

# CHANGES IN INDICATORS OF THE DEVELOPMENT OF PLANT PRODUCTION IN THE CZECH REPUBLIC WITHIN THE PERIOD OF 1990–1998

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The paper summarises partial knowledge obtained in studies on the development of basic indicators of evolution of plant production in the period of transformation of the Czech national economy to a free market economy. Applied methods of statistical processing of concrete data about harvest, harvested acreage and yields of some crops enable not only to carry out an exact analysis of absolute level and relative variability of economic phenomena under study but also to evaluate their evolution and developmental trends within the study period of 1990–1998. Based on models of developmental trends as well as on derived values of average annual changes it can be concluded that the highest average annual relative decrease in the total harvest was recorded in case of other cereals (–23.71%). This maximum was followed by potatoes (–13.90%), rye (–13.14%), oats (–9.56%), fodder crops on arable land (–9.21%), total legumes (–7.59%), barley (–4.87%), peas (–3.82%), triticale (–3.77) and wheat (–2.38%). An average annual increase in total harvest was recorded only in case of rape (+7.29%), grain maize (+7.07%), poppy seed (+6.31%) and early potatoes (+5.66%). As far as yields per hectare (that together with the total harvested acreage markedly influenced the total harvest of crops under study) were concerned, the values of relative annual decrease were as follows: other cereals (–12.38%), poppy seed (–7.12%), barley (–5.80%), oats (5.39%), peas (3.86%), total cereals (–3.44%), rye (–3.29%), wheat (–2.85%), total legumes (–2.29%), triticale (–1.98%), rape (–1.04%) and fodder crops on arable land (–0.23%). An average annual increase in hectare yields was recorded in case of grain maize (+6.07%), sugar beet (+3.27%), potatoes (+2.62%) and early potatoes (+1.51%).

plant production; harvest; harvest acreage; hectare yields; dynamics; developmental trends; Czech Republic

## INTRODUCTION

When considering long-term objectives of Czech agrarian policy (i. e. stability of prices of agricultural commodities with a long production cycle and liberalisation of agrarian trade with other countries), it is necessary to take into account also a markedly decreasing volume of agricultural production. Within the period of 1990–1998, this parameter (expressed by means of the volume of gross agricultural production per hectare in thousands CZK – fixed prices of 1989), decreased by 27.1%. The corresponding figure for gross plant production was 22.25% and the average annual relative decrease was –3.39% ( $I_{yt} = 0.8219^{++}$ ).

Among factors influencing the above negative phenomena it is possible to enumerate not only an unsuitable allocation of production and a decrease in the total volume of intensification inputs but also a decrease in production potential (of soil and of basic stock in case of plant and animal production, respectively).

The main objective of this paper is to analyse dynamics and developmental trends of total volume of harvest, hectare yields and harvested acreage of crops that contributed significantly to the formation of gross agricultural production. Presented will be also results of studies on relative changes in total plant production within time intervals of 1990–1993 and 1994–1998 and on effects of

changes in hectare yields, harvests and harvested acreage on the total volume of production.

Many authors tried to evaluate dynamics and trends of indicators of development and prediction of plant production not only in the Czech Republic but also abroad. Bruthans (1939) published an analytical study dealing with a long-term development of the level of and variation in the total volume of harvest of cereals in the former Czechoslovakia (i.e. in Bohemia, Moravia, Slovakia and Sub-Carpathian Ukraine) within the period of 1921–1937. This author found that rye, oats, wheat, barley and maize contributed to the average volume of harvest by 33.9%, 26.4%, 20.9%, 18.2% and 0.6%, respectively, and that the average annual increase in indexes of total harvest of all cereals was 1.21% (49.02 thous. tons). This average annual increase resulted above all from increasing hectare yields. Within the study period, variability in total harvest volumes of cereals was characterised by derived values of variation coefficients ( $v_y$  %). For wheat, rye, barley, oats and maize these variation coefficients were 11.32%, 12.72%, 14.37%, 14.56% and 22.42%, resp.; the corresponding figure for total cereals was 10.79%.

Stořes (1958) investigated long-term developmental trends in hectare yields, total harvest and harvested acreage of selected crops within the period of 1848–1936. Jemelíková (1995) compared developmental

trends in hectare yields of major crops in the Czech Republic within the period of 1920–1988 and 1945–1990. Using models of developmental trends, she was able to demonstrate that, within the first study period, the highest average annual relative increase in hectare yields was recorded in case of potatoes followed by grain maize, rape, wheat, barley and sugar beet. Within the second study period, this sequence was as follows: rape, wheat, barley, grain maize, barley and sugar beet. As compared with the first time interval, in the period of 1945–1990, there was an increase in hectare yields of grain maize, wheat and barley by 71%, 69% and 55%, respectively. The corresponding figures for rape, potatoes and sugar beet were 31%, 20% and 14%, respectively.

