ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS
SBORNÍK MENDELOVY ZEMĚDĚLSKÉ A LESNICKÉ UNIVERZITY V BRNĚ

Ročník LV 8 Číslo 3, 2007

DEVELOPMENT OF PRODUCTION INTENSITY OF CZECH AGRICULTURE IN 1998–2004 AND ITS SHORT-TERM FORECAST

M. Palát, B. Bodečková, E. Maca

Received: December 15, 2006

Abstract

PALÁT, M., BODEČKOVÁ, B., MACA, E.: *Development of production intensity of Czech agriculture in 1998–2004 and its short-term forecast*. Acta univ. