

LABOUR PRODUCTIVITY IN CZECH AGRICULTURE AND FACTORS OF ITS IMPROVEMENT*

J. Brčák

Czech University of Life Sciences, Faculty of Economics and Management, Department of Economic Theories, Prague, Czech Republic

Labour productivity in the Czech Republic measured as gross agricultural production per worker has increased during the whole time series, on average by 5% annually. Labour productivity measured by net added value per worker from 1995 has stagnated. Regional differences within the Czech agricultural sector in productivity development were identified as significant. There is a huge gap in labour productivity between advanced EU states and new entrants. The highest productivity is achieved in The Netherlands and Belgium (in 2007 up to 120 billion CZK). Other countries with high productivity are France, Sweden and Germany. By contrast the lowest values are typical for new entrants, especially Bulgaria and Romania (app. 5–6 million EURO), followed by Poland, Latvia, Lithuania and Slovenia with output from 8 to 10 million EURO. The Czech Republic is amongst the average of EU countries; in 2007 productivity ZP/AWU amounted to 30.5 million EURO with app. 15% annual growth. The pace of growth in EU27 is only 3% annually, so it can be assumed that Czech Republic will improve and move forward compared to other EU states.

labour productivity; gross agricultural production; net added value; dynamics of agriculture development, determinants of labour productivity

INTRODUCTION

Labour productivity can be generally defined as volume of output for one unit of input. For agricultural needs labour productivity can be characterized by an equation where there is volume of production in numerator and volume of labour in denominator.

Labour productivity is the central category of whole economics and there are a lot of authors, who deal with it. Almost all significant macroeconomists (for example Samuelson, Nordhaus, 1995) give special attention to a general delimitation of indicator of labour productivity and its use in economics. Problems of the evolution of labour productivity in Czech agriculture are dealt by Boháčková (2002), Bervidová (2001, 2004), Svatoš et al. (2009) and others. Boháčková (2002) analyzes means of observing and defining labour productivity in agriculture and the meaning of its indicator in a market economic situation. Bervidová (2001) deal with questions of labour productivity in circumstances of a farming business. She comprehends labour productivity as an important assumption of company activities. Bervidová (2004) further investigates the evolution of labour productivity in agriculture and defines factors, which affect this evolution.

The purpose of this essay is to analyze the basic aspects of labour productivity in agriculture development in the Czech Republic, including a regional comparison at a national and an international level. For this purpose labour productivity will be expressed in different ways because of the different conditions and interpretation. Furthermore a definition of the basic drivers of labour productivity will be given together with prospects of its further development.

MATERIAL AND METHODS

The scope of production can be characterized by the commonly used parameter, gross agricultural production, which (according to the Czech statistical office definition) reflects the aggregated volume of animal and plant production, including interim product. Specifically it is the sum of values of all products of all physical and legal bodies, including an estimate for other small farmers. The bottom line is that the methodology of calculation has remained unchanged over the last few years, which enables a direct comparison of the gross agricultural production values.

An alternative option for expressing production volume, which can be also used for creating a productivity indicator, is net added value of the agricultural sector. This is defined by CSO as the total value aggregated from all partial values created by all agricultural production resources after deduction of a sum for fixed capital consumption.

The denominator of the productivity indicator usually contains the number of workers within the agriculture sector. The number of workers is commonly expressed as the average number of statistically registered workers. Permanent and temporary workers are differentiated and temporary workers are recalculated on a comparable level with permanent workers. Alternatives to recalculated workers within agriculture can be the agricultural work force through the means of AWU units (recalculated worker, i.e. one worker with 100% work capacity in agricultural production) or wage costs.

Net added value (NAV) is currently a synthetic indicator of standard EU output, which expresses the overall

* Knowledge given in this article is the result of solution of research project MSM 6046070906 Economy of Czech agriculture resources and their efficient using in framework of multifunctional agrarian systems.

affect of total production, efficiency of inputs and operational subsidies. Its share on worker or recalculated worker (respectively AWU) is hence one of the most important indicators of labour productivity.

Another potential indicator for labour productivity is gross agricultural production (GAP), which is the sum of individual agricultural areas, i.e. plant and animal production, agricultural services and non-agricultural side activities. Its share of workers or AWU can be applied within different views on development and labour productivity comparison.

RESULTS AND DISCUSSION

Development of labour productivity in Czech agriculture

Gross agricultural production in the Czech Republic has slightly decreased from 1995 with the exception of 2004, where production grew by 14.9% due to plant production. 2005 and 2006 are characterized again by the decline of production by app. 7% annually.

Net added value was decreasing from 1996 till 2000, when it stabilized at the level of 17 billion until 2006. 2001 and 2004 were exceptional, net added value jumped to 25 billion and 29 billion respectively (Table 1, Fig. 1).

