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The Impact of Livestock Supports on Production and Income of the Beef Cattle Farms: A Case of Samsun Province, Turkey

Nevra ALHAS EROGLU[a], Mehmet BOZOGLU[b], Abdulbaki BILGIC[c]

[a]*Regional Directorate of Turkish Statistical Institute, Samsun, TURKEY*

[b]*Department of Agricultural Economics, College of Agriculture, Ondokuz Mayis University, Samsun, TURKEY*

[c]*Department of Agricultural Economics, College of Agriculture, Ataturk University, Erzurum, TURKEY*

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Corresponding Author: Nevra ALHAS EROGLU, E-mail: nevraalhas@tuik.gov.tr, Tel: +90 (505) 778 92 79
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AUTHORS ORCID ID
(Nevra ALHAS EROGLU: 0000-0002-1188-8274), (Mehmet BOZOGLU: 0000-0001-8333-1865), (Abdulbaki BILGIC: 0000-0002-1003-7072)

ABSTRACT
Although the beef cattle sector has been considerably supported during the last two decades, Turkey could not get its self-sufficiency yet. The objective of this case study was to examine the impacts of livestock supports on production and income of beef cattle farms. The survey data was collected from randomly selected 171 cattle farms in Samsun province of Turkey. The Treatment Effect Model was used to measure the impacts of livestock supports on beef meat production and gross profit of the farms. The results indicate that the farmers, who have larger land and herd, higher education level, keeping farm records, are mechanized and specialized in beef cattle breeding were more likely to benefit from livestock supports than their counterparts. The Treatment Effect Model highlights that livestock support has a statistically significant effect on the amount of beef meat produced whereas it has no statistically significant effect on the gross profits of the farms. The research recommended that the livestock supports are necessary for the sustainability of beef cattle farms. The farms should be encouraged to get records via Farm Accountancy Data Network and the record keeping farms should be supported by higher amounts.

Keywords: Beef cattle breeding; Livestock supports; Impact assessment; Treatment effect; Turkey

1. Introduction

The livestock sector is of an important place in the agricultural sector of the world. Thus, 38.6% of the gross production value of agricultural production in the world was provided by the livestock sector in 2016. In the same year, in Turkey, the livestock sector provided 34.5% of total agricultural production value (FAO 2018). In the last decade, the livestock sector has been substantially supported both in Turkey and in the world due to its essential role by meeting food demand and supplying input to the agro-food industry. Therefore, the evaluation of the impacts of supports on production and income of the beef cattle farms is essential to develop more efficient support policies.

The development of the livestock sector is important to meet the food need of countries. Therefore, it is essential to maintain the sustainability of the sector, to improve it by means of supports and to assess

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the impacts of the supports. In the period of 2000-2016, in Turkey, the budget of total agricultural supports had nominally changed from $4.5 to $3.97 billion whereas the budget of livestock supports had increased from $0.02 to $1.02 billion. The share of the livestock supports in the total agricultural supports had increased from 0.5% to 25.7% in the same period (Anonymous 2015).

The main output of the sector is definitely beef meat. In the last two decades, the number of slaughtered beef had increased by 214% and the production of beef meat had increased by 351% in Turkey (TurkStat 2018a). While the producer prices had increased nominally, there had not been a significant increase in reel prices except for the last few years. Because of inadequacies in domestic beef meat production, continuously rises in consumer prices, the country had to import breeding material, live animal or beef meat. Therefore, there had been an important rise in import especially after the year 2010.

The costs of the beef cattle breeding activity is another disputable field. The major cost of the beef meat production is feed. This cost constituted about 40.95% (Alhas Eroğlu 2017), 33.1% (Çelik & Sarıözkan 2017) and 48.3% (Özkan & Erkuş 2003) of the total cost of production. The increase in this main cost element pushes up beef meat prices. The parity between beef meat and forage increased by 25.7%, whereas the parity between beef meat and milk increased by 28.1% during the period of 1994-2017. This data could be interpreted in favor of the cattle beef producers but the negative developments for dairy sector have affected dairy cattle sector and resulted in difficulties in obtaining breeding material and increasing in beef meat production costs and prices. The government has supported forage and roughage crops to increase production. These supports had increased both in sown areas and production of forage and roughage crops. Nevertheless, rising especially in price of concentrate feeds have negatively affected the production cost of beef meet.

