



RESEARCH ARTICLE

Agricultural Loan and Agricultural Production Value in Turkey

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ABSTRACT

One of the major tools in agricultural finance is agricultural loans. Therefore, it is important to investigate the relationship between agricultural loans and agricultural production. In this study we aim to determine whether there is a causality relationship between the agricultural loan and agricultural production value. For this purpose we use the time series data for the years of 2005-2018. In the study, we use Phillips-Perron unit root test to determine the stationarity levels of the variables examined. After we examine the stationary levels of time series, we perform Granger causality test to detect the causality relationship between agricultural loans and agricultural production. As a result of the Granger causality test, we determine that there is a unilateral causality relationship from the agricultural loan variable to the agricultural production value variable, that is, it can be said that agricultural loans affect the value of agricultural production. For this reason, we can state that facilitating the use of loans in the agricultural sector, and increasing the lending institutions will contribute to the increase of agricultural production value in meeting the input needs of the producers effectively.

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Introduction

The agricultural sector is a vital role in supplying raw materials to agriculture-based industries, the nutrition of the population, and increasing the export income for the country. For agricultural activities, modern agriculture practice is essential. Modern agriculture is important for the economic growth and development of the country. If the producers provide financial opportunities, it is possible for them to purchase agricultural inputs, to make new investments and so they use advanced production technologies (Sjah et al., 2003). However, as the application of modern agricultural technology to increase agricultural production requires intensive capital use, the financing needs of the farmers and thus the demand for loans increases (Schultz, 1964; Mellor, 1966; Johnston and Cownie, 1969; Zuberi, 1989). It can be mentioned that especially small farmers can increase the production value with agricultural loans. So, the loan is an important tool for

modern agricultural production systems.

Financial institutions play an important role in providing financial support to the real sector in developing countries. Financial support is an important issue for the sustainability of agricultural activities. The agricultural loans are considered in providing financial support to farmers for their activities. Farmers receive loans according to their different needs and aims. However, in general, these aims can be distinguished into two groups as production and investment loans. The production loans are used by producers to increase their production and the investment loans are used by producers to increase and improve their production (Karacan, 1991). The use of production loans can be exemplified by purchasing the necessary assets, seeds, and breeds, increasing the assets of animals. Investment loans are used for the equipment of the enterprise, buildings and facilities, land acquisition and efficiency, and improvement. Loan availability allows both

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higher consumption and the use of more purchased inputs, which can be said to increase the welfare of farmers. Therefore, the marginal contribution of the loans brings the input levels closer to optimal levels. Thereby it rises the output because the amount of land is constant and the productivity increases (Feder et al., 1990). So, it is stated that agricultural loans serve as a bridge between the income and expenditures of the farmer and it is an essential ingredient in the growth strategy of the agricultural sector.

In the studies which are investigating the relationship between agricultural production and agricultural loans, it is understood that there is a relationship between these two variables. Azimi (2013) says that the loan positively affects the production and employment process. According to Terin et al. (2014) study results, there is unilateral causality from agricultural production to agricultural credit use. Chandio et al. (2017) assert that formal loan plays an important role in the development of agriculture and ultimately in the development of the economy. They also show a positive correlation between loan supply and the increase in agricultural production in the country. Ansari (2001) states that farmers need financial resources to increase agricultural productivity and to obtain loans under easy terms and conditions. Therefore, it can be stated that the relationship between agricultural production and agricultural loan utilization, which is thought to be effective in increasing or sustaining agricultural production, should be investigated.

The main developments in recent years are the expansion in loan volume for agriculture and the sectoral orientation of private sector banking. However, the most important thing is the relationship between the loan expanding and growing of the agricultural sector (Güneş et al., 2017). So, in this study, it is aimed to examine the relationship between the agricultural loan and agricultural production value in the time period 2005-2018.

Agricultural loan develops along with internal and external factors such as structural status of agricultural enterprises, production and market conditions, farmer purchasing power, and parity (Güneş et al., 2017).

The agricultural enterprises are in the form of small family enterprises and that a certain period of time is required in order to obtain the product in the agricultural sector. That is, the lack of time coherence between income and expenditure requires the need for a loan in agriculture important (Turkey Agricultural Finance Summit, 2017). Producers' income from crop and animal production is related to their ability to provide production factors (Özden et al, 2012). On the other hand, agricultural loans are important financial instruments in providing production factors.

When the structure of agriculture in Turkey are examined, the total agricultural area of 23.180 (thousand ha) (TURKSTAT, 2018). Some field crop production quantity such as wheat, barley, corn, sugar beet, potato respectively; 20 000 000 tons, 7 000 000 tons, 5 700 000 tons, 18 900 000 tons, 4 550 000 tons. In 2018 total fresh fruits and vegetable production are respectively; 20 494 028 tons and 30 032 727 tons (TURKSTAT, 2018). Organic agricultural products' total quantity is 2 371 612

tons (transition period included). On the other hand, there are 8 419 204 cattle, 7 030 297 cattle crossbreeds, 1 593 005 domestic cattle, and 178 397 buffaloes. In the presence of small ruminants, there are 32 513 293 domestic sheep, 2 681 679 merinos, 10 698 553 head hair goats, 223 874 head angora goats. In 2018, the number of tractors is 1 332 139. According to the Turkish Statistical Institute (TURKSTAT) 2018 data, the share of agriculture in Gross Domestic Product (GDP) is 5.8%, including forest and fisheries. The agricultural sector with 216.6 billion GDP value has an important place for Turkey's economy. In the agricultural sector, which is economically and socially important, resources must be used effectively (Güneş et a., 2017). Therefore, in the agricultural sector, financial instruments are important in the efficient use of resources.

At Agricultural Finance Summit (2017) it was compared the share of agriculture in GDP and the share of loan volume in the developing countries. As a result, this comparison, it was seen that the share of agriculture in loan volume was lower than the share of agriculture in GDP. Also, in the prepared report, it was expressed that the agriculture of Turkey has a similar situation with developing countries and noted that the banking system is still unable to access adequate funding. The factors which affect the agricultural financing need in the Agricultural Finance Summit report listed as:

1. Agricultural enterprises are in the form of small family businesses. Due to a significant rate of the business that are more family-run agricultural businesses in Turkey, it is inadequate in terms of business size and capital accumulation. These enterprises with insufficient agricultural income and equity need other sources of funding. On the other hand, the small and divided structure of agricultural enterprises creates problems in the structure of the enterprise and hinders the development of enterprises and the creation of new financing opportunities in agricultural markets.

2. In the agricultural sector, where the products are mostly sold once a year, but the whole year is spent in the agriculture sector, the amount of usable capital is often insufficient since the turnover of capital is slow and it is difficult to create capital by saving. This inadequacy largely hinders the realization of the necessary activities to increase production, the rationalization of the enterprises, and thus the increase of the income of the farmer. The fact that agricultural production depends on natural resources which creates high risk and uncertainty.

3. As the innovations experienced in the industry and finance sector day by day require the renewal of the methods used in the preparation of the market and product supply as well as the mechanization in the agricultural sector, rapid mechanization and the adaptation of the farmers to the changes in the consumer preferences, they create new expense items in the agricultural sector and create the need for financing.

4. The fluctuations in the market prices that arise due to the supply and demand elasticities of agricultural products have a high impact on the income of agricultural enterprises. The farmers, who can not obtain the expected income, need foreign capital to continue their activities.