Apart from production (GAP, NAV) the number of workers is another important characteristic within labour productivity in agriculture. The total number of workers in the agricultural sector continuously decreased from 1993 (with the exception of 1997). At the beginning of the monitored period 260 thousand agricultural workers were registered, eleven years later it was less than 150 thousand. The absolute decline of the total number of persons represented almost 140 000, inter-yearly decline amounted to

app. 5% in the last six years. Between 1997 and 2000 the decrease of the labour force was even higher and reached values around 8%. In the respective period there was permanent decline of the share of agricultural workers in the total number of workers. The most up-to-date data, related to 2007, indicates a 3.3 % share of the total aggregate number of employees in the national economy.

The main causes of this development can be seen in income inequality compared to other sectors of the national economy, the international competitiveness of Czech products and also the legacy of excessive dimensioning of agriculture before 1989. The income difference between agriculture and other Czech economy sectors remains significant, although in 2007 wages in agriculture grew by almost 10 percent.

Labour productivity will be, in the following paragraphs, expressed by two indicators. In the first case it will be an indicator of gross agricultural production (in stable prices) of one worker of OKEC category A. In the second case it will be indicator of net added value (in stable prices) per one worker. The reason for this is that it allows the possibility of following the influence of price fluctuation on labour productivity.

Labour productivity as counted based on gross agricultural production per worker in agriculture keeps increasing from 1997. This is caused predominantly by the significant decline of the number of workers in agriculture compared to only a slight decrease of the gross agricultural production. A significant change in productivity was recorded between 2003 and 2004, when inter-yearly change amounted to almost 21% thanks to high gross agricultural production in 2004 and at the same time a 5% decrease of labour force in agriculture (Fig. 2).

An up-to-date value of labour productivity in 2006 amounted to 477963 CZK, when inter-yearly relevant

Table 1. Summary data of labour productivity in agriculture

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---------|---------|---------|---------|---------|---------|
| Labour productivity (NAV/number of workers, in CZK, current prices) | 116 269 | 128 962 | 105 527 | 118 938 | 103 748 | 99 133 |
| Basic index (NAV/number of workers, in CZK) basis 1995 | 100 | 110.9 | 90.8 | 102.3 | 89.2 | 85.3 |
| Labour productivity (GAP/number of workers, in CZK) current prices | 314 733 | 314 793 | 297 217 | 323 306 | 372 985 | 386 138 |
| Basic index (GAP/number of workers) basis 1995 | 100 | 100 | 94.4 | 102.7 | 118.5 | 122.7 |
| Gross agricultural production (mil. CZK) basis 1989 | 82 031 | 80 916 | 76 803 | 77 351 | 77 798 | 74 269 |
| Net Added Value (mil. CZK) current prices | 30 304 | 33 149 | 27 269 | 28 456 | 21 640 | 19 067 |
| Number of workers (OKEC A) | 260 637 | 257 045 | 258 407 | 239 250 | 208 582 | 192 338 |
| Economic result of agriculture | 0.5 | -0.498 | -1.3 | -0.648 | -2.23 | 3.41 |
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
| Labour productivity (NAV/number of workers, in CZK) | 135 267 | 101 324 | 102 312 | 185 742 | 112 456 | 91 008 |
| Basic index (NAV/number of workers, in CZK) basis 1995 | 116.3 | 87.1 | 88 | 159.8 | 96.7 | 78.3 |
| Labour productivity (GAP/number of workers, in CZK) current prices | 411 581 | 419 671 | 409 778 | 495 755 | 481 886 | 477 963 |
| Basic index (GAP/number of workers) basis 1995 | 130.8 | 133.3 | 130.2 | 157.5 | 153.1 | 151.9 |
| Gross agricultural production (mil. CZK) basis 1989 | 76 135 | 72 752 | 67 227 | 77 261 | 73 558 | 70 500 |
| Net Added Value (mil. CZK) current prices | 25 022 | 17 565 | 16 785 | 28 947 | 17 166 | 13 424 |
| Number of workers (OKEC A) Czech Statistical Office | 184 982 | 173 355 | 164 057 | 155 845 | 152 646 | 147 501 |
| Economic result of agriculture | 2.73 | -3.55 | -2.36 | 8.58 | 7.64 | 7.2 |

Source: Czech Statistical Office, MZE Report on Agriculture status, own calculations

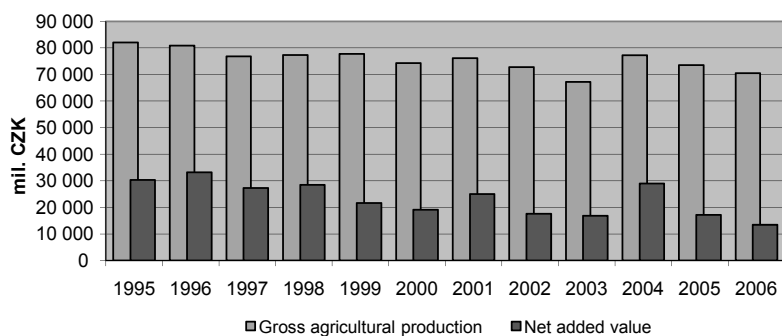


Fig. 1. Net added value, gross agricultural production 1995–2006
Source: MZE Reports on agriculture status