Later on, studies on developmental trends in hectare yields of major crops were carried out by B o d e ě k o v á et al. (1980) who on the basis of an exact analysis of empirical data came to a conclusion that a marked increase in hectare yields was influenced not only by concentration, specialisation and integration of agricultural production, but also (and above all) by a scientific-technical progress in the field of plant breeding, nutrition and protection. As compared with yields of 1945, those from the year 1980 were higher by 257%, 229% and 226% in wheat, barley and maize, respectively. The corresponding figures for potatoes and sugar beet were 146% and 67%, respectively. These authors corroborated conclusions published by M i l j a v s k i j (1959) who wrote that “the better the methods of farming in the field of plant production, the higher the hectare yields and the lower their variability”.

K l í m a and M a c a (1995) analysed the development of plant production within the last years (1986–1989) of the existence of command system of Czech national economy and in the period of transition to a free market economy (1990–1993).

From the viewpoint of the analytical activities it is possible to appreciate the data obtained by T v r d o ň (1999) in his studies on structural changes in plant production (cereals, technical crops, fodder crops and tubers, potatoes, vegetables, fruit and grapes, and hops) within the time interval of 1988–1996. When evaluating dynamics of annual changes (expressed as percentage proportions of this branch in gross agricultural production), this author demonstrated positive changes in case of technical crops (0.41), vegetables (0.27), hops (0.02) and fruit and grapes (0.004). On the other hand, in case of fodder crops and tubers a negative change (0.13) was recorded. According to this author, the restructuring of this branch (that took place in the first half of the 90s) influenced significantly the extent of aggregated supply of agricultural products. However, dynamics and trends of intra-branch structural changes in production of individual products were different. The proportions of production of technical crops, cereals, vegetables and, partially, also hops fruit and grapes increased, while those of fodder crops and tubers and potatoes decreased.

## MATERIAL AND METHODS

Data about the factual level of hectare yields and the total volume of harvest were obtained from the d-base of the Czech Statistical Office (ČSÚ). These data were thereafter used for the calculation of harvested acreage. Within the study period of 1990–1998, the analysis of parameters of plant production investigated was focused on cereals the proportion of which in the total sowing acreage was 57.2% in the last year of this time interval. The corresponding figures for technical crops, root crops and fodder crops on arable land were 9.6%, 5.3% and 23.8%, respectively.

In accordance with objectives of this analysis, empirical data were described by means of basic numeric characteristics, both from the viewpoint of their absolute level and relative variability. Dynamics of phenomena investigated was quantified by basic and chain indexes and trends using models of developmental tendencies of the type:

$$y' = a_y + b_{yt} \cdot t \text{ and } y' = a_y + b_{yt} \cdot t + c_{yt} \cdot t^2$$

The suitability of their application was tested by means of correlation indexes ( $I_{yt}$ ) at the significance levels of  $P = 0.05$  and  $P = 0.01$ .

To express the increase and/or decrease in the total production, the following indexes were used:

$$\frac{\sum y_1 p_1}{\sum y_0 p_0}$$

The effect of changes in hectare yields on the and/or decrease in the total production the index

$$\frac{\sum y_1 p_1}{\sum y_0 p_1}$$

was used and the effect of harvested was expressed by means of the index

$$\frac{\sum y_0 p_1}{\sum y_0 p_0}$$

where  $y$  is the hectare yield and  $p$  the harvested acreage in the current (1) and basic (0) period.

