



## Research Article (Araştırma Makalesi)

Ege Üniv. Ziraat Fak. Derg., 2025, 62 (4):511-522  
<https://doi.org/10.20289/zfdergi.1617344>

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**Keywords:** Agricultural credits, agricultural input price index, agricultural sector, financing

**Anahtar sözcükler:** Tarımsal krediler, tarımsal girdi fiyat endeksi, tarım sektörü, finansman

# Analysis of the relationship between agricultural credit utilization and agricultural input price index

Tarımsal kredi kullanımı ile tarımsal girdi fiyat endeksi arasındaki ilişkinin analizi

Received (Alınış): 10.01.2025

Accepted (Kabul Tarihi): 11.10.2025

## ABSTRACT

**Objective:** This study aims to investigate the relationship between agricultural credit (vital for the continuity of agricultural activities) and the Agricultural Input Price Index, which shapes the cost environment in which these activities take place.

**Material and Methods:** The analysis employs monthly data spanning January 2015 to March 2024. Methodologically, it applies the Fractional-Frequency Fourier ADF unit root test, the Fractional-Frequency Fourier ADL cointegration test, and the Fractional-Frequency Fourier TY causality test.

**Results:** The empirical findings indicate that a 1% rise in the Agricultural Input Price Index is associated with increases in agricultural credit utilization of 0.95% in the long-run and 0.18% in the short-run. The results of the cointegration test are further supported by the results of the causality test.

**Conclusion:** The findings suggest that sustaining agricultural production nationwide requires targeted financial support for all producers engaged in farming—particularly small-scale farmers—through low- or zero-interest credit facilities channelled via publicly capitalized commercial banks. Such support would mitigate the adverse effects of rising input prices, reduce underutilization of essential inputs, and help avert productivity losses.

## ÖZ

**Amaç:** Bu çalışma, tarımsal faaliyetlerin devam etmesi için gereken tarımsal kredi ile bu faaliyetleri etkileyen Tarımsal Girdi Fiyat Endeksi arasındaki ilişkiyi incelemeyi amaçlamaktadır.

**Materyal ve Yöntem:** 2015 Ocak-2024 Mart dönemini kapsayan aylık verilerin kullanıldığı çalışmada yöntem olarak Kesirli-Frekanslı Fourier ADF birim kök testi, Kesirli-Frekanslı Fourier ADL eş bütünleşme testi ve Kesirli-Frekanslı Fourier TY nedensellik testi uygulanmaktadır.

**Araştırma Bulguları:** Analiz bulgularına göre Tarımsal Girdi Fiyat Endeksi değerinde yaşanan %1'lik yükseliş, tarımsal kredi kullanımını uzun ve kısa dönemde %0,95 ve %0,18 oranında yükseltmektedir. Nedensellik testinin sonuçları, eş bütünleşme testinin sonuçlarını desteklemektedir.

**Sonuç:** Bulgular, ülke genelinde tarımsal üretimin sürdürülebilmesi için, özellikle küçük ölçekli çiftçiler başta olmak üzere, tarımla uğraşan tüm üreticilere yönelik, kamu sermayeli ticari bankalar aracılığıyla düşük veya sıfır faizli kredi imkanları şeklinde hedeflenmiş finansal desteğin gerekli olduğunu göstermektedir. Bu tür bir destek, artan girdi fiyatlarının olumsuz etkilerini hafifletecek, temel girdilerin yetersiz kullanımını azaltacak ve verim kayıplarını önlemeye yardım edecektir.

## INTRODUCTION

Agriculture—commonly recognized as the earliest productive activity in human history—remains vital both for domestic food security and for participation in international markets. Deemed indispensable given its role in producing basic foodstuffs, the sector has been reshaped by technological advances and now encompasses a range of production techniques (Topal, 2010). The sector's share of Gross Domestic Product (GDP) declined from 25.8% in the 1980s to 4.8% in 2022. Its growth rate stood at 0.6% in 2022, while data for the second quarter of 2023 indicate a 1.2% increase. In 2022, agriculture accounted for 15.8% of total employment. Despite its diminished weight in the economy—driven by industrial expansion, technological breakthroughs, and growth in services—agriculture retains its strategic importance, particularly through its contributions to employment and external trade (Ministry of Trade of the Republic of Türkiye, 2024). As a sector of central importance in both Türkiye and the global economy, agriculture shapes socio-ecological as well as economic systems. Although Türkiye benefits from fertile soils, established infrastructure, and ongoing technological progress, the sector also faces significant constraints. Chief among these, for agricultural enterprises, is access to finance, which constitutes a major obstacle to investment and sustained productivity (Taşkıran & Özüdoğru, 2010; Keskin, 2024).

Disruptions in supply and demand driven by global warming, climate change, pandemics, and armed conflicts have once again underscored the strategic significance of agriculture and livestock. The COVID-19 pandemic, in particular, revealed the central role these sectors play in national resilience. Ensuring the uninterrupted continuation of agricultural activities is therefore essential. Given its contributions to intergenerational continuity, the satisfaction of food demand, food security, and the provision of industrial raw materials, the sector also necessitates the establishment of a self-sufficient structure (Kutluay et al., 2021; Yaman et al., 2021). The adoption of technology in agriculture supports the development of an environmentally conscious, innovative, sustainable, and digitally enabled production paradigm. This transformation—captured by the term “Agriculture 4.0”—entails the integration of digital systems and smart farming applications, which are expected to enhance productivity and strengthen sustainability (Ertaş, 2020). Policy frameworks concerning food and sustainability will decisively shape the sector's trajectory. Indeed, food stands alongside energy and defense among the most critical and strategic domains (Sertyeşilşik, 2022).

Multiple determinants shape production costs in agriculture, including fluctuations in petroleum prices, climate change, price indices, the dollar exchange rate, fuel and electricity costs, and irrigation and drying expenses. Cost dynamics are further influenced by price movements in primary factors of production—labor, land, and capital (Köftecioglu & Paksoy, 2024). Cost inflation transmits to output prices, constraining demand. In turn, cost-driven price increases compress production possibilities and contribute to a shrinking sectoral share within the broader economy. Accordingly, targeted support measures, coherent policy design, and sustainable initiatives are critical. Access to finance during the production phase is also widely recognized as a binding constraint on sectoral development. To mitigate this constraint, public and private actors deploy instruments such as subsidized credit, incentives, and exemptions. Sectoral credit utilization for June, July, and August 2024 is reported in Table 1.

A review of Table 1 indicates broad-based increases across all categories from June through August. Utilization of short- and medium-run credit, as well as cash and non-cash facilities, expanded; however, non-performing credits also rose. Credit uptake within agricultural enterprises is thus being leveraged as a primary instrument to alleviate financing constraints. Another key sectoral indicator capturing price dynamics is the Agricultural Input Price Index (AIPI). Table 2 reports the June 2024 changes in this index, as published by the Turkish Statistical Institute (TurkStat).

**Table 1.** Distribution of sectoral credit utilization (thousand TL)**Çizelge 1.** Sektörel kredi dağılımı (bin TL)

Periods	Short-run cash credits	Medium- and long-run cash credits	Cash credits	Non-performing credits	Total cash credits	Non-cash credits
2024/06	246,274,871	442,873,767	689,148,638	2,540,078	691,688,716	33,244,458
2024/07	252,046,464	452,057,009	704,103,473	2,754,025	706,857,498	33,788,436
2024/08	258,801,886	476,372,993	735,174,879	2,868,391	738,043,270	35,206,510

**Source:** Banking Regulation and Supervision Agency (BRSA), 2024.

**Table 2.** Change in the agricultural input price index (June 2024)**Çizelge 2.** Tarımsal girdi fiyat endeksi değişimi (Haziran 2024)

Variable	Index	Month-over-month change (%)	Year-over-year change (%)
AIPI	564.93	0.93	47.56

**Source:** Turkish Statistical Institute, 2024.

An examination of the index indicates a 0.93% increase in June 2024 relative to the previous month and a 47.56% increase relative to the same month of the previous year. These increases are assessed to have influenced price dynamics.

This study aims to identify the relationship between agricultural credit and AIPI. Following the introduction, the literature is reviewed, the methodology is detailed, and the findings are reported. The conclusion presents assessments and policy recommendations.

Agriculture is recognized as a strategic sector that enables countries to meet essential needs and contributes to the economy through foreign trade. Numerous academic studies have examined issues such as financing, credit utilization, and price dynamics in agricultural enterprises. This section reviews research specifically focused on the agricultural sector and directly related to the topic of this study. Studies on agricultural credit and indices are summarized in terms of their objectives, methods, and findings in Table 3.

A review of the literature shows that agricultural credit is frequently examined in relation to production, productivity, and performance. Although the methods employed vary across studies, they typically include sector-specific recommendations and assessments. A notable gap in the literature, however, is the identification of the relationship between agricultural credit and AIPI. This gap constitutes the key motivation for the present study. The study's originality and contribution to the literature lie in establishing this relationship using up-to-date data.

Numerous theories in the literature, such as agricultural finance theory, risk and uncertainty theory, and contract farming theory, have discussed the relationship between agricultural production and financing. The model developed in this study adopts the Theory of Change, which posits that increased access to finance, technical knowledge transfer, and agricultural product markets will enhance productivity levels in the agricultural sector. The Theory of Change was introduced in 2014 by the Council on Smallholder Agricultural Finance. Its practical application is being implemented through case studies in various countries, and the results of these studies are regularly and transparently reported and shared with the public (Council on Smallholder Agricultural Finance, 2022).

**Table 3.** Summary of prior literature**Çizelge 3. Literatür özeti**

Author(s)	Objectives	Methodology	Results
Çevik and Zeren (2014)	Determination of the relationship between agricultural credits and financial development for the period from December 2005 to October 2013 in Türkiye	Hatemi-J Asymmetric Causality Test	No significant relationship was found for negative shocks. Positive shocks in agricultural credit were found to Granger-cause financial development, leading to the conclusion that the agricultural sector holds a significant position within the financial system.
Ekwere & Edem (2014)	To examine the impact of agricultural credit on agricultural production among a sample of 136 small-scale farmers	Regression Analysis and Cobb–Douglas Production Function Analysis (CDPFA)	Access to agricultural credit positively affects agricultural production. The study recommended that the government and private-sector institutions provide farmers with regular credit.
Ogbuabor & Nwosu (2017)	To determine the effect of deposit money banks' agricultural credit on agricultural productivity in Nigeria over the period 1981-2014	Johansen Cointegration and Granger Causality Tests	It is stated that the availability of bank credit with favorable interest rates in the agricultural sector would positively affect agricultural production, and corresponding policy recommendations are provided.
Adanacioğlu et al. (2017)	Identifying similarities and differences among Türkiye's 81 provinces by examining various agricultural indicators	Multidimensional Scaling (MDS) Method	The results indicate that provinces differ in their performance regarding agricultural credit. Credit should be utilized more efficiently; provinces with relatively weaker performance require further assessment. Moreover, the efficiency of functions such as production and marketing needs to be improved.
Yalçınkaya (2018)	Determining the impact of agricultural loans and non-performing agricultural loans on GDP	Granger Causality Analysis	The results show that agricultural credit Granger-causes GDP; there is bidirectional causality between agricultural GDP and total GDP; and no significant relationship is found with non-performing agricultural loans.
Amanullah et al. (2020)	Identifying the impact of credit constraints on the welfare of wheat-producing farmers operating in Pakistan	Ordinary Least Squares (OLS) and Logistic Regression	The result indicates that constraints on access to commercial bank credit adversely affect farmers' welfare and income.
Aytekin & Hatırlı (2021)	Identifying the determinants of unprocessed food inflation in Türkiye using data from 2016 to 2020	Vector Autoregressive Model (VAR) and Autoregressive Distributed Lag Model (ARDL)	Findings demonstrate that the variables have an inflationary effect on unprocessed food inflation, with the effect driven primarily by the import unit variable of food products manufacturing, followed by the agricultural input price index and the agricultural products producer price variable.
Semerci (2021)	Identifying the agricultural credit status of various farming enterprises operating in Türkiye using firm-level data	Neyman's Method and Various Statistical Analyses	The findings indicate that Ziraat Bank is the primary choice for agricultural credit; as farm size increases, credit demand also rises; and maintaining zero- or low-interest credit schemes is necessary for a sustainable structure.
Akçaöz et al. (2022)	Using an Antalya province sample to identify producers' socio-economic characteristics, credit usage, credit sources and terms, and their main problems	A Survey Study Conducted with 80 Producers	Ziraat Bank is preferred for credit use due to subsidized loans and favorable interest rates offered to enterprises, and that producers primarily borrow to finance agricultural inputs and to address working capital shortages.
Oğul (2022)	Testing the relationship between agricultural credit and agricultural production using data for the 1990-2020 period	Johansen Cointegration Test, FMOLS, DOLS and CCR Methods	The analysis confirms the presence of cointegration and indicates that increases in agricultural credit lead to higher agricultural production.

Table 3. Continued

## Çizelge 3. Devamı

Author(s)	Objectives	Methodology	Results
Uygur & Öner Kaya (2022)	Exploring the relationship between agricultural credit and agricultural growth for the period 2005:Q1-2021:Q4	ARDL	The results indicate the presence of cointegration between the series and show that increases in agricultural credit have a positive effect on agricultural GDP.
Özyücel et al. (2022)	Discovering the causality relationships among food inflation, the agricultural producer price index, and agricultural input price indices in Türkiye for the period 2016M01-2022M08	The Hacker and Hatemi-J Bootstrap-Enhanced Toda-Yamamoto Causality Test, Based on Efron's Bootstrap Method	In conclusion, causality relationships are identified, and price dynamics are found to operate bidirectionally, suggesting the potential emergence of structural problems due to mutual feedback between prices. As a policy recommendation, the study proposes developing and implementing productivity-oriented policies in agriculture.
Manoharan & Varkey (2022)	Testing selected agricultural credit and productivity variables in India using data from fiscal years 1990-1991 to 2017-2018	Panel Data Analysis	The findings show that both direct agricultural credit and doubling the agricultural credit policy have positive effects on productivity, whereas indirect credits exert a negative effect. Accordingly, the study recommends implementing large-scale, productivity-oriented policies through direct credit channels to enhance agricultural productivity.
Önder (2023)	Testing agricultural and economic variables for Türkiye's seven geographical regions over 2004-2021	Dynamic Panel Data Analysis	The study finds a long-run relationship between agricultural credit and economic growth; however, agricultural credit is not a Granger cause of growth. Regional assessments further indicate that credits should be utilized efficiently and in a targeted manner to enhance outcomes.
Özden (2023)	Identifying the best model for forecasting the changes in the agricultural input price index	ARIMA, SARIMA, CNN and LSTM	It was concluded that ARIMA and CNN models performed the best prediction, and the two models were followed by the LSTM model.
Keskin & Çalışır (2024)	Testing the relationship between economic and agricultural variables in Türkiye using data from 1976 to 2021	ARDL, VAR and Granger Tests	In terms of cointegration, a negative effect between the two variables was identified both in the short- and long-run. Additionally, it was found that there is a unidirectional causality running from the interest rate to crop production.

