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Erzurum İlinde Tarımsal Desteklerin Bazı Yem Bitkilerinin Maliyeti Üzerindeki Etkisi

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Öne Çıkanlar:
- Yonca
- Korunga
- Fiğ
- Brüt Marj
- Net Kar

Anahtar Kelimeler:
- Tarımsal Destekler
- Maliyet
- Yem Bitkileri

ÖZET:

Bu çalışmanın amacı Erzurum ilinde tarımsal desteklerin belirli yem bitkilerinin maliyetine olan etkisini incelemektedir. Tarım ve Orman Bakanlığı tarafından sağlanan desteğin üretim maliyetleri üzerindeki etkisi özellikle vurgulanmıştır. Çalışmada 2021 üretim yılında Erzurum ilinde yonca, korunga ve fiğ üretimi yapan işletmelerden basit tesadüfi örnekleme yöntemine göre yapılan 306 anketten elde edilen veriler kullanılmıştır. Anketlerden sağlanan tüm verilerin dekara ortalaması alınarak analizler yapılmıştır. Maliyet hesabı bir ürünün üretilebilmesi için yapılan tüm harcamaları içermektedir. Yonca çiftliklerinde, destek almadan önce yonca maliyeti 1.05 ₺/kg olarak hesaplanmıştır. Ancak, destek alındıktan sonra bu maliyetin 0.86 ₺/kg'a düştüğü belirlenmiştir. Korunga çiftliklerinde, destek almayan çiftlikler için üretim maliyeti 1.32 ₺/kg olarak belirlenirken, destek alan çiftlikler için bu maliyet 0.99 ₺/kg olarak tespit edilmiştir. Fiğ çiftliklerinde ise, destek almayan çiftlikler için üretim maliyeti 1.49 ₺/kg olarak bulunmuşken, destek alan çiftlikler için bu maliyet 1.25 ₺/kg olarak belirlenmiştir. Araştırma, tarımsal desteklerin bu yem bitkilerinin üretiminde nasıl bir fark yarattığını açıklamaktadır. Bulgular, tarımsal desteklerin maliyetleri azaltma potansiyeline sahip olduğunu ve bu durumun çiftçilerin gelirini artırabileceğini ve tarımsal üretimi teşvik edebileceğini göstermektedir.

The Impact of Agricultural Support on the Cost of Certain Forage Crops in Erzurum Province

Highlights:
- Alfalfa
- Sainfoin
- Vetch
- Gross Margin
- Net Profit

Keywords:
- Agricultural Support
- Cost
- Forage Crops

ABSTRACT:

The objective of the study is to reveal the impact of agricultural subsidies provided by the Ministry of Agriculture and Forestry on the costs of certain forage crops in Erzurum province. The study used data obtained from 306 surveys conducted through a simple random sampling method from farms producing alfalfa, sainfoin, and vetch in Erzurum province during the 2021 production year. All data obtained from the surveys were averaged per decare and analyzed. The cost calculation includes all expenses incurred to produce a crop. In alfalfa farms, the cost of alfalfa was calculated as 1.05 ₺/kg before receiving subsidies. However, after receiving subsidies, this cost decreased to 0.86 ₺/kg. In sainfoin farms, the production cost was determined to be 1.32 ₺/kg for farms not receiving subsidies, while it was 0.99 ₺/kg for farms receiving subsidies. In vetch farms, the production cost was found to be 1.49 ₺/kg for farms not receiving subsidies, while it was 1.25 ₺/kg for farms receiving subsidies. The research explains the difference that agricultural subsidies make in the production of these forage crops. The findings indicate that agricultural subsidies have the potential to reduce costs, which can increase farmers' income and encourage agricultural production.

