*AGRICULTURE, LIVESTOCK, FISHERY*
*AND ENVIRONMENT STATISTICS DIVISION*
*Agricultural Input-Output and Indices Section*

# INFORMATION NOTE

## on the revision of Cost Indices for the Factors of Agricultural – Livestock Production

**Base year 2020 = 100.0**

*Piraeus, July 2023*

**General remarks**

The cost indices for the factors of agricultural and livestock production are compiled since 1975.
The General cost index is calculated as a weighted average of the three separately compiled indices of production factors, namely:

a) Labour remuneration index (Labour)
b) Utilized land remuneration index (Land)
c) Capital remuneration index (Capital)

The annual weighting coefficients have been calculated on the basis of the expenditures of Economic Accounts of Agriculture (EAA) for the year 2020, and the data of the 2021 Agricultural census with 2020 as reference year, for each category of individual indices.

**Purpose of the indices - Base period - Sources of data collection**

The purpose of the cost indices for the factors of the agricultural and livestock production is to measure the relative change in the remuneration paid by the producers for agricultural wages (Labour), farm rents (Land), machinery rents and farm loan interest (Capital), required for the production process.

The Cost indices for the factors of agricultural and livestock production are annual indices and the geographical reference level of the data is Greece Total. They are fixed base year indices and are revised every five (5) years, in years ending in 0 or 5. The current revision is conducted with base year 2020=100.0, and with year 2021 as first reference year.

The price data for the cost indices for the factors of agricultural and livestock production are collected as far as the agricultural wages (Labour), land rents (Land) and machinery rents are concerned, from producers, agricultural cooperatives and enterprises, while for the interest on agricultural loans, the lending rates announced by Piraeus Bank (previous Agricultural Bank).

The methodology for the compilation of the cost indices for the factors of production is as follows:

**1. Labour**

A proxy variable for labour remuneration in agriculture is the daily wages of seasonal workers, since the number of permanent workers is limited (according to the Agricultural census data for the year 2020). The type of seasonal work provided and, consequently, the corresponding remuneration depends on the type of crop, the period of the year the work is provided and the geographical area. Specifically, in some areas or for some crops, the remuneration is paid by the piece of work, while elsewhere by the

working hours. Also, in some cases food or housing is provided in addition to the daily wage, while in others only the daily wage.

Finally, daily wages are different for men's work (they usually provide more skilled work) and women's work. For this purpose, for the main crops in which seasonal workers are employed, the representative areas where the specific crops are cultivated were selected (according to the cultivated area per type of crop from the Agricultural census data for the year 2020) and the time periods of employment of seasonal workers, after recommendations of experts-agronomists, e.g. for apple tree cultivation, the employment periods are: a) February (pruning), b) May–June (sprinkling) and c) September–October (fruit harvest period). The main crops, where seasonal workers are employed, are: cotton, tobacco, vegetables, citrus fruits, olives, vines and other trees, while, main types of work where prices are recorded, are: ploughing, milling, planting, sprinkling, carving, harvesting, etc.

Two indices are compiled for agricultural wages, one for men and one for women. The overall index is the weighted mean of the above individual indices (the weights are compiled according to the percentage of male-female seasonal workers, derived from the Agricultural census data for the year 2020):

$$H = \sum_{s=1}^{2} H_s * W_s$$

*H* the overall wage index and $W_s$ is the weighted coefficient per gender $s, s = 1,2$ .

The wage index by gender, $H_s$ , is calculated according to the formula:

$$H_s = \frac{1}{n}\sum\left[\frac{1}{m}\sum\left(\frac{1}{g}\sum\frac{T_{sijk}^{(1)}}{T_{sijk}^{(0)}}\right)\right]$$

Where, the index $H_{s,}$ is calculated as the simple arithmetic mean of the wage indices per crop $i$ , $i = 1,2,...,n$ :

$$H_s = \frac{1}{n}\sum_{i=1}^{n} H_{si}$$

The wage index per crop is calculated as the simple arithmetic mean of the individual wage indices per labour specialty $j$ , $j = 1,2,...,m$ :

$$H_{si} = \frac{1}{m}\sum_{j=1}^{m} H_{sij}$$

The wage index per labour specialty is calculated as the simple arithmetic mean of the individual indices per geographical area $k$, $k = 1,2,...,g$ :

$$H_{sij} = \frac{1}{g}\sum_{k=1}^{g}\frac{T_{sijk}^{(1)}}{T_{sijk}^{(0)}}$$

Where, $T_{sijk}^{(1)}$ and $T_{sijk}^{(0)}$ are the average wages for the current period *(1)* and the base period *(0)* for the gender *s,* crop *i*, labour specialty *j* and geographical area *k*.

2. **Land**

The most representative prices for the remuneration of the production factor land, are the rents paid. Since farm rent prices depend on the type of crop and the geographical area, a sample of farms was selected for the main crops from different areas of the country. These crops are: wheat, maize, cotton, sugar beets, potatoes, alfalfa, rice, tobacco, vegetables. The compiled farm rent index is the weighted average of the rent indices by crop, according to the percentage share of the rented cultivated area derived from the Agricultural census for the year 2000.

The Rent index of utilized land is calculated by the formula:

$$L = \sum_{i=1}^{n} L_i W_i$$

Where, $L_i$ is the land rents index by crop and $W_i$ is the weighted coefficient for each crop $i$ ,$i = 1,2,...,n$ .

Specifically, the land rents Index $L$ is calculated by the formula:

$$L = \sum_{i=1}^{n}\left(\frac{1}{g}\sum_{k=1}^{g}\frac{Y_{ik}^{(1)}}{Y_{ik}^{(0)}}\right) * W_i$$

According to this formula, the land rents index for the crop $i$ , $L_i$ , is calculated as the simple arithmetic mean of the indices of the land rents of the geographical areas $k$, $k = 1,2,...,g$ :

$$L_i = \frac{1}{g}\sum_{k=1}^{g}\frac{Y_{ik}^{(1)}}{Y_{ik}^{(0)}}$$

Where, $Y_{ik}^{(1)}$ και $Y_{ik}^{(0)}$ are respectively the land rents for the current period *(1) and* the base period *(0),* for a specific crop *i* and geographical area *k.*

**3. Capital**

**a. Interest**

The loans to farmers are used either for the needs of consumable means of agricultural production (short-term loans), or for fixed capital formation (long-term loans). Consequently, the amount of

interest paid depends on the interest rate and the amount of expenses for the purchase of the means of production and the goods of fixed capital formation.

If we assume that $E_A^{(0)}$ is the interest rate of short-term loans for the base period *(0)* and $E_A^{(1)}$ for the period *(1),* and $I^{(0)}$, $I^{(1)}$, are the corresponding price indices of the consumable means of agricultural-livestock production, $E_B^{(0)}$ is the rate interest of long-term loans for the base period *(0)* and $E_B^{(1)}$ for the period *(1),* and $\Delta^{(0)}$, $\Delta^{(1)}$, are the corresponding indices of the fixed capital formation, then the index of loans interest *T* is:

$$T = \frac{E_A^{(1)} I^{(1)}}{E_A^{(0)} I^{(0)}} W_1 + \frac{E_B^{(1)} \Delta^{(1)}}{E_B^{(0)} \Delta^{(0)}} W_2$$

Where, $W_{1,2}$ are the weights or else the ratio, of short-term loans and long-term loans.

At the initial compilation of the indices, only data for renting machinery were used for the production factor Capital, while from 1980=100.0 revision onwards, the index of loans interest is compiled, so, the capital remuneration index derives from the composition of the indices of loans interest and renting machinery.

**b. Machinery**

Several producers are hiring agricultural machinery. The rent for the use of the machine represents:

1. The interest on its purchase capital,
2. The depreciation,
3. The profit of the entrepreneur.

For the compilation of the index, first the machinery used per agricultural work and crop were selected and then the representative areas from which the rental prices of machines are collected. The main crops in the specific types of agricultural machinery used, are: wheat, maize, cotton, sugar beet, alfalfa, rice, potatoes, horticulture, tobacco, citrus fruits, while the main types of machinery work whose prices are recorded are: soil preparation (plowing, harrow, cultivator), sowing, fertilizing, sprinkling, carving, cutting, harvesting, exporting, baling, transporting, etc. The compiled machinery rental index is the weighted average of the machinery use indices per job and crop, according to the rental value of machinery per job and crop, with data calculated from technical and economic indicators, while the cultivated area derives from the Agricultural census for the year 2000.

