



# Global Value Chains for the Turkish Agricultural Sector According to WITS Data

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## Abstract

This study aims to assess the position of Türkiye's agricultural sector within Global Value Chains (GVCs) from 2000 to 2022, using WITS data and the Forwardness Index to identify the nature of Turkish agricultural participation, whether forward, backward, or two side, and determine whether it contributes to enhancing domestic value added or keeps the agricultural economy in a low-return participation loop. The findings reveal that Türkiye's integration remains predominantly backward oriented, with a strong reliance on imported agricultural inputs such as wheat and fertilizers, which are processed domestically and re-exported. In contrast, forward participation, which refers to the use of Turkish agricultural exports in other countries' exports, remains limited, reflecting Türkiye's weak position within the highest-value links of the international production chain. The Index of GVC Upgrading reinforced these findings, revealing that Türkiye's agricultural integration pattern is moving downstream, meaning the country imports more value-added components than it exports. Furthermore, two-way participation remains ineffective, missing out on opportunities to increase access to high-yield markets. The study recommends a set of industrial upgrading policies, including improvements in quality control and certification, support for branding and marketing, enhanced cold chain and packaging systems, and stronger public-private R&D collaboration for boosting Türkiye's forward positioning and achieving deeper integration into higher value-added stages of global agri-food chains.

**Keywords:** Global Value Chains, Türkiye, Forwardness Index, Value-Added Trade, GVC Integration, Agricultural Policy

**Jel Codes:** Q17, Q18, F14

## WITS Verilerine Göre Türk Tarım Sektörü İçin Küresel Değer Zincirleri

### Öz

Bu çalışma, Türkiye'nin tarım sektörünün 2000–2022 yılları arasındaki Küresel Değer Zincirleri'ndeki (GVC) konumunu WITS verileri ve "Forwardness Index" (İleri Yönlü Katılım Endeksi) kullanarak Türk tarımsal katılımının ileri, geri veya iki yönlü olup olmadığını teşhis etmeyi ve yurt içi katma değeri artırmaya katkıda bulunup bulunmadığını veya tarım ekonomisini düşük getirili bir katılım döngüsünde tutup tutmadığını belirlemeyi amaçlamaktadır. Bulgular, Türkiye'nin entegrasyonunun büyük ölçüde geriye dönük (backward) olduğunu, yani bu süreçte buğday ve gübre gibi tarım girdilerinin ithalatına güçlü bir şekilde bağımlı olduğunu göstermektedir. Bu girdiler yurt içinde işlenmekte ve yeniden ihraç edilmektedir. Buna karşılık, ileri yönlü katılım—yani Türk tarım değerinin diğer ülkelerin ihracatında kullanılması—sınırlı kalmakta, bu da Türkiye'nin küresel üretim ağlarının yüksek katma değerli aşamalarıyla zayıf bağlantılara sahip olduğunu göstermektedir. Çalışma, Türkiye'nin daha yüksek katma değerli küresel tarım üretim zincirlerine entegrasyonunu derinleştirmek amacıyla sanayi dönüşümünü hedefleyen politika önerileri sunmaktadır. Bu öneriler arasında kalite kontrol ve sertifikasyon sistemlerinin geliştirilmesi, markalaşma ve pazarlama altyapısının desteklenmesi, soğuk zincir ve ambalajlama kapasitelerinin artırılması ve kamu-özel sektör Ar-Ge iş birliklerinin güçlendirilmesi yer almaktadır.

**Anahtar Kelimeler:** Küresel Değer Zincirleri (KDZ), Türkiye, İleri Yönlü Katılım Endeksi, Katma Değerli Ticaret, KDZ Entegrasyonu, Tarım Politikası

**Jel Kodları:** Q17, Q18, F14

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## INTRODUCTION

The increasing fragmentation of international production over the past decades has affected both trade and production: these activities have become increasingly organized around what are commonly referred to as GVCs. It can be defined as the full range of activities, spread across different countries, involved by firms and workers to move a product from design to final use (Gereffi and Fernandez-Stark, 2011). The proliferation of GVCs has challenged the prevailing view of how trade is viewed and interpreted. Traditional measures of trade measure only the total value of exchanges between partners. They are unable to reveal how foreign producers, at the initial stages of the value chain, are connected to final consumers at the end of the value chain and are no longer an accurate measure of how final demand in importing countries stimulates the production of exporters (WTO, 2019). Türkiye is considered one of the best agricultural countries in the Middle East and Eastern Europe. The agricultural sector is also the most vital economic sector in Türkiye in terms of production and employment. However, its integration into GVCs is very limited compared to its potential. The agricultural sector in Türkiye is considered a family-based sector, meaning there are no multinational companies involved in the agricultural sector in Türkiye. Reports and studies by the Organization for Economic Co-operation and Development (OECD) (2016, 2020, 2023a) indicate that Türkiye's agricultural sector's participation in global value chains is low, both in terms of forward participation (domestic value added used in other countries' exports) and backward participation (foreign inputs used in Turkish exports to other countries). Data published by the World Bank in 2022 (WITS) shows that agricultural product exports are expanding relatively, and Türkiye is considered a downstream country for agricultural products, meaning it relies on backward participation in global value chains for the agricultural sector. Studies conducted by international organizations on the agricultural sector highlight several structural and institutional constraints that hinder Turkish agriculture's deeper integration into global value chains, including: fragmented land ownership and weak cooperatives in terms of land ownership for the household sector (Türker, 2022; OECD, 2011); low investment in research, development, innovation, and agricultural extension services (OECD, 2016); heavy reliance on imported inputs (backward participation) such as fertilizers, seeds, and machinery (FAO, 2020; World Development Bank, 2021); and weak cold chain infrastructure, logistics, and digital tracking (OECD, 2023; FAO, 2020).

Accordingly, one of the most significant research gaps is that Türkiye has not yet achieved a qualitative shift

from agricultural exports, where exports are considered intermediate raw material trade in traditional semi-processed products, to participation in the high-value-added domestic stages of global agricultural value chains. Despite increasing trade openness, most exports still follow the traditional low-value model. Despite Türkiye's strategic location and its large and diverse agricultural base, the country's agricultural sector remains relatively unintegrated into global value chains, particularly at high value-added levels. Between 2000 and 2022, Türkiye showed only modest improvements in its backward, forward, and sideways participation in global value chains, particularly when compared to peer economies such as Poland and Brazil, according to the (World Bank, 2022). Given the largely unintegrated nature of the Turkish agricultural sector, structural constraints, weak technology adoption in the agricultural sector, fragmentation of land in terms of family ownership, challenges related to international trade, gaps in logistics coordination, and weak certification systems, this study aims to analyze the evolution of the Turkish agricultural sector's participation in GVCs from 2007 to 2022. Using WITS data and GVCs growth indicators, this study analyzes the degree of integration in global agri-food production networks and identifies the key economic and institutional factors that enhance Türkiye's position in global value chains.