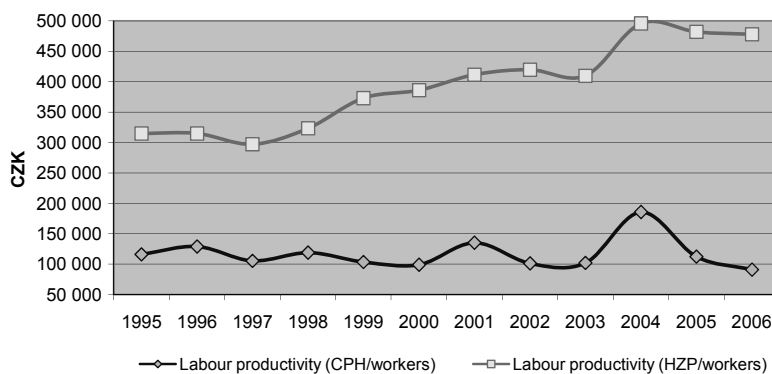


Fig. 2. Time series CPH/number of workers and HZP/number of workers 1995–2006
Source: MZE Report on farming status, CSO

change compared to previous year was minimal. In comparison with the value characterizing labour productivity for the same time period, but expressed in fixed 1989 prices, exceeded the defined value by more than 50%.

Labour productivity calculated based on the ratio of net added value per worker is almost constant during the period 1995 to 2000 and varies between 99 thousand to 128 thousand CZK. The same situation is in 2002, 2003 and 2006 when values did not differ from normal. Years 2001 and 2004 represent exceptions, when labour productivity suddenly steeply rose to 135 and 185 thousand CZK especially thanks to high net added value.

In Table 1 changes in both types of productivity can be followed as percentage change of the value based on the base year of 1995. It is evident that there is continuous growth of productivity when using the indicator of gross agricultural product, meanwhile net added value per worker differs a lot and varies between 78% and 159% of the base year value.

The financial results of agriculture corporations measured by the internationally comparable indicator NAV/AWU for corporations, according to their legal form was the highest value for a group of physical person corporations over 300 ha (more than 600 ths. CZK/ha) with the lowest production intensity, with lowest AWU per 100 ha and a very low portion of the animal production. By contrast the lowest value of this parameter in this category was recorded by the smallest corporations of physical persons up to 50 ha (app. 220 ths. CZK/AWU), which are characterized especially by high AWU per 100 ha.

Corporations having a dominant share on results of agriculture sector within examination of FADN showed in the NAV/AWU indicator with a value of 300.5 th CZK/AWU, which is in the middle of the stated range. These

corporations are characterized by an average AWU per 100 ha and average focus on animal production.

Regional development of labour productivity in CR

Regional analysis of labour productivity can be carried out only for the period 2003–2006, when there is relevant data available. The indicator of labour productivity is constructed as share of total agricultural production (including taxes and subsidies) to the average number of workers in group A, which includes farming, forestry and gamekeeping stated in the standard OKEC classification. Labour productivity hence also reflects workers in forestry and gamekeeping, which causes a distortion of regional productivity analysis.

The case of a higher share of forestry or gamekeeping workers in a particular region is handicapped, with respect to productivity value, because the production of these economic subjects is not contained in the respective indicators of total farming production, but their number is comprised in category A. However, these rough indicators can provide solid evidence about regional differences as well as a comparison with a nationwide average based on the indicator of the same structure.

When comparing relevant characteristics of regions, which determine the productivity indicator, we can identify the most important, and respectively the less important regions, from agriculture statistics of Czech municipal structure point of view.

Based on the last analysis in 2006 the region which, employs the highest number of persons in the sector (OKEC category A), is The Central-Bohemian region (comprising estates in Prague) with 20 100 workers. In

2005 this primacy was occupied by the traditional farming district Vysocina (in 2006 there were registered 18 100 persons, which caused a change in the first two places). Third place is captured by the region Southern-Moravia and Olomouc, where there were over 17000 registered workers (Table 2).

Regions with the lowest number agricultural workers in 2006 were Karlovy Vary region (1700 workers) and Liberec (4700). The order of regions did not change.

All regions were characterized by an annual decline of numbers of agricultural workers, with special exceptions (e.g. Southern Bohemia in 2004). In comparison of 2006 with 2003 there was an absolute decline of registered agricultural workers in each region.

The highest number of workers in Central Bohemia in 2006 was reflected also with the highest cumulative volume of production. Those farmers recorded total production of 17.482 billion CZK. Second place was Southern Moravia region with production of 12.815 billion CZK, with at the same time the 3rd highest number of farmers. The 3rd position for output is held by Vysocina region with output of 11.449 billion CZK.