## RESULTS AND DISCUSSION

In accordance with the concept and objectives of this study it is possible to present the obtained results of analysis of factual data in three separate but complementary sets. The first one deals with the description of analysed phenomena from the one-dimensional point of view (Table I). This set enables an objective evaluation of average level and relative fluctuation of harvests, harvested acreage and hectare yields of selected crops that represented 77.70% of the total sowing acreage in the territory of the Czech Republic in the period under study. When comparing characteristics of the absolute level ( $y$ ) with those from the pre-transformation period of 1986–

I. Numeric characteristics of the absolute level and relative variability of indicators of the development of plant production in the Czech Republic within the period of 1990–1998

Crop	Harvest (thous. tons)	$v_y$ (%)	Harvested acreage (ha)	$v_y$ (%)	Hectare yield (t)	$v_y$ (%)
	$\bar{y}$		$\bar{y}$		$\bar{y}$	
Cereals – total	7 154.5	10.9	1 645 925	2.5	4.347	10.7
Wheat	3 896.6	9.4	836 689	6.6	4.657	9.2
Rye	296.0	33.5	79 506	22.1	3.722	10.9
Barley	2 480.1	12.8	603 379	5.8	4.108	32.8
Oats	242.3	24.4	69 944	10.4	3.464	17.1
Triticale	68.3	22.0	17 269	20.5	3.955	10.1
Grain maize	152.0	38.4	32 125	12.9	4.731	20.7
Other cereals	19.2	91.7	6 713	47.0	2.860	20.8
Legumes – total	161.9	22.9	66 960	22.2	2.418	7.8
Peas	138.1	23.4	54 697	23.4	2.525	10.1
Early potatoes	248.8	21.6	16 430	17.0	14.838	6.4
Late potatoes <sup>1)</sup>	1 387.4	28.5	75 368	24.3	18.408	14.6
Sugar beet	3 853.0	8.8	103 260	13.3	37.313	10.6
Rape	466.4	29.8	188 339	29.0	3.466	7.9
Fodder crops	5 836.0	19.3	888 944	12.1	6.563 <sup>2)</sup>	9.4

<sup>1)</sup> including industrial potatoes, <sup>2)</sup> hay

1990, a decrease in hectare yields was observed in the majority of crops. In cereals this decrease was  $-7.32\%$  (for wheat, rye and barley the decrease was  $-6.47\%$ ,  $-5.05\%$  and  $-10.70\%$ , resp.) and the corresponding figures for poppy and fodder crops on arable land were  $-25.12\%$  and  $13.62\%$ , respectively. An increase in average hectare yields was recorded in case of sugar beet, grain maize and rape ( $+3.33\%$ ,  $10.28\%$  and  $21.54\%$ , respectively).

With the exception of a more than doubled increase in the harvest of rape (index = 211.6) there was a decrease in harvests of wheat, rye, barley and grain maize by  $-8.12\%$ ,  $-4.14\%$ ,  $32.88\%$ ,  $8.52\%$  and  $14.61\%$  in the period of 1990–1998 against the preceding five years. The corresponding decrease in harvests of fodder crops on arable land and sugar beet were  $-27.09\%$  and  $-14.47\%$ , respectively.

Values of basic indexes (presented in Tables II, III and IV) were used as entry data for an exact analysis of dynamics of the volume of harvests of selected crops, harvested acreage and hectare yields in the period under study. Using these data, it was possible to conclude that, as compared with the results obtained in 1990, the most marked decrease in the total volume of harvested crops was recorded in 1993 in case of other cereals ( $-86.4\%$ ). In years to follow, the greatest decreases were recorded for rye in 1996 ( $-63.4\%$ ) and for oats and fodder crops on arable land in 1998 ( $-52.0\%$  and  $-42.1\%$ , resp.). As far as the other crops were concerned, rank of the decrease in their harvest in individual years was as follows: late potatoes  $-38.5\%$  (1994), poppy  $-32.4\%$  (1993), barley  $-32.2\%$  (1995), total legumes  $-31.8\%$  (1997), wheat  $-28.6\%$  (1993), total cereals  $-27.7\%$ , triticale  $-21.5\%$

(1996), sugar beet  $-19.4\%$  (1994), peas  $-14.3\%$  (1997), grain maize  $-7.1\%$  (1994) and rape  $-3.8\%$  (1992). All these data indicate that the highest frequency in the decrease in the volume of harvested crops occurred in the years 1993 and 1994.

As indicated by derived values of basic indexes (quantifying dynamics of harvested acreage), an enormous decrease was recorded in the last year of the study period in case of other cereals ( $-63.9\%$ ), followed by rye ( $-42.2\%$ ), late potatoes ( $-40.8\%$ ), fodder crops on arable land ( $-32.5\%$ ), sugar beet ( $-31.1\%$ ) and oats ( $-18.1\%$ ). A marked increase in the acreage of harvested crops was recorded for total legumes, total cereals, barley, grain maize, wheat, triticale, peas, early potatoes, rape and poppy.