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INTRODUCTION

In a balanced diet, the role of animal products is crucial, with an ideal protein intake of 40% from animal sources and 60% from plant sources. However, the high prices of animal products limit animal protein consumption, particularly in less developed or developing countries. The primary reasons for these high price increases are low productivity and high feed costs, threatening the sustainability of animal production. To ensure sustainable production, it is essential to reduce input costs and increase efficiency and quality. Feed costs constitute roughly 70% of total costs in animal production. Although promoting the production of forage crops through agricultural support policies may not be sufficient to meet the production gap, the sustainability of forage crop production is critical in terms of the current situation and future measures (Aydoğdu et al., 2016; Harmanşah, 2018; Özkan, 2020).

To address the forage gap and increase production, the Ministry of Agriculture and Forestry provides support for certain products. Agricultural subsidies are fundamental in supporting farmers and ensuring the sustainability of agricultural activities in Turkey. In 2023, the Turkish government allocated approximately 56 billion TL to various agricultural support programs, with 20.5 billion TL specifically earmarked for crop production, including forage crops. This allocation represents approximately 36.6% of the total agricultural subsidies, underscoring the significant emphasis placed on supporting field crops and ensuring a stable supply of quality feed for the livestock sector (Ministry of Agriculture and Forestry, 2023).

In Turkey, agricultural activities are conducted on a total area of 19.8 million decaress, including fallow areas. Within this area, an annual production of 55.4 million tons of quality forage, including forage crops such as green fodder and silage corn, is carried out on 2.1 million decaress (Yavuz et al., 2020). Accordingly, forage crops are grown on 11.1% of Turkey's agricultural lands. The forage crops that meet the demand for animal production are alfalfa at 24%, sainfoin at 4%, and vetch at 14%. Additionally, considering the number of cattle in Turkey, there is a 27 million ton forage deficit, which is attempted to be compensated with low-quality feed such as straw (TAGEM, 2022).

The agricultural sector is one of the cornerstones of economic development, with livestock being one of its most critical sub-components. Ensuring sustainability in livestock is directly related to the production of high-quality and cost-effective forage crops. Erzurum province has significant potential for livestock activities, with forage crop production being of great importance in this region. However, high production costs economically challenge forage crop producers. The impact of agricultural subsidies on reducing production costs and increasing profitability is a major research topic. Understanding the cost effects of agricultural support programs on forage crops in Erzurum province is crucial for enhancing the welfare of local farmers and evaluating the effectiveness of agricultural policies at the national level. The purpose of this study is to determine the impact of agricultural subsidies on the production costs of certain forage crops such as alfalfa, sainfoin, and vetch.

MATERIALS AND METHODS

In Erzurum province, in 2021, the cultivated areas of alfalfa, sainfoin, and vetch (721 thousand decaress) constitute 75% of the total cultivated forage crop area (955 thousand decaress). Within these areas, alfalfa accounts for 38%, sainfoin 27%, oats 20%, vetch 11%, silage corn 3%, and triticale 1% (TURKSTAT, 2022). Oats, as a cool-season cereal, are also used as an alternative forage crop. The shares of silage corn and triticale are relatively low. Therefore, the focus of the study on forage crops primarily centers on alfalfa, sainfoin, and vetch.

The study utilized survey data from farms producing alfalfa, sainfoin, and vetch in Erzurum province, with the survey data being prepared for analysis using Microsoft Excel. All data obtained from the surveys were averaged per decares for analysis. The data for the study were obtained from surveys conducted in 2021 with farms growing alfalfa, sainfoin, and vetch in the districts of Horasan, Köprüköy, Pasinler, Palandöken, Yakutiye, Aziziye, and Aşkale in Erzurum province. Villages included in the study were selected purposively. The selection of farms for sampling from the main population was conducted using simple random sampling, determining the number of farms to be sampled according to Formula 1 with a 10% margin of error and 90% confidence interval (Çiçek & Erkan, 1996).

$$n = \frac{N * \sigma^2}{(N-1) * D + \sigma^2} \quad (1)$$

n = Number of farms to be surveyed,

N = Total number of farms in the population.