The regions with the lowest volumes are Karlovy Vary (1.41 billion CZK), Liberec (1.903 billion CZK) and Usti (5.820 billion CZK), when this order corresponds to number of farmers.

Labour productivity expressed by volume of farming production to registered number of workers in respective regions shows significant regional differences. Meanwhile the highest absolute indicators in 2006 were registered in Central Bohemia, Karlovy Vary and Southern Bohemia, the less productive were farmers in the Morava-Silesian, Liberec and Olomouc regions. High productivity was achieved in Central and Southern Bohemia, being determined predominantly by production, meanwhile high productivity in Karlovy was determined by the number of workers.

The ranking in 2003 differed partially from the ranking in 2006. Stable high productivity was kept up, in spite of unfavourable conditions in that year, by Central and Southern Bohemia. The next two most productive regions were the Zlin and Plzen regions. On the other hand the least productive were the same regions as in 2006, this means Liberec, Moravia-Silesian region and Olomouc region. The yearly pace of productivity growth could have been monitored in 2004–2006 only, because for other years there are no data available at regional level. In 2004 there was growth of productivity recorded, which differed significantly between regions. This general growth was determined especially by the successful year 2004, as well as by production decline in 2003. The highest growth was in Usti region, where the value of growth coefficient was 1.95. By contrast the smallest growth was in the Zlinsky region (3%).

Three years later the situation was different. At a nationwide level productivity grew by 3%. This growth was stimulated by districts Karlovy Vary (57% growth), Hradec Kralove (+26%) and Vysocina (+23%). By contrast CR average was negatively affected by districts Liberec (–12%), Central Bohemia (–12%) and Southern Bohemia (–13%).

Dynamics of agriculture development and comparison with other countries

The dynamics of Czech agriculture development can be further analysed on the basis of comparison with all EU member states.

One of productivity indicators for comparison within EU is agriculture production recalculated for one AWU. From the data in Table 3 it is evident there was an increasing trend of that indicator, which means that labour productivity expressed by this indicator in EU increases (Table 3).

There is a huge gap in labour productivity between advanced EU states and new entrants. The highest productivity is achieved in Denmark, The Netherlands and Belgium (in 2007 up to 100 thousand EUR). High values in The Netherlands are caused by landscape type and the fact that it is one of the biggest flower producers. Other countries with high productivity are France, Sweden and Germany.

By contrast the lowest values are typical for new entrants, especially Bulgaria and Romania (app. 5–6 thousand EUR), followed by Poland, Latvia, Lithuania and Slovenia with output from 8 to 10 thousand EUR.

The Czech Republic is amongst the average of EU countries, in 2007 productivity ZP/AWU amounted to 30.5 thousand EUR with app. 15% annual growth. The pace of growth in EU27 is only 3% annually, so it can be assumed that Czech Republic will improve and move forward compared to other EU states.

Determinants of labour productivity

Generally factors influencing labour productivity can be split into two basic areas. Considering the basic approach to labour productivity as the relationship of production to specific labour volume, then these are:

- determinants affecting the volume of production,
- determinants affecting the size of the work.

a) Determinants affecting volume of production

There are many factors affecting the growth of agriculture production, for example:

- size and quality of the land
- number and quality of production factors used
 - number and quality of fertilizers
 - number and quality of seeds
 - number and quality of machines used etc.
- level of animal production, relationship between plant and animal production
- volume of investment made
- level of general scientific development
- prices of inputs into agriculture
- scope of required consumption of agricultural products

The vast majority of those factors are connected with an important indicator of agricultural production, i.e. indicator of farming production (production per 1 hectare of farming land).