Yılmaz (2008) states that the share of the Republic of Turkey Ziraat Bank in total agricultural loans in 2003 was 88.15% and that of private banks was 11.85%. In addition, in 2004, the share of private banks in used agricultural loans increased to 18.81%, and in 2005, 26.77%. In Turkey Agricultural Finance Summit (2017) report, it was stated that the ratio of private banks had in 2017 to 31.8% in the year-end. In 2018, the total amount of agricultural loans extended to 77.8 billion Turkish Liras (TL) and Republic of Turkey Ziraat Bank (Agricultural Bank) had a share of approximately 80% with

62.2 billion TL. Private banks were also included in total agricultural loans with approximately 20%. As can be seen from the ratios of total agricultural loans for some years the Republic of Turkey Ziraat Bank has a significant share in providing agricultural financing. It is observed that the rate of private banks has increased in providing agricultural loans by years. Republic of Turkey Ziraat Bank gave almost all agricultural loans in Turkey until the mid-2000s (Güneş and Artukoğlu, 2010).

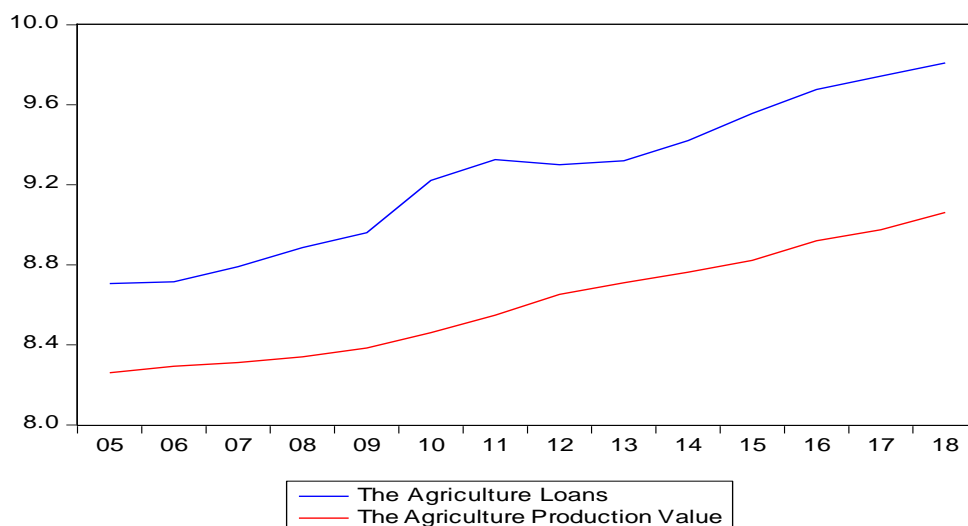


Figure 1. The trend of non-logarithmic time series in 2005-2018 period

After 2002, agricultural loans have started to increase, especially with the provision of loans to the agricultural sector by private banks and improvements in loan terms (Terin et al., 2014; Duramaz and Taş, 2018). There has been a significant increase in agricultural loan balances due to the interest shown by private banks in the sector and the subsidized loan application that has been implemented since 2004. Agricultural loan balance, which was 10 billion TL in 2007, reached 22.8 billion TL in 2010 and 61.3 billion TL in 2015 (Ünlüer and Güneş, 2016). Figure 1 shows the trend of the agricultural production value and agricultural loans between 2005 and 2018. When Figure 1 is examined, we can see that the value of agricultural production increases between the 2005- 2018 years and the amount of agricultural loans increases in years. But the agricultural loans are higher between 2009 and 2012 than from the other years.

The study is planned in four sections. In the introduction section of the research, the importance of agricultural loans in the agricultural sector and its effect on production, and information about agricultural loans in Turkey are explained. In the second section, the materials and methods of the study are mentioned. In the third section, the findings of the study are interpreted and discussed. Finally, the study is completed with conclusion.

Materials and Methods

The aim of this study is to determine the relationship between agricultural production value and agricultural loans

for the 2005-2018 time period at an annual frequency. We use agricultural production value and agricultural loan data.

In this study, when we form the time series of agricultural loans provided by the banking sector, we do not exclude the 2008 global crisis data from the scope of analysis. Because in 2008, there was an expansion of loan volume (Hedlund and Kahn, 2009; Boeri and Guiso, 2007; Zandi, 2008). In order to see the effect of this loan volume expansion on the agricultural production value, we include the 2008 global crisis year in the scope of analysis. As a matter of fact, in the studies examining the relations between the agricultural loans and agricultural production value (Duramaz and Taş, 2018; Terin et al., 2014), we see that the 2008 global crisis year was included in the data.