The livestock supports have been provided with farms in the last twenty years in order to get sustainability in the sector. Of all livestock supports, both breeding male cattle and forage crop support are of great importance and directly affect the beef cattle farms. Breeding male cattle supports have been granted for the farms that slaughtered one year old and at least 200 kg carcass weighted male cattle and record it to the official system. It was granted since 2011 but the unit price of the support has been decreasing over the time. The forage crop support has been granted for farms in order to decrease the feed cost. The farmers who have grown clover, corn, sainfoin, etc. at least 1 ha officially recorded land could provide with support. Contrary to breeding male support, the unit price of forage crop support has risen over the years. Although the sector has been seriously supported for 15 years, there have been some considerable problems such as supplying adequate breeding materials, rising feed cost and beef meat prices and increasing import. Therefore, the impacts of the cattle support on production and prices make these policies controversial. Though the sector received 30% of total agricultural supports, the cattle breeding sector has some important obstacles such as depending on external inputs like feed and breeding material, the prevalence of small-scale farm sizes. Therefore, the efficiency of the support policies has been disputable (Anonymous 2018). The assessment of the impacts of direct supports is highly essential for the beef cattle sector.

Literature review shows that the number of the studies concerning the impacts of agricultural support policies had considerably increased in recent year. The majority of this literature addressed the impacts of decoupled payments. Although the impacts of agricultural supports had been explored in a broad context including farmer, farm structure, input use, production, income and environment, the emphasis of the literate has been mainly on production and income of farms. The literature about the impacts of agricultural supports on production and income has mainly concentrated on the three different scenarios such as supports have (i) no effect, (ii) positive effect and (iii) negative effect. A number of studies identified decreasing impacts of agricultural supports on production and income (Chau & de Gorter 2000; Moss et al 2002; Breen et al 2005; Goodwin & Mishra 2005; Goodwin & Mishra 2006; Shrestha et al 2007; Gorton et al 2008; Acs et al 2010; Morgan-Davies et al 2012; Kazukauskas et al 2014). Some of them highlighted that the changes of supports decreased production due to the reduction of cattle number (Moss et al 2002; Shrestha et al 2007; Acs et al 2010; Morgan-Davies et al 2012), while Breen et al (2005) stated that some of the producers terminated production activity. Chau & de Gorter (2000) and Gorton et al (2008) stressed that thank to the supports, the farms continued to produce regardless of profit.

Numerous research results indicated that the agricultural supports had an increasing impact on production and income of the farms (Hennessy 1998; Sckokai & Moro 2006; Revell & Oglethorpe 2003; O'Donoghue & Whitaker 2010; Majewski et al 2011; Viaggi 2011; El Benni et al 2012; Bartolini & Viaggi 2013; Severini & Tantari 2013). In addition to income-boosting effect, the agricultural supports decrease volatility and inequality in income (El Benni et al 2012; Severini & Tantari 2013). However, Hennessy (1998) and Sckokai & Moro (2006) stated that agricultural supports have decreased the degree of risk by reducing income variability faced by farmers. Some researcher stressed that without agricultural supports the further number of producers would be likely to end up their production (Majewski et al 2011; Viaggi 2011; Bartolini & Viaggi 2013).

Some literature highlighted that agricultural supports had neither an increasing nor decreasing impact on production and income (Douarin et al 2007; Genius et al 2008; Lobley & Butler 2010; Weber & Key 2012; Giannoccaro & Berbel 2013; Latruffe et al 2013). Thus, 66% of the producers in the study of Latruffe et al (2013) and 62% of the producers in the study of Lobley & Butler (2010) did not change the amount of production in case of no support scenario.