Regarding objectives of this study it can be said that important is also an analysis of dynamics of hectare yields as quantified by values of basic indexes (Table IV). Based on these data it can be concluded that the decrease in hectare yields of total cereals rose from  $-10.8\%$  in 1991 to  $-27.3\%$  in 1998. As far as the other crops were concerned, the corresponding drops were as follows: wheat  $-9.2\%$  and  $-25.4\%$  and rye  $-14.6\%$  and  $-19.0\%$ . An enormous decrease in hectare yields was recorded in case of barley and oats ( $-13.6\%$  and  $-36.0\%$ ) and other cereals ( $-31.4\%$  and  $-57.8\%$ ). An insignificant decrease was recorded in hectare yields of triticale ( $-13.4\%$  and  $-17.0\%$ ). Hectare yields of peas (index = 4.38) and rape decreased more than four and two-times, respectively. Yields of poppy seed decreased in 1991 and 1998 by  $-23.0\%$  and  $-31.5\%$ , respectively.

An increase in hectare yields was recorded only in case of early potatoes, sugar beet, late potatoes and grain maize ( $+21.2\%$ ,  $+25.7\%$ ,  $+40.2\%$  and  $+90.9\%$ , respectively).

II. Dynamics of the volume of harvests of selected crops in the Czech Republic within the period of 1990–1998 (1990 = 100)

Crop	Year							
	1991	1992	1993	1994	1995	1996	1997	1998
Total cereals	87.7	73.4	72.3	75.7	73.8	74.3	78.0	74.5
Wheat	88.2	93.3	71.4	80.3	82.7	80.6	78.7	83.1
Rye	63.3	43.0	45.9	49.4	47.0	36.6	46.5	46.8
Barley	89.7	79.6	76.6	76.6	67.8	71.6	78.7	66.3
Oats	80.7	55.6	70.2	55.5	49.9	57.3	65.9	48.0
Triticale	155.3	116.9	90.2	84.5	96.1	78.5	86.0	119.1
Grain maize	152.7	105.4	159.6	92.9	115.1	171.4	289.8	203.9
Other cereals	33.2	14.8	13.6	19.9	18.4	22.3	13.9	15.2
Total legumes	128.0	133.9	149.6	107.3	94.8	89.2	68.2	87.8
Peas	128.2	165.3	185.9	137.6	120.2	110.7	85.7	95.0
Early potatoes	117.1	138.1	177.3	162.4	175.3	216.2	180.3	192.1
Late potatoes	116.3	109.8	132.7	61.5	66.5	91.1		70.4
Sugar beet	99.8	96.4	107.2	80.6	92.4	107.4	92.6	86.6
Rape	114.4	96.2	123.9	148.4	217.5	171.0	184.1	223.4
Poppy	79.4	77.4	67.6	161.8	246.1	95.1	93.1	201.0
Fodder crops on arable land	106.3	78.6	84.7	68.4	71.8	72.8	65.0	57.9

III. Dynamics of the harvested acreage of selected crops in the Czech Republic within the period of 1990–1998 (1990 = 100)

Crop	Year							
	1991	1992	1993	1994	1995	1996	1997	1998
Total cereals	98.3	96.5	97.9	100.9	96.1	96.5	102.9	102.5
Wheat	97.2	116.6	95.3	98.9	101.3	97.3	100.7	111.4
Rye	71.6	52.7	54.0	63.1	63.7	51.1	60.7	57.8
Barley	105.0	114.6	114.7	115.3	100.4	108.1	116.6	104.2
Oats	106.1	96.6	98.4	108.1	85.3	92.8	109.9	81.9
Triticale	179.2	146.5	117.1	107.9	117.1	99.4	107.5	146.3
Grain maize	112.8	98.9	104.6	87.4	85.8	107.4	133.6	106.8
Other cereals	48.5	34.0	27.3	40.5	37.0	43.0	30.1	36.1
Total legumes	126.6	160.5	166.8	125.9	106.6	97.5	88.5	102.1
Peas	135.6	216.5	237.5	178.0	150.5	135.9	126.5	147.0
Early potatoes	107.4	123.8	141.1	149.3	153.8	175.6	158.7	158.5
Late potatoes	103.2	98.4	88.4	60.7	61.3	66.8	55.4	59.2
Sugar beet	100.6	105.0	90.3	77.1	87.8	87.8	78.1	68.9
Rape	121.1	129.1	158.9	180.7	240.7	215.6	216.1	252.1
Poppy	103.1	130.6	194.3	320.7	379.8	158.0	184.6	273.7
Fodder crops on arable land	87.3	93.6	87.9	83.3	82.0	80.7	72.4	67.5

When analysing annual changes in hectare yields of crops with decreasing developmental trends, it was possible to observe a decrease by  $-13.4\%$  and  $-11.6\%$  in case of triticale and rye, resp., in 1991. In 1992, the corresponding figures for other cereals, oats, fodder crops on arable land and rape were  $-36.5\%$ ,  $-24.3\%$ ,  $-23.8\%$  and  $-21.3\%$ , respectively. In peas, barley, total legumes, total cereals and wheat the corresponding decrease was  $-19.3\%$ ,  $-18.7\%$ ,  $-17.5\%$ ,  $-14.8\%$  and  $-11.9\%$ , respectively. In case of poppy seeds a decrease by  $-26.9\%$  was recorded in 1994.

Using models of developmental trends in values of investigated indicators of the development of plant production for the period under study it was possible to derive values of average annual relative changes (increases and/or decreases). These data are presented in Table V.

These data enable an exact quantification of developmental trends in volume of total harvest, harvested acreage and hectare yields of selected crops in the whole study period. Based on these data it can be concluded that the maximum decrease in the total volume of harvest

## IV. Dynamics of hectare yields of selected crops in the Czech Republic within the period of 1990–1998 (1990 = 100)

Crop	Year							
	1991	1992	1993	1994	1995	1996	1997	1998
Total cereals	89.2	76.0	75.6	75.1	76.7	76.9	75.8	72.7
Wheat	90.8	80.0	75.0	81.2	81.6	82.8	78.2	74.6
Rye	88.4	81.7	85.0	78.3	73.7	71.6	76.6	81.0
Barley	85.4	69.4	66.8	66.4	67.5	66.2	67.5	63.6
Oats	85.7	64.9	80.4	57.9	66.0	69.6	67.6	64.0
Triticale	86.6	79.7	77.0	78.3	82.0	78.9	8.0	83.0
Grain maize	135.4	106.6	152.7	106.3	134.2	159.6	216.9	190.9
Other cereals	88.6	43.6	50.0	49.1	52.6	52.0	46.2	42.2
Total legumes	101.6	83.4	89.7	85.2	88.9	91.5	77.1	86.0
Peas	94.6	76.3	78.3	77.3	79.9	81.5	67.7	76.3
Early potatoes	109.0	111.5	125.7	108.7	113.9	123.1	113.6	121.2
Late potatoes	112.8	111.6	150.0	101.3	106.4	137.6	127.1	140.7
Sugar beet	99.2	91.7	118.7	104.6	117.2	122.4	118.5	125.7
Rape	94.5	74.5	77.9	82.1	90.3	79.3	85.2	88.6
Poppy	77.0	59.3	69.0	50.4	64.6	60.2	50.4	65.5
Fodder crops on arable land	110.2	83.9	96.3	82.1	87.5	90.2	89.7	85.8

 V. Average annual relative changes ( $b_{yt}$ ) of indicators of the development of plant production in the Czech Republic within the period of 1990–1998

Crop	Parameter	Total harvest		Harvested acreage		Hectare yields	
		$b_{yt}$ (%)	$I_{yt}$	$b_{yt}$ (%)	$I_{yt}$	$b_{yt}$ (%)	$I_{yt}$
Total cereals		-3.02	0.63	0.37	0.39	-3.44	0.73 <sup>+</sup>
Wheat		-2.38	0.59	-0.22	0.09	-2.83	0.72 <sup>+</sup>
Rye		-13.14	0.66 <sup>+</sup>	-6.38	0.59	-3.29	0.66 <sup>+</sup>
Barley		-4.87	0.79 <sup>++</sup>	0.36	0.17	-5.80	0.77 <sup>+</sup>
Oats		-9.56	0.73 <sup>++</sup>	-2.46	0.55	-5.39	0.68 <sup>+</sup>
Triticale		-3.77	0.38	-1.78	0.21	-1.98	0.59
Grain maize		7.07	0.66 <sup>+</sup>	1.33	0.28	6.07	0.79 <sup>++</sup>
Other cereals		-23.71	0.63	-18.74	0.59	-12.38	0.70 <sup>+</sup>
Total legumes		-7.59	0.87 <sup>++</sup>	-4.88	0.72 <sup>+</sup>	-2.29	0.67 <sup>+</sup>
Peas		-3.82	0.68 <sup>+</sup>	-0.92	0.77 <sup>+</sup>	-3.86	0.75 <sup>+</sup>
Early potatoes		5.66	0.92 <sup>++</sup>	4.81	0.91 <sup>++</sup>	1.51	0.62
Late potatoes		-13.90	0.81 <sup>++</sup>	-12.98	0.91 <sup>++</sup>	2.62	0.53
Sugar beet		-1.23	0.35	-5.54	0.88 <sup>++</sup>	3.27	0.18
Rape		7.29	0.89 <sup>++</sup>	7.48	0.95 <sup>++</sup>	-1.04	0.28
Poppy		6.51	0.48	4.39	0.58	-7.12	0.66 <sup>+</sup>
Fodder crops on arable land		-9.21	0.91 <sup>++</sup>	-5.33	0.93	-0.23	0.58

