Galt & Taggart's Agricultural Development Index

Methodological Note

The Agricultural Development Index (ADI) is a composite indicator designed to track the evolution of Georgia's agricultural sector over time.

The index is constructed by aggregating nine key indicators of sector activity, enabling:

- Assessment of overall trends and cyclical dynamics in agriculture;
- Identification of key growth drivers (e.g. productivity, price dynamics, investments, etc.);
- Detection of constraints limiting growth (e.g. low efficiency, infrastructure or technological challenges).

The ADI provides a consistent analytical framework for evaluating sector progress, reduces fragmented interpretation of individual indicators, and ensures comparability over time.

Index structure

Galt & Taggart's Agricultural Development Index for Georgia combines nine indicators across three thematic pillars:

- Productivity
- Price stability
- Investment

Each pillar includes three indicators, resulting in a total of nine indicators that collectively capture sector dynamics and provide a comprehensive assessment of agricultural sector development.

Table 1. Indicators included in the ADI		
Section	**Indicator**	**Content / Interpretation**
Productivity	Yield of annual crops per hectare	Annual crops include: wheat, barley, maize, potatoes, and vegetables.
	Livestock productivity per unit	Livestock products include: meat, milk, eggs, wool, and honey.
	Labor productivity	Real value added generated per employed person in the agricultural sector
Price Stability	Food price stability	The inverted standard deviation of food prices is used; lower volatility corresponds to a better index outcome.
	Farm-gate prices	The price paid by the buyer when purchasing directly from the farmer; includes both annual and permanent crops, as well as livestock products.
	Intermediate input costs	The share of intermediate input costs in total agricultural output. This indicator is inverted; an increase reflects lower costs per unit of output.
Investment	Capital expenditure per hectare	Capital expenditure includes both private and public investment, measured per hectare of total cultivated area, covering both annual and permanent crops.
	Execution rate of agricultural budget programs	The overall execution rate of government-funded agricultural programs.
	hare of agriculture in total government expenditure	The share of agricultural funding in total government expenditure.

Due to data availability, the Agricultural Development Index is calculated for the period 2017–2024. All indicators included in the index are expressed in index form, with 2022 set as the base year.

Weight determination

To determine the weights of the nine indicators included in Galt & Taggart's Agricultural Development Index (ADI), Principal Component Analysis (PCA) is applied. This method ensures that weights are data-driven rather than subjective, allowing the data itself to identify which indicators are most important in explaining the overall dynamics of the sector.
In the first stage, all indicators are standardized to ensure comparability across variables measured in different units:

$$Z_{t,j} = \frac{X_{t,j} - \bar{X}_j}{s_j}$$

where $X_{t,j}$ is the value of indicator j in year t, $\bar{X}_j$ is its mean, and s_j is its standard deviation.
Next, a covariance matrix is constructed based on the standardized data, capturing the extent to which the indicators included in the index move together. The objective of PCA is to identify a vector of weights that maximizes the explained joint variation. The first principal component is defined as a linear combination of the standardized indicators:

$$PCA_{1,t} = \sum_{j=1}^{9} \omega_j Z_{t,j}$$

where ω_j represents the loading of each indicator. This vector is obtained by solving the following optimization problem:

$$w = \arg \underbrace{\max}_{\|w\|=1} Var(Zw)$$

In other words, PCA selects weights that maximize the variance of the first principal component. In practical terms, this means that the first component[1] captures the common dynamics across the indicators and can be interpreted as the „overall performance factor" of the agricultural sector.

The loadings obtained from PCA are then transformed into index weights using the following formula:

$$\widetilde{\omega}_j = \frac{|\omega_j|}{\sum_{k=1}^{9} |\omega_k|}$$

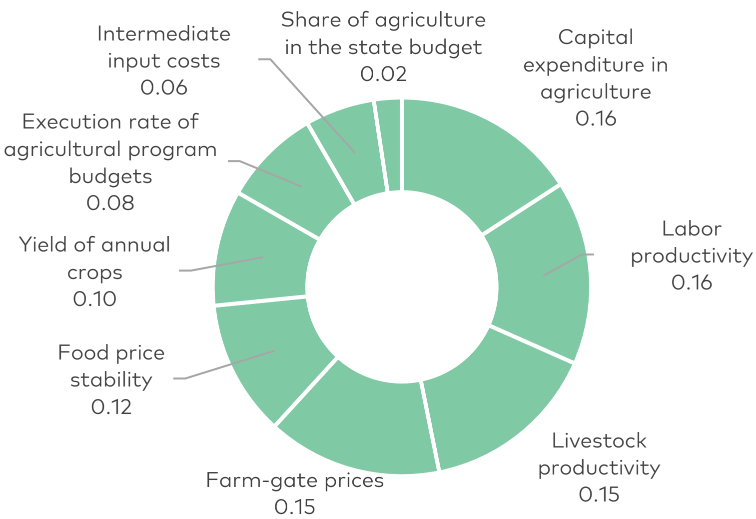
The resulting weights sum to 1, with higher weights assigned to indicators that are more closely associated with the overall dynamics of the sector.

