

Contributions of Agricultural Subsidies to Increase Producer Income in Cotton and Milk Productions: A Case Study of Hatay Province-Turkey

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Agricultural production is subsidized at different levels depending on the country's development status. The budget that was allocated for agricultural subsidies in Turkey in 2020 was around 22 billion TL (Turkish Lira) which was equal to 3.14 billion USD. In this study, the contribution of agricultural subsidies to product income and gross profit value was examined specifically on cotton as crop production and dairy cattle as animal production. According to the research results, agricultural subsidies increased production value by 30.70% in cotton and 4% in milk income. Those increased rates also significantly increased the gross profit values of the products. The results also indicate that enterprises sustain their existence with the income from subsidies, and that the income from production barely covers operating costs. It is necessary to allocate a sufficient budget for agricultural subsidies in order to secure Turkey's agricultural sustainability, improve producers' income, and provide affordable food supplies for consumers by decreasing the production costs.

Keywords: cotton, milk, subsidy, product cost, income, producer income, Turkey

Abbreviations: GP—gross profit, FC—fixed costs, L—liter, NP—net profit, PFVI—productive fixture value increase, PV—production value, TL—Turkish Lira, VC—variable costs

INTRODUCTION

Despite the global trend of liberalization, policies that support agricultural production are still continuing effectively. The most common types of supportive policies could be listed as subsidies, inland tariffs, quotas, and other protective policies. Contradictorily, the countries which are the biggest defenders of liberalization are also the ones setting barriers against the liberal trade of agricultural products. Despite some international organizations such as the International Monetary Fund (IMF), World Bank (WB), and World Trade Organization (WTO) often urging developed countries towards liberalization, agricultural production is still being widely supported by most developed economies such as the United States (US) and European Union (EU). This situation is seen as an obstacle to the growth rate of developing countries (Civan 2010).

The total agricultural subsidy value for the world is over 700 billion USD per year. In the EU, this value is around 56 billion € (~64 billion USD) per year; with 77% of it allocated to direct payments, 20% to rural development expenditures, and 3% to market measures. Also, many developing countries are supporting agricultural production depending on their level of development (OECD 2019).

Agricultural production is one of the main sectors which is supported and protected by almost every government due to some features that distinguish it from other sectors such as seasonal production, seasonal demand for labor force, the dependence on natural conditions, and the delay in adaptation to changes in market conditions among others.

Agricultural production is supported in Turkey for similar reasons as the rest of the world. According to the Agricultural Law of Turkey, the purposes of agricultural

subsidies could be summarized as managing the agricultural production according to domestic and foreign demands, protecting natural and biological resources, increasing efficiency, ensuring food safety, improving producer organizations, strengthening agricultural markets, and improving the wealth level of rural areas. Agricultural subsidies of Turkey and subsidy values by year are given in Table 1.

The tendency of agricultural subsidy values is to increase yearly in Turkey. The total agricultural subsidy value was around 22 billion TL in 2020. The majority of that value was distributed between livestock subsidies (30%), deficiency payments (27%), and area based subsidies which include diesel fuel, fertilizer, and soil analysis subsidies collectively (25%).

Besides production value, gross profit value is an important indicator of agricultural production management. Gross profit value is used commonly in comparison between businesses as a success indicator. It is obtained by subtracting variable costs from the production value, yet the products with a high gross profit value take priority in the product decision-making process (İnan 2016). Therefore, in this study, the gross profit values of the products were examined aside from the production values.

Within this study, dairy as animal production and cotton as crop production were examined in terms of the contribution of agricultural subsidies to producers' income. The reason for presenting these two specific topics was that both of these activities take an important place in Turkey's and Hatay province's agricultural production; moreover, there is a need to represent the importance of subsidies for both crop and animal production. In terms of cotton production, Turkey is the 7th largest producer in the world with a proportional share of 3% (MAF 2021a). According to the Turkish Ministry of Agriculture and Forestry (MAF), the province of Hatay is the 3rd major production area in Turkey for cotton production. Around 10% of the total cotton production in Turkey is provided by the Hatay province (MAF 2021b).

Turkey's total cotton (unseed) production amount was 1,773,646 tons in 2020, and Hatay province's contribution to this amount was 174,843 tons (TSI 2021). Turkey is also an important milk producer in the world. In 2019, around 716 million tons of raw cow milk was produced in the world, and Turkey's proportional share in that was around 2.9% (FAO 2021). According to the Turkish Statistical Institute (TSI) data of 2019, 20.8 million tons of raw cow milk was produced in Turkey, and Hatay province's contribution to this amount was 154,936 tons (TSI 2021).

There are previous studies that focused on the effects of agricultural subsidies on production, producers' welfare, and producer income. Some of those studies are listed below.

In a study conducted in Czech Republic (Czechia) by Strelec et al. (2009), the effects of operational subsidies on farm income and costs were examined comparatively in countries with similar types of farming. Those countries were the Czech Republic, Germany, France, Poland and Great Britain. The products examined were field crops, milk production, other grazing livestock, granivores, and mixed production. According to the research results, operational subsidies covered up to 38.5% of the costs (milk production), and increased farm income significantly depending on the subsidy amount per hectare.

El Benni et al. (2012) examined the effects of agricultural supports on income risks in Switzerland. According to the research results, direct payments, which are a kind of subsidy, help to decrease the instability of farm revenues and household income. In other words, they work as an insurance for farmers and reduce risks in both household income and revenue.

Muncan and Božić (2013) researched the stimulative effect of direct support in field crop production. Direct support was considered to raise both the output and quality of agricultural products, as well as farmers' incomes.

Table 1. Turkey's agricultural subsidy values by years (x1000 TL).

Subsidies	2007	2012	2017	2018	2019	2020
Area based subsidies	2,461,938	2,166,841	2,696,054	3,561,106	4,439,000	5,546,000
Deficiency payments	1,782,203	2,378,701	3,927,947	3,623,511	4,590,000	5,842,000
Livestock subsidies	722,676	2,241,556	3,847,098	3,745,241	4,639,000	6,602,000
Compensatory payments	174,841	292,819	697,603	1,055,756	1,168,000	1,402,000
Rural development	79,987	291,891	877,118	1,478,186	1,063,000	1,436,000
Agricultural insurance	320,350	263,276	853,518	1,060,565	1,020,000	1,140,000
Total	5,544,002	7,637,096	12,901,355	14,526,383	16,974,000	21,968,000

Source: MAF 2021b

*1 USD = 1.30 TL (2007); 1.80 TL (2012); 3.65 TL (2017); 4.82 TL (2018); 5.68 TL (2019); 7.02 TL (2020)

Semerçi (2016) found that the agricultural subsidy amount per enterprise in Turkey was 4.3 times less than the EU average. Also, it was mentioned that agricultural subsidies help to reduce production costs and increase producer revenue.

Within a study published by OECD (2019), agricultural subsidies of many countries which have influences on the global economy were examined in detail.

Turkey has been facing high inflation and high foreign exchange rates in recent years. Some of the imported input prices that depend on USD such as diesel fuel, fertilizer, animal feed, animal medicines, etc. have increased exponentially due to the increase in exchange rates. This situation is making conditions harder for the farmers to continue their financial existence. Furthermore, farmers depend on subsidies because agricultural enterprises in Turkey are mostly small scaled which causes difficulties in finding capital for production. The purpose of this study is to present the essential role of subsidies in farmers' income in order to sustain their agricultural activities. Policy makers could use the outcomes of this study as guidelines in the decision-making of subsidy unit prices and medium-long term policies.

MATERIALS AND METHODS

Materials

The Eastern Mediterranean region of Turkey (which is located in the third sub-region of the Mediterranean region determined as TR63 in the Statistical Region Units Classification of Turkey) was selected as the research area. The Hatay province, which is the largest settlement in the region, was chosen for sampling. The main materials of the study consist of the data of dairy cattle breeding collected from 141 enterprises in 2013 and the data of cotton production collected from 136 enterprises in 2016. The data of both studies were collected through face-to-face questionnaires. Also within the study are secondary data taken from some organizations such as the Turkish Ministry of Agriculture and Forestry (MAF), the Turkish Statistical Institute (TSI), the Food and Agriculture Organization (FAO), Turkish National Dairy Council (TNDC), and previous studies related to the topic.