Note: The correlation index  $I_{yt}$  was significant at the significance levels  $P = 0.05$  (<sup>+</sup>) and  $P = 0.01$  (<sup>++</sup>)

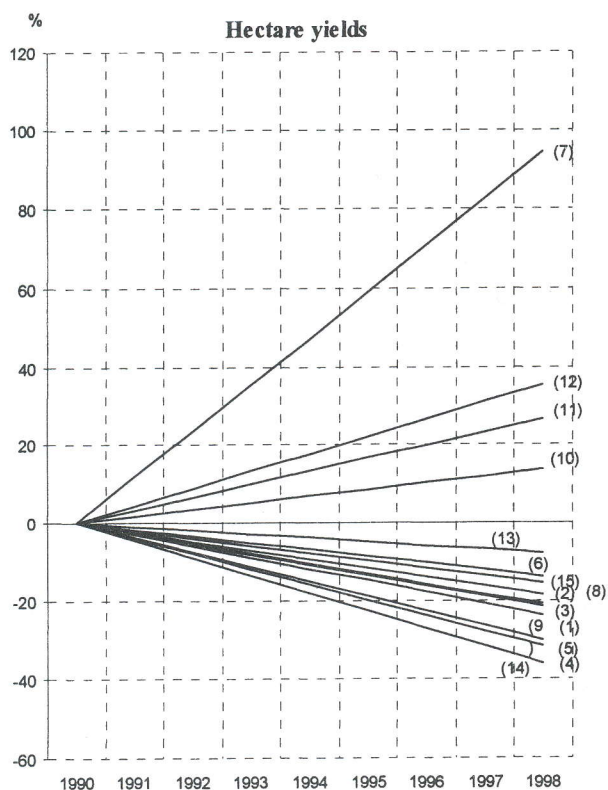
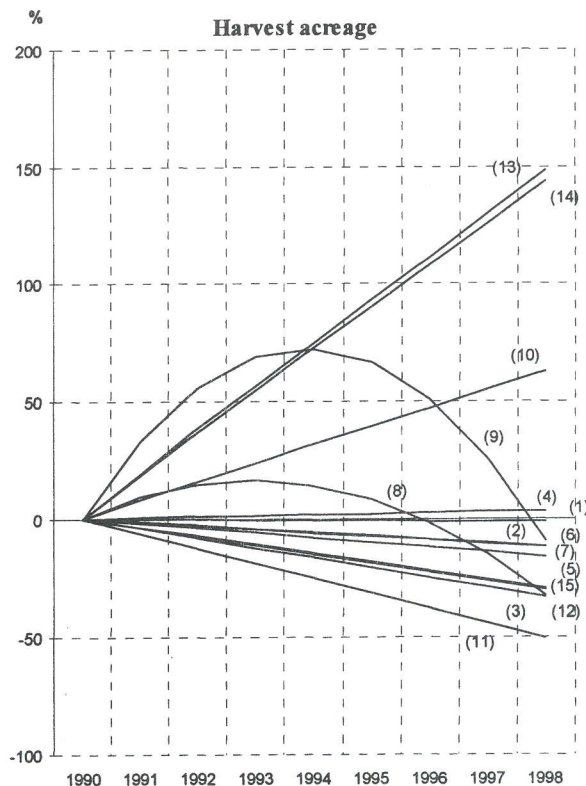
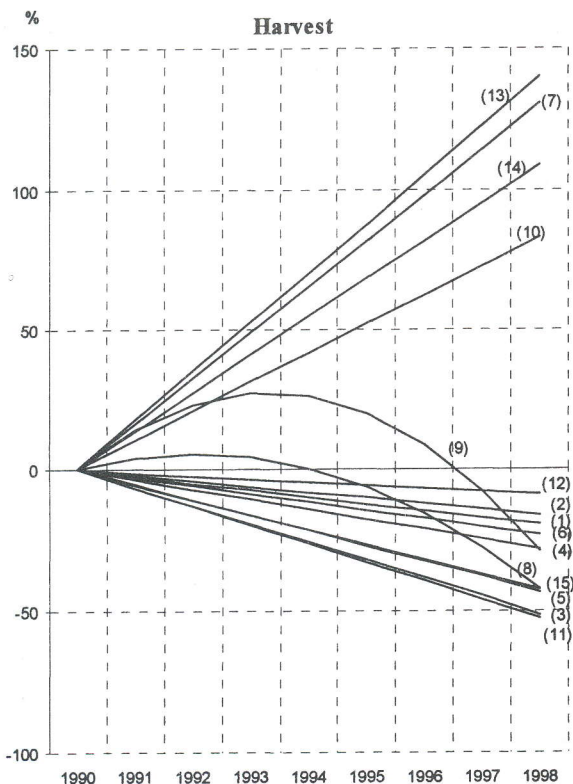
took place in case of total cereals. The decreasing rank of other crops was as follows: late potatoes, rye, oats, fodder crops on arable land, total legumes, barley, peas, triticale, total cereals, wheat and sugar beet. The highest average relative increase in the volume of total harvest was recorded in grain maize, poppy seeds and early potatoes.

The most marked average annual decrease in harvested acreage was recorded also in case of other cereals. The decreasing rank of other crops was as follows: late

potatoes, rye, sugar beet, fodder crops on arable land, total legumes, oats, triticale, peas and wheat.

The decreasing rank of average annual relative increases was quantified as follows: rape (+7.48%), poppy (+7.39%), early potatoes (4.81%), grain maize (+1.33%), total cereals (+0.37%) and barley (+0.36%).

As far as the hectare yields were concerned, the values of average annual relative decreases were as follows: other cereals (-12.38%), poppy (-7.12%), barley (-5.80%), oats (-5.39%), peas (-3.86%), total cereals



1. Developmental trends in the total volume of harvest (A), harvested acreage (B) and hectare yields (C) of selected crops in the Czech Republic

Total cereals (1), wheat (2), rye (3), barley (4), oats (5), triticale (6), grain maize (7) total legumes(8), peas (9), early potatoes (10), late potatoes (11), sugar beet (12), rape (13), poppy (14), fodder crops on arable land (15)

(-3.44%), rye (3.29%), wheat (-2.85%), total legumes (-2.29%), triticale (-1.98%), rape (-1.04%) and fodder crops on arable land (-0.23%). An increasing trend (quantified by values of "byt") was observed in case of grain maize (+6.07%), sugar beet (+3.27%), late potatoes (+2.62%) and early potatoes (+1.51%).

Developmental trends in the total volume of harvest, harvested acreage and hectare yields of selected crops in the territory of the Czech Republic within the whole period under study are illustrated in Fig. 1

Values of overall indexes (quantifying not only relative changes in the total volume of production but also

VI. Average annual relative changes ( $b_{yr}$ ) of indicators of the development of plant production in the Czech Republic within the period of 1990–1998

Crop	Parameter	Values of overall indexes			Increase/ /decrease in production (%)	Effect of change in	
		(1)	(2)	(3)		hectare yields (%)	harvested acreage (%)
Total cereals		0.9032	0.8887	1.0163	-9.68	-44.13	1.63
Wheat		0.9189	0.9214	0.9973	-8.11	-7.86	-0.27
Rye		0.7178	0.8422	0.8523	-28.22	-15.78	-14.77
Barley		0.8351	0.8324	1.0032	-16.49	-16.76	0.32
Oats		0.7222	0.7816	0.9241	-27.78	-21.84	-7.59
Triticale		0.8030	0.9423	0.8522	-19.70	-5.77	-14.78
Grain maize		1.3490	1.3271	1.0014	34.90	34.71	0.14
Other cereals		0.4445	0.6243	0.7120	-55.55	-37.57	-28.80
Total legumes		0.6997	0.9308	0.7517	-30.03	-6.92	-24.83
Peas		0.7821	0.6079	1.2866	-21.79	-39.21	28.66
Early potatoes		1.3916	1.0321	1.3484	39.16	3.21	34.84
Late potatoes		0.6508	1.0420	0.6246	-34.92	4.20	-37.54
Sugar beet		0.9117	1.1523	0.7912	-8.83	15.23	-20.88
Rape		1.7386	1.0013	1.7364	73.86	0.13	73.64
Poppy		1.9648	0.9599	2.0469	96.48	-4.01	104.69
Fodder crops on arable land		0.7283	0.8686	0.8374	-27.27	-13.14	-16.26