Contrary to the international literature, in Turkey, there have been limited studies concerning the impact of supports on the livestock sector. Of all, the impacts of supports were examined at the levels of provincial, regional or countrywide using secondary data or primary survey data (Topçu 2008; Yılmaz et al 2008; Topçu et al 2008; Demir 2009; Demir & Yavuz 2010; Keskin et al 2010; Aksoy et al 2012; Özüdoğru & Tatlıdil 2012). Aksoy et al (2012) indicated that the livestock supports during the period of 2002-2009 had not an effect on milk production and suggested that it is essential to design support policies at the regional level. This suggestion was also emphasized by other scholars in order to increase efficiency (Demir 2009; Keskin et al 2010; Demir & Yavuz 2010). While Yılmaz et al (2008) stated that the supports increase the inequality of income distribution; Özüdoğru & Tatlıdil (2012) indicated that unionized producers could reduce their cost by benefiting from supports. These empirical studies mostly examined the effects of supports on production and income of the dairy farms. Despite the increase in beef prices in Turkey and government supports, the beef meat production could not be increased to the expected levels of the country. Therefore, it is essential to evaluate the impacts of cattle support policies at the farm level. The objective of this study was to explore the impacts of cattle breeding supports on the production and gross profit of beef cattle farms in Samsun province of Turkey by using the treatment effect model (TEM). The average treatment effect (ATE) and the average treatment effect on the treated farms (ATET) have been put forward in terms of direction, size, and statistics in the current study.

This paper is structured as follows: after the introduction, main developments of the beef cattle sector in Turkey and the essence of the study was described in the next section. The data and methodology were specified in the third section. In the fourth section, descriptive statistics and the model results were introduced. In the last section, conclusions with policy recommendations were presented.

2. Material and Methods

2.1. Research area

The research area, Samsun province, has located in the Black Sea Region. It has 9352 km² acreages and it consists of approximately 1% of total area of Turkey. In 2017, 1.61% of the total agricultural land in Turkey has located in Samsun province (TurkStat 2018b). In the same year, the value shares of crop production, livestock and animal products of Samsun province in the country value were 2.40%, 1.80%, and 0.72%, respectively. The share of the total production value of Samsun province in Turkey was 1.82% (TurkStat 2018c).

The support of breeding male cattle has been given to the farms since 2011 and Samsun province had received about 1.3% of the total support (Anonymous 2016). Whereas, the share of Samsun province in total cattle and beef cattle number of Turkey were 2.42% and 2.69%, respectively (TurkStat 2018c). This figure indicates that Samsun could not sufficiently benefit from the supports.

2.2. Material

The research population consisted of 799 beef cattle farms which were members of two Beef and Lamb Producers Associations in Samsun province. In the study, 137 farms were selected randomly using strata sampling method with the farms that have less than 130 cattle and 34 cattle farms having than 130 cattle were determined using census method[1]. The total number of surveyed beef cattle farms was 171. The sampling method is determined with 99% a confidence interval and 1% of error. The sampling procedure was presented in Equation 1 and Table 1 (Yamane 2001).

$$n = \frac{N\sum(N_h S_h^2)}{N^2 D^2 + \sum(N_h S_h^2)} \quad (1)$$

Where; *n*, sample size for the strata of I and II (137); *N*, population size (761); N_h, number of units in the strata of h; S_h, the standard deviation in the strata of h; $D^2 = d^2/Z^2$; *d*, level of precision (acceptable sampling error); *z*, the value from z score table.

Table 1- The population and sample of the research

Strata	*Strata range (per cattle)*	*N*	*n*	*Method*
I	1-59	628	110	Sample
II	60-129	133	27	Sample
III	130+	34	34	Census
Total	---	799	171	-

2.3. Method

In this research, Treatment Effect Model was used to analyze the impacts of supports on production and gross profit of beef cattle farms. TEM is used to estimate the impacts of a treatment and evaluate the probable outcome of it. In the model, there is a treatment that is farms which receive a support from the government. This model is used to determine the difference between the state where the farmer does not receive support and the state he/she receives. If the difference is positive and statistically significant, there is an incentive for the sustainability of support; otherwise, it means that other plans should be considered. However, the information of the farmer in the absence of support is sometimes not fully achieved. For this purpose, it integrates the farmers who do not receive support but they are totally similar in socio-demographic and economic characteristics with farmers who receive the support in order to put the difference between the two states. The aim of the empirical model is to determine whether this treatment has an impact on response variable and if has, the direction of this impact (Hsieh 2009).

Let outcome y_j, treatment t_j, error term ε_j and the vector of all exogeneous covariates $z_j = (w_j x_j)$, the equation can be denoted;

$$E(y_j | x_j, t_j, \varepsilon_j) = \exp(x_j\beta + \delta t_j + \varepsilon_j) \quad (2)$$

Where; y_{0j} is potential outcome without treatment ($t_j = 0$), y_{1j} is potential outcome with treatment ($t_j = 1$), β_0 and β_1 are coefficients for the control and treatment regimens and let the potential outcome model be;

$$E(y_{0j} | x_j, \varepsilon_j) = \exp(x_j\beta_0 + \varepsilon_{0j})$$

$$E(y_{1j} | x_j, \varepsilon_j) = \exp(x_j\beta_1 + \varepsilon_{1j})$$

[1] Although there were 38 cattle farms in the third strata, 4 of them were unanswered because of repetition and merging of farms.

$$t_j = \begin{Bmatrix} 1, w_j\gamma + u_j > 0 \\ 0, otherwise \end{Bmatrix} \quad (3)$$

In the binary model, y_{0j} and y_{1j} have never been observed together and it can be denoted;

$$y_j = t_j y_{1j} + (1 - t_j)\, y_{0j} \quad (4)$$

Average treatment effect and average treatment effect on the treated are the major parameters of the TEM model. ATE refers to the average treatment effect and it is the average difference of treatment and control potential outcomes and estimated by;

$$ATE = E\left[\{\exp(x_j\beta_1) - \exp(x_j\beta_0)\}\exp\left(\frac{\sigma^2}{2}\right)\right]$$

$$= E\{E(y_{1j} - y_{0j}|z_j)\} = E(y_{1j} - y_{0j}) \quad (5)$$

On the other hand, ATET refers to the average treatment effect on the treated and it is the average effect of treatment on outcome compared with no treatment for a random draw from the subpopulation selecting (or assigned) no treatment (Rubin 1974; Heckman & Robb 1985; Terza 1998; Angrist 2001).

$$ATET = \left[\{\exp(x_j\beta_1) - \exp(x_j\beta_0)\}\exp\left(\frac{\sigma^2}{2}\right)\frac{\Phi(\rho\sigma + w_j\gamma)}{\Phi w_j\gamma}|t_j = 1\right]$$

$$= E\{E(y_{1j} - y_{0j}|z_j, t_j = 1)|t_j = 1\} = E(y_{1j} - y_{0j}|t_j = 1) \quad (6)$$

In this study, livestock supports are taken account as treatment and the impacts of this treatment on beef meat production and gross profit were estimated. The model is based on the three assumptions such as the livestock supports have (i) no effect, (ii) increase effect or (iii) decrease effect on the amount of beef meat produced and gross profit of the farms.

3. Results and Discussion

3.1. Descriptive analysis

The descriptive statistics are presented in Table 2. The results of the study indicate that 50.9% of beef cattle farms were specialized in the beef cattle breeding and 57.3% of them were keeping physical or financial records. About 25% of cattle farms employed permanent labor for beef cattle breeding, whereas 59.1% of them employed temporary labor. About 64% of total farms were small-scale owning less than 60 cattle. The average gross profit of farms was $ 60435.23[2]. About 95% of beef cattle farms benefited from $ 4969.73 of total agricultural support, whereas 80.1% of farms benefited from $ 2425.19 of fattening male cattle and forage crop supports. The share of fattening male cattle and forage crop supports into the total agricultural supports was 48.8%. The farms spent 90% of the support revenues for agricultural activities.

The cattle farms were averagely 8.25 km far from the district center and 40.4% of them have located in Bafra and Çarşamba districts. The average agricultural land was 10.7 ha and 32.2% of farms had 10 ha or more agricultural land. However, average agricultural land was found 15.8 ha for the unionized and 7.1 ha non-unionized farmers in the study of Özüdoğru & Tatlıdil (2012). The average agricultural land of Goodwin & Mishra (2005; 2006), Latruffe et al (2013) and Giannoccaro & Berbel (2013) is above the result of this research whereas it is below in the research of Majewski et al (2011). About 82% of the farms grew forage crops.

[2] In the field research period, the average exchange rate of TL/$ is 2.33

The average membership duration in Turkish Beef and Lamb Producers Associations was 4.29 years and 3.5% of farm managers participated in the governance of the association. Besides, 61.4% of beef cattle farms were a member of other farmer organizations. Majewski et al (2011) stated the proportion of unionization as 54% whereas it was estimated 55% and 79.7% in Giannoccaro & Berbel (2013) and Gorton et al (2008), respectively. About 76% of the farms had non-agricultural income. About 91% of the farms own one or more agricultural machines and 53.8% of the farms had tractor and trailer.

The farms had averagely 6.84 household members. About 73% of householders' main profession was a farmer, whereas 14% of them perform the beef cattle breeding activity with other profession. Therefore, 87.7% of the farms directly conduct cattle breeding activity. While 68.18% of households were within the economic active age group (15-64 age), main profession of 83.6% of them is farmer. The average age of managers was 49.16 years and average experience in beef cattle farming was 20.19 years. About 64.91% of managers graduated from primary school, whereas 17.5% of them graduated from high school or above. The share of high school graduates was found as 65% in the study of Majewski et al (2011) and 13.5 years in the study of Gorton et al (2008).

Table 2- Descriptive statistics of beef cattle farms

Variables	*Mean*	*Std. dev.*
Cattle farming		
Specialized in beef cattle breeding (Yes= 1, No= 0)	0.509	0.501
Keeping record (Yes= 1, No= 0)	0.573	0.496
Temporary labor employment (Yes= 1, No= 0)	0.591	0.493
Permanent labor employment (Yes= 1, No= 0)	0.251	0.435
Cattle farm size is between 1 and 59 beefs (Yes= 1, No= 0)	0.643	0.480
Gross profit ($)	60435.23	109034.38
Benefit from cattle breeding supports (Yes = 1, No= 0)	0.801	0.400
Farm structure		
Distance of the farm to the district center (km)	8.257	6.855
The farm is situated in Bafra ve Çarşamba districts (Yes= 1, No= 0)	0.404	0.492
Household size (unit)	6.842	3.767
Farm size is over 10 ha (Yes= 1, No= 0)	0.322	0.468
Growing fodder crop (Yes= 1, No= 0)	0.819	0.386
Membership duration into the Beef and Lamb Producers Association (year)	4.292	1.903
Participation in the management of the Management of Beef and Lamb Producers Association (Yes= 1, No= 0)	0.035	0.185
Membership of other farmer organizations (Yes= 1, No= 0)	0.614	0.488
Have non-agricultural income (Yes= 1, No= 0)	0.760	0.428
Tractor and trailer ownership (Yes= 1, No= 0)	0.538	0.500
Other agricultural machines ownership (Yes= 1, No= 0)	0.906	0.292
Manager		
The main profession as farmer (Yes= 1, No= 0)	0.877	0.329
The cattle farming experience (year)	20.199	11.022
High school or higher education (Yes= 1, No= 0)	0.175	0.381
Agricultural supports ($)	4969.73	8238.30
Cattle breeding supports ($)	2425.19	3614.39

About 71% of cattle farms were satisfied with the cattle breeding activity. Nevertheless, the major reason of dissatisfaction was stated as high cost of production and inadequacy of supports. About 49% of the farms intended to increase the number of cattle in the near future. The fundamental problems of the farms were stated as increase in forage prices, an inadequacy of support policies and negative effects of cattle import on production and prices. Aydın et al (2010) found that 31.7% of the farmers have not considered the increase in supports as a solution for a rise in beef meat prices. However, Goodwin & Mishra (2005) highlighted that 54% of the farmers consider the costs as the main element of production decision.

