National Statistics Office of Georgia
(Geostat)

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Unit Value Index of Agricultural Products

Technical Manual

Tbilisi 2023

The presented technical manual is elaborated by the National Statistics Office of Georgia according to the internationally acclaimed methods and practice and is based on the following handbooks:

1. **„Producer Price Index Manual : Theory and Practice", International Monetary Fund, 2004.**

   Responsible organizations: International Labor Organization (ILO), International Monetary Fund (IMF), Organization for Economic Co-operation and Development (OECD), United Nations Economic Commission for Europe (UNECE) and World Bank;

   https://www.imf.org/en/Publications/Manuals-Guides/Issues/2016/12/30/Producer-Price-Index-Manual-Theory-and-Practice-16966

2. **„Handbook on industrial producer price indices (PPI)", Eurostat, 2012;**

   Responsible organizations: Statistical Office of the European Union (Eurostat), European Commission.

   https://ec.europa.eu/eurostat/en/web/products-manuals-and-guidelines/-/KS-RA12020?ineritRedirect=true

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1. Introduction

1.1 Unit Value Index of Agricultural Products and its use

The Unit Value Index of Agricultural Products represents the change in the average price level of products that are sold in the reporting period by agricultural holdings throughout the country, compared to the reference period.

The index covers the following products:

- Non-perennial agricultural crops (wheat, maize, sunflower seeds, potatoes, etc.);
- Perennial crops (grapes, fruits, hazelnuts, walnuts. etc.);
- Live animals and animal products (cattle, sheep, honey, milk, etc.).

The structure of the Unit Value Index of Agricultural Products follows the Statistical Classification of Products by Activity (CPA 2008). According to the CPA, the index covers 01.1 (non-perennial crops), 01.2 (perennial crops) and 01.4 (live animals and animal products) groups of the Section A (agricultural, forestry and fishing products).

The Unit Value Index of Agricultural Products is used for the following purposes:

1. The index has an important role in deflating different economic indicators;
2. The index is an analytical instrument for researchers and representatives of business sector.

1.2 Coverage of the index and the observable prices

The survey of agricultural holdings is the source of information for the index calculation. The survey provides information on the number of cattle and poultry in the country, number of bee families, production of livestock products, average milk yield, average number of livestock, production and average yield of sown and harvested areas of non-perennial agricultural crops, production of perennial crops, and also information about the sales of the products listed above.

The unit value of agricultural products used for the index calculation represents the ratio between the total value of the agricultural and/or livestock products sold by the agricultural holdings and the total volume of these sales in the specified period. The mentioned indicator reflects the average value of agricultural products at the farm gate.

2. The selection of products and agricultural holdings for observation

The sampling used by the Department of Agricultural and Environment Statistics is the source for the selection of holdings to be observed. For the latter, the population is approximately 642 000 agricultural holdings (households and agricultural enterprises) in the country. The Agricultural Census 2014 is the main source for the sampling base. The sampling base is updated regularly using surveys of agricultural holdings, business registers and other administrative sources available in the country.

For the sample of agricultural products, the data is obtained from a survey of agricultural holdings conducted by the Agricultural and Environment Statistics about agricultural products sales. The selection of specific products is carried out according to the share of this product in the total sales of agricultural products throughout the country.

The sampling of agricultural products is carried out once a year, according to the sales data from the preceding year. Based on this information, calculation of unit values and indices is carried out quarterly for the selected agricultural products.

3. Data Validation

Data validation for the Unit Value Index of Agricultural Products is conducted in two stages:

At the first stage, the validation is carried out by the Agriculture and Environmental Statistics Department within the framework of the relevant survey.

At the second stage, the Price Statistics Department performs additional analysis and processing of the data received from the Agricultural and Environment Statistics Department, in order to ensure its applicability for price statistics purposes.

4. Weights

The weights of products included in the Unit Value Index of Agricultural Products are updated annually based on the output structure defined by the system of national accounts. It reflects the latest data on the output of agricultural products across the country. The obtained weights represent the share of the specific type of product's value in the overall value of agricultural products produced throughout the country. Weights for the reporting period *t* are calculated based on *t-2* period information. The list of products included in the index may also be changed while updating the weights.

5. Price imputation techniques

During the calculation of the Unit Value Index of Agricultural Products, if in the reporting period there are no sales for a specific product, an imputation method will be used - repeating the latest recorded unit value before the reappearance of the real sales.

6. Calculation of the Unit Value Index of Agricultural Products on different levels

6.1 Calculation of the lowest level index

The lowest-level index is the index that is calculated for individual agricultural products. Graph #1 shows the structure of the unit value index of agricultural products, where the lowest level index is the index calculated for wheat, maize and other non-perennial agricultural crops. The lowest level long term index is obtained from the ratio of unit values for comparable products in the reporting (t) and reference (0) periods.

$$I_i^{t/0} = \frac{\sum_i \left(p_{i,k,t} \times w_{k,t}\right) / \sum_i \left(q_{i,k,t} \times w_{k,t}\right)}{\sum_i \left(p_{i,k,0} \times w_{k,0}\right) / \sum_i \left(q_{i,k,0} \times w_{k,0}\right)}$$

Where:

$I_i^{t/0}$ is the Unit Value Index of *i* agricultural product in the reporting period *t* compared to the index reference period *0*.

$p_{i,k,t}$ is the sale value of *i*-agricultural product by *k*-agricultural holding in the reporting period;

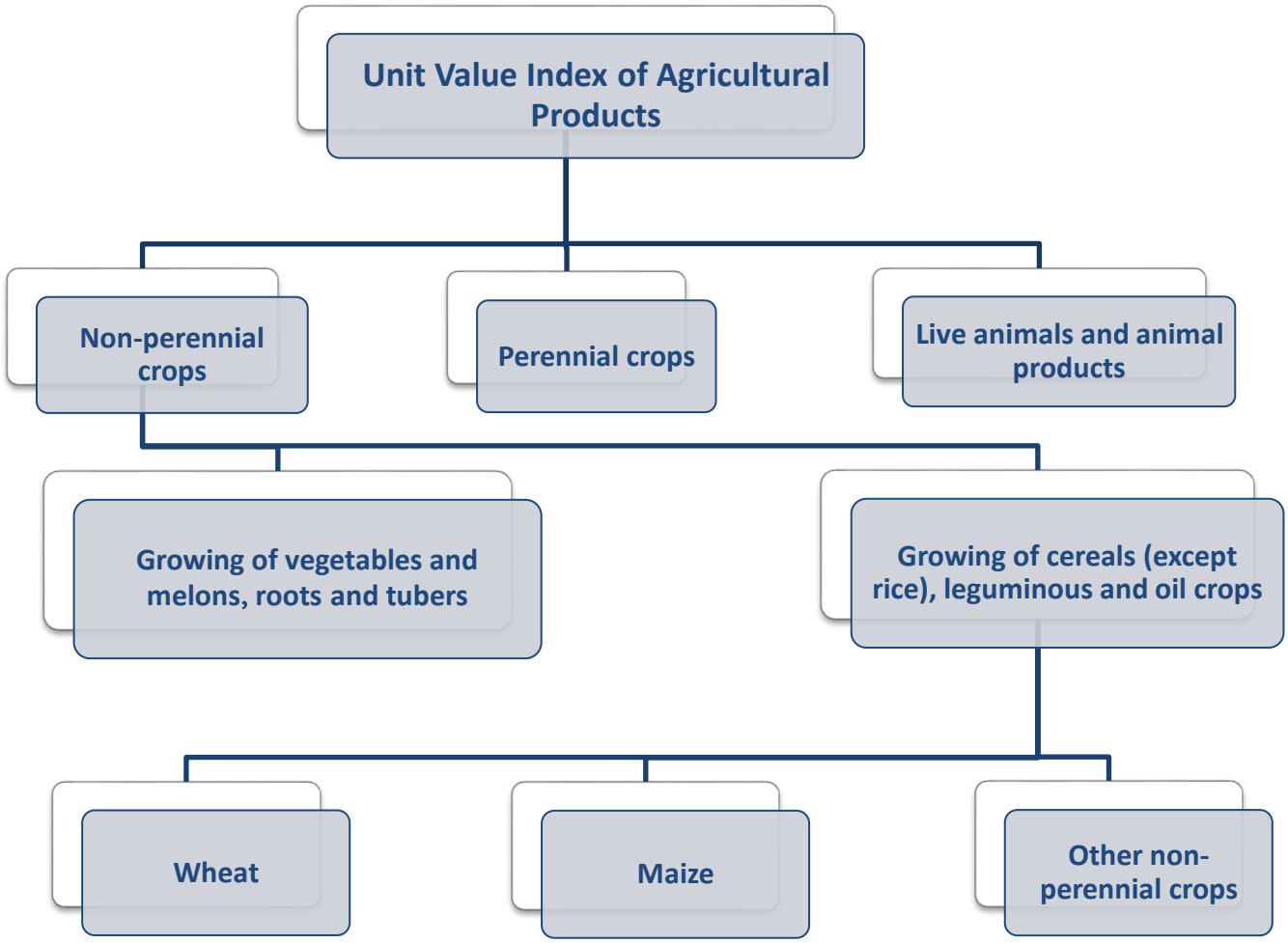
$q_{i,k,t}$ is the sale volume of *i*-agricultural product by *k*-agricultural holding in the reporting period;