Methods

Sampling Methods

The cotton research was carried out in 14 villages from four districts in the Hatay province. The total number of cotton enterprises in the research area was determined as

782. The Neyman Method was used in order to determine the sample size (Yamane 1967) of 136 enterprises with a 5% margin of error and at a 95% confidence interval.

The dairy cattle research was carried out in 24 villages from 12 districts in the Hatay province. The total number of dairy cattle enterprises in the research area was determined as 1.664, and the Neyman Method was used in order to determine the sample size (Yamane 1967) of 141 enterprises with a 3.5% margin of error and at a 95% confidence interval.

The formula of the Neyman Method which was used in order to determine the sample size is given below (Çiçek and Erkan 1996; Yamane 2010):

$$n = \frac{(\sum(Nh \times Sh)^2)}{N^2 \times D^2 + \sum(Nh \times Sh)^2}$$

n = sample size

Nh = Number of enterprises at hth layer

Sh = Standard deviation at hth layer

Sh² = Variation of data at hth layer

t = "T value" at a certain confidence limit

N = Total enterprise number that belongs to the sampling frame

D = The margin of error (d/t)

d = Deviation ratio from average

Cost and Return Analysis

Cotton

The items which were used to calculate cost and returns of cotton production are as follows (Kıral et al. 1999);

Gross Profit (GP): PV -VC

Net Profit (NP): PV- (VC+FC)

Production Value (PV): yield (production amount per unit area: kg/da x product sale price (including subsidies)

Variable Costs (VC): soil cultivation cost + planting costs + fertilisation + harvest + transportation + seed + pesticide + fertiliser + temporary labor costs

Fixed Costs (FC): ground rent + common expenses + capital interest + administrative expenses + permanent labor payments + amortisation

Total Expenses (Variable Expenses): soil cultivation and planting + care works + harvest + seed + fertiliser + pesticide

Common Expenses: total costs x 0,05(*)

Capital Interest: (total costs + common expenses + ground rent) x 0,02

Administrative Expenses: (total costs + common expenses + ground rent) $\times$ 0.03

(*)Common Expenses: Expenses which are not included in the production cost elements, but are among the common cost elements as return for expenses such as; general insurance, taxes, repair costs, mail and communication costs, etc.

Dairy Cattle

The items which were used to calculate cost and returns of dairy cattle production are as follows (Kıral et al. 1999);

Gross Profit (GP): GPV – Variable Costs

Net Profit (NP): PV- (VC+FC)

Gross Production Value (GPV) = (milk production amount * milk sale price + increase in productive inventory stock value(*)) + animal manure income.

(*)Increase in Productive Inventory Stock Value = (end of the year stock value + value of the animals sold + value of the animals slaughtered) - (value of the stock at the beginning of year + value of the animals bought).

Variable Costs in Milk Production = roughage costs + concentrate feed costs + veterinary and medicinal costs + artificial insemination costs + variable labor costs + salt costs + electricity costs + water costs + other costs.

Fixed Costs in Milk Production = labor cost + amortisation + interest rate + administrative expenses

Machinery and Tools Amortisations:

Amortisation = (value of a new machine or tool – salvage value) / economic life time

Animal Amortisation: Amortisation = (breeding value – butchery value) / economic life time of animal

Interest expense calculation for machinery, tools and facilities:

Interest expense = (value of machinery, tool or facility + salvage value) * interest rate

Interest expense calculation for animals:

Interest expense = (breeding value + butchery value) / 2 * interest rate

RESULTS AND DISCUSSION

Cotton Production of Turkey and Hatay Province

Turkey is one of the major cotton producers in the world. During the season of 2019/2020, the total global cotton (fiber) production amount was 26.6 million tons, and

Turkey's proportional share in that amount was around 3%. The major cotton producers in the world are India (26%), China (26%), USA (13%), Brazil (10%), Pakistan (4%), Uzbekistan (3%), and Turkey (3%). These 7 countries provide around 85% of the total global cotton production (MAF 2021a). In terms of Turkey, the textile industry is one of the leading sectors in the country for export and employment. Around 3 million people are employed in the textile industry. Thus, as the major raw material for the textile industry, cotton production has an important place in Turkey's agricultural production (Mert and Çopur 2010).