## MATERIALS and METHODS

In line with the objective of the study, monthly data on agricultural credits (AGCR) and AIPI were collected. The data on AGCR were obtained from the monthly bulletins published by the Banking Regulation and Supervision Agency (2024), while AIPI data were sourced from the relevant statistical tables of the Turkish Statistical Institute (2024). The dataset covers the period from January 2015 to March 2024, consisting of 111 observations for each variable. The starting point of January 2015 was chosen because the publication of AIPI commenced at that time. Considering the purpose of the study and the characteristics of the data, the analyses were carried out using EViews 13 and Gauss 24 programs.

The study employs contemporary time-series methods. Specifically, it applies, in order, the Fractionally-Frequency Fourier Augmented Dickey-Fuller (FFFADF) unit root test developed by Bozoklu et al. (2020), the Fractionally-Frequency Fourier Autoregressive Distributive Lag (FFFADL) cointegration test proposed by İlkay et al. (2021), and the Fractionally-Frequency Fourier Toda-Yamamoto (FFFTY) causality test introduced by Pata & Yılanıcı (2020). As all three tests are augmented with Fourier functions, they account for all structural changes present in the series.

$$\Delta AGCR_t = \alpha_0 + \alpha_1 \sin\left(\frac{2\pi kt}{T}\right) + \alpha_1 \cos\left(\frac{2\pi kt}{T}\right) + \alpha_2 AGCR_{t-1} + \sum_{i=1}^p \varphi_i \Delta AGCR_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta AIPi_t = \beta_0 + \beta_1 \sin\left(\frac{2\pi kt}{T}\right) + \beta_1 \cos\left(\frac{2\pi kt}{T}\right) + \beta_2 AIPi_{t-1} + \sum_{i=1}^p \phi_i \Delta AIPi_{t-1} + \mu_t \quad (2)$$

In the FFFADF test, the models specified in Equations (1) and (2) are estimated. In these specifications, *AGCR* denotes agricultural credits, *AIPi* denotes the Agricultural Input Price Index,  $\Delta$  is the first-difference operator,  $\pi$  is the constant 3.1416,  $k$  is the frequency parameter,  $t$  represents the time trend,  $T$  is the sample size,  $\varepsilon_t$  and  $\mu_t$  are the error terms (Bozoklu et al., 2020).

$$\Delta AGCR_t = \alpha_0 + \beta_1 \sin\left(\frac{2\pi kt}{T}\right) + \beta_1 \cos\left(\frac{2\pi kt}{T}\right) + \delta_1 AGCR_{t-1} + \delta_2 AIPi_{t-1} + \delta_3 \Delta AGCR_{t-1} + \delta_4 \Delta AIPi_{t-1} + \nu_t \quad (3)$$

In the FFFADL test, the model specified in Equation (3) is estimated. In this specification, *AGCR* denotes the dependent variable, agricultural credits, while *AIPi* represents the independent variable, the Agricultural Input Price Index. Implementation of the test requires both variables to be integrated of order one,  $I(1)$  (İlkay et al., 2021).

$$AGCR_t = \alpha_0 + \alpha_1 \sin\left(\frac{2\pi kt}{T}\right) + \alpha_1 \cos\left(\frac{2\pi kt}{T}\right) + \sum_{i=1}^{l+dmax} \gamma_i AGCR_{t-i} + \sum_{i=1}^{l+dmax} \lambda_i AIPi_{t-i} + \xi_t \quad (4)$$

$$AIPi_t = \beta_0 + \beta_1 \sin\left(\frac{2\pi kt}{T}\right) + \beta_1 \cos\left(\frac{2\pi kt}{T}\right) + \sum_{i=1}^{l+dmax} \phi_i AGCR_{t-i} + \sum_{i=1}^{l+dmax} \delta_i AIPi_{t-i} + \zeta_t \quad (5)$$

In the FFFTY test, the models specified in Equations (4) and (5) are estimated. Within these models,  $l$  is the optimal lag length and  $dmax$  represents the maximum order of integration among the variables (Pata & Yılancı, 2020). In this study, agricultural credits and the Agricultural Input Price Index are alternately assigned as the dependent variable to determine whether the causality between them is bidirectional or unidirectional.