In this study, the total number of farms engaged in fodder crop production in the 7 districts is 9.790. However, due to the negligible effect of farms with less than 1 da (2.66%) and over 300 da (0.07%) on variance, they were excluded, resulting in a value of 9.457.

σ^2 = Variance depending on the size of fodder crop land, with a value of 825.8.

$D = (d^2 / z^2)$ is calculated as shown and is 2.7.

d = Permissible error from the sample mean ($\bar{x}$*0.10), with a value of 2.71.

$\bar{x}$ = Average land area per business, with a value of 27.1 da.

z = Represents the z-value in the standard normal distribution table according to the error rate, with a value of 1.65.

$$n = \frac{N * \sigma^2}{(N-1) * D + \sigma^2} = \frac{9457 * 825.8}{9456 * 2.7 + 825.8} = 305.45 \sim 306$$

In calculating unit production costs, variable and fixed expenses are aggregated. This value is then divided by the product yield to obtain the cost per kilogram of the product. Costs for perennial crops like alfalfa and sainfoin are calculated in the establishment year. Average costs per decares are used as weighted averages in cost analysis. The economic life of alfalfa is assumed to be 5 years, while sainfoin is considered to be 3 years (Kumbasaroğlu & Dağdemir, 2010). The expenses of farms producing alfalfa, sainfoin, and vetch are initially calculated without subsidies. Subsequently, for the year 2021, agricultural supports provided by the Ministry of Agriculture and Forestry (such as fertilizer, certified seeds, and direct income support) are taken into account, and the amount of support provided is deducted from the expenses. Thus, the reduction in costs for farms receiving government support is calculated. For instance, fertilizer support for alfalfa is set at 8 ₺/da, diesel support at 19 ₺/da, certified seed support at 30 ₺/da, and direct income support at 90 ₺/da (BÜGEM, 2022).

Preparation of soil, primary tillage, secondary tillage, fertilization, sowing, and covering (rolling) costs are included. These expenses are calculated in the establishment year for perennial crops and in the production year for annual crops. Each expense item (sowing, fertilization, etc.) is converted into equivalent man-days (EMD), including family and hired labor. Foreign labor costs are converted to EMD based on hours worked and wages paid, while family labor is determined per farm in EMD, multiplied by hours worked and applicable hourly wage (Kıral et al., 1999; Kumbasaroğlu & Dağdemir, 2011; Şahinli, 2019).

For sowing operations, labor costs are calculated based on hours worked by foreign labor, excluding the driver. Additionally, costs for seeds and fertilizers used in sowing are recorded as

expenses based on unit prices. Labor and machinery hours used on the farm reflect actual usage values (Kıral et al., 1999; Kumbasaroğlu & Dağdemir, 2011). Irrigation expenses are calculated per decares based on irrigation fees and labor (Kumbasaroğlu & Dağdemir, 2011).

General administrative expenses are calculated as 3% of variable expenses. However, opportunity costs of fixed assets are not included in calculations. For leased lands, the actual rental value paid as land rent is based on the current rental value of similar quality lands in the region if the land belongs to the producer. The current year's interest rate for investments is calculated with a real interest rate of 9.50% (Kıral et al., 1999; Demircan, 2002; Kenan & Bayramoğlu, 2020).

In the production year, costs for fuel and foreign labor wages, rental of equipment and baling machines, if baling is done externally, are calculated by multiplying the total number of bales by the fee paid per bale. If baling is done by the producer, costs for baling twine are included in variable costs. Costs for covering with tarpaulin in farms without closed storage facilities are also included in variable costs. Interest on working capital represents the opportunity cost of the capital used in production. The interest rate is calculated by taking half of the interest rate on agricultural production loans from Ziraat Bank, considering a 50% subsidy (Gündoğmuş, 1998; Kıral et al., 1999). Capital investment interest is calculated by applying a 9.50% interest rate to half of the investment cost due to the economic life of investment components (Açıl, 1977; Kıral et al., 1999; Demircan et al., 2005; İşleyen & Erden, 2019).