Despite Turkey being one of the largest cotton producers in the world, the cotton production amount and area size in the country have been diminishing in recent years (Fig. 1). Furthermore, the cotton production amount in Turkey does not meet the demand. Turkey's cotton (fiber) demand for 2019 was around 1.5 million tons; however, the supply amount was around 950,000 tons (supply/demand coverage ratio: 61%). Due to the gap between demand and supply amounts, Turkey is one of the major (5th largest) cotton importers in the world (MAF 2019). In addition, the cotton importation amount has been increasing in recent years. While the cotton (fiber) importation amount was 766,947 tons in 2018, this amount reached around 1.1 million tons in 2020 (MAF 2021a).

The Hatay province is one of the major agricultural production areas in Turkey in terms of cotton production. Around 10% of Turkey's total cotton production is produced in the province. In 2020, 1,773,646 tons of cotton (unseed) was produced in Turkey, and 178,843 tons of it was produced in the province of Hatay (TSI 2021).

The Contributions of Subsidies to Cotton Producers' Income in the Research Area

The Commodity Exchange Market prices of winter 2016 were taken into consideration in order to calculate the buying prices of cotton. Besides the cotton buying prices, agricultural subsidies which were provided by the Turkish Ministry of Agriculture and Forestry were used in the cotton income calculations. The research findings show the importance of subsidies and deficiency payments in cotton production.

According to the research results (Table 2), the gross production value of cotton was found as 304.95 USD/da (920,96 TL/da), and the total production cost (fixed + variable costs) was found as 355.14 USD/da (1.072, 53 TL/da), which means a negative return or negative net profit (-50.19 USD/da) without subsidies. There are two kinds



Fig. 1. Cotton (unseeded) production of Turkey by years. (Source: MAF 2021a)

of subsidies for cotton production: deficiency payments, which is a payment per unit production amount (0.75 TL/kg = ~0.25 USD/kg; and an area size-based subsidy which is a payment depending on the size of the producer's cotton production area (11 TL/da = 3.64 USD/da). The area size-based subsidy aims to support diesel fuel and fertiliser costs, specifically. When subsidies are included, gross profit increases four times to 180.05 USD/da (543.76 TL/da) from 44.96 USD/da (135.79 TL/da), and net profit increases to 84.90 USD/da (256.40 TL/da) from -50.19 USD/da (-151.57 TL/da). These results indicate that subsidies help to cover production costs and significantly increase producers' income.

In a different study, the cost of unseeded cotton was calculated as 0.78 USD/kg for 2012 and 0.61 USD/kg for

2013 which is close to the production cost of this study (0.67 USD/kg). The subsidy unit price for cotton in 2012 was 0.30 USD/kg which covered 38.11% of the costs, and the subsidy unit price of cotton in 2013 was 0.27 USD/kg which covered 44.66% of the costs (MAF 2015).

Yılmaz and Gül (2015) carried out a study in Antalya in which cotton production costs and profitability were calculated for 2011. According to the research results, the gross production value average in cotton was calculated as 817.4 TL/da (920.96 TL/da for 2013), the average yield was 391.3 kg/da (529.29 kg/da), and the production cost was 2.05 TL/kg (2.03 TL/kg).

Cattle Breeding in Turkey

Turkey is an important country in terms of cattle breeding. Turkey has 1.13% of the cattle existence in the world with 17 million heads. According to FAO data, in the last decade (between 2010 and 2019), the number of cattle in the world increased by 6.73% and increased by 58.92% in Turkey (Table 3). This rapid increase mostly occurred due to the increase in live stock importation in recent years.

Table 2. Effects of agricultural subsidies on cotton producers' income.