Note: Indexes (1), (2) and (3) were described in section MATERIAL AND METHODS

the effect of changes in hectare yields and harvested acreage enable to carry out an exact analysis of relative changes (increase and/or decrease) in total production of selected crops within the period of 1994–1998 and their comparison with the basal period of 1990–1993. Results of this analysis are presented in Table VI. Basing on these data it can be concluded that, as compared with this basal period, for example the production of cereals decreased by -9.68% in the time interval of 1994–1998 and that the change in hectare yields would be manifested in a decrease in production by 11.13% while the change in harvested acreage would result in an increase by in production +1.63%. In case of early potatoes, the total harvest of which increased by 39.16% within the period of 1994–1998, the change in hectare yields would result in an increase in production by +3.21% and the change in harvested acreage even by +34.84%.

A similar interpretation of obtained results could be presented also in case of calculated values of overall indexes, but it is not possible to present these data here because of the limited extent of this paper.

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### Změny indikátorů rozvoje rostlinné výroby v České republice v letech 1990–1998.

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Příspěvek je zaměřen na matematicko-statistickou analýzu indikátorů rozvoje rostlinné výroby v období přechodu české ekonomiky z direktivního způsobu řízení na systém tržní. Aplikované metodické postupy zpracování údajů o sklizni, sklizňových plochách a hektarových výnosech sklizně vybraných plodin v období let 1990 až 1998 umožňují exaktizaci vyvozených závěrů nejen ve sféře hodnocení průměrné úrovně posuzovaných indikátorů a jejich kolísavosti (relativní variabilitu), ale i dynamiky a vývojových tendencí. Dynamiku objemu sklizně charakterizují hodnoty relativního poklesu do roku 1998 oproti bazickému období ve výši –84,8 % u ostatních obilovin, –53,2 % u žita, –52,0 % u ovsa, –42,1 % u píce na orné půdě celkem, –33,7 % u ječmene, –25,5 % u obilovin celkem, –17,0 % u brambor pozdních konzumních včetně průmyslových, –16,9 % u pšenice, –13,4 % u cukrovky technické, –12,2 % u luskovin celkem a –5,0 % u hrachu setého. Ke zvýšení objemu sklizně ve finálním roce oproti bazickému období došlo u řepky (123,4 %), kukuřice na zrno (103,9 %), máku (101,0 %), brambor raných (92,1 %) a triticale (19,1 %).

K nejvyššímu poklesu hektarového výnosu sklizně ve shodných referenčních obdobích došlo u ostatních obilovin (–57,8 %), ječmene (–36,4 %), ovsa (–36,0 %), máku (–34,5 %), obilovin celkem (–27,3 %), pšenice (–25,4 %), hrachu setého (–23,7 %), žita (–19,0 %), triticale (–17,0 %), píce na orné půdě celkem (–14,2 %), luskovin celkem (–14,0 %) a u řepky (–11,4 %). K růstu hektarových výnosů sklizně došlo naproti tomu u kukuřice na zrno o 90 %, u brambor pozdních konzumních včetně průmyslových o 40,2 %, u cukrovky technické o 25,7 % a brambor raných o 21,2 %.

Prostřednictvím aplikovaných modelů vývojových tendencí lineárního a kvadratického typu byl v definovaném referenčním období prokázán průměrný roční relativní úbytek objemu sklizně ve výši –23,71 % u ostatních obilovin, –13,90 % u brambor pozdních konzumních včetně průmyslových, –13,14 % u žita, –9,56 % u píce na orné půdě celkem, –7,59 % u luskovin celkem, –4,87 % u ječmene, –3,82 % u hrachu setého, –3,77 % u triticale, –3,02 % u obilovin celkem a –2,38 % u pšenice. K průměrnému ročnímu relativnímu přírůstku došlo naproti tomu u sklizně řepky (7,29 %), kukuřice na zrno (7,07 %), máku (6,51 %) a brambor raných (5,66 %).

Příspěvek je součástí výzkumného záměru 9ZA 07 – „Formování struktury zemědělství a potravinářského průmyslu a trendy chování podnikatelských subjektů“.

rostlinná výroba; sklizeň; sklizňové plochy; hektarový výnos; dynamika; vývojové tendence; Česká republika

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