The hypotheses of this study are as follows:

$H_1$ : There is a statistically significant cointegration relationship between the Agricultural Input Price Index and agricultural credits.

$H_2$ : There is unidirectional causality running from the Agricultural Input Price Index to agricultural credits.

## RESEARCH FINDINGS

As depicted in Figure 1, the variables appear to follow a similar trajectory over time. However, this visual correspondence does not serve as conclusive evidence of a comovement. A definitive determination requires a more detailed and formal empirical analysis.

The course of the variables over time is as follows:

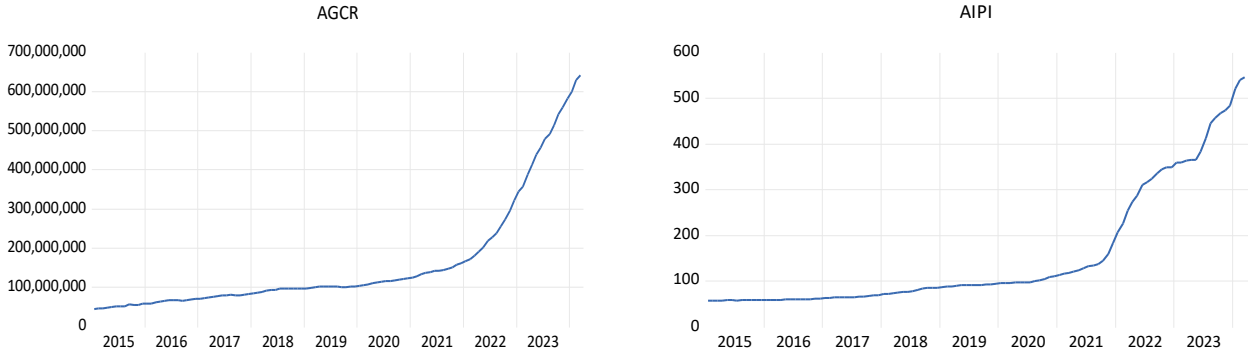


Figure 1. Course of series.

Şekil 1. Değişkenlerin seyri.

To mitigate potential issues related to scale and to stabilize variance, a natural logarithmic transformation was applied to both variables. Consequently, all subsequent analyses were conducted using these transformed series.

The analytical procedure began with unit root tests to assess the stationarity properties of each variable. Following this, the long-run relationship and causal linkages between the variables were investigated using cointegration and causality tests, respectively. The results of these empirical tests are presented sequentially below.

As shown in Table 4, the Fourier functions were found to be statistically insignificant for both variables. In such cases, the appropriate methodology, as outlined by Bozoklu et al. (2020), requires deferring to the results of the conventional Augmented Dickey-Fuller (ADF) test rather than the FFFADF test.

Table 4. Unit root test results

Çizelge 4. Birim kök test sonuçları

Variable	FFFADF unit root test		ADF unit root test	
	F test statistic	FADF test statistic	Test statistic	p-value
logAGCR	6.122 <sup>#</sup>	-3.813	-1.024	0.935
logAPI	1.532 <sup>#</sup>	-0.650	-1.469	0.834
logAGCR(1)	-	-	-4.799	0.000 <sup>*</sup>
logAPI(1)	-	-	-4.012	0.011 <sup>**</sup>

<sup>#</sup> This indicates that the Fourier terms are insignificant at the 10% significance level; the critical value used for comparison is 7.78.

<sup>\*</sup> and <sup>\*\*</sup> indicate that the corresponding variable is stationary at the 1% and 5% significance levels, respectively.

