total fixed cost of the examined enterprises has been determined as \$28.07. 33.99% of this value is depreciation cost, 9.60% is bee capital interest and 46.87% is permanent labor cost. Fixed costs are not dependent on production size and volume. As the fixed costs remain same when production volume increases, this value per hive is similar in each enterprise group (Table 5)

**Table 6: Total costs in examined enterprises**

	Enterprise Size Groups (Colony)							
	0-100		101-250		251-+		Entrp. Avrg.	
	\$	%	\$	%	\$	%	\$	%
Variable costs	3,886.05	62.77	9,394.16	62.45	20,102.44	63.96	14,663.50	63.68
Fixed costs	2,304.96	37.23	5,648.37	37.55	11,324.96	36.04	8,365.12	36.32
Total costs	6,191.00	100	15,042.53	100	31,427.40	100	23,028.62	100
Per hive	96.11		87.60		74.70		77.28	

In the enterprises examined within the scope of the study, the total enterprise cost per enterprise has been determined as \$23,028.62. Of the total costs, 63.68% are variable costs and 36.32% are fixed costs. Furthermore, the average of enterprise costs per hive has been

determined as \$77.28 (Table 6). Net product has been calculated by deducing enterprise costs from gross product value. Net product has measures the success of capital included in production in a production season (Erkuş, 1995).

**Table 7: Gross revenue in examined enterprises**

	Enterprise Size Groups (Colony)							
	0-100		101-250		251-+		Entrp. Avrg.	
	\$	%	\$	%	\$	%	\$	%
GP	6,331.75	100	24,318.95	100	66,815.73	100	45,931.08	100
Total Costs	6,191.00	97.78	15,042.53	61.86	31,427.40	47.04	23,028.62	50.14
Gross Revenue	140.75	2.22	9,276.42	38.14	35,388.33	52.96	22,902.47	49.86
Per hive	2.19		54.02		84.11		76.85	

The net product per enterprise in the examined enterprises has been determined to be \$22,902,47. 50.14% of gross product is enterprise costs, and 49.86% is net product. Net product increases as the size and the volume of enterprises increases. Furthermore, the enterprise average of net product per hive has been determined as \$ 76.85.

Gross profit is calculated by subtracting the total variable costs incurred for agricultural activity branches from the gross production value total, which has been generated from the same agricultural activity branches. Gross profit levels are shown in Table 8.

**Table 8: Gross profit in examined enterprises**

	Enterprise Size Groups (Colony)							
	0-100		101-250		251-+		Entrp. Avrg.	
	\$	%	\$	%	\$	%	\$	%
GPV	6,331.75	100	24,318.95	100	66,815.73	100	45,931.08	100
Total Variable Costs	3,886.05	61.37	9,394.16	38.63	20,102.44	30.09	14,663.50	31.92
Gross profit	2,445.70	38.63	14,924.78	61.37	46,713.29	69.91	31,267.59	68.08
Per hive	37.97		86.91		111.03		104.92	

The gross profit calculated per examined enterprise has been determined as \$31,267.59. 31.92% of GDP is comprised of total changing costs and 68.08% of gross profit. Gross profit increases as production size increases. Gross profit per hive in enterprises has also been calculated. The gross profit per hive has been determined as \$104.91 in the enterprises.

The method of deducing production costs from gross product value has been used to calculate net profit per enterprise. Net profit is the profit of the entrepreneur who takes the responsibility for the organization of production and production risk in a business. The enterprise owners of the examined enterprises have contributed to their own enterprises and IPARD program by taking responsibility of risk and production organization under IPARD program. Net profit per enterprise has been determined as \$20,684.16. Makri *et al.* has conducted an economic activity analysis in beekeeping enterprises in Greece and stated that beekeeping is a profitable economic activity and honey can be obtained in the same amount and quality by reducing the input cost by 34% in the short run and 43% in the long run. Masuku stated that as the size of the colony increases, honey production would increase to the level of 0.57% with a 1% increase in the number of hives actively used in production at the enterprises (Masuku, 2013).

**Table 9: Net profit in examined enterprises**

	Enterprise Size Groups (Colony)			
	0-100	101-250	251-+	Entrp. Avg.
	\$	\$	\$	\$
GP	6,331.75	24,318.95	66,815.73	45,931.08
Production Costs	7,030.64	16,573.40	34,346.81	25,246.92
Net Profit	-698.89	7,745.55	32,468.92	20,684.16
Net Profit per Hive	-10.85	45.10	77.17	53.75

The examined beekeeping enterprises earned \$1.82 in return of \$1 expense incurred and relative profit is 1.82 (Table 10). In a similar study by Emir (2015), the relative profit of beekeeper enterprises across Turkey has been determined as 1.88. In a province-level similar study (Ören *et al.*, 2010) the relative profit of beekeeping enterprises in Adana province has been determined as 1.2 (Table 10).

