Eurostat is recently developing agricultural productivity indicators for the member states of the European Union as a response to the common Agricultural Policy reform ‘Agenda 2000’ and in anticipation of greater interest from policy makers and analysts alike. The provisional derived productivity data of the member states are published in the annual publication of the Eurostat ‘Income from agricultural activity’. The author makes an attempt to set up similar indicators for the Hungarian agricultural industry using data from Economic Accounts for Agriculture (EAA) and Agricultural Labour Input statistics (ALI).

KEYWORDS: Multi-factor productivity; Partial productivity; EAA; ALI.

The two main objectives of the Common Agricultural Policy (CAP) of the EU are to increase agricultural productivity and to provide fair standard of living for the agricultural community. Reflecting on the reforms to the CAP introduced under the title ‘Agenda 2000’, the Eurostat embarked on the development of new agricultural productivity indicators, which has caught the attention of both politicians and analysts. The Economic Accounts for Agriculture (EAA), revised in 1997, and the closely related Agricultural Labour Input (ALI) statistics provide a consistent framework for defining the productivity indicators. The so-called agricultural income indices, regularly derived from EAA and ALI statistics, are in fact productivity indicators, which measure the state of the sector. The methodological development aims at the development of two productivity indicators, although their final definition depends on further research and the data available.

PRODUCTIVITY INDICATOR TYPES

What is productivity? A productivity indicator is a fraction, the numerator of which is a measure of output and the denominator is a measure of input indicator. Output is measured as a function of four inputs (production factors): capital, labour, land and raw materials. The indicators are created to compare the growth rates of member states’ rather than their productivity levels (although they may be studied as well in the future).

1 Head of Section of the Agricultural Statistics Department of the HCSO.

Productivity indicators can be classified into two categories:

1. partial productivity: relates an output indicator to a single input indicator,
2. multi-factor productivity: relates every output indicator to a bundle of input indicators.

Both types have their advantages and disadvantages. Partial productivity is easy to measure and understand but it does not reflect the fact that in reality output can be dependent on the interaction of several production factors. Multi-factor productivity is much better at that point but it requires a substantial amount of input data.

The output factors of the productivity indicators are taken at basic prices, which include product subsidies. This is in harmony with the primary objective of the EAA, the measurement of income from agricultural activity, and is the best to reflect the price actually retained by the producer. Eurostat also made experimental calculations with producer prices, and the results were very similar.

The multi-factor productivity indicators have been given greater priority, because they allow a better comparison among the member states. Partial productivity indicators are more suitable for comparisons within a single country. Eurostat is working on the development of the following two indicators.

**Multi-factor productivity.** The member states agreed that the productivity indicators will be based on the (constant) volume indicators of output and input, which are derived from EAA and ALI statistics. The numerator is the volume of agricultural industry output in basic prices at 1995 euro prices. The denominator is the volume of a bundle of agricultural input factors at 1995 prices. These factors are capital (weighted by the current euro prices of depreciation data), raw materials (weighted by the current euro prices of intermediate consumption) and labour (the use of paid labour weighted by the current euro prices of compensation of employees and the use of unpaid labour weighted by the implicit average compensation by employee).

Depreciation, used in the weighting of capital input, is in fact not the most suitable indicator. The OECD proposes the use of the value of fixed assets, but it is difficult to measure. The term 'raw materials’ is not well defined. Actually both the index and the weight refer to a broader concept: intermediate consumption in agriculture, including the value of products (seeds, fertilisers, pesticides etc.) and services (maintenance, veterinary fees etc.) used in production.

The OECD manual recommends the adjustment of labour input for differences in type of labour (age, education etc.) but Eurostat does not calculate such indicator due to the lack of all necessary data. The base year for the calculation of the productivity indicator is 1995 both for the output and the input indices. The partial indices are weighted by the Fisher-index number formula (the geometric average of the indices weighted at the 1995 and the current year prices).

Several things must be taken into account when analysing these indicators.

- Output refers only to production in the physical sense, but there are social and environmental factors as well (such as desertification etc.).

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2 In theory there is a third kind of productivity indicator reflecting every production factor, but because there are no reliable data on the price of agricultural land and it is methodologically implicated to take into account the implicit rental of owner-occupied land such an indicator is not calculated.
Depreciation, used in the weighting of capital, may require empirical correction. The labour input data are not broken down by age, sex and education. The Annual Work Units (AWU) used by the member states differ to a great extent and, those persons working more than those in full employment cannot be calculated as more than one AWU.

The partial (single-factor) productivity is proposed as a secondary indicator only, mainly for comparing different industries within a single member state. The data are also derived here from EAA and ALI statistics. The numerator of the indicator is the gross value added of the agricultural industry at 1995 euro prices, while its denominator is the agricultural labour input expressed in Annual Work Units.