The conventional ADF test results indicate that both variables become stationary after taking their first differences, meaning they are integrated of order one, I (1). This finding satisfies the necessary precondition for applying the FFFADL cointegration test.

As shown in Table 5, the absolute value of the test statistic, [-6.217], is greater than the absolute value of the critical value at the 1% significance level, [-4.859]. This result leads to the rejection of the null hypothesis of "no cointegration between the variables" confirming that a long-run cointegrating relationship exists.

**Table 5.** Cointegration test result**Çizelge 5.** Eşbütünleşme test sonucu

Estimated model	Lag length	Frequency value (k)	Test statistic	Critical value	Cointegration relationship
$\log\text{AGCR} = f(\log\text{AIPi})$	10	2.7	-6.217*	-4.859	There exists a cointegration relationship.

\* Indicates significance at the 1% level. Note: In accordance with the applied methodology, the absolute values of the test statistic and the critical value are used for comparison.

Furthermore, the fractional value of the frequency parameter (k) indicates that the structural breaks affecting this cointegrating relationship are gradual and smooth, rather than abrupt.

As seen in Table 6, the long-run coefficient for the logAIPi variable is positive and significant at the 1% level. This indicates that the Agricultural Input Price Index has a statistically significant positive effect on agricultural credits. A 1% increase in the index is associated with a 0.95% increase in the use of credit in the long-run.

**Table 6.** Long-run coefficient result**Çizelge 6.** Uzun dönem katsayı sonucu

Dependent variable: logAGCR				
Independent variable	Coefficient	Standard error	T-statistic	p-value
logAIPi	0.948	0.031	30.460	0.000*
c	14.129	0.149	94.590	0.000*
sin	-0.123	0.031	-3.952	0.000*
cos	-0.073	0.030	-2.386	0.018**

\* and \*\* indicate that the corresponding variable is stationary at the 1% and 5% significance levels, respectively.

As shown in Table 7, the short-run coefficient for the logAIPi variable is positive and statistically significant at the 5% level. This finding suggests that the Agricultural Input Price Index also has a positive effect on agricultural credits in the short-run. A 1% increase in the index value leads to a 0.18% increase in credit usage.

**Table 7.** Short-run coefficient result**Çizelge 7.** Kısa dönem katsayı sonucu

Dependent variable: logAGCR				
Independent variable	Coefficient	Standard error	T-statistic	p-value
d(logAIPi)	0.185	0.077	2.395	0.018**
Error Correction Coefficient	-0.072	0.025	-2.885	0.004*
c	0.019	0.004	4.843	0.000*

\* and \*\* indicate that the corresponding variable is stationary at the 1% and 5% significance levels, respectively.

As seen in Table 8, there is a unidirectional causal relationship running from the logAIPi variable to the logAGCR variable ( $p < 0.01$ ). This result supports the findings of the FFFADL cointegration test applied earlier. Furthermore, since the frequency value (k) is fractional, it implies that the structural changes affecting causality are permanent. Finally, the analysis confirms both of the study's hypotheses.

**Table 8.** FFFTY test result**Çizelge 8.** FFFTY test sonucu

Dependent variable	Independent variable	Test statistic	Bootstrap p-value	Frequency value (k)	Result
logAGCR	logAIPi	25.581	0.005*	1.9	logAIPi → logAGCR
logAIPi	logAGCR	7.687	0.566	1.9	logAGCR ⇄ logAIPi

\* Indicates significance at the 1% level. The number of simulations used is 10,000.

The findings of this study are consistent with those reported by Oluwasola & Alimi (2008), Chandio et al. (2021), and Rizwan et al. (2019). No studies were found that reported contradictory findings.

## CONCLUSION and DISCUSSION

Agriculture is an activity that is carried out to meet the fundamental needs of nutrition and food demand, maintaining its importance for countries through export opportunities as well. Although its share has been partially overtaken by industrial activities compared to past years, the sector continues to preserve its strategic significance today. Establishing a self-sufficient structure is particularly crucial during periods like pandemics, crises, and wars. The sector, which reduces foreign dependency and adds value through the impact of new technologies, holds an indispensable position for nations due to both domestic and international activities. Various resources are utilized for financing, which is one of the most critical needs for businesses operating in the agricultural sector. In this context, agricultural loans are used by farmers to carry out production activities. Many studies have expressed the necessity of creating policies for loans with favorable interest rates and terms. In addition, input prices are another crucial point for farmers. Rising costs also increase prices, leading to difficulties in terms of demand. In this study, a quantitative analysis was conducted on the agricultural sector with a focus on finance and costs using available data. Within this scope, the relationships were identified, and policies for the sector were proposed. For financing, data on agricultural loans were obtained, and for costs, the Agricultural Input Price Index was used. Thus, by determining the relationship between these two variables, commentary on the sector's operations was provided. The fact that limited research has previously been conducted on the Agricultural Input Price Index is one of the original aspects of this study. The aim of the study is to identify the relationship between the two variables and to make financial inferences to promote sectoral development.

This study analyzes the relationship between changes in the value of the Agricultural Input Price Index and the amount of agricultural loans used, from the perspectives of cointegration and causality. The analysis employs fractional-frequency Fourier methods, specifically the Fourier ADL and TY tests, which account for both permanent and temporary structural changes. The findings from the analysis reveal that a 1% increase in the Agricultural Input Price Index leads to a 0.95% and 0.18% rise in the amount of agricultural loans used in the long- and short-run, respectively. This result is supported by the findings from the causality test. In line with these findings, it is clear that both long-run and short-run changes in the prices of inputs used in agricultural production shape the need for agricultural financing from commercial banks. At this juncture, Agricultural Credit Cooperatives, which possess a large organizational network throughout Türkiye and a wealth of experience, should continue to play an active role. They must intervene through their subsidiary companies like Gübretaş, Tareks, and Tarkim to focus on input production and thereby help lower prices. Furthermore, to reduce external dependency on inputs, other private sector organizations that produce inputs should also be encouraged to take an active role in production. It can be argued that supportive and incentive-based government policies (such as support/incentives for energy, investment location, and tax exemptions) would be effective in this regard. This approach would not only provide farmers with access to inputs at lower prices but also minimize the credit risk arising from the continuous use of agricultural loans.

Considering the volatility in agricultural input prices, flexible credit limits indexed to input prices should be established. This will protect farmers from cost shocks. Regional cooperative support funds should be created in different agricultural zones to enable cooperatives to accumulate equity and purchase inputs collectively. To counteract the anticipated annual increases in input costs, predefined fixed-rate subsidies should be introduced to reduce dependency on credit. Another way to lower input costs is to increase efficiency. In this context, government-supported 'smart farming practices' should be promoted. An insurance-based risk-sharing model, integrated into the agricultural credit system, should be developed to protect both farmers and banks against default risks. To increase capacity in input production, investments based on public-private partnerships should be encouraged, such as the state allocating land for the establishment of fertilizer plants in the private sector.

Building on this study, it is recommended to valuable researchers for future work that they investigate the impact of changes in the Agricultural Input Price Index on variables such as the total input consumption in Türkiye.

### **Data Availability**

Data will be made available upon reasonable request.

### **Author Contributions**

Conception and design of the study: BM; sample collection: ÖK; analysis and interpretation of data: ÖK; statistical analysis: ÖK; visualization: BM; writing manuscript: BM.

### **Conflict of Interest**

There is no conflict of interest between the authors in this study.

### **Ethical Statement**

We declare that there is no need for an ethics committee for this research.

### **Financial Support**

This study was not supported by external financing.

### **Article Description**

This article was edited by Section Editor Dr. H. Ece SALALI.

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