The rent index *K* is calculated by the formula:

$$K = \sum_{i=1}^{n} C_i \Pi_i$$

Where, $C_i$ the rent index by crop and $\Pi_i$ is the weighted coefficient by crop $i$ , $i = 1,2,...,n$ .

More specifically, the machinery rent index is calculated by the formula:

$$K = \sum_{i=1}^{n}\left[\sum_{j=1}^{m}\left(\frac{1}{g}\sum_{k=1}^{g}\frac{M_{ijk}^{(1)}}{M_{ijk}^{(0)}}\right) * P_j\right] * \Pi_i$$

According to this formula, the rent index by crop $C_i$ is calculated as weighted average of the $C_{ij}$ indices and $P_j$ is the weighted coefficient for the different types of machinery $j$, $j = 1,2,...,m$ :

$$C_i = \sum_{j=1}^{m} C_{ij} P_j$$

The rent index by type of machinery $C_{ij}$ is calculated as the simple arithmetic mean of the indices by geographical area $k$, $k = 1,2,...,g$ :

$$C_{ij} = \frac{1}{g}\sum_{k=1}^{g}\frac{M_{ijk}^{(1)}}{M_{ijk}^{(0)}}$$

Where, $M_{ijk}^{(1)}$ and $M_{ijk}^{(0)}$ are respectively the average rents for the current period *(1)* and the base period *(0)* for a specific crop *i*, type of machinery *j* and geographical area *k*.

**Back casting of time series**

Backdated calculations for the annual Cost Indices for the factors of Agricultural and Livestock production for the period 2000 - 2019, were made, using the mean annual indices in year 2020 with 2015 as base year, according to the formula:

$$R_{i(2020)}^{(t)} = R_{i(2015)}^{(t)} * \frac{100}{\overline{R}_{i(2015)}^{(2020)}}$$

where:

$R_{i(2020)}^{(t)}$ *is the* retrospective indices *i in the period (year) t with 2020 as base year,*

$R_{i(2015)}^{(t)}$ *is the compiled indices i in the period (year) t with 2015 as base year and*

$\overline{R}_{i(2015)}^{(2020)}$ *is the mean annual indices i in 2020, with 2015 as base year.*

The weighting coefficients and the annual cost indices for the factors of agricultural and livestock production for each category, are presented in the following Tables, for the period 2013 - 2022 with base year 2020=100.0.

**Table 1. Annual cost indices for the factors of agricultural and livestock production: 2013 - 2022**
**Base year: 2020=100.0**

| GROUPS | Weights 2020 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **General Cost Index for the factors of production** | **10,000.0** | **96.4** | **96.6** | **95.2** | **94.5** | **96.7** | **97.1** | **99.7** | **100.0** | **104.1** | **119.1** |
| 1. Labour (wages) | 4,054.2 | 94.3 | 92.5 | 92.7 | 92.5 | 93.4 | 94.5 | 98.0 | 100.0 | 105.1 | 123.0 |
| 2.Land (land rents) | 2,718.6 | 97.9 | 96.5 | 95.6 | 95.6 | 96.6 | 97.8 | 100.2 | 100.0 | 104.1 | 110.0 |
| 3. Capital (capital income) | 3,227.2 | 98.7 | 101.4 | 98.3 | 96.9 | 100.9 | 100.1 | 101.3 | 100.0 | 102.9 | 121.9 |
| (a) Loans interest | 1,303.0 | 100.1 | 105.4 | 100.6 | 98.2 | 104.3 | 103.0 | 104.3 | 100.0 | 102.8 | 122.1 |
| (b) Machinery rents | 1,924.1 | 98.8 | 97.4 | 97.2 | 97.1 | 97.9 | 98.1 | 99.9 | 100.0 | 103.0 | 121.8 |