The ADI is then calculated as follows:

$$ADI_t = \sum_{j=1}^{9} \widetilde{\omega}_j I_{t,j}$$

where $I_{t,j}$ is the index value of the corresponding indicator.
The resulting weights of the indicators included in the Agricultural Development Index are given below.

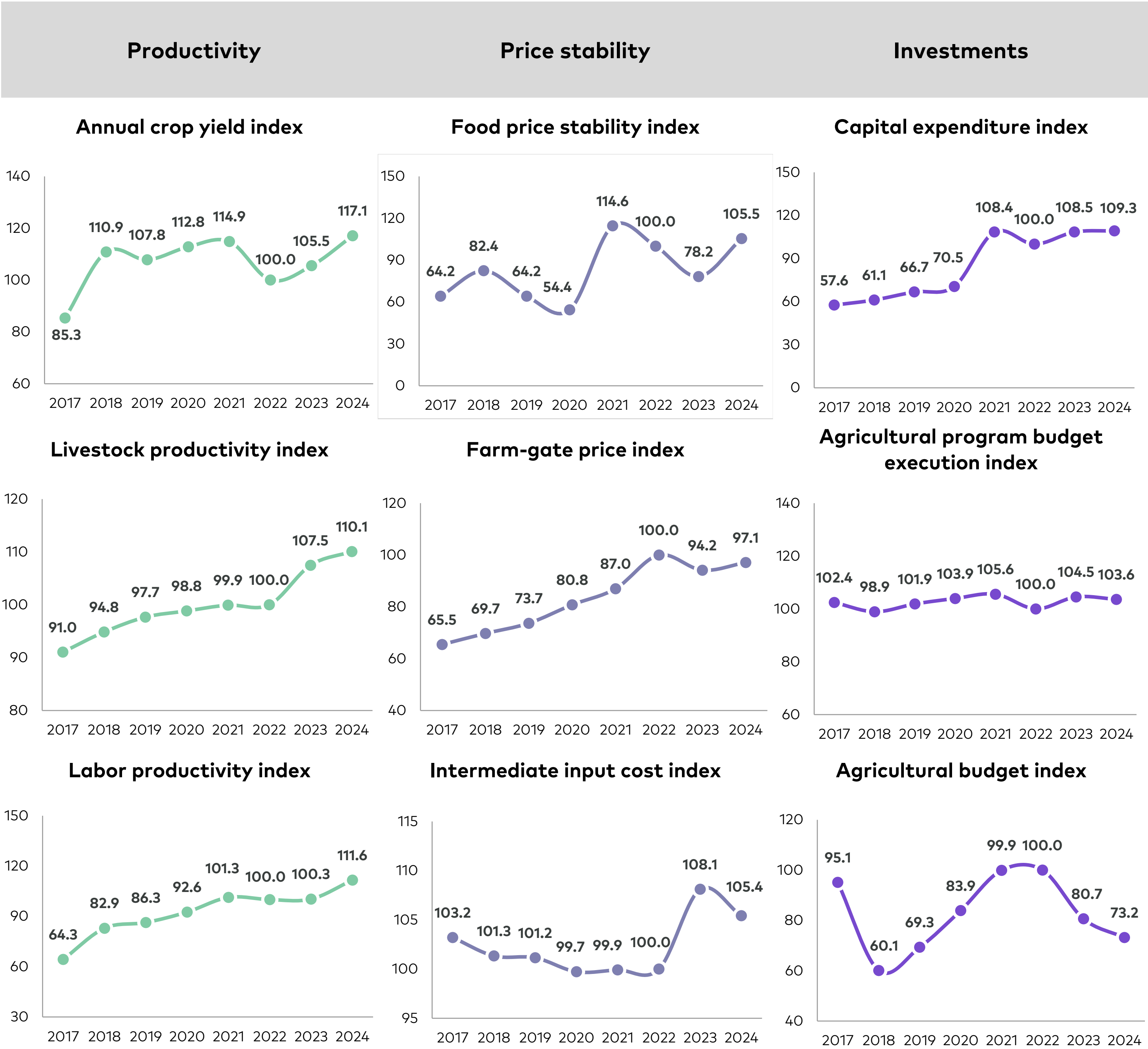
Figure 1: Weights of the indicators included in the ADI



Source: Galt & Taggart

[1] $PCA_{1,t}$ explains approximately 2/3 of the joint variation across the nine indicators.