Table 2. Regional labour productivity of agriculture in CR

| | SK | JK | PLZK | KVK | UK | LIBK | KHK | PDBK | VYS | JMK | OLK | MSK | ZK | CR |
|---|--------|--------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|---------|
| Year 2003 | | | | | | | | | | | | | | |
| Agriculture production (mil. CZK, current prices) | 15 626 | 10 140 | 6 474 | 1 310 | 5 238 | 1 534 | 6 840 | 7 250 | 10 455 | 11 018 | 7 468 | 5 597 | 4 270 | 93 219 |
| Number of employees (thousands) | 23.6 | 15.3 | 10.6 | 2.9 | 10.4 | 7.0 | 13.0 | 13.6 | 20.1 | 20.9 | 20.2 | 16.0 | 6.8 | 180 |
| Labour productivity (1000 CZK/employee) | 661 | 663 | 611 | 451 | 505 | 219 | 525 | 535 | 520 | 527 | 370 | 350 | 632 | 517 |
| Inter-yearly labour productivity growth | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Difference from CR average | 128% | 128% | 118% | 87% | 98% | 42% | 102% | 103% | 101% | 102% | 72% | 68% | 122% | 100% |
| Year 2004 | | | | | | | | | | | | | | |
| Agriculture production (mil. CZK, current prices) | 19 883 | 12 342 | 8 439 | 1 609 | 6 512 | 1 961 | 8 626 | 8 873 | 12 483 | 13 646 | 8 939 | 6 711 | 5 240 | 115 265 |
| Number of employees (thousands) | 22.4 | 13.3 | 9.2 | 2.4 | 6.6 | 6.8 | 13.6 | 11.8 | 21.0 | 22.8 | 19.2 | 15.9 | 8 | 173 |
| Labour productivity (1000 CZK/employee) | 888 | 928 | 920 | 681 | 983 | 288 | 635 | 750 | 595 | 599 | 466 | 421 | 653 | 666 |
| Inter-yearly labour productivity growth | 1.34 | 1.40 | 1.51 | 1.51 | 1.95 | 1.32 | 1.21 | 1.40 | 1.14 | 1.14 | 1.26 | 1.20 | 1.03 | 1.29 |
| Difference from CR average | 133% | 139% | 138% | 102% | 148% | 43% | 95% | 113% | 89% | 90% | 70% | 63% | 98% | 100% |
| Year 2005 | | | | | | | | | | | | | | |
| Agriculture production (mil. CZK, current prices) | 1 7681 | 11 774 | 7 658 | 1 412 | 5 422 | 1 828 | 7 533 | 7 605 | 11 008 | 12 401 | 7 687 | 6 292 | 4 592 | 102 894 |
| Number of employees (thousands) | 18.0 | 12.9 | 11.4 | 2.7 | 7.6 | 3.9 | 12.6 | 9.8 | 21.5 | 17.9 | 16.6 | 16.3 | 8 | 159 |
| Labour productivity (1000 CZK/employee) | 984 | 910 | 672 | 532 | 717 | 467 | 598 | 779 | 513 | 694 | 463 | 386 | 599 | 648 |
| Inter-yearly labour productivity growth | 1.11 | 0.98 | 0.73 | 0.78 | 0.73 | 1.62 | 0.94 | 1.04 | 0.86 | 1.16 | 0.99 | 0.91 | 0.92 | 0.97 |
| Difference from CR average | 148% | 137% | 101% | 80% | 108% | 70% | 90% | 117% | 77% | 104% | 70% | 58% | 90% | 100% |
| Year 2006 | | | | | | | | | | | | | | |
| Agriculture production (mil. CZK, current prices) | 17 482 | 11 085 | 7 916 | 1 419 | 5 820 | 1 903 | 7 676 | 7 220 | 11 449 | 12 401 | 7 409 | 5 896 | 4 177 | 102 265 |
| Number of employees (thousands) | 20.1 | 14.0 | 11.0 | 1.7 | 7.6 | 4.7 | 10.2 | 9.8 | 18.1 | 17.9 | 17.1 | 14.6 | 6.9 | 153 |
| Labour productivity (1000 CZK/employee) | 870 | 792 | 717 | 834 | 769 | 406 | 753 | 737 | 631 | 694 | 433 | 404 | 609 | 669 |
| Inter-yearly labour productivity growth | 0.88 | 0.87 | 1.07 | 1.57 | 1.07 | 0.87 | 1.26 | 0.95 | 1.23 | 1.16 | 0.94 | 1.05 | 1.02 | 1.03 |
| Difference from CR average | 131% | 119% | 108% | 125% | 115% | 61% | 113% | 111% | 95% | 112% | 65% | 61% | 91% | 100% |

Source: CSO

Note: SK – Central Bohemia (including capital of Prague), JK – Southern Bohemia, PLZK – Pilsen, KVK – Karlovy Vary, UK – Usti, LIBK – Liberec, KHK – Hradec Kralove, PDBK – Pardubice, VYS – region Vysočina, JMK – Southern Moravia, OLK – Olomouc, MSK – Moravia-Silesian, ZK – Zlin. Values for the Czech Republic are sum of values from all regions

Table 3. Labour productivity in EU countries (agricultural production/AWU in thousands EURO)