## LITERATURE REVIEW

Global value chains (GVCs) refer to the "fragmentation of production processes across multiple countries," where inputs, services, and production stages are distributed internationally so that value is added in each country and coordinated through global trade and investment flows (World Bank, 2022). This concept encompasses not only manufacturing but also agriculture, services, and digital processes. It focuses on how value is added at each stage, how countries participate, and how economic development occurs within these transnational networks. They refer to the full range of activities—from design, production, and distribution to marketing and after-sales services—that take place across multiple countries to bring a product or service to the market. The GVC analysis, led by Gereffi and colleagues, focuses on the governance structures and development strategies within these fragmented transnational networks. Reports indicate that Türkiye's participation in global value chains (GVCs) within the agricultural sector shows a structural imbalance. While the absolute size of backward participation—which reflects the use of foreign inputs in agricultural production—has

grown steadily from USD 391 million in 2000 to USD 1,719 million in 2022, forward participation—which represents the value of Turkish agricultural inputs embedded in other countries' exports—remains consistently lower, reaching only USD 1,491 million in 2022. This demonstrates that Türkiye's integration into GVCs is more prominent in upstream activities, such as the import and use of inputs in primary production, than in final processing and re-export. Türkiye remains more of a consumer of foreign agricultural inputs than a significant supplier of value-added intermediates to the global market. While its position is at the bottom of the chain, these patterns indicate that while the country is increasingly involved in international production networks, its functional status remains restricted to low- and medium-value segments (based on the WITS GVC Output Table, 2024; see also the methodology of Koopman et al., 2014 as applied in Demirhan & Warfa, 2020). GVCs in the agricultural and food sectors are characterized by dispersed production networks and high standards of food safety, traceability, and quality certification. In the case of Türkiye, GVC integration is particularly evident in the fruit and vegetable sector, which benefits from the country's favorable climate and strategic location. However, despite ranking tenth in the world in agricultural production, a significant portion of Türkiye's production remains domestically oriented, with only 12% of total agricultural production being exported—mostly as intermediate goods rather than high-value products (Demirhan & Warfa, 2020). Türkiye's study reports on global value chains in the agricultural sector highlight the role of services—such as cold storage, packaging, research and development, and logistics—as key enablers of participation in global value chains. These services contribute significantly to value creation, particularly in perishable product chains. However, Türkiye still faces constraints such as fragmented land ownership, low productivity of smallholder farmers, and significant losses along the value chain due to poor infrastructure (Demirhan and Warfa, 2020; World Bank, 2022).

Tracking GVC participation typically relies on the OECD–WTO Trade in Value Added (TiVA) indicators, which distinguish:

**Backward participation:** the share of foreign value added to a country's gross exports.

**Forward participation:** the domestic value added that is embodied in other countries' exports.

A growing body of empirical literature confirms that deeper integration into Global Value Chains (GVCs) can significantly enhance agricultural competitiveness. Białowas and Budzyńska (2022) highlight that a higher share of foreign value added (FVA) in agricultural exports

is associated with stronger export performance among developing economies. Similarly, Miroudot and Cadestin (2017) emphasize that broad participation across both domestic and foreign value-added stages supports long-term economic gains. In Türkiye's case, recent World Bank (2022) data reveal an important nuance: while total GVC-related output in agriculture rose from 3.7% in 2000 to approximately 7.5% in 2022, the composition remains skewed. Specifically, pure backward participation (FVA) reached 1,719 million USD in 2022, surpassing forward participation (1,491 million USD). This trend indicates that Türkiye's integration is tilted toward importing agricultural inputs (e.g., seeds, fertilizers, machinery) rather than embedding its domestic value added into downstream global exports. The World Bank further confirms that most GVC-related activities remain upstream, reflecting Türkiye's position in semi-processed and bulk commodity supply chains (e.g., flour, pasta, dried fruits). Despite positive developments, both the OECD (2016) and IsDB (2020) argue that structural constraints—such as small farm sizes, limited certification systems, and weak cold chain logistics—continue to limit Türkiye's potential to move into higher-value segments of agri-food GVCs.

Studies by the OECD (2016) and the Islamic Development Bank (2020) highlight several institutional and structural barriers that continue to limit Türkiye's effective participation in Global Value Chains (GVCs), particularly in the agricultural and agri-food sectors. The fragmented land holdings remain a critical structural problem. The predominance of small-scale, subsistence-oriented farms limits productivity growth and prevents economies of scale, which are essential for meeting global quality standards and efficiency benchmarks (Islamic Development Bank, 2020). According to the report, the sector is dominated by low-value, commodity fruits and vegetables, and the concentration of production in just a few provinces increases vulnerability to climatic and market shocks. The agricultural productivity per worker in Türkiye lags peer countries, in part due to outdated infrastructure, such as inefficient irrigation systems, post-harvest losses, and insufficient cold storage facilities. The OECD (2016) emphasized that the limited adoption of modern technologies and mechanization exacerbates the productivity gap between smallholders and commercial farms, weakening Türkiye's ability to compete internationally. The research and development (R&D) ecosystem remain weakly connected to the farming community. The limited transfer of innovation, combined with poor compliance with international quality and safety standards, inhibits the functional upgrading of the agri-food sector into higher-value activities like food processing or branded exports (OECD, 2016;