Figure 2: Assessments of indicators included in the ADI

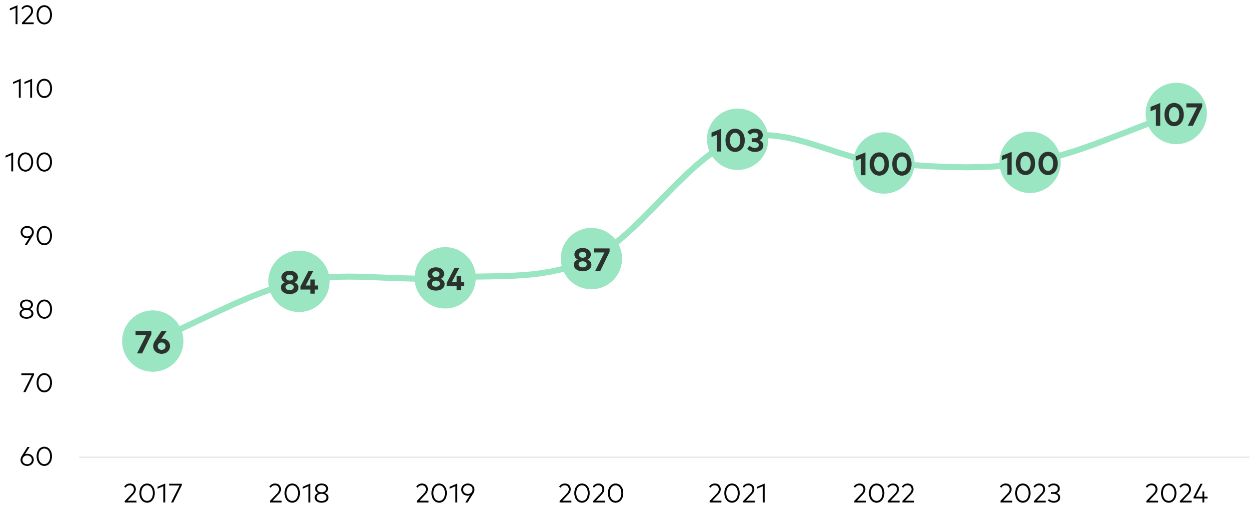


Galt & Taggart's ADI results

Below, Figure 3 presents the Agricultural Development Index calculated based on the methodology outlined in this document. An increase in the index reflects positive dynamics in the development of the agricultural sector, while a decline indicates a deterioration in the sector dynamics.

Over 2017–2024, the index increased steadily, indicating progress in Georgia's agricultural sector and reflecting improvements across the underlying indicators.

Figure 3: Galt & Taggart's Agricultural Development Index (ADI)
(2022=100)



The relatively rapid growth observed in 2017–2021 was primarily driven by broad-based improvements across all components of the productivity pillar, alongside increased private and public investment. This momentum coincided with a more active entry of businesses into the sector from 2017 onward, reflected in a gradual rise in their share in sector output. Nevertheless, despite this progress, the role of businesses in agriculture remains limited (accounting for only around 11% of the sector value added in 2024).

In 2022–2024, the trajectory of progress in the agricultural sector shifted, specifically:

- 2022: The index declined, mainly due to lower yields of annual crops, increased volatility in food prices, and reduced investment and funding of agricultural programs.
- 2023: The index remained broadly unchanged, as deterioration in price stability and reduced budgetary support were offset by improvements in productivity indicators and capital expenditure.
- 2024: The index improved, supported by a relatively more stable price environment and gains in productivity.

Limitations of the Index

Galt & Taggart's Agricultural Development Index is based on annual data and covers a relatively short period of only eight observations. As a result, the loadings derived from PCA and the corresponding weights may partially change as new data becomes available.

In addition, comprehensive statistical coverage is lacking for certain important areas. For example, detailed data on permanent crops are not fully captured in the index, which may affect the overall assessment.

Further refinement of the index would benefit from the inclusion of additional indicators, such as:

- Share of irrigated land in total arable area
- Fertilizer use per hectare
- Share of farmers using modern technologies
- Indicators of farmers' education and skill levels, etc.

Index update frequency

The Galt & Taggart team updates the Agricultural Development Index on an annual basis. With the addition of new observations, both the standardized indicator series and the PCA-derived loadings and final weights are recalculated. Accordingly, historical series may be subject to minor revisions where necessary.

If additional relevant statistical data becomes available, it will be gradually incorporated into future versions of the index to improve the accuracy of the assessment of agricultural sector dynamics.

Disclaimer

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