**Table 2. Annual Land Rents indices: 2013 - 2022**

**Base year: 2020=100.0**

| | | Weights 2020 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AA** | **Overall Land rents index** | **10,000.0** | **97.9** | **96.5** | **95.6** | **95.6** | **96.6** | **97.8** | **100.2** | **100.0** | **104.1** | **110.0** |
| 1 | Cultivation of wheat | 3,903.4 | 94.3 | 93.5 | 93.8 | 94.4 | 94.4 | 96.4 | 99.9 | 100.0 | 106.1 | 111.8 |
| 2 | Cultivation of cotton | 2,692.8 | 97.7 | 97.5 | 96.2 | 96.2 | 95.2 | 98.0 | 100.4 | 100.0 | 102.3 | 108.7 |
| 3 | Cultivation of sugarbeet | 11.7 | 93.0 | 94.4 | 93.6 | 92.9 | 93.2 | 99.0 | 99.9 | 100.0 | 102.9 | 108.1 |
| 4 | Cultivation of alfalfa | 1,435.0 | 103.4 | 101.3 | 98.1 | 96.7 | 100.1 | 99.8 | 101.0 | 100.0 | 102.4 | 109.9 |
| 5 | Cultivation of rice | 261.5 | 95.5 | 94.0 | 99.1 | 97.3 | 99.3 | 99.3 | 102.1 | 100.0 | 105.6 | 109.8 |
| 6 | Cultivation of potatoes | 133.9 | 101.7 | 94.7 | 91.7 | 92.3 | 94.8 | 95.1 | 99.2 | 100.0 | 102.2 | 107.9 |
| 7 | Cultivation of vegetables | 402.2 | 102.5 | 94.6 | 95.1 | 96.3 | 97.9 | 98.3 | 99.7 | 100.0 | 104.8 | 111.0 |
| 8 | Cultivation of tobacco | 117.7 | 94.7 | 94.7 | 95.0 | 99.2 | 99.8 | 101.2 | 100.2 | 100.0 | 100.0 | 95.6 |
| 9 | Cultivation of maize | 1,041.9 | 104.5 | 102.7 | 99.4 | 99.1 | 102.6 | 100.4 | 99.8 | 100.0 | 103.7 | 108.6 |

## Table 3. Annual Labour remuneration indices (agricultural wages): 2013 - 2022
## Base year: 2020=100.0

| Weights 2020 | GROUPS | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Overall Labour remuneration index** | **94.3** | **92.4** | **92.7** | **92.6** | **93.4** | **94.5** | **98.0** | **100.0** | **105.1** | **123.0** |
| 0.732 | Labour remuneration for Men | 94.9 | 93.3 | 93.3 | 93.1 | 94.0 | 95.1 | 98.3 | 100.0 | 105.0 | 122.9 |
| 0.268 | Labour remuneration for Women | 93.0 | 90.5 | 91.3 | 91.4 | 92.2 | 93.3 | 97.5 | 100.0 | 105.3 | 123.4 |

| AA | Indices per crop | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Labour remuneration for Men** | **94.9** | **93.3** | **93.3** | **93.1** | **94.0** | **95.1** | **98.3** | **100.0** | **105.0** | **122.9** |
| 1 | Cultivation of cotton | 89.8 | 88.8 | 88.3 | 88.5 | 90.5 | 92.8 | 97.1 | 100.0 | 103.3 | 120.2 |
| 2 | Cultivation of vegetables | 96.8 | 93.4 | 93.3 | 92.5 | 93.6 | 93.7 | 98.4 | 100.0 | 107.4 | 124.1 |
| 3 | Cultivation of tobacco | 85.1 | 85.1 | 87.4 | 89.1 | 92.9 | 98.2 | 98.7 | 100.0 | 103.9 | 119.9 |
| 4 | Citrus trees | 104.2 | 99.1 | 99.2 | 99.2 | 100.1 | 97.1 | 101.5 | 100.0 | 106.1 | 132.8 |
| 5 | Olives trees | 97.8 | 95.4 | 95.4 | 94.1 | 94.1 | 95.0 | 99.8 | 100.0 | 104.3 | 131.1 |
| 6 | Cultivation of vines | 94.7 | 94.4 | 94.8 | 94.7 | 94.7 | 95.6 | 97.8 | 100.0 | 103.1 | 119.9 |
| 7 | Other trees | 95.1 | 95.4 | 95.2 | 94.3 | 94.1 | 94.6 | 96.1 | 100.0 | 103.8 | 117.3 |
| 8 | Animal, sheep-goats | 92.8 | 89.3 | 87.3 | 91.6 | 95.5 | 96.0 | 99.2 | 100.0 | 107.0 | 118.2 |