AGRICULTURAL PRODUCTIVITY IN HUNGARY

The adaptation of the calculation methods in Hungary was made possible by the recent introduction of EAA and ALI statistics. The delayed introduction of these systems compared to the current member states has not just drawbacks but also advantages. The lack of time series is always a problem when introducing new statistics. Productivity is substantially affected by the weather among other things, and trends can be identified only in the course of several years. The Hungarian Central Statistical Office (HCSO) has been publishing the EAA since 2000, however, due to capacity shortages, retrospective data are available only from 1998. Because in the case of such a short time series every single year counts, the year 1997, a year with raw and unpublished but still comparable data is included in the calculation. Consequently, our base year can only be 1997, instead of 1995.

In Eurostat calculations, the indicators used for weighting are expressed in euro. As the indicators are not intended to measure productivity levels, the following experimental calculation is made in Hungarian forints.

To generate EAA data, member states are required to supply data compared to the previous year, the supply of 1995-based data being optional. Because of the volatility of the Hungarian agricultural industry and the rapid structural changes, the HCSO calculates EAA data only on the basis of previous year. (At first, we calculated the gross output on a fixed base as well but these data significantly differed from those on the basis of the previous year.) The volume indices of the output and the individual production factors could only be calculated on a (quasi) 1997 basis by chaining of the indices at prices of the previous year. In the (Fisher-)weighting of the partial input indices the base year weights were also used.

THE RESULT OF CALCULATIONS IN EUROPEAN COMPARISON

As opposed to the dynamic growth in many of the EU member states, the Hungarian productivity indicators fluctuate in an irregular manner depending on good or bad weather. The slight increase in the trend is only due to the fact that the number of those working in agriculture is falling steadily.

The volume of gross output stagnated in the period under review (see the table). Although there are no comparable EAA data from the first half of the 1990s, the time series based on traditional national methodology suggests that output volumes have plummeted
by as much as 30 percent since the beginning of that decade (most of the decline happened in the early years of the decade). During the same years, the output volumes in the EU either slowly grew or stagnated.3

<table>
<thead>
<tr>
<th>Indicator</th>
<th>1997*</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume index of gross agricultural output</td>
<td></td>
<td>100.9</td>
<td>100.4</td>
<td>94.7</td>
<td>104.9</td>
<td>100.3</td>
</tr>
<tr>
<td>Volume index of gross value added</td>
<td></td>
<td>103.9</td>
<td>100.6</td>
<td>84.2</td>
<td>101.3</td>
<td>89.4</td>
</tr>
<tr>
<td>Volume index of depreciation</td>
<td></td>
<td>99.0</td>
<td>98.1</td>
<td>93.7</td>
<td>94.3</td>
<td>95.8</td>
</tr>
<tr>
<td>Volume index of total labour input</td>
<td></td>
<td>96.8</td>
<td>93.9</td>
<td>87.1</td>
<td>82.8</td>
<td>79.1</td>
</tr>
<tr>
<td>Volume index of intermediate consumption</td>
<td></td>
<td>96.6</td>
<td>100.4</td>
<td>102.9</td>
<td>107.3</td>
<td>107.5</td>
</tr>
<tr>
<td>Depreciation at current prices***</td>
<td>78 499</td>
<td>95 085</td>
<td>104 689</td>
<td>118 583</td>
<td>122 821</td>
<td>130 926</td>
</tr>
<tr>
<td>Compensation of employees at current prices***</td>
<td>104 772</td>
<td>109 744</td>
<td>114 650</td>
<td>121 313</td>
<td>133 403</td>
<td>143 950</td>
</tr>
<tr>
<td>Imputed compensation of unpaid labour at current prices***</td>
<td>432 075</td>
<td>462 121</td>
<td>529 480</td>
<td>545 475</td>
<td>627 368</td>
<td>699 349</td>
</tr>
<tr>
<td>Intermediate consumption***</td>
<td>578 515</td>
<td>599 086</td>
<td>639 782</td>
<td>739 142</td>
<td>888 292</td>
<td>890 967</td>
</tr>
<tr>
<td>Multi-factor input at current prices***</td>
<td>1 193 860</td>
<td>1 266 037</td>
<td>1 388 601</td>
<td>1 524 512</td>
<td>1 771 885</td>
<td>1 865 192</td>
</tr>
<tr>
<td>The weight of depreciation in the multi-factor productivity indicator</td>
<td>0.07</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>The weight of total agricultural labour in the multi-factor productivity indicator</td>
<td>0.45</td>
<td>0.45</td>
<td>0.46</td>
<td>0.44</td>
<td>0.43</td>
<td>0.45</td>
</tr>
<tr>
<td>The weight of intermediate consumption in the multi-factor productivity indicator</td>
<td>0.48</td>
<td>0.47</td>
<td>0.46</td>
<td>0.48</td>
<td>0.50</td>
<td>0.48</td>
</tr>
<tr>
<td>Multi-factor productivity indicator***</td>
<td>102.2</td>
<td>102.2</td>
<td>99.4</td>
<td>109.7</td>
<td>106.8</td>
<td></td>
</tr>
<tr>
<td>Partial (labour) productivity indicator***</td>
<td>107.3</td>
<td>107.1</td>
<td>96.7</td>
<td>122.4</td>
<td>113.1</td>
<td></td>
</tr>
</tbody>
</table>