For each farm, the production quantity per decares (yield) is calculated to determine the average production per farm. The cost per kilogram of product is determined by dividing per decares production expenses by yield quantity. Gross and net profits per unit area for farms are thus calculated. Gross margin is a measure that allows for the comparison of profitability across different production branches. The gross margin of each production branch is calculated by subtracting variable expenses from gross production value. This method determines the gross margin for different production branches (Açıl & Demirci, 1984; Karagölge, 1996).

Gross Margin = Gross Production Value (GPV)- Variable Costs

Net Profit = Gross Production Value- Total Production Costs

GPV is obtained by multiplying the product price by the production value per decare (Kıral et al., 1999; Tanrıvermiş, 2000). In the agricultural production values for Erzurum province in 2021, the prices for alfalfa, sainfoin, and vetch were officially recorded at 1.56 ₺/kg and 1.52 ₺/kg, respectively (TURKSTAT, 2022). However, due to nearly all producers selling dry forage at 1.75 ₺/kg for alfalfa, sainfoin, and vetch, this higher price of 1.75 ₺/kg was used for calculating the production value.

As a final step in the calculations, due to the limited number of farms operating without subsidies, analyses were conducted as if these farms were not receiving support. This approach was taken to accurately assess the effects by illustrating how operations changed with and without subsidies.

RESULTS AND DISCUSSION

The production costs for alfalfa, sainfoin, and vetch farms were calculated without receiving forage crop support, and a post-support cost calculation was conducted to determine how much the costs would decrease after receiving support. The cost calculation for alfalfa was based on 268 alfalfa-producing farms, for sainfoin it was based on 125 sainfoin-producing farms, and for vetch it was based on 99 vetch-producing farms. Data regarding the support for the year 2021 were obtained from the official website of the General Directorate of Agricultural Research and Policies (GDARP).

Table 1 indicates that the cost of alfalfa in alfalfa-producing farms was 1.05 ₺/kg, while Table 2 shows that after receiving support, this cost decreased to 0.86 ₺/kg. Kumbasaroğlu and Dağdemir (2010) determined the cost of alfalfa in their study as 0.106 ₺/kg for farms with state support and 0.129 ₺/kg for those without state support. In a study conducted by İnan et al. (2022), the cost of alfalfa in Tokat province for the production year 2021 was calculated as 0.84 ₺/kg.

Table 1. Cost of Alfalfa Production

	Total (₺)	Distribution (%)
Establishment Year		
Total Variable Expenses (I)	586.45	72.27
Total Fixed Expenses (II)	220.55	27.33
Total Establishment Expenses (I+II)	807.00	100.00
Economic Life	5.00	
Depreciation Share of Establishment Expenses	161.40	
Production Year		
Total Variable Expenses (I)	362.91	50.35
Total Fixed Expenses (II)	357.87	49.65
Production Expenses (I+II)	720.78	100.00
Alfalfa Yield (kg/da)	690.00	
Cost per kg of Alfalfa (₺/kg)	1.05	

Table 2. Cost of Alfalfa Production With Government Support

	Total (₺)	Distribution (%)
Establishment Year		
Total Variable Expenses	586.45	
Variable Expenses- Seed Support: 30 ₺ per decares*(I)	556.45	71.96
Total Fixed Expenses (II)	216.80	28.04
Total Establishment Expenses (I+II)	773.25	100.00
Economic Life	5.00	
Depreciation Share of Establishment Expenses	154.65	
Production Year		
Total Variable Expenses (I)	334.62	48.97
Total Fixed Expenses (II)	348.67	51.03
Production Expenses (I+II)	683.29	100.00
Forage Crops Support* (90 ₺ per decares)	90.00	
Production Expenses After Support	593.29	
Alfalfa Yield (kg/da)	690.00	
Cost per kg of Alfalfa after Support (₺/kg)	**0.86**	