The agricultural loan variable covers banking sector agricultural loans of Development and Investment Banks, Deposit Banks, and Participation Banks. Agricultural production value is the value of agricultural products produced in a year in TL. We obtain agricultural production value and banking sector agricultural loan data from the Republic of Turkey Central Bank Electronic Data Distribution System (EDDS). Time series are included in the analyses in logarithmic form.

The functions of the deposit banks, participation banks and, development and investment banks are different between each other. However, in this study, we include the total of the loans given by these banks in TL in the data. Furthermore, such

as the Republic of Turkey Central Bank and the Banks Association of Turkey institutions declare the agricultural loans given by the banks. In this study, only the agricultural loans given by the banks operating in the Turkish banking sector in TL are taken into consideration.

If the average of a time series does not change over time, it is considered that these series are stationary. Mean and variance of non-stationary time series change over time. If the time series is not stationary, they are made stationary taken the difference from the first and second or higher levels. The stationarity of time series is investigated by unit root tests in the literature (Gujarati 1995). In this study, we use the Phillips-Perron unit root test, which takes structural breaks into consideration, to determine the stationarity levels of time series. In the Phillips-Perron unit root test, the null hypothesis is that the variable contains unit root at the level value. As the alternative hypothesis is that the variable does not contain unit root at the level value.

After determining the stationarity levels of the time series included in the study, we use the Granger causality test to examine whether there is a causality relationship between the variables and to research the direction of causality relationship if there is any causal relationship between the agricultural production value and the agricultural loans.

When the direction of the relationship between economic variables can not be determined by economic theory, the existence and direction of the interaction between the variables can be detected by Granger (1969) causality test. In this test, the variables are not separated as a dependent and independent variable. The interaction between variables can be analyzed simultaneously in the Granger causality test. For this reason, we use the Granger causality analysis in this study (Doğan et al., 2016).

The Granger causality test starts with the determination of the optimum lag length that minimizes the Akaike Information Criterion (AIC) or Schwartz Information Criterion (SIC) obtained by regressing the dependent variable with its own lagged values (Yapraklı and Güngör 2007). In the Granger causality test, the presence of the causality relationship (→ indicates the direction of the causality relationship) requires

Table 2. Phillips-perron unit root test results

Variables	Level Values		First Difference Values		Second Difference Values	
	Constant	Constant/Trend	Constant	Constant/Trend	Constant	Constant/Trend
Agricultural Loans	0.22(6)	-2.17(3)	-3.77(11) ^(b)	-3.72(3) ^(c)	-	-
Agricultural Production Value	1.67(1)	-3.42(2)	-1.82(1)	-2.25(0)	-4.1(2) ^(b)	-4.42(3) ^(c)

*^(b) and ^(c) indicate statistical significance at 5% and 10% levels.

*Values in parentheses represent the optimum lag lengths for the Phillips-Perron unit root test.

The results of the Phillips-Perron unit root test in Table 3 show that the null hypothesis that the agricultural loan variable contains unit root at level value is rejected and the variable is stationary in the first difference. Furthermore, the findings reported in Table 3 indicate that for the agricultural production value variable, the null hypothesis, which the variable contains unit root at the level value, is rejected and the variable becomes stationary in the second difference as

the following hypothesis to be rejected.

$$\text{For } Z \rightarrow P: H_0 : \sum_{i=1}^r \lambda_i = 0 \tag{1}$$

$$\text{For } P \rightarrow Z: H_0 : \sum_{i=1}^s \phi_i = 0 \tag{1}$$

In Equality (2) and Equality (3), there is a mathematical representation of the Granger causality test applied in this study.