| | 1997 | 2000 | 2003 | 2005 | 2007 |
|-------------------|--------|---------|---------|---------|---------|
| EU (27 countries) | | | 24.628 | 25.803 | |
| EU (25 countries) | | | 31.922 | 32.849 | |
| EU (15 countries) | 40.085 | 44.701 | 45.670 | 46.933 | |
| Belgium | 89.328 | 89.440 | 90.053 | 95.563 | 105.990 |
| Bulgaria | | | 4.125 | 5.372 | |
| Czech Republic | | | 17.676 | 22.744 | 31.495 |
| Denmark | 89.009 | 126.139 | 135.486 | 130.760 | 163.939 |
| Germany | 66.009 | 69.547 | 59.081 | 60.379 | 74.450 |
| Estonia | | | 11.126 | 14.860 | 21.164 |
| Ireland | 29.960 | 35.532 | 37.108 | 37.519 | 40.486 |
| Greece | 19.633 | 19.745 | 19.487 | 20.022 | |
| Spain | 30.732 | 33.665 | 42.249 | 39.892 | 42.067 |
| France | | | 68.515 | 74.362 | 82.697 |
| Italy | 24.302 | 32.051 | 30.942 | 31.802 | 34.069 |
| Cyprus | | | 19.364 | 21.691 | 24.345 |
| Latvia | | 3.272 | 4.184 | 5.473 | 9.987 |
| Lithuania | | | 5.504 | 7.338 | 11.283 |
| Luxembourg | 46.279 | 64.056 | 66.358 | 63.814 | 71.243 |
| Hungary | | | 10.614 | 13.214 | 16.549 |
| Malta | | | 25.303 | 30.882 | 31.738 |
| The Netherlands | 90.185 | 96.995 | 109.841 | 119.526 | 139.394 |
| Austria | 32.521 | 30.768 | 32.608 | 32.697 | 38.914 |
| Poland | | | 5.369 | 6.620 | 8.809 |
| Portugal | 11.615 | 12.089 | 14.577 | 16.511 | 19.616 |
| Romania | | | 3.986 | 4.951 | 6.489 |
| | 1997 | 2000 | 2003 | 2005 | 2007 |
| Slovenia | | 9.125 | 10.067 | 11.215 | 13.299 |
| Slovakia | | 10.367 | 13.665 | 17.138 | 22.080 |
| Finland | 32.532 | 40.823 | 43.606 | 52.566 | 62.320 |
| Sweden | 58.763 | 65.586 | 68.197 | 61.736 | 77.553 |
| United Kingdom | 61.346 | 68.353 | 65.118 | 61.642 | 66.944 |

Source: Eurostat

Intensity of agricultural production can be defined as the relationship of production and the territory where the process goes on. One of the most common indicators of farming intensity is gross agricultural production per square unit (usually hectare). Also an indicator of net added value can be used. Subject value related to labour productivity can be understood as an efficiency indicator describing the affectivity of using all production factors, including labour (Table 4).

An examination of the development of both production intensity indicators shows an evident decreasing trend.

Meanwhile the indicator derived from gross production in 1995 reached value of 19166 CZK per ha, in 2006 it had a calculated value of 16573 CZK, which represents a relative decline of 14%.

The development of production intensity reflecting the amount of net added value is also characterized by a decreasing trend. Compared to gross farming production per hectare there is higher volatility. If current trends last, the efficiency of production expressed as an indicator of production intensity would show a decline of work productivity.

Table 4. Intensity of farming production indicators

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| CPH/ha in stable prices of 1999 | 7 080 | 7 747 | 6 372 | 6 642 | 5 054 | 4 455 | 5 850 | 4 111 | 3 932 | 6 788 | 4 030 | 3 156 |
| HZP/ha in stable prices of 1989 | 19 166 | 18 910 | 17 946 | 18 056 | 18 169 | 17 353 | 17 801 | 17 027 | 15 747 | 18 117 | 17 269 | 16 573 |

Source: CSO and own calculations

Based on the above stated aspects the positive influence of investment realization on labour productivity can be seen, because investment made changes in favour of increasing production. However its impact can be delayed by a few years.

Rising investment (formation of gross fixed capital) should positively regulate the production component of labour productivity in future.

Prices of agricultural production affects productivity directly, since they increase the value of gross agricultural production and other forms of expressing outputs in current prices. An easily identified relatively high correlation rate between labour productivity and the level of price movements of farm products can be seen especially in the last few years.

b) The determinants affecting scope of work

Growth or decline of work scope is affected by a number of factors, for example:

- number of labour force within the industry
- price of labour
- the process of substituting something for labour
- prices of inputs and outputs
- influence of scientific development etc.

Cumulative numbers expressing work service of human resources in production substantially affect productivity, because they participate directly on the construction of productivity indicators. Labour has also an important influence on production output indicators, which should be in direct relationship (higher scope of work determines higher production). This hypothesis however is not necessarily relevant, because the current relationship between production and the number of workers is weakened (e.g. new technologies, substitution of capital and labour, organizational scheme of corporations etc.)

In the Czech Republic the traditional relationship between workers and production is still important, which can be observed from Fig. 3 describing the changes in the number of workers and net added value, where without excluding trend both time series are positively correlated (Fig. 3).

With regard to labour price, for analytical purposes statistical data mapping development of gross wages within agricultural sector is used. It is a generally well known fact that the level of wages in farming lags behind the level of wages in national economy in the long term. Although the level of wages in agriculture has continuously increased, in 2006 it was only 73% of the national economy's average wage.

Prices of agricultural inputs regulate the value of labour productivity in two aspects. The first aspect concerns the increasing prices of production factors, raw materials and other resources, which affect the price growth of agricultural products. The second aspect concerns the growth of farming input prices, which can also cause a decrease of the labour force, because when costs rise unbearably, the labour force is usually sacrificed.

CONCLUSIONS

Labour productivity in the Czech Republic as measured as gross agricultural production per worker increases within the whole time series on average by 5% annually. Its value was 477 963 CZK.