**Table 10: Relative profit in examined enterprises**

	Enterprise Size Groups (Colony)			
	0-100	101-250	251-+	Entrp. Avrg.
GPV (\$)	6,331.75	24,318.95	66,815.73	45,931.08
Production Costs (\$)	7,030.64	16,573.40	34,346.81	25,246.92
Relative Profit	0.90	1.47	1.95	1.82

Agricultural income per enterprise has been determined as \$34,797.31 in the enterprises. Also, agricultural income per hive has been calculated and the enterprise average of this value is \$116.76. Reducing the initial capital of enterprises with the support has led to an increase in agricultural income in the examined enterprises (Table 11).

**Table 11: Agricultural income in beekeeping enterprises**

	Enterprise Size Groups (Colony)			
	0-100	101-250	251-+	Entrp. Avrg.
	\$	\$	\$	\$
Net Product	140.75	9,276.42	35,388.33	22,902.47
Debit Interests and Rental	604.19	787.72	524.17	600.32
Family Labor Fee	13,475.94	12,438.02	12,214.88	18,742.75
Agricultural Income	13,012.49	20,926.72	47,079.04	34,797.31
Agricultural Income per Hive	202.02	121.86	111.90	116.76

The honey cost chart of beekeeping enterprises has been shown in Table 12. Total costs have been examined in two groups: fixed and variables costs. Fixed costs include union fee, permanent labor, general administrative cost, repair and maintenance, bee capital interest, machinery and tool capital interest, depreciation and land rent. When calculating general administrative costs, the 3% variable cost has been included. Variable costs include nutrition, fuel and transportation, temporary labor, beekeeper accommodation, marketing, colony purchase, queen bee, honeycomb, frame, medicine and vitamin, transportation document expense and circulating capital cost.

**Table 12: Honey cost in beekeeping enterprises**

	Enterprise Size Groups (Colony)
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	0-100	101-250	251-+	Entrp. Avg.	
	\$	\$	\$	\$	%
<b>A. Income</b>					
1. Main Product Income	6,331.75	24,281.45	66,604.23	45,798.55	99.71
2. Other Product Income	0.00	37.49	211.51	132.53	0.29
<b>Total Production Value</b>	6,331.75	24,318.95	66,815.73	45,931.08	100.00
<b>B. Variable Costs</b>					
Nutrition	565.26	1,736.84	4,078.11	2,894.85	12.57
Fuel and Transportation	306.99	1,092.74	2,286.50	1,649.11	7.16
Temporary Labor	641.71	1,157.02	2,047.75	1,585.00	6.88
Bee Accommodation (Field Rental)	247.57	574.69	1,249.46	910.34	3.95
Beekeeper Accommodation	310.95	831.04	1,303.95	1,013.68	4.40
Marketing	173.72	575.39	1,559.87	1,078.77	4.68
Colony purchase	320.16	524.33	1,413.19	1,007.48	4.37
Queen bee	513.87	1,059.07	1,818.24	1,404.67	6.10
Honeycomb	355.62	571.93	1,051.36	813.33	3.53
Frame	162.66	568.62	1,772.27	1,199.46	5.21
Medicine, Vitamin	78.43	181.36	431.28	308.98	1.34
Transportation Document Expense	6.52	31.37	42.45	33.36	0.14
Interest cost of circulating capital	202.59	489.74	1,047.99	764.45	3.32
<b>Total Variable Costs (\$)</b>	3,886.05	9,394.16	20,102.44	14,663.50	63.68
<b>C. Fixed Costs</b>					
Beekeeping Insurance (Hive and Machinery, Equipment)	145.47	149.83	178.26	165.67	0.72
Union Fee	40.40	40.40	40.40	40.40	0.18
Permanent Labor	475.34	2,464.03	5,567.80	3,920.41	17.02
General Administrative Cost (3%)	116.58	281.82	603.07	439.91	1.91
Repair, Maintenance	0.00	0.00	0.00	0.00	0.00
Interest Expense of Bee Capital	173.50	462.57	1,133.27	802.72	3.49
Interest Expense of Tools, Machinery Capital	39.45	121.35	200.64	152.93	0.66
Depreciation	1,314.20	2,128.36	3,601.52	2,843.07	12.35
<b>Total Fixed Costs (\$)</b>	2,304.96	5,648.37	11,324.96	8,365.12	36.32
<b>D. Total Cost (\$)</b>					
	6,191.00	15,042.53	31,427.40	23,028.62	100.00
<b>E. Amount Of Honey Produced</b>					
	1,019.71	3,357.73	9,054.91	6,268.35	
<b>F. Honey Production Cost (US\$/kg)</b>					
	6.07	4.47	3.45	4.16	

In the examined beekeeping enterprises, the cost of one kilogram of honey is determined to be \$4.16. Honey sales income constitutes 99,71% of the total income of beekeeping enterprises in honey production. In the cost matrix, the rate of variable costs is 63.68% and the rate of fixed costs is 36.32%. Nutrition costs (12.57%) and transportation costs (7.16%) have the largest shares in the total enterprise costs while total labor costs (23.90%) has the largest share in honey production costs (Table 12). In order to reduce the unit cost of honey, side products should be considered as a priority to increase income. In this context, machinery and equipment which are supported by IPARD program should be used effectively.