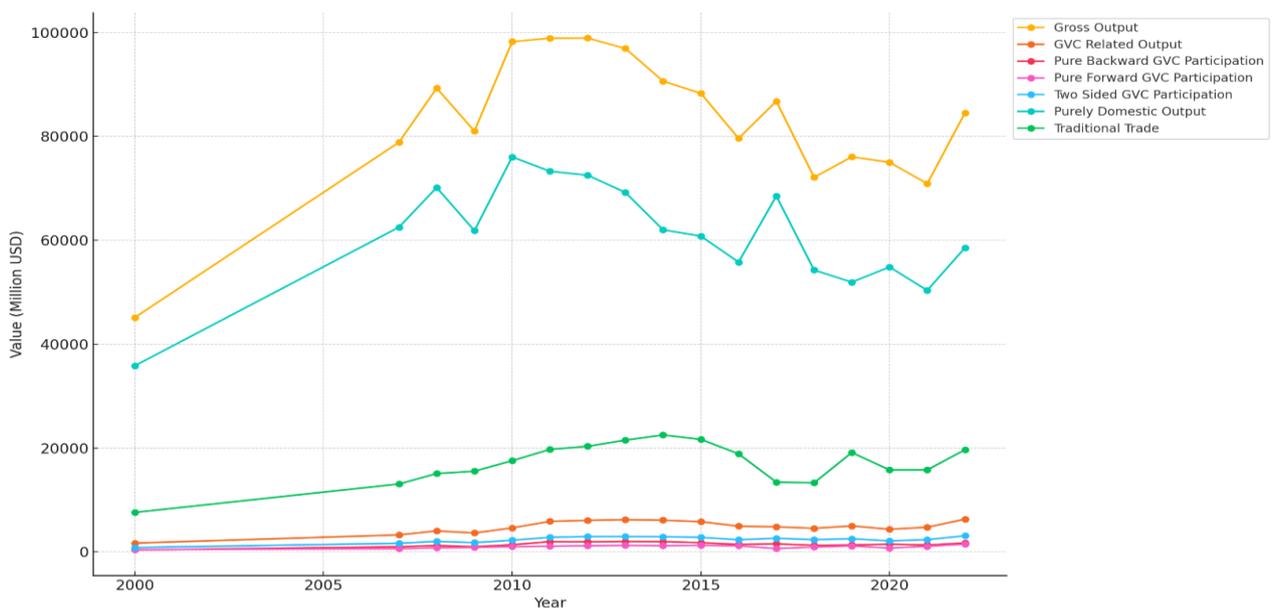
IsDB, 2020). The market concentration and limited diversification in export destinations are additional GVC constraints. A large share of Turkish fresh fruit and vegetable exports go to a narrow set of countries—primarily Iraq, Russia, and Syria—which increases the sector’s exposure to geopolitical and demand-side risks (IsDB, 2020).

### TRENDS IN TRADE ALONG GLOBAL VALUE CHAINS: TÜRKIYE’S POSITION IN THE AGRICULTURAL SECTOR<sup>1</sup>

Türkiye’s agricultural sector has demonstrated a steady increase in integration with global value chains (GVCs)

over the past two decades. Gross agricultural output more than doubled between 2000 and 2011, rising from USD 45.1 billion to nearly USD 98.9 billion, reflecting major structural transformation and growing productivity. Although output declined after 2016 due to currency fluctuations and global shocks, the sector recovered by 2022, reaching USD 84.5 billion. In parallel, GVC-related output—representing the portion of agricultural production linked to global supply chain rose significantly from USD 1.7 billion in 2000 to over USD 6.3 billion in 2022.

**FIGURE 1** Türkiye’s Agricultural Sector Output Breakdown by GVC Participation (2000–22)



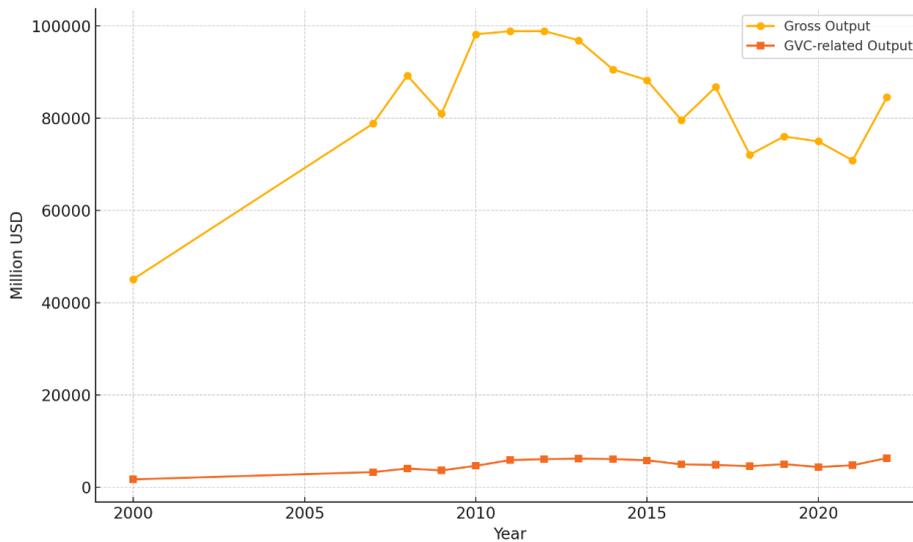
**Note:** Author’s own calculation based on: World Bank. (2024). GVC Output Table – Agriculture Sector, Türkiye (2000–2022). Retrieved from <https://wits.worldbank.org/gvc/gvc-output-table.html>

This steady growth suggests increasing internationalization and processing activities within the Turkish agri-food system. Despite this progress, the share of GVC-related output in total gross output remains modest, indicating that while Türkiye is participating more in global agri-food value chains, it still lags in transitioning toward

higher value-added stages such as branded and consumer-ready products. The trend underscores the need for enhanced integration policies focusing on logistics, quality standards, and certification systems to further embed Turkish agriculture within complex international production networks.

<sup>1</sup> **Data Source:** This study adopts a quantitative analytical methodology based on secondary data sourced from the World Bank’s WITS platform, specifically the “GVC Output Table – Agriculture Sector, Türkiye (2000–2022).” This dataset provides annual values in million USD for Türkiye’s agricultural sector output, disaggregated by types of Global Value Chain (GVC) participation, including backward, forward, two-sided participation, traditional trade, and purely domestic output. The analysis focuses on the period from 2007 to 2022 due to incomplete data before 2007, allowing for the examination of structural

trends and cyclical fluctuations linked to major events such as the 2009 global financial crisis, the 2016 Turkish lira crisis, and the COVID-19 pandemic in 2020. The data were analyzed using statistical tools and visual techniques such as line charts and a quadrant-based mapping to assess annual performance patterns. GVC participation rates were calculated as percentages of total gross output. The findings were contextualized with relevant political and institutional developments to explain changes in Türkiye’s position within global agricultural value chains and to highlight key strengths and constraints.