The amount of supports was not seen sufficient by 66.7% of the farmers and 40.4% of the farmers stated that support payments were not paid on time. Almost half of the farmers stated that the announcement of supports was not enough and the application procedure of the supports takes much time due to the red tape (Table 3).

Table 3- The problems facing with utilization of supports

Problem area	*1. Strongly disagree*	*2. Disagree*	*3. Neutral*	*4. Agree*	*5. Strongly agree*	*Total score*	*Rank*
The amount of support is not sufficient	1.2	7.6	1.2	23.3	66.7	764	1
Supports are not paid on time	11.7	40.4	1.1	21.1	25.7	528	2
The request of support takes much time due to red tape	15.8	35.1	1.7	18.7	28.7	529	3
The announcement of supports isn't adequate	25.1	29.2	0.6	32.2	12.9	476	4
The supports could be confiscated due to debt, sponsorship etc.	29.9	33.9	2.3	14.0	19.9	445	5

The main expectations of the farms on cattle breeding were stated respectively as getting stability in cattle and meat prices, reducing forage prices, enhancing and revising supports in respect to quality, hygiene and amount of meat, paying supports on time and enhancing extension opportunities (Table 4).

Table 4- The expectations of the farms on cattle breeding

Type of expectation	*1. Strongly disagree*	*2. Disagree*	*3. Neutral*	*4. Agree*	*5.Strongly agree*	*Total score*	*Rank*
The price of cattle and meat should be stable	0.6	0	1.2	18.7	79.5	815	1
The price of forage should be decreased	0.6	1.2	2.3	16.4	79.5	809	2
The amount of supports should be increased	0	4.7	1.2	12.3	81.9	806	3
The supports should be paid on time	0	0	4.7	41.2	54.1	764	4
The producers should be provided with more extension opportunities about breeding	1.8	2.3	1.8	47.4	46.8	744	5
The supports should be focused on quality, hygiene and amount of production	8.2	2.9	3.5	31.0	54.4	719	6
Membership fee of the unions should be lessened.	1.2	14.0	10.5	28.7	45.6	690	7
The supports should be seasonally organized	2.9	26.3	10.5	21.6	38.6	627	8

3.2. Treatment effect model results

TEM model was analyzed for both production (beef meat) and gross profit. The log-likelihood value and sigma (σ) value was measured -241.445 and 0.776 for beef meat model and -340.112 and 1.495 for gross profit model. Rho (ρ) parameter shows that one standard deviation in the probability of benefit from supports resulted in 0.39 standard deviation in beef meat production and 0.02 standard deviation in gross profit. But these effects were not found statistically significant.

Even though there is no relationship between the probability of cattle breeding supporting system and the amount of meat production and gross profit when taking non-controlled factors into account (e.g., correlation coefficients), the results of the model highlight that cattle breeding supports had positive statistically significant effect on production of beef meat. Therefore, these supports are essential to boost beef meat production and to ensure economic sustainability of beef cattle sector. On the other hand, cattle breeding supports had statistically insignificant effect on gross profit. By the way, this effect indicates that cattle farms could not be financially well-managed. Besides, the statistically insignificant effect can be explained by the high costs of production in the farms that was not get benefit from the livestock supports.

According to the beef meat production and gross profit TEM results, cattle farms which are situated in Çarşamba and Bafra districts and keeping farm records were more likely to benefit from livestock supports than their counterparts. On the other hand, the gross profit model resulted that the farms that have land larger than 10 ha were also more likely to benefit from livestock supports. The effect of location can be explained by some reasons. First of all, beef cattle farms in Bafra and Çarşamba the districts were relatively large-scaled, closer to district center and had easier access to information sources of supports. Besides, one of the Beef and Lamb Producers Association has located in Bafra district. The higher probability of benefiting from subsidy for the farms keeping records can be explained by their advantages such as management, planning, and technology. Lastly, the farms that have 10 ha or larger land grow forage crops and provide the roughage requirement of their farms. Therefore, it enables the farms to decrease their production costs and increase their profitability.