Labour productivity, measured by net added value per worker from 1995 stagnated with exception in 2001 and 2004, when it increased dramatically by up to 135 thousand, and 185 thousand CZK respectively. The common value amounted approximately to 90–100 thousand CZK.

Regional differences within the Czech agricultural sector in productivity development were identified as significant. In some of the analysed years productivity in individual regions exceeded the nationwide average by tens of percentages (e.g. Central Bohemia in 2005, Southern Bohemia in 2004). Important differences were found also in the supporting values of labour productivity in concrete regions (e.g. Liberec district, Moravian-Silesian region in all analysed year).

For comparison between Czech Republic and EU an indicator of productivity expressing ratio of farming production on re-calculated worker AWU was used. Czech Republic has productivity comparable with EU27 average,

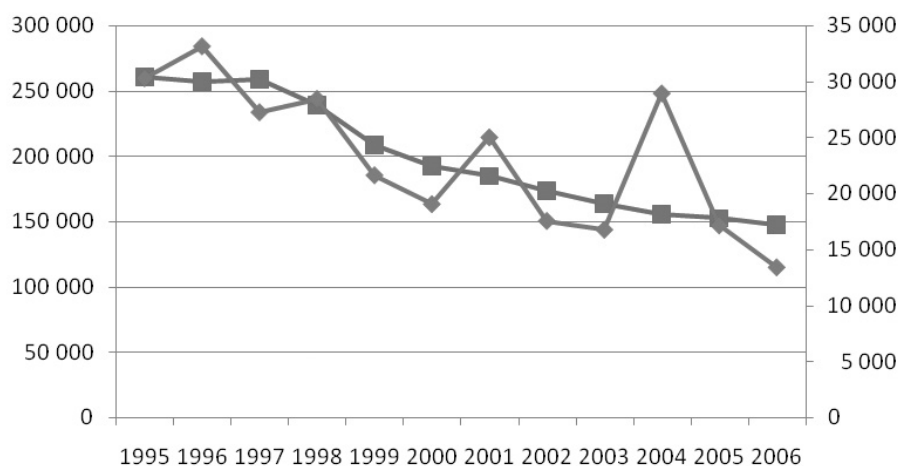


Fig. 3. Changes in the number of workers in agriculture (OKEC A) and net added value
Source: MZE and CSO

but its productivity is growing at a faster pace than EU productivity. If that trend continues, Czech Republic could reach level of the best countries in EU.

Determinants of agricultural labour productivity can be categorized into two basic groups, depending whether they affect production or labour content.

The growth of farm production is affected by many factors. The most important factors are the number and quality of the used production factors, level of animal production and general scientific development and the volume of investment made. The majority of factors affecting the growth of farm production are connected with an important indicator of agricultural production, i.e. indicator of farming production. The intensity of agricultural production up to 2006 negatively affected the level of productivity, because production per 1 ha of farming land decreased.

It can be presumed that investment has a positive influence on labour productivity, because investment made an impact in favour of production growth. However, its effect can be delayed, even by years. Investment growth (respectively formation of gross fixed capital) should positively regulate the production component of labour productivity in the future.

The growth of productivity is related to the growth or decline of work scope, which is generally affected by a number of factors. Among them the most important are the price of labour, inputs and outputs and the process of substituting other things for labour.

The number of full-time workers in the agricultural sector positively affects the growth of productivity, but we have to point out that this trend cannot be considered as long-term, because the number of workers in this sector cannot be decreased forever. With regard to the price of labour level, wages in agriculture lags behind the level of wages in the national economy.

On the basis of evaluating all the stated determinants it can be assumed that further development of labour productivity in CR will be affected predominantly by the following factors:

- A slight decline of the agricultural land fund
- Growth of volume and quality of production factors
- Increase of investment in farming
- Further increase of input prices
- Stagnation or decline of demand
- Gradual stabilization of the number of workers
- Gradual increase of wages in agriculture

Therefore it has to be emphasized that revolutionary future changes of labour productivity in agriculture cannot be expected. We expect labour productivity expressed by NAV per worker will keep on decreasing in the near future.

REFERENCES

- BERVIDOVÁ, L.: Produktivita práce jako faktor rozvoje podniku. In: Sborník z mezinárodní vědecké konference Faktory podnikové úspěšnosti – Liptovský Ján. FEM SPU Nitra, 2001.
- BERVIDOVÁ, L.: Předpoklady růstu produktivity práce v zemědělství ČR. In: Sborník z konference Agrární perspektivy XII, 2004.
- BOHÁČKOVÁ, I.: Je produktivita práce ukazatelem vyjadřujícím výkonnost zemědělství? In: Sborník z MVK, Mezinárodní vědecké dny 2002. Nitra, 2002. 8 pp.
- SAMUELSON, P. A. – NORDHAUS, W. D.: *Ekonomie*. Praha, Svoboda 1995.
- SVATOŠ, M. et al.: *Ekonomika zdrojů českého zemědělství a jejich efektivní využívání v rámci multifunkčních zemědělsko-potravinářských systémů*. ČZU Praha, 2009.
- Zpráva o stavu zemědělství (roky 1995–2007). Praha, MZE 1995–2007.