**FIGURE 2** Trends in Gross Agricultural Output and GVC-Related Output in Türkiye (2000-22)

**Source:** World Bank. (2024). GVC Output Table. World Integrated Trade Solution (WITS).

Available at: <https://wits.worldbank.org/gvc/gvc-output-table.html>

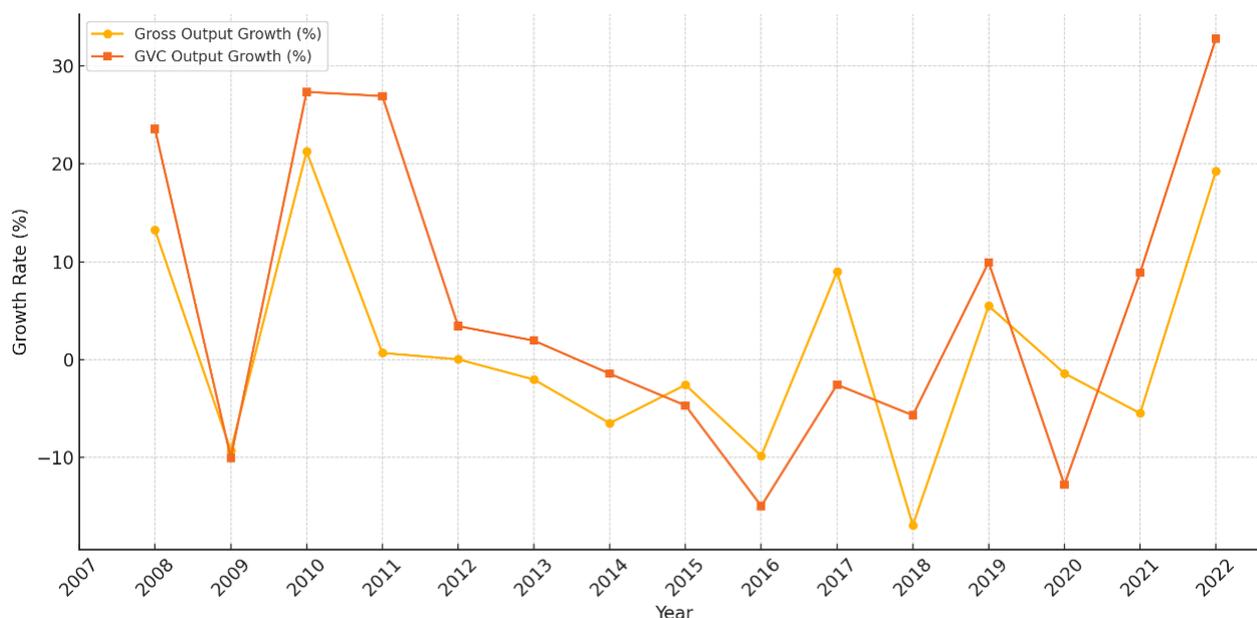
### GROWTH TRENDS IN GVC-RELATED OUTPUT IN TURKISH AGRICULTURE (2007–2022)

Between 2007 and 2022, Türkiye’s agricultural sector exhibited a consistent upward trend in GVC-related output, indicating a deepening integration into global value chains. Starting from USD 3.27 billion in 2007, GVC-related output grew steadily to reach USD 6.31 billion in 2022—an increase of over 93% in fifteen years. This expansion was particularly notable during periods of global and domestic transformation, including recovery from the 2009 financial crisis and adjustments to trade dynamics following the COVID-19 pandemic.

Despite intermittent slowdowns—such as the declines observed around 2015–2017 due to exchange rate volatility and regional trade disruptions—the overall trajectory demonstrates resilience and growing participation in international agri-food supply chains. Importantly, the

consistent year-on-year rise in value-added trade through processing and re-exporting highlights Türkiye’s evolving role not only as a raw goods exporter but also as a semi-processed goods provider within regional value networks.

However, while the growth in absolute terms is significant, GVC-related output still represents a relatively small proportion of total agricultural output. This suggests untapped potential for Türkiye to scale up its participation in higher-value chain segments, particularly through branding, innovation, and market diversification. To realize this potential, targeted policy support is essential—especially in upgrading logistics infrastructure, improving compliance with global standards, and fostering agri-processing capacity.

**FIGURE 3** Growth Rates of Gross Agricultural Output and GVC-Related Output in Türkiye (2007–2022)

**Source:** Author's calculations based on data from the World Bank – GVC Output Table, World Integrated Trade Solution (WITS). Available at: <https://wits.worldbank.org/gvc/gvc-output-table.html>

### TÜRKIYE'S EVOLVING ROLE IN GLOBAL AGRICULTURAL VALUE CHAINS: TRENDS IN BACKWARD, FORWARD, AND TWO-SIDED PARTICIPATION (2000–2022)

Between 2000 and 2022, Türkiye witnessed substantial growth in its integration into Global Value Chains (GVCs) in agriculture. Pure backward participation—the share of foreign value added in Türkiye's agricultural exports—increased significantly from USD 391 million in 2000 to approximately USD 1.72 billion in 2022. This sustained growth highlights Türkiye's rising dependence on imported agricultural inputs such as seeds, fertilizers, pesticides, and mechanized equipment, predominantly sourced from strategic partners like Russia and Ukraine. Such reliance is especially notable in wheat imports, which are processed domestically and then re-exported in the form of flour, pasta, and other semi-finished food products—a pattern emphasized in the World Bank and Islamic Development Bank reports.

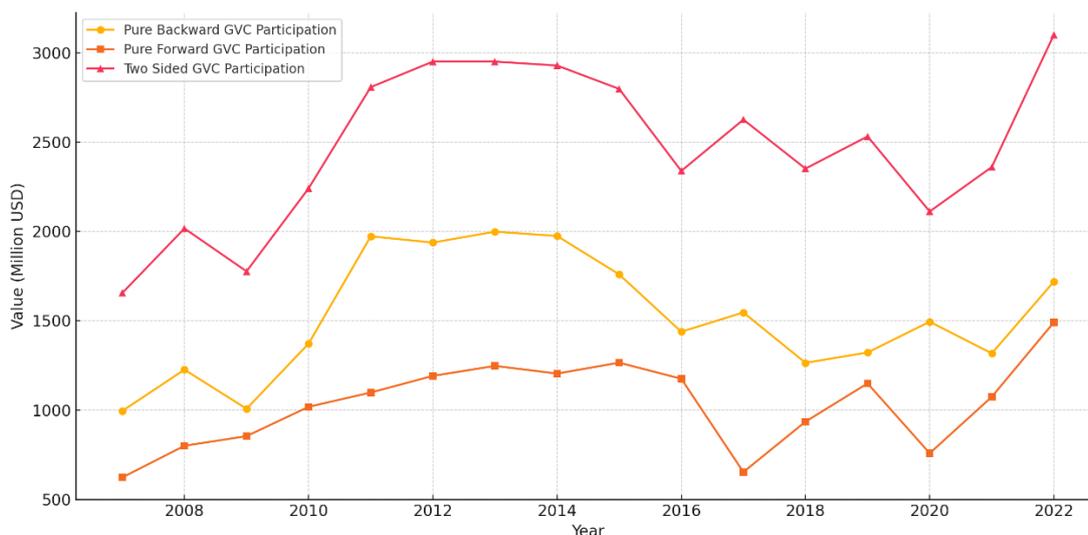
Forward participation—the domestic value added that is incorporated into other countries' exports—also expanded from USD 454 million to USD 1.49 billion over the same period. Although this indicates Türkiye's growing involvement in supplying intermediate agricultural goods to international markets, its forward participation remains relatively lower than that of top OECD exporters. This

reflects structural constraints, such as fragmented landholdings, insufficient investment in branding and packaging, and gaps in traceability infrastructure, all of which hinder Türkiye's ability to climb the value chain and engage in more sophisticated downstream activities.

Most notably, the two-sided GVC participation—which reflects the simultaneous engagement in both backward and forward linkages—nearly quadrupled from USD 847 million in 2000 to USD 3.1 billion in 2022. This expansion underscores Türkiye's evolving role as a regional processing and logistical hub for the agri-food sector, especially for markets in Europe and the Middle East. The country's strategic geographic location, coupled with an extensive transport network and trade agreements with neighboring regions, reinforces this position.

However, as both the World Bank (2022) and IsDB (2020) reports suggest, this upward trend should be interpreted with caution. While numerical participation has improved, Türkiye still faces challenges in functional upgrading—transitioning from low- and mid-value stages to high-value-added segments such as branded, ready-to-eat products and certified organic goods. To fully capitalize on GVC integration, policy reforms must prioritize quality certification, cold chain development, and digital traceability tools to enhance both export diversification and value retention within the domestic economy.

**FIGURE 4** Trends in Türkiye’s Agricultural GVC Participation (2007–2022)



Source: Constructed by the author using data from World Bank – WITS GVC Output Table (2024).

**GROWTH TRENDS IN TÜRKİYE’S AGRICULTURAL GVC PARTICIPATION (2008–2022)<sup>2</sup>**

The line chart in **Figure 5** highlights the dynamic evolution of Türkiye’s participation in global value chains (GVCs) within the agricultural sector from 2008 to 2022, measured across three key dimensions: **pure backward participation**, **pure forward participation**, and **two-sided participation**. The trends reveal a distinct pattern of expansion and adjustment in Türkiye’s integration with international agri-food production networks. Over the period, **pure backward participation**—which reflects Türkiye’s reliance on foreign inputs for its agricultural exports—grew significantly, particularly between 2008 and 2012, with an average annual growth rate of 15.3%. This growth aligns with Türkiye’s strategy of importing key inputs like wheat and fertilizers from global suppliers (notably Russia and Ukraine), processing them domestically, and re-exporting semi-processed products (World Bank, 2022;

Demirhan & Warfa, 2020). However, the indicator exhibited volatility post-2016 due to geopolitical shocks and currency instability, pointing to the sensitivity of backward participation to external market fluctuations. **Forward participation**, indicating Türkiye’s domestic agricultural value added embedded in the exports of other countries, showed a slower but steady increase. While its average growth was more modest (6.9%), the upward trend reflects Türkiye’s strengthening role in regional processing chains, albeit still below OECD averages in terms of value-added sophistication (World Bank, 2022). **Two-sided GVC participation**—the most comprehensive measure—displayed overall growth, with a notable dip during 2017–2020 likely linked to domestic structural inefficiencies and rising trade protectionism. The rapid recovery in 2021–2022 underscores Türkiye’s resilience and its expanding function as a regional processing and re-export hub, especially toward Europe and the Middle East.

<sup>2</sup> **1. GVC Participation Rate (%)**: Measures the share of agricultural output linked to global value chains:

$$\text{GVC Participation Rate} = \frac{\text{GVC Related Output}}{\text{Gross Output}} \times 100$$

**2. Backward Participation Ratio (%)**: Represents the share of foreign value-added (FVA) in Türkiye’s agricultural exports:

$$\text{Backward Participation Rate} = \frac{\text{Pure Backward Participation}}{\text{Gross Output}} \times 100$$

**3. Forward Participation Ratio (%)**: Represents the share of domestic value-added in Turkish exports used in other countries’ exports:

$$\text{Forward Participation Rate} = \frac{\text{Pure Forward Participation}}{\text{Gross Output}} \times 100$$

**4. Two-Sided Participation Ratio (%)**: Represents the share of output both using foreign inputs and serving as inputs in others’ exports:

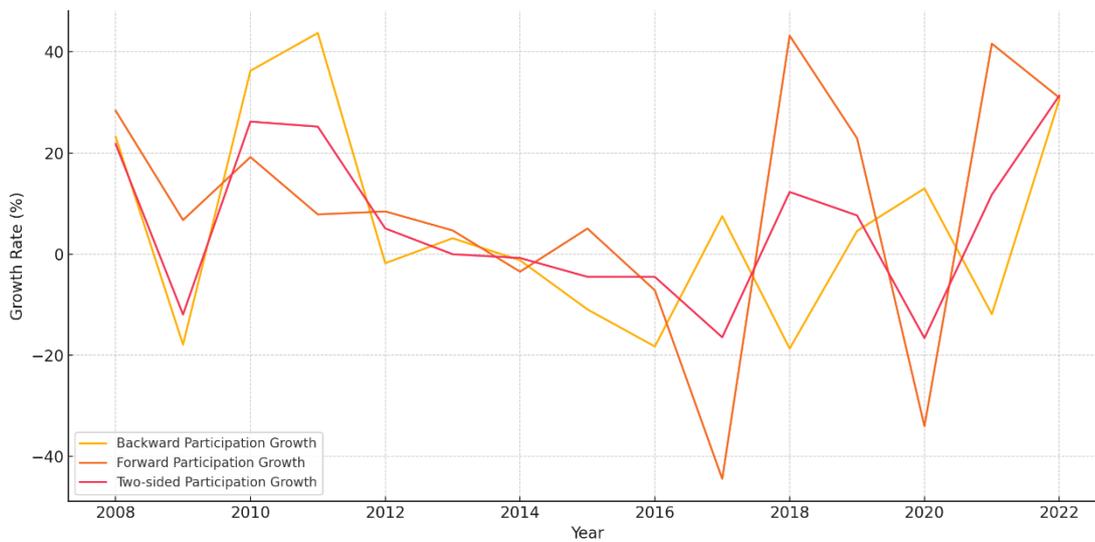
$$\text{Two-Sided Participation Rate} = \frac{\text{Two - Sided GVC Participation}}{\text{Gross Output}} \times 100$$