*Seed support was deducted from the planting expenses in the establishment year, fertilizer support from the fertilization expenses in the production year, diesel support from the variable expenses in the production year, and forage crop support was subtracted from the total production expenses as by-product income

Table 3. Cost of Sainfoin Production

	Total (₺)	Distribution (%)
Establishment Year		
Total Variable Expenses (I)	530.20	75.02
Total Fixed Expenses (II)	176.53	24.98
Total Establishment Expenses (I+II)	706.73	100.00
Economic Life	3.00	
Depreciation Share of Establishment Expenses	235.58	
Production Year		
Total Variable Expenses (I)	136.12	26.20
Total Fixed Expenses (II)	383.48	73.80
Production Expenses (I+II)	519.60	100.00
Sainfoin Yield (kg/da)	395.00	
Cost per kg of Sainfoin (₺/kg)	**1.32**	

In the calculation of establishment costs for sainfoin, an economic life of 3 years was assumed. Costs were determined based on the current expenses of farms without support and the expenses after receiving government support. For sainfoin-producing farms not receiving support, the production cost was found to be 1.32 ₺/kg, while for those receiving support, it was determined as 0.99 ₺/kg. Kumbasaroğlu & Dağdemir (2010) determined the cost of sainfoin in their study as 0.217 ₺/kg for farms with state support and 0.243 ₺/kg for those without state support. In a study by İnan et al. (2022), the cost of sainfoin was determined as 1.03 ₺/kg.

For vetch-producing farms receiving support, the production cost was determined as 1.25 ₺/kg, while for those not receiving support, it was found to be 1.49 ₺/kg. Kumbasaroğlu (2009) found the cost of vetch in their study to be 0.123 ₺/kg for farms with state support and 0.181 ₺/kg for those without state support. In a study by İnan et al. (2022), the cost of vetch was determined as 1.01 ₺/kg.

Table 4. Cost of Sainfoin Production with Government Support

	Total (₺)	**Distribution (%)**
Establishment Year		
Total Variable Expenses	530.20	
Variable Expenses- Seed Support: 22 ₺ per decares*(I)	508.20	74.52
Total Fixed Expenses (II)	173.78	25.48
Total Establishment Expenses (I+II)	681.98	100.00
Economic Life	3.00	
Depreciation Share of Establishment Expenses	227.33	
Production Year		
Total Variable Expenses (I)	107.84	22.42
Total Fixed Expenses (II)	373.21	77.58
Production Expenses (I+II)	481.05	100.00
Forage Crops Support* (90 ₺ per decares)	90.00	
Production Expenses After Support	391.05	
Sainfoin Yield (kg/da)	395.00	
Cost per kg of Sainfoin after Support (₺/kg)	**0.99**	

*Seed support was deducted from the planting expenses in the establishment year, fertilizer support from the fertilization expenses in the production year, diesel support from the variable expenses in the production year, and forage crop support was subtracted from the total production expenses as by-product income

Table 5. Cost of Vetch Production

	Total (₺)	**Distribution (%)**
Total Variable Expenses (I)	591.58	82.82
Total Fixed Expenses (II)	122.75	17.18
Production Expenses (I+II)	714.32	100.00
Vetch Yield (kg/da)	480.00	
Cost per kg of Vetch (₺/kg)	**1.49**	

Table 6. Production Cost of Vetch with Government Support

	Total (₺)	**Distribution (%)**
Total Variable Expenses (I)	540.25	81.68
Total Fixed Expenses (II)	121.21	18.32
Production Expenses (I+II)	661.45	100.00
Forage Crops Support* (60 ₺ per decares)	60.00	
Production Expenses After Support	601.45	
Vetch Yield (kg/da)	480.00	
Cost per kg of Vetch after Support (₺/kg)	**1.25**	

*Seed support was deducted from the planting expenses, diesel and fertilizer support from the variable expenses, and forage crop support was subtracted from the total production expenses as by-product income

Table 7 compares the gross margin and net profit of farms engaged in alfalfa, sainfoin and vetch production, between those receiving and not receiving support. Gross margin is calculated by subtracting variable expenses from gross production value. For alfalfa farms, the gross margin was

determined as 872.88 ₺/da for those receiving support, and 844.59 ₺/da for those not receiving support. In a study by İnan et al. (2022), the gross margin for alfalfa in Tokat province was reported as 1344.00 ₺/da.