As in almost all other studies examining the distribution of cost elements in honey production, the high cost of labor has been highlighted in our study. In a study conducted by Hodges in Florida, the most prominent cost elements are reported to be labor (27%) and transportation (17%) (Hodges *et al.*, 2001). In various studies related to the economic analysis of beekeeping and production costs of honey product, the share of the variable costs in the total costs was determined as 69.37% (Onyekuru *et al.*, 2010), 51.39% (Okpokiri *et al.*, 2015) 38.59% (Mbah, 2012) and 10.57% (Folayan and Bifarin, 2013). Among the studies conducted in Turkey, a particular study by Saner *et al.* covering Mugla and Izmir provinces concluded that the most prominent cost element has been calculated as unpaid labor and its share in the total cost has been determined as 48% (Saner *et al.*, 2004). It is followed by transportation and storage costs. Total labor cost share is also 48% in the study of Oren *et al.* (Ören *et al.*, 2010). The studies have shown that distribution of fixed and variable costs varies based on whether the beekeeping enterprise located in relevant provinces is mobile or not. In the studies which are mostly focused on fixed and locally mobile beekeeping enterprises, fixed costs have larger share compared to variable costs. In Bahcesaray, Van, 40% of total production costs is variable cost while 34% of total production costs is labor cost (Yildirim and Agar, 2008). Also, in the PhD. Dissertation of Emir (2015), the distribution of fixed and variable costs among business enterprise production costs are similar to the outcomes of our study (Emir, 2015). In the studies conducted by Saner *et al.* in 2004 and 2011, colony renewal costs were substantially different. In the studies conducted in Adana, the share of variable costs in the total enterprise costs is 54% and nutrition (feed) cost (19%), which has the same proportion as our study, constituted the largest share among variable costs (Ören *et al.*, 2010). Nutrition has the largest share (25%) in the cost matrix of the beekeeping enterprises in Tokat (Yalcin, 2014).

## 5. Conclusions and Recommendations

GPV per hive has been determined as \$154.12 in the enterprises. It has been determined that as the size of the business increases, the gross production value per hive increases too. Net product increases as the size and the volume of enterprises increases. Furthermore, enterprise average of net product per hive is determined as \$76.85. Gross profit increases as production size increases. Gross profit per hive has been determined as \$104.92 in the enterprises.

Net profit is the profit of the entrepreneur who takes responsibility for the organization of production and production risk in a business. The enterprise owners of the examined enterprises have contributed to their own enterprises and IPARD program by taking responsibility of risk and production organization under IPARD program. Net profit per enterprise has been determined as \$20,684.16. Net profit increases as enterprise size and volume increases. The examined beekeeping enterprises earned \$1.82 in return for every \$1 expense incurred and their relative profit was 1.82. It is determined that as enterprise size increases, earned income in return for \$1 expense also increases. Agricultural income per enterprise has been determined as \$ 34,797.31 in the enterprises. Also, agricultural income per hive has been calculated and the enterprise average of this value has been determined to be \$116.76. The enterprise costs are categorized into two groups as variable costs and fixed costs. In the enterprises examined within the scope of the study, 63.68% of the total costs are variable costs and 36.32% are fixed costs. Furthermore, enterprise average of enterprise costs per hive has been determined as \$77.28. It is determined that as enterprise size increases, variable cost per hive decreases. As fixed costs remain the same while increasing production volume, the value per hive is similar in each enterprise group. In examined beekeeping enterprises, the business average cost of one kilogram of honey is determined as \$4.16. Revenue generated from honey sales constitutes 99,71% of the total income of beekeeping enterprises in honey production. In order to reduce unit cost of honey and increase revenues, side products should be taken into consideration. In this context, machinery and equipment which are supported by IPARD program should be used effectively.

Considering unit cost of honey, gross profit, net profit, relative profit, and agricultural revenues, it is clearly shown that enterprises supported by IPARD are economically successful. It is determined that as the number of hives with colonies increases, economic performance also increases. It is shown that IPARD program has driven more competitive and well-organized beekeeping enterprises. IPARD program has achieved its purpose in terms of providing assistance to beekeeping business.

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## **7. Acknowledgement**

This article has been prepared by using the PhD dissertation entitled " The Determination of Impact Evaluation of IPARD Support Beekeeping Business; The Case Study Van Province ".