$p_{i,k,0}$ is the sale value of *i*-agricultural product by *k*-agricultural holding in the reference period;

$q_{i,k,0}$ is the sale volume of *i*-agricultural product by *k*-agricultural holding in the reference period;

w_k - the weight of *k*-agricultural holding in the survey of agricultural holdings.

Graph#1. The structure of the Unit Value Index of Agricultural Products



6.2 The Unit Value Index of Agricultural Products for separate product groups and a whole sector

The long-term Unit Value Index of Agricultural Products for the entire group or sector compared to the price reference period is calculated by using the following Laspeyres-type formula:

$I^{t/0} = \sum_{i=1}^{n}\left(I_i^{t/0}\right) \times s_i^b$, where:

$I_i^{t/0}$ - the lowest level long term index for product *i* compared to the price reference *(0)* period.

s_i^b is the weight of product *i* in the weight reference period, which represents the share of produced product *i* in the whole agricultural production, where $\sum_{i=1}^{n} s_i^b = 1$.

A short-term index compared to the previous quarter is obtained from the ratio of long term indices in the reporting and previous periods, calculated comparing to the price reference period.

6.3 Chain index

During the update of weights, the list of agricultural products may also be updated. At this time, the unit value is calculated for products both in old and new samples, which enables chain-linking of indices calculated for different samples. Chaining enables to calculate indices with a long term reference period.

For example, before the 4th quarter of 2018 the index was calculated compared to the 4th quarter of 2017, using w_i weights, whereas starting from 2019 the index is calculated compared to the 4th quarter of 2018, using k_i weights (see table 1).

X_1 (see table 1) is the chain index for the 1st quarter of 2019, which is calculated with the reference period of the 4th quarter of 2017 and is calculated as follows:

Table 1.