**5. Domestic Orientation Rate (%)**: Represents the share of production that is consumed domestically and not integrated into GVCs:

$$\text{Purely Domestic Rate} = \frac{\text{Purely Domestic Output}}{\text{Gross Output}} \times 100$$

**6. Traditional Trade Share (%)**: Represents exports that are final goods not involved in multi-stage global production:

$$\text{Traditional Trade Rate} = \frac{\text{Traditional Trade}}{\text{Gross Output}} \times 100$$

**FIGURE 5** Growth Rates of GVC Participation Components in Turkish Agriculture (2008–2022)

**Source:** Author's calculations based on World Bank – WITS GVC Output Table.

Overall, the chart illustrates that while Türkiye has deepened its involvement in GVCs, particularly through backward linkages, forward integration remains a critical area for policy improvement. Enhancing technological capabilities, upgrading cold chain infrastructure, and aligning with international quality standards are essential to shift from mid-stream processing to higher value-added export roles (Demirhan & Warfa, 2020; World Bank, 2022).

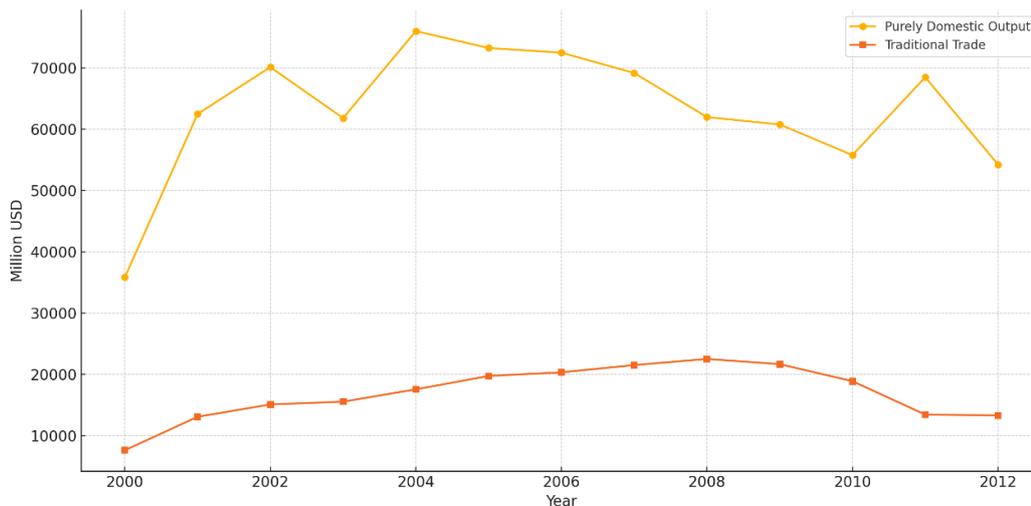
### TRENDS IN DOMESTIC OUTPUT AND TRADITIONAL TRADE IN TURKISH AGRICULTURE

The line chart in Figure 6 highlights the evolution of purely domestic agricultural output and traditional trade (gross exports and imports not linked to value chains) in Türkiye from 2000 to 2012. Purely domestic output grew steadily from USD 35.8 billion in 2000 to a peak of USD 76 billion in 2010, before gradually declining to USD 54.2 billion in 2012. This trajectory indicates that while internal agricultural production initially experienced strong growth, the post-2010 period was marked by volatility,

possibly due to external shocks, domestic inflation, and structural bottlenecks in land use and input efficiency.

Simultaneously, traditional trade volumes rose from USD 7.6 billion in 2000 to over USD 22.5 billion by 2014, reflecting Türkiye's expanding agricultural export activities. However, the concurrent rise in trade and domestic output did not necessarily indicate deeper integration into global value chains. According to the World Bank (2022), Türkiye's agri-food sector is still largely characterized by midstream processing and a reliance on raw input exports, which limits its ability to capture higher value-added activities. Demirhan & Warfa (2020) further underscore that traditional trade in Türkiye remains less dynamic compared to GVC-linked trade, suggesting that agricultural exports are often constrained to commodity-based trade rather than being embedded in complex, multi-country production networks.

This pattern highlights the importance of transitioning from traditional trade models to GVC-oriented strategies that prioritize certification, logistics, and branding to unlock higher-value segments of global agricultural markets.

**FIGURE 6** Trends in Purely Domestic Output and Traditional Agricultural Trade in Türkiye (2000–2012)

**Source:** Author's compilation based on World Bank (2024), World Integrated Trade Solution (WITS) – GVC Output Table. Retrieved from <https://wits.worldbank.org/gvc/gvc-output-table.html>

### FORWARDNESS INDEX AND TÜRKIYE'S AGRICULTURAL SECTOR POSITIONING WITHIN GVCs<sup>3</sup>

The **Forwardness Index** provides a comprehensive and synthetic approach to evaluating the **primary mode of participation** by which a country or sector engages in **Global Value Chains (GVCs)**. Rather than merely measuring the volume of integration, it captures the directionality of value chain involvement—whether a country participates more **upstream**, by supplying intermediate goods that are embedded in other countries' exports (forward participation), or **downstream**, by importing inputs to produce exports (backward participation) (Borin et al., 2021).

This index has significant analytical power as it aligns closely with other well-established measures in the literature, such as “**Upstream**”, “**Downstream**”, and “**positioning**”. These measures have been extensively developed in the works of **Antràs and Chor (2019)** and **Wang et al. (2017)** and were systematized in a comprehensive

database compiled by **Mancini et al. (2024)** based on Inter-Country Input-Output (ICIO) tables.

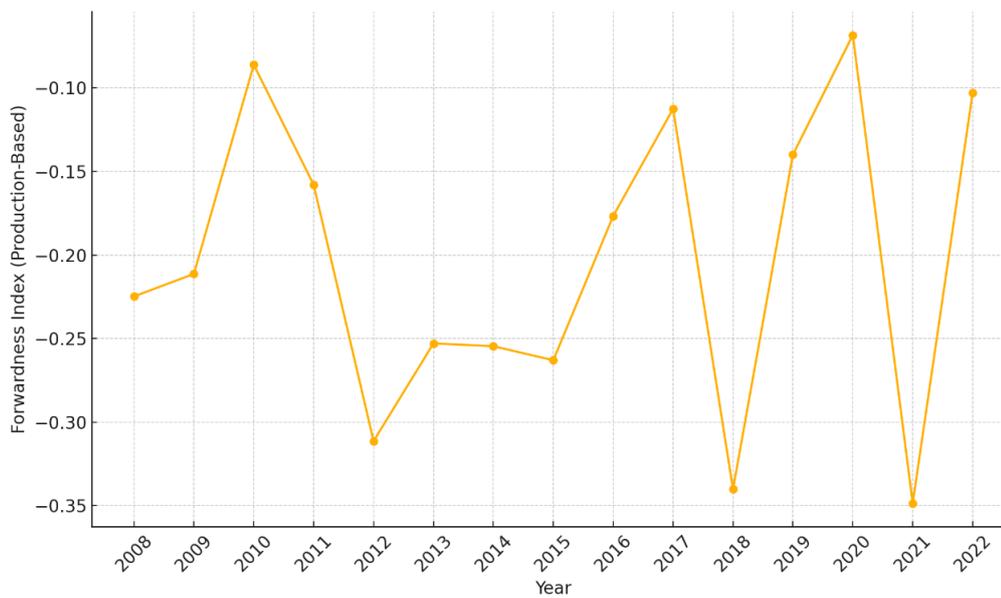
It is reassuring to observe that the forwardness index correlates strongly and positively with these established positioning metrics. This suggests that the index is a valid proxy for assessing a country's or sector's place in the global production network. Moreover, its intuitive interpretation—bounded between -1 and +1, and neutral (zero) at the global average—makes it particularly effective for comparative and policy analysis.

By integrating both the **extent of GVC participation** and the **dominant mode of engagement**, the forwardness index facilitates a nuanced understanding of global production dynamics. It serves as an accessible yet powerful tool for assessing sectoral upgrading, regional integration potential, and the strategic role of countries like Türkiye in international value chains.

<sup>3</sup> The **Forwardness Index** is designed to evaluate whether a specific sector in each country is more involved in **Global Value Chains (GVCs)** through backward participation (i.e., relying on foreign inputs for its exports) or forward participation (i.e., domestic value added being embedded in other countries' exports). It is calculated using the following formula:

$$\text{Forwardness Index} = \frac{\text{Pure Forward GVC Participation} - \text{Pure Backward Participation}}{\text{Total GVC Participation}}$$

The index ranges from -1 to +1: A negative value indicates stronger backward participation (dependency on foreign inputs). A positive value implies stronger forward participation (domestic inputs used in foreign exports). A value of zero implies a balance, which is the global average.

**FIGURE 7** Forwardness Index of Türkiye's Agricultural Sector (2008–2022)

**Source:** Author's calculations based on data from the World Bank WITS GVC Output Table (2024): <https://wits.worldbank.org/gvc/gvc-output-table.html> and methodology adapted from Borin & Mancini (2024).

From 2008 to 2022, Türkiye's forward participation index in GVCs remained negative or close to zero, reflecting a heavy reliance on backward participation. In other words, Türkiye relies primarily on imports of agricultural inputs, such as wheat, fertilizers, and seeds, from countries such as Russia, Ukraine, and Kazakhstan (World Bank, 2022).

Despite some slight improvement in forward participation, in terms of the domestic value added of the Turkish agricultural sector in other countries' exports, Turkish agricultural sector exports are mostly for direct consumption and are rarely used as inputs in global value chains (Ziemann & Guérard, 2017). This has implications for the absence of the Turkish agricultural sector from international markets in terms of advanced agricultural inputs for other countries' exports, such as improved seeds or specialized components in production processes. This requires international superiority in the field of agricultural technology. The continued reliance on backward participation in value chains demonstrates that Turkey has not yet been able to advance to more advanced stages of the agricultural value chain. This reality masks significant untapped opportunities, such as developing end-consumer-oriented agricultural exports, strengthening ties with multinational agricultural companies, and entering advanced sectors such as packaged organic foods or technology-based food products.

## CONCLUSION AND POLICY RECOMMENDATIONS

The Forwardness Index is a composite analytical tool developed by (Borin and Mancini, 2024) to identify countries' structural positioning patterns in GVCs by comparing forward (upstream) and backward (downstream) participation. Backward participation refers to a country's use of imported inputs (intermediate inputs) in the production of its exports. In other words, the higher the foreign content of exports, the higher the backward participation. Forward participation refers to a country's export of intermediate inputs (such as agricultural or industrial components) that are then used in other countries' exports. That is, domestic value added enters GVCs via intermediate exports. (World Bank; Borin et. al., 2021). In the case of the Turkish agricultural sector, an analysis of the Progress Index for the period 2008–2022 reveals a stable structural pattern of backward participation, with the index remaining negative or close to zero throughout the period. This shows that Turkish agricultural exports are highly dependent on foreign inputs, particularly wheat, fertilizers, and seeds, which are mostly imported from Russia, Ukraine, and Kazakhstan (World Bank, 2022). These inputs are converted into semi-finished products such as wheat flour and pasta, reflecting Türkiye's role as a regional processing and distribution hub in agricultural value chains, without moving to higher-yield stages such as design, product development, or brand expansion (Gereffi & Fernandez-Stark, 2016). Although there has been a slight improvement in forward participation,

measured by the contribution of Turkish value added to other countries' exports, this improvement remains limited. Turkish agricultural exports are often directed for direct consumption and rarely used as inputs into global production chains for subsequent re-export. This compares unfavourably with countries such as the Netherlands or Germany, which export high-tech agricultural products such as improved seeds or specialized food ingredients (OECD, 2023; Mertens & Swinnen, 2012).

According to the Islamic Development Bank (2021) report, the analysis results support it report, which states that Turkish agricultural exports are concentrated in products with low to medium value added. This reflects Türkiye's position in the middle or low stages of global value chains. Domestic value added is often high in the final stages of agricultural production, particularly in terms of innovation. This is due to low investment in research and development (R&D) and limited use of modern technologies in agricultural systems. These factors contribute to limiting the ability to contribute forward to value chains, as Turkish agricultural products are difficult to integrate into foreign production systems as strategic inputs. Furthermore, the geographic orientation of Turkish agricultural exports, which are heavily focused on Middle Eastern and North African markets, reveals limited forward participation. These markets tend to import basic processed food commodities, rather than re-export markets, limiting

Türkiye's opportunities to penetrate the initial links of global value chains. Finally, both this report and the current analysis point to a coordination gap between agricultural, trade, and industrial policies. Despite the development of Türkiye's manufacturing infrastructure, these developments have not translated into effective strategies to promote advancement in agricultural value chains, whether through branding, quality certification, or innovation in agricultural biotechnology.

Evidence suggests that the Turkish agricultural sector continues to play a pivotal role in global value chains, but within the confines of regional processing stages with limited added value. To strengthen Türkiye's position, a comprehensive vision for upgrading value chains must be adopted, based on: Stimulating agricultural innovation and research and development in biotechnology and food safety. Improve marketing, packaging, and cold chain infrastructure to enable the export of high-quality fresh produce. Supporting the establishment of national agricultural brands and linking them to targeted international markets. Encouraging partnerships with global food companies to facilitate technology transfer and increase supply chain collaboration. These measures represent essential steps to transform Türkiye from a mere intermediate processing centre to an advanced player in the production and trade of high-value agricultural products within GVCs.

**TABLE 1** GVC Output Table – Agriculture Sector, Türkiye (2000–2020) Million Dollar

	Gross Output	GVC related Output	Pure backward GVC Participation	Pure forward GVC Participation	Two sided GVC Participation	Purely Domestic Output	Traditional Trade
2000	45,131	1,692	391	454	847	35,836	7,603
2007	78,858	3,272	995	623	1,655	62,514	13,071
2008	89,291	4,042	1,226	800	2,016	70,161	15,088
2009	81,016	3,637	1,007	854	1,776	61,844	15,536
2010	98,231	4,631	1,372	1,018	2,241	76,046	17,554
2011	98,898	5,877	1,972	1,098	2,807	73,285	19,735
2012	98,929	6,078	1,937	1,191	2,950	72,522	20,329
2013	96,920	6,196	1,998	1,247	2,950	69,208	21,516
2014	90,627	6,107	1,974	1,204	2,928	62,005	22,515
2015	88,293	5,821	1,759	1,265	2,797	60,804	21,668
2016	79,622	4,951	1,438	1,175	2,338	55,792	18,880
2017	86,780	4,824	1,546	653	2,625	68,521	13,434
2018	72,112	4,550	1,264	935	2,351	54,268	13,293
2019	76,067	5,002	1,322	1,149	2,531	51,933	19,132
2020	75,005	4,363	1,494	758	2,111	54,856	15,785
2021	70,897	4,751	1,317	1,074	2,360	50,351	15,795
2022	84,548	6,309	1,719	1,491	3,100	58,572	19,666

Source: World Bank. (2024). GVC Output Table. World Integrated Trade Solution (WITS). Retrieved from <https://wits.worldbank.org/gvc/gvc-output-table.html>

This table presents all GVC Output variables related to Türkiye's agricultural sector in absolute values (in million USD). It includes gross output, GVC-related output, forward and backward participation, two-sided participation, purely domestic output, and traditional trade flows.<sup>4</sup>

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#### <sup>4</sup> Economic Interpretation of GVC Variables

**Gross Output** Represents the total agricultural production in Türkiye, including the entire value of goods produced within the year for both domestic consumption and export. **Economic Relevance:** It is a core indicator of the sector's scale. An increase reflects expanded agricultural activity and the sector's capacity to meet local and international demand. It serves as the basis for calculating GVC integration ratios.

**GVC Related Output:** This is the portion of agricultural production that is directly linked to Global Value Chains (GVCs), whether through imported inputs or outputs that are used in subsequent stages of international production.

**Economic Relevance:** A higher value suggests deeper integration into GVCs, which may enable access to larger markets, improved efficiency, and increased opportunities for technological upgrading.

**Pure Backward GVC Participation:** Refers to foreign value added (e.g., imported seeds, fertilizers, machinery) that is incorporated into Turkish agricultural exports.

**Economic Relevance:** Indicates the degree of reliance on imported inputs. While it may signal exposure to global supply shocks, it also reflects a certain level of sophistication and global interconnectedness in production.

**Pure Forward GVC Participation:** Captures the domestic value added in Türkiye that is embedded in exports from other countries—i.e., Türkiye supplies intermediate inputs used further along in global production chains. **Economic Relevance:** This reflects Türkiye's upstream position in GVCs. A high value means that Turkish agricultural outputs are essential inputs in downstream global processing, often associated with higher strategic importance.

**Two-Sided GVC Participation:** Describes cases where Türkiye imports input, processes them, and then exports the output to be used in another country's exports.

**Economic Relevance:** This is the most complex form of participation, showing Türkiye's role as an intermediate processing hub. High values suggest strong integration and centrality within regional or global value networks.

**Purely Domestic Output:** Represents agricultural output consumed or utilized entirely within Türkiye, without any GVC or trade involvement.

**Economic Relevance:** Signifies reliance on the domestic market. A high share may reflect limited global integration, while a decline in this value accompanied by a rise in GVC-related output suggests a transition toward an outward-oriented production system.

**Traditional Trade:** Refers to direct exports of final agricultural goods that are not embedded in multistage GVCs (fresh apples or tomatoes exported without further transformation).

**Economic Relevance:** Represents basic trade in raw or lightly processed goods, without participation in complex global supply chains. While it brings revenue, it often limits local value addition and innovation potential.

**General Conclusion:** Participation in GVCs—whether backward, forward, or two-sided—is a strong indicator of structural transformation in agriculture. Countries that are more deeply integrated in GVCs tend to benefit from technology transfer, greater efficiency, and market expansion. Türkiye is showing growing importance as a processing and transit node in agricultural value chains but still faces the challenge of moving further up the chain into higher-value, branded, and consumer-ready exports.

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