Net profit represents the difference between gross production value and production expenses. The net profit value for farms receiving support was found to be 614.21 ₺/da, while for those not receiving support, it was 486.72 ₺/da.

For sainfoin farms, the gross margin was 583.41 ₺/da for those receiving support and 555.13 ₺/da for those not receiving support. When evaluated in terms of net profit, the net profit value for farms receiving support was 300.20 ₺/da, while for those not receiving support, it was 171.65 ₺/da.

For vetch farms, the gross margin was 299.75 ₺/da for those receiving support and 248.42 ₺/da for those not receiving support. When evaluated in terms of net profit, the net profit value for farms receiving support was 238.55 ₺/da, while for those not receiving support, it was 125.68 ₺/da.

Table 7. The Net Profit of Farms Engaged in Alfalfa, Sainfoin, and Vetch Production

	Alfalfa	Support with Alfalfa	Sainfoin	Support with Sainfoin	Vetch	Support with Vetch
Production Expenses (₺/da)	720.78	593.29	519.60	391.05	714.32	601.45
Variable Expenses (₺/da)	362.91	334.62	136.12	107.84	591.58	540.25
Selling Price (₺/kg)	1.75	1.75	1.75	1.75	1.75	1.75
Gross Production Value (₺/da)	1207.50	1207.50	691.25	691.25	840.00	840.00
Cost of Goods Sold ((₺/kg)	1.05	0.86	1.32	0.99	1.49	1.25
Gross Margin (₺/da)	**844.59**	**872.88**	**555.13**	**583.41**	**248.42**	**299.75**
Net Profit (₺/da)	**486.72**	**614.21**	**171.65**	**300.20**	**125.68**	**238.55**

CONCLUSION

In the study, the costs of farms producing alfalfa, sainfoin, and vetch in Erzurum province were calculated without receiving agricultural subsidies, and it was determined how these costs changed with support. It was found that in alfalfa farms, costs decreased by 18.10% with subsidies, while in sainfoin farms, costs decreased by 25%, and in vetch farms, costs decreased by 16.11%. This significant reduction allows farmers to lower production costs and achieve more sustainable production. Additionally, subsidies were found to increase gross margins by 3.35% in alfalfa farms, 5.10% in sainfoin farms, and 20.66% in vetch farms. Moreover, in terms of net profit, subsidies led to an increase of 26.19% in alfalfa farms, 74.90% in sainfoin farms, and 89.90% in vetch farms. This substantial increase in net profit highlights the effectiveness of subsidies in enhancing overall profitability for farmers, thereby significantly improving their financial sustainability and economic welfare.

Considering the gross and net profit values per decares in alfalfa, sainfoin, and vetch production, alfalfa emerges as the most profitable crop for producers. Similar studies also confirm alfalfa as the most profitable crop for the region. However, despite alfalfa being economically the most profitable, sainfoin and vetch are valued for their ecological conditions and as alternative crops.

Based on these results, it is evident that benefiting from support programs significantly reduces costs and greatly enhances farm profitability. In this context, increasing participation in support programs through enhanced information and advisory activities can be encouraged. Furthermore, expanding the scope of support programs and simplifying application processes are crucial steps. These measures can enable more farms to benefit from support, thereby enhancing competitiveness in the sector. Ultimately, such initiatives can promote sustainability in the production of alfalfa, sainfoin, and vetch, while supporting profitability for farms.

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Conflict of Interest

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

Author's Contributions

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

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