| AA | Indices per crop | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Labour remuneration for Women** | **93.0** | **90.5** | **91.3** | **91.4** | **92.2** | **93.3** | **97.5** | **100.0** | **105.3** | **123.4** |
| 1 | Cultivation of cotton | 92.0 | 89.0 | 87.7 | 89.0 | 90.2 | 93.0 | 97.0 | 100.0 | 103.8 | 120.2 |
| 2 | Cultivation of vegetables | 96.6 | 93.2 | 92.9 | 91.6 | 91.8 | 92.0 | 97.5 | 100.0 | 107.8 | 125.5 |
| 3 | Cultivation of tobacco | 82.9 | 82.7 | 87.5 | 89.6 | 93.7 | 96.7 | 97.8 | 100.0 | 103.8 | 120.4 |
| 4 | Citrus trees | 94.2 | 92.3 | 97.4 | 103.5 | 100.3 | 98.7 | 100.7 | 100.0 | 105.8 | 137.9 |
| 5 | Olives trees | 90.7 | 90.5 | 93.0 | 91.6 | 91.6 | 92.5 | 98.6 | 100.0 | 103.7 | 131.0 |
| 6 | Cultivation of vines | 98.1 | 94.0 | 93.1 | 93.9 | 92.8 | 94.3 | 97.8 | 100.0 | 101.8 | 118.7 |
| 7 | Other trees | 89.5 | 88.4 | 90.0 | 90.6 | 90.6 | 92.4 | 94.4 | 100.0 | 103.9 | 117.4 |
| 8 | Animal, sheep-goats | 93.8 | 87.5 | 86.9 | 90.1 | 95.2 | 95.2 | 99.0 | 100.0 | 107.3 | 120.3 |

## Table 4. Annual Machinery rents indices: 2013 - 2022
## Base year: 2020=100.0

| AA | GROUPS | Weights 2020 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Overall Machinery rents index** | **10,000.0** | **98.8** | **97.4** | **97.2** | **97.1** | **97.9** | **98.1** | **99.9** | **100.0** | **103.0** | **121.8** |
| 1 | Cultivation of wheat | 1,630.6 | 99.0 | 98.1 | 97.0 | 97.2 | 97.2 | 98.1 | 99.7 | 100.0 | 105.3 | 120.7 |
| 2 | Cultivation of cotton | 2,999.7 | 100.8 | 99.7 | 100.5 | 100.3 | 99.6 | 98.3 | 99.5 | 100.0 | 103.4 | 123.8 |
| 3 | Cultivation of sugarbeet | 16.3 | 98.3 | 98.1 | 99.4 | 98.5 | 100.9 | 99.4 | 100.0 | 100.0 | 101.7 | 120.8 |
| 4 | Cultivation of alfalfa | 1,998.1 | 97.7 | 95.6 | 95.4 | 95.8 | 97.3 | 97.3 | 100.8 | 100.0 | 101.4 | 121.8 |
| 5 | Cultivation of rice | 415.1 | 100.2 | 97.2 | 97.2 | 94.9 | 97.2 | 98.7 | 99.2 | 100.0 | 102.7 | 117.9 |
| 6 | Cultivation of potatoes | 260.9 | 103.3 | 101.8 | 99.7 | 99.9 | 99.8 | 101.2 | 100.5 | 100.0 | 103.3 | 112.1 |
| 7 | Cultivation of vegetables | 672.1 | 99.3 | 98.6 | 95.9 | 95.6 | 98.2 | 98.9 | 100.0 | 100.0 | 101.7 | 120.4 |
| 8 | Cultivation of tobacco | 262.2 | 95.7 | 93.2 | 95.5 | 95.4 | 94.7 | 96.9 | 98.8 | 100.0 | 101.4 | 116.8 |
| 9 | Cultivation of maize | 1,015.5 | 102.3 | 101.9 | 101.3 | 100.9 | 100.4 | 100.1 | 100.5 | 100.0 | 102.8 | 123.5 |
| 10 | Citrus trees | 729.6 | 86.6 | 84.2 | 87.0 | 86.4 | 91.9 | 93.7 | 99.8 | 100.0 | 103.4 | 123.1 |