Received for publication on May 25, 2009
Accepted for publication on September 11, 2009

BRČÁK, J. (Česká zemědělská univerzita, Provozně ekonomická fakulta, Praha, Česká republika):

Produktivita práce v českém zemědělství a faktory jejího zvyšování.

Scientia Agric. Bohem., 40, 2009: 236–244.

Syntetickým ukazatelem standardního výstupu produktivity práce v EU je v současné době ukazatel čisté přidané hodnoty (ČHP) na jednoho pracovníka. Dalším z možných ukazatelů je hrubá zemědělská produkce (HZP) na pracovníka. Tento ukazatel lze uplatnit při různých pohledech vývoje a srovnání produktivity práce.

Produktivita práce v České republice měřená ukazatelem hrubé zemědělské produkce na pracovníka roste v celém průběhu časové řady v průměru o 5 % ročně. Její současná hodnota (rok 2006) činí 480 tis. Kč. Produktivita práce měřená pomocí čisté přidané hodnoty na pracovníka od roku 1995 stagnuje, až na výjimky let 2001 a 2004, kdy prudce vzrostla. Běžný stav přitom zaznamenává hodnoty okolo 90–100 tis. Kč.

Regionální diference v rámci českého zemědělského sektoru ve vývoji produktivity práce byly identifikovány jako významné. V některých analyzovaných letech v konkrétních krajích převyšovaly celorepublikový průměr o desítky procent (např. Středočeský kraj v roce 2005, Jihočeský kraj v roce 2004). Výrazné diference bylo možné objevit i v podprůměrných hodnotách produktivity u konkrétních krajských územních celků (např. Liberecký kraj a Moravskoslezský kraj ve všech analyzovaných letech).

Dynamiku vývoje českého zemědělství z mezinárodního hlediska lze analyzovat na základě srovnání výsledků za všechny členské státy EU. V produktivitě práce mezi jednotlivými zeměmi v rámci EU existuje obrovský rozdíl mezi vyspělými státy EU a jejich novými členy. Nejvyšší produktivity dosahuje Nizozemsko a Belgie (v roce 2007 až 120

mil. EUR). Vysoké hodnoty v Nizozemsku jsou způsobeny zejména charakterem krajiny a faktem, že země je jedním z největších vývozců květin. Dalšími zeměmi dosahujícími vysoké produktivity práce jsou Francie, Švédsko a Německo. Naopak nejnižšími hodnotami ukazatele jsou charakterizovány hlavně země nově vstoupivší do EU, zejména pak Bulharsko a Rumunsko (cca 5–6 mil. EUR), následovány Polskem, Lotyšskem, Litvou a Slovinskem s výkonem od 8 do 13 mil. EUR. Česká republika se zatím řadí spíše k průměru zemí EU a v roce 2007 činila produktivita ZP/AWU cca 30,5 mil. EUR a vykázala zhruba 15% meziroční růst. Tempo růstu EU27 je jen cca 3 % ročně, takže lze předpokládat, že se Česká republika posune směrem vpřed ve srovnání s ostatními státy EU.

Determinanty produktivity práce v zemědělství byly kategorizovány do dvou základních skupin s ohledem na to, zda ovlivňují produkci či obsah práce. Na základě zhodnocení všech výše uvedených determinant je možné předpokládat, že další vývoj produktivity práce v ČR bude ovlivněn zejména těmito aspekty:

- mírný pokles zemědělského půdního fondu,
- růst objemu a kvality výrobních faktorů,
- vzestup investic do zemědělství,
- další růst cen vstupů,
- stagnace či pokles poptávky,
- postupná stabilizace počtu pracovníků,
- postupný růst mezd v zemědělství.

Z hlediska budoucího vývoje produktivity práce v zemědělství nelze očekávat nějaký převratný vývoj. Je možné očekávat, že produktivita práce vyjádřená vztahem ČPH na pracovníka bude v nejbližším období v ČR i nadále klesat. Poznatky uvedené v daném příspěvku vyplynuly z řešení výzkumného záměru MSM 6046070906 Ekonomika zdrojů českého zemědělství a jejich efektivní využívání v rámci multifunkčních zemědělsko-potravinářských systémů.

produktivita práce; hrubá zemědělská produkce; čistá přidaná hodnota; intenzita zemědělské výroby; determinanty produktivity práce

Contact Address:

Doc. Ing. Josef B r č á k , CSc., Česká zemědělská univerzita v Praze, Provozně ekonomická fakulta, katedra ekonomických teorií, Kamýčká 129, 165 21 Praha 6-Suchbát, Česká republika, tel.: +420 224 382 317, e-mail: brcak@pef.czu.cz