The results of beef meat production and gross profit models were presented in Table 5. The results indicate that supports, specialization, keeping a record, employing permanent labor and having higher mechanization level had statistically significant positive effects on beef meat production. On the other hand, the location of the farm and non-agricultural income had a statistically significant negative effect on beef meat production. Benefiting from higher supports by the farms in Çarşamba and Bafra districts decrease production risk and negatively affect the expansion of the scale of farms. The farms that have non-agricultural income produce less beef meat than the other farms. This shows that that non-agricultural income prevents farms from specialization and expansion of the scale.

The results of the gross profit model indicate that the participation into the management of Beef and Lamb Producers Association, higher mechanization and education level of a manager (high school or over) had statistically significant positive effects on beef meat production, whereas ownership of tractor and trailer had statistically significant negative effects. The farms whose manager participated in the management of Beef and Lamb Producers Association had higher gross profit than their counterparts. Because they had more chance to get technical assistance, cheaper input and market their products with better conditions by the association. Although the gross profit of the farms which had the modern machines for cattle farming was higher than the others, the gross profit of the farms which had tractor and trailer was lower than the other farms. The farms who own tractor and trailer concentrate on crop production and their beef meat production and gross profit was lower than their counterparts. Lastly, the farms whose education level of a householder with high school or higher education had higher gross profit than their counterparts. This parameter shows that education had a positive effect on the profitability of the farm because education is essential on adoption and application of new technologies.

ATE and ATET of beef meat production and gross profit models are presented in Table 6. Cattle breeding supports increase the meat production by 11760 kg and the gross profit by $ 8025.75 on average. Among the farms that are supported (treated), the beef meat production of a farm increase by 12620 kg when it is supported compared with the case that it is not supported and the coefficient of production is statistically significant. On the other hand, though the gross profit also increases by $ 7811.15 in this comparison, the results of the research highlight that the coefficient of gross profit is not statistically significant. Therefore, we can say that cattle breeding supports significantly increase average meat production in the region. At the same time, this increase is more important among the beneficiaries (e.g., the treated farms). However, although the increase in gross profit is not statistically significant, the estimated values can be attributed to increased production costs. The optimal use of inputs used in meat production can make gross profit more advantageous and make the use of supports more sustainable.

Table 5- TEM results for beef meat production and gross profit of cattle farms

Variables	*Probability of being supported*		*Production value (log)*		*Probability of being supported*		*Gross profit*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
Constant	1.6702	0.9825	-1.7181***	-2.8464	1.2876	0.8007	-1.0174	-0.6983
Cattle farming								
Specialized in beef cattle breeding	0.7328	1.5828	0.6573***	3.0660	0.6588	1.4490	0.3557	0.8852
Keeping record	0.8850*	1.7513	0.4359**	2.1190	0.8832*	1.8484	0.3594	0.6986
Temporary labor employment	-0.1737	-0.4387	0.1807	1.0282	-0.0944	-0.2588	0.1928	0.5114
Permanent labor employment	-0.2803	-0.3016	0.5103**	2.3811	-0.0004	-0.0005	0.6437	1.5389
Cattle farm size is between 1 and 59 beefs	-1.4818	-1.3863	-	-	-1.2239	-1.4250	-	-
Farm Structure								
Distance of the farm to the district center (km)	-0.0053	-0.1239	0.0077	0.5301	-0.0074	-0.1718	0.0342	1.2735
The farm is situated in Bafra and Çarşamba districts	1.1204**	2.2191	-0.4423*	-1.8916	1.0572**	2.2412	-0.4358	-1.0114
Household size (unit)	0.0189	0.2570	0.0211	0.8065	0.0174	0.2484	-0.0273	-0.6112
Farm size is over 10 ha	0.7427	1.1769	-0.1640	-0.7802	0.8162*	1.7266	-0.0107	-0.0210
Growing fodder crop	-	-	-0.3469	-1.5379	-	-	-0.4494	-1.0910
Membership duration into the Beef and Lamb Producers Association (year)	-0.1576	-1.4325	0.0155	0.3450	-0.1451	-1.1662	0.1262	1.2560
Participation in the Management of Beef and Lamb Producers Association	-1.0688	-0.7190	0.5110	0.7160	-0.9306	-0.6811	1.5275**	2.5064
Membership of other farmer organizations	-0.6708	-1.1975	-0.0249	-0.1278	-0.7035	-1.3009	-0.6753	-1.6539
Have non-agricultural income	0.2437	0.4600	-0.3456*	-1.6560	0.2112	0.4240	0.0589	0.1398
Tractor and trailer ownership	-0.2379	-0.2751	0.6042*	1.7977	-0.2302	-0.3154	1.4370*	1.9332
Other agricultural machines ownership	0.1434	0.2615	-0.2719	-1.4830	0.0882	0.2074	-0.6655*	-1.7311
Manager								
The main/second profession as farmer	0.0045	0.0071	-0.1769	-0.7496	0.1953	0.3301	0.2530	0.3623
The cattle farming experience (year)	0.0076	0.3603	-0.0008	-0.1040	0.0095	0.4628	-0.0016	-0.1092
Education level is equal or over high school	-0.1937	-0.3101	0.2292	1.0478	-0.2353	-0.3742	0.9100**	2.2800
Benefit from cattle breeding supports	-	-	1.4778***	3.1693	-	-	0.2760	0.1619
σ	0.7761***	12.2346			1.4953***	15.308		
ρ	-0.3969	-1.0522			-0.0277	-0.0322		
Log-likelihood	-241.444				-340.112			