$$\text{Agricultural Loans} = \theta_0 + \sum_{i=1}^n \theta_1 \text{Agricultural Loans}_{t-1} + \sum_{i=1}^n \delta_1 \text{Agricultural Production Value}_{t-1} + \varepsilon_t \tag{2}$$

$$\text{Agricultural Production Value} = \theta_0 + \sum_{i=1}^n \theta_1 \text{Agricultural Production Value}_{t-1} + \sum_{i=1}^n \delta_1 \text{Agricultural Loans}_{t-1} + \varepsilon_t \tag{3}$$

Results and Discussion

In this part of the study, firstly we present descriptive statistics of related variables to examine the relationship between agricultural production value and banking sector agricultural loans. Then, we examine the stationarity levels of related variables by the Phillips-Perron unit root test, and finally, we use the Granger causality test to determine whether there is a causal relationship between the variables. Descriptive statistics of agricultural loans and agricultural production value time series are reported in Table 1.

Table 1. Descriptive statistics

Variables	Mean	Standart Deviation	Minimum	Maximum
Agricultural Loans	9.25	0.38	8.7	9.8
Agricultural Production Value	8.61	0.27	8.26	9.06

According to the descriptive statistics in Table 1, we can say that the agricultural loan variable fluctuates more than the agricultural production value variable. Similarly, the average of the agricultural loan variable is greater than the average of the agricultural production value variable. After we present the descriptive statistics, we perform the unit root test to determine the stationarity levels of the variables and report in Table 2.

[2]. After the determination of stationarity by the Phillips-Perron unit root test, we perform the Granger causality test and present it in Table 3.

The findings in Table 3 indicate that there is a unilateral causality relationship from the agricultural loan variable to the agricultural production value variable. In this case, it can be said that agricultural loans affect the agricultural production value. Such that, our results are in line with theoretical

expectations; but also, our results are opposite with the claim of Terin et al. (2014). Because Terin et al. (2014) argue that agricultural production affects agricultural loans.

In the related literature, the loan increases agricultural production and the effect of the loan on agricultural

production is positive and significant (Saleem and Jan ,2011; Chandio et al., 2016). Guirkingner and Boucher (2007) find that if all credit restrictions were removed in Peru, the agricultural production value in Peru would increase by 26%. These findings are consistent with the findings that we obtain in our study.

Table 3. Granger causality test results

Dependent Variable-Independent Variable	F Statistic Value	Probability Value
Agricultural Loans-Agricultural Production Value	3.87	0.08
Agricultural Production Value-Agricultural Loans	0.03	0.85

*The optimum lag length is 1, based on AIC and SIC

Conclusion

The agricultural loan has an important role in the development of the agricultural sector, especially in developing countries. Because, it is one of the financial instruments needed in agricultural enterprises to benefit from new production technologies and marketing opportunities. In this study, it is aimed to present the relationship between agricultural loans and agricultural production value. As a result of the study, it is concluded that there is a relationship between agricultural loans and agricultural production value. The Granger causality analysis shows that the changes in agricultural loans affect the changes in the agricultural production value. That is, the direction of the relationship between the two variables is from agricultural loans to agricultural production value. For this reason, it is thought that loans will contribute to the increase of agricultural production value in facilitating the use of loans in the agricultural sector, increasing the institutions providing loans, supplying the input needs of the producers, marketing the products, and expanding the area of activity or investment. As a result, the findings show that there is an effect from the loan used to agricultural production value is in line with theoretical expectations. It can be said that loan expansion will increase the welfare of farmers as it allows both higher consumption and the use of more purchased inputs. The contribution of the study to the literature can be expressed as follows. This study is one of the few research to examine the relationship between the agricultural production value and agricultural loan in Turkey. This aspect of the study is expected to fill an important gap in the literature. In addition, the study has the ability to show evidence for future studies on determining factors affecting agricultural production value. Another contribution of the study to the literature is to provide evidence for detecting the relationship between the agricultural loan and agricultural production value for policymakers in decision making.

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