* Estimated data.
** Preliminary data.
*** HUF million.
**** Percent.
***** Note: The time sequence of the partial and multi-factor productivity indicators are shown by Figure 1 and 2.

The gross value added fell more than 10 percent between 1997 and 2002. In the EU member states, the value added usually grew more rapidly than the output. The weight of the production factors in the multi-factor productivity indicator showed little or no change over the course of the examined period. Their share in the input bundle is the same as in most of the member states (intermediate consumption, total labour, depreciation).

The weight of intermediate consumption was 48 percent in 2000, which is pretty close to the 51 percent EU average. The annual changes in its volume are smaller (more stable) than those in the output and gross value added (not surprisingly: it is necessary to plough, sow, fertilise etc. every year while the yield is quite uncertain). The Hungarian volume index has been increasing for four years, which may indicate the start of positive changes. The corresponding data in the EU show either a moderate increase or a small decline.

3 Unfortunately, the used literature does not offer data about the EU 15 (and member state data often cover different periods of time).
The weight of compensation of employees shows a wide variance within inputs among the member states, from 16 percent in Austria to 47 percent in Finland, the EU average being 35 percent. With the two extreme values left out, the member states can be classified into two groups. In the ‘southern’ countries and Ireland the proportion of labour is high while in the ‘northern’ ones the same proportion is low. With its 44 percent, Hungary comes among the ‘southern’ countries, characterised by fragmented, mainly family farms.

The volume of labour decreases steadily year by year in every EU country (and in Hungary, too). This process has been going on in the EU for decades and still does not show any sign of slowing down. This production factor (and the more stable output) has the greatest influence on the growing productivity in the EU. The slight increase in the Hungarian productivity is also a result of this phenomenon. As opposed to the declining volume, the per-capita compensation grew significantly, inflating the current price data as well.

The weight of depreciation was stable at seven to eight percent. This is below the EU average (14%), in fact there is no such a low value in any of the member states. The main
reasons are obsolete equipment and overcapacity (in buildings). The expected average use of fixed assets is significantly longer, therefore their depreciation rate is smaller than in the EU countries.

The volume of depreciation in Hungary decreased until 2000, then, in the course of the past two years, it surged back as subsidising policies brought about impressive investments, which, in turn, expanded the basis of depreciation: the stock of fixed assets. The picture is a mixed one in EU member states; there are examples for increase and decrease as well.

My opinion is that, the weight of fixed assets is grossly undervalued in the index. If member states had accurate data about the value of the stock of the fixed assets at replacement costs, this item would have the highest share in the output bundle (it would be 20 to 30-times more than the value of depreciation at current prices). This would cause the data to show a significantly different (worse) picture about the trend of agricultural productivity of the EU. The General Agricultural Census of 2000 has provided a reliable data background of fixed assets in Hungary, which offers a basis for not only depreciation estimates but also some future experimental calculations. Changing the weight of capital input would further deteriorate Hungarian data.

FUTURE TASKS

Productivity calculations have been a part of ‘Income from agricultural activity’ annual publication of the Eurostat for the past two years. The published data are getting more comprehensive from year to year. Hungarian productivity data will be fully comparable with EU data once they will be available as from the base year (1995) at least. Furthermore, the fixed price EAA data on fixed base will also have to be compiled (recently only data compared to the previous year are available). The conditions of converting to euro are already in place.

The methodology developed by Eurostat is not to be considered as the final one since there are several constraints to its use. Therefore the present indicators are expected to change and/or be supplemented. In my view, one possible way of development can be replacing depreciation by the capital stock within the multi-factor productivity indicator. A precondition of this is to supplement the accounts of the EAA with the balance sheet, which has been planned for so long. Another possible (although longer-term) direction of development is the inclusion of environmental factors. The environment is becoming more and more important which is apparent in the agricultural subsidy system of the EU. A major obstacle of the development, however, is that environmental factors are difficult to quantify.

REFERENCES