Indicators	Values
General Information	
Yield (kg/da)	529.29
Sale Price (USD/kg)	0.58
Gross Production Value (USD/da)	304.95
Variable Costs (USD/da)	259.99
Fixed Costs (USD/da)	95.15
Production Costs (USD/da)	355.14
Unit Cost (USD/kg)	0.67
Profit Values (subsidies excluded)	
Gross Profit (USD/da)	44.96
Net Profit (USD/da)	-50.19
Relative Profit	0.28
Subsidy Items	
Area Based Subsidies (diesel fuel and fertiliser-USD/da)	3.64
Deficiency Payment (USD/kg; ~0,25 USD*yield)	131.45
Profit Values (subsidies included)	
Gross Profit (USD/da)	180.05
Net Profit (USD/da)	84.90
Relative Profit	0.41
Total Cotton Income (GPV+subsidies)	440.04

*1 USD = 3.02 TL (2016)

Table 3. Cattle existence in Turkey and the world (2010-2019).

Years	Turkey (Head)	World (Head)	Ratio (%)
2010	10,723,958	1,415,683,233	0.76
2011	11,369,800	1,420,596,982	0.80
2012	12,386,337	1,430,213,852	0.87
2013	13,914,912	1,434,769,082	0.97
2014	14,415,257	1,442,097,792	1.00
2015	14,223,109	1,468,146,269	0.97
2016	13,994,071	1,488,964,581	0.94
2017	14,080,155	1,491,687,239	0.94
2018	15,943,586	1,494,158,137	1.07
2019	17,042,506	1,511,021,075	1.13

Source: FAO 2021

Table 4. Cow milk production in Turkey and the world (2010-2019).

Years	Turkey (Ton)	World (Ton)	Ratio (%)
2010	12,418,544	600,610,606	2.07
2011	13,802,428	614,852,276	2.24
2012	15,977,838	628,952,994	2.54
2013	16,655,009	634,097,932	2.63
2014	16,998,850	654,760,410	2.60
2015	16,933,520	661,089,390	2.56
2016	16,786,263	666,161,505	2.52
2017	18,762,319	695,240,598	2.70
2018	20,036,877	713,734,201	2.81
2019	20,782,374	715,922,506	2.90

Source: FAO 2021

Table 5. Gross profit and net profit values of dairy cattle enterprises.

Indicators	Total	Average
Milk Production (L)	3,860,010	27,376
Gross Production Value (USD)	1,931,091	13,695
Variable Costs (USD)	1,223,908	8,680
Gross Profit (USD)	707,182	5,015
Fixed Costs (USD)	680,848	4,828
Net Profit (USD)	26,333	186

*1 USD = 1.90 TL (2013)

Milk Production of Turkey and Hatay Province

Turkey is one of the major milk producers in the world. In 2019, around 716 million tons of cow milk was produced in the world, and 20.8 million tons of it was produced by Turkey (2.90%). According to FAO data between 2010 and 2019, while global milk production increased by 19 to 20% in a decade, Turkey's milk production amount increased by 67.35% (Table 4). The major milk producers in the world are EU-28 (23.47%), USA (13.88%), India (13.57%), Brazil (4.98%), China (4.48%), Russia (4.38%), New Zealand (3.07%), and Turkey (2.90%). These eight countries/unions provide around 71% of the total global milk production.

In terms of the foreign trade numbers of dairy products, Turkey's export value was 371.5 million USD, and import value was 85.0 million USD in 2020. While cheese (50%), whey products (14%), milk powder (12%), and ice cream (12%) were the main products which were exported, cheese (41%) and butter (41%) were the main products which were imported (TNDC 2020).

Dairy cattle breeding has an important place in Hatay province's animal production. The province provides around 1% of Turkey's total milk production. In 2019, 154,936 tons of raw milk was produced in the province (TSI 2021).

Table 6. Cost and profit values of milk production.