IV.2017=100	IV.2018=100
IV.2018: $I^{IV.18/IV.17} = \sum_i I_i^{IV.18/IV.17} \times w_i = 106$	IV.2018: $I^{IV.18/IV.18}$=100
X_1	I.2019: $I^{I.19/IV.18} = \sum_i I_i^{I.19/IV.18} \times k_i = 102$

$$\frac{106}{X_1} = \frac{100}{102}, \text{ resulting } X_1 = \frac{106 \times 102}{100} \approx 108$$

The following result is derived from the chain-linking as well:

$$I^{IV.18/IV.17} \times I^{I.19/IV.18} = 106 \times 102/100 \approx 108$$

7. Publication

7.1 Press release

A press release for the Unit Value Index of Agricultural Products is published quarterly through the Geostat website. It contains information about quarterly and annual index data and contributions of the groups to the index formation.

7.1.1 Contribution of groups to the percentage change of the overall index

Calculation of contributions made by agricultural products or their groups to the percentage changes in the overall index provides a powerful analytical tool for analyzing the Unit Value Index of Agricultural Products. The contribution of the change of the unit value of a product to the total index change refers to the percentage difference that would be caused by a change of the unit value of this product alone, provided the permanence of the unit values of other products.

The contribution of an index change for any product to the change in the overall index is calculated using the following formula:

$$\text{Contribution of an i product to the quarterly index} = (\frac{I_t^i}{I_{t-1}^i} - 1) \times 100 \times \frac{I_{t-1}^i}{I_{t-1}^a} \times w_t^i$$

Where:

I_t^i - is the index of product *i* in period (quarter) *t;*

I_{t-1}^i - the index for product *i* in period *t-1*;

I_{t-1}^a - the Unit Value Index of Agricultural Products in period t-1;

w_t^i - the weight of product *i* in period *t*.

Contribution of certain group of products to the quarterly index represents the sum of contributions of each product included in it.

In the case of weights change, the contribution of product *i* to the annual index is calculated using the following formula:

$$\text{Contribution of the product } i \text{ to the annual index} = \left(\frac{I_L^i - I_{t-4}^i}{I_{t-4}^a}\right) \times w_{t-4}^i \times 100 + \left(\frac{I_t^i - 100}{I_{t-4}^a}\right) \times I_L^a \times w_t^i$$

Where:

I_L^i - is the index for product *i* in the weight change period;

I_{t-4}^i - the index of product *i* in the period *t-4* (previous reference period =100);

I_{t-4}^a - the Unit Value Index of Agricultural Products in period *t-4*;

w_{t-4}^i - the weight of product *i* in the period *t-4*;

I_t^i - index for product *i* in period *t*;

I_L^a - the Unit Value Index of Agricultural Products in the weights change period;

w_t^i - the weight of product *i* in the period *t*.

Example: Calculating the product group's contribution in the case of a weight change

Using the above formula, the contribution of changes in value for the group of agricultural products to the change in the annual index for the 4th quarter of 2018, considering the weights of 2017 and 2018 (0.35 and 0.28, respectively) can be calculated as follows (see table 2)

Table 2.

Indices compared to the 4th quarter of the previous year			
	3rd quarter of 2017	4th quarter of 2017	3rd quarter of 2018
Index for the group of agricultural products	101.2	101.7	102.2
Overall index	101.6	103.2	101.8

$$Contribution = \frac{(101.7 - 101.2)}{101.6} \times 0.35 \times 100 + \frac{(102.2 - 100)}{101.6} \times 0.28 \times 103.2 = 0.8\%$$

According to the given data, the contribution of the group of agricultural products to the overall index for the 3rd quarter of 2018 amounted to 0.8 percentage points.

7.2 Time series of the Unit Value Index of Agricultural Products

Along with the press release, different time series of the Unit Value Index of Agricultural Products are published on the website on a quarterly basis:

1. The Unit Value Index of Agricultural Products compared to the previous quarter;
2. The Unit Value Index of Agricultural Products to the same quarter of the previous year.

The published indices are rounded to four digits and are final data.

Graph #2 represents the calculation stages of the Unit Value Index of Agricultural Products and its periodicity.

Graph #2. Calculation stages for the Unit Value Index of Agricultural Products