***, significant at 1%; **, significant at 5%; *, significant at 10%

Table 6- ATE and ATET of production and gross profit

Variables	*Production*		*Gross profit*	
	Coefficient	*t-value*	*Coefficient*	*t-value*
ATE	1.176***	3.135	0.080	0.110
ATT	1.262***	3.020	0.078	0.100

***, significant at 1%; **, significant at 5%; *, significant at 10%

4. Conclusions

Although the number of cattle and beef meat production has been substantially raised by means of supports in Turkey in recent years, the domestic production could not fulfill the demand of beef meat yet and therefore the demand has been met by a great amount of import. In this sense, the evaluation of the impacts of livestock supports on beef cattle farms is essential to analyze the efficiency of resource utilization, self-sufficiency, and sustainability of beef cattle sector. This research seeks to identify the impact of cattle breeding supports on production and income of beef cattle farms via the case of Samsun province.

The results of this study highlight that the farms have larger land and herd, specialized in beef cattle breeding, using modern devices and machines, and keeping records were more likely to benefit from livestock supports than their counterparts. The essential result of the study indicates that the supports could increase the production and income of the farms. Nevertheless, the cattle breeding supports had only a statistically significant effect on the beef meat production. As the supports had a significant contribution to the self-sufficiency of beef meat production, the farms should be continuously supported in order to increase the production in spite of no effect on gross profit. The statistical insignificance of gross profit model can be explained with the inability of farms to transform the physical product to fiscal return. The reason why the farms could not able to achieve sufficient gross profit can be explained by about half of the farms have lack of record and could be hardly managed. Therefore, cattle farms should be encouraged to keep financial records via mandatory of Farm Accountancy Data Network and supports should be revised in the form that the more detail financial record the farms have, the more support they could be granted. Although the specialization of about half of the farms in beef cattle breeding is essential, the dependency on external input for breeding cattle has increased the farm costs. This dependency raises the requirement of capital and reduces the economic profitability and sustainability in the long run. The supports would be effective in this sense and they should be revised in order to encourage the farms to produce their own breeding cattle and reduce the costs.

Cross-sectional and province-based data were used in this study. Therefore, it is proposed that the data should be expanded to regional and countrywide studies using either panel or single cross-sectional data in order to consider the wide perspective of the sector. Future researches should also examine all supply chain of beef meat sector. In this study, only support based economic sustainability was examined. It is also recommended that social, environmental and politic sustainability of the cattle farming should be analyzed in order to get a complete view of the sector.

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