Indicators	Values
Total Milk Production (L)	3,860,010
Milk Production Cost (USD)	1,904,757
Milk Cost per Liter (USD/L)	0.49
Sale Price (USD/L)	0.53
<i>Profit Values (subsidies excluded)</i>	
Absolute Profit (USD)	0.03
Relative Profit (USD)	0.56
<i>Profit Values (subsidies included)</i>	
Absolute Profit (USD)	0.05
Relative Profit (USD)	0.58

*1 USD = 1.90 TL (2013)

The Contributions of Subsidies to Milk Producers' Income in the Research Area

Within the research, the average milk production per enterprise was around 27 tons, the GPV per enterprise was 13,695 USD (26,022 TL), the gross profit average per enterprise was 5,015 USD (9,529 TL), and the net profit average per enterprise was 186 USD (355 TL) (Table 5). The proportional share of gross profit in the GPV of milk production was found as 36.62% in this study. Bayramoğlu and Direk (2006) found this ratio to be 36%, and Dağıstan (1998) found it as 55.51%.

In the research, the Productive Fixture Value Increase (PFVI) of the enterprises was found considerably significant. In this respect, the unit cost of milk production was calculated considering the proportional share of milk in the gross production value (Aras 1988).

According to the research results, without subsidies, milk cost was calculated as 0.49 USD/L (0.94 TL/L), and the milk sale price average was 0.53 USD/L (1 TL/L) in 2013. In the research area, 3.86 tons of milk were produced in total from 141 enterprises. The absolute profit was 0.03 USD/L (0.06 TL/L) and the relative profit was calculated as 0.56 USD/L (1.07 TL/L). In consideration of subsidies from milk production, absolute profit reached 0.05 USD/L (0.10 TL/L) and relative profit reached 0.58 USD/L (1.11 TL/L) (Table 6). In another study that was carried out in the same province, absolute profit was found as 0.08 TL/L and relative profit was found as 1.12 TL/L (Dağıstan 1998).

In conclusion, considering the monetary production values and gross profit values of each production activity examined above in detail, it is proven that subsidies considerably increase production values and accordingly help to cover production costs. Gross profit value takes an important place in agricultural production planning. In light of the research results above, subsidies increase

gross profit values considerably. This situation also indicates that producers likely intend to carry out agricultural activities with high subsidy values.

CONCLUSION

This study focused on the contribution of subsidies to agricultural enterprises specific to dairy cattle breeding and cotton production in the Hatay province, which is an important agricultural production area of Turkey.

It has been concluded that agricultural subsidies take an important place in the agricultural production value of each activity. Deficiency payments, which have a 25% proportional share among the agricultural subsidies countrywide, provide the highest contribution to enterprises' incomes and considerably help agricultural enterprises maintain their activities for the next production period. According to the research results, income that is gained from agricultural subsidies considerably increases enterprise profit. In terms of cotton production, which is in high demand by the textile industry in Turkey, while gross profit was 44.96 USD/da without subsidies, it increased four times and reached 180.05 USD/da when subsidies were included. Similarly, cotton net profit was calculated as -50.19 USD/da without subsidies which means a negative return, and increased to 84.90 USD/da with subsidies. In terms of milk production, which is a raw material of important staple foods such as cheese, butter, yogurt, etc., the absolute profit was calculated as 0.03 USD/L without subsidies and 0.05 USD/L with subsidies. These results indicate that subsidies help cover production costs and significantly increase producers' income.

In Turkey, around 90% of the agricultural enterprises are small-scaled, and these enterprises are far behind meeting their economic, social, and cultural needs. Moreover, being small-scaled makes it harder to find the capital necessary for the next production period. Consequently, producers often decrease the production or abandon it entirely. Specific to cotton production, both production areas and amounts have shrunk around 31% between 2018 and 2020 in Turkey, and the gap between the supply and demand ratio (61%) has been extended. This situation makes it necessary to question current agricultural policies.

In order to support agricultural production in Turkey for short and medium terms, temporary and expensive policies should be lifted. Instead, agricultural subsidy policies that are focused on the long-term, and are competitive in terms of cost and yield, should be put into practice. In this regard, it is inevitable to improve political instruments such as subsidies in order to keep

producers in the agricultural production system and to increase production amounts, especially in products which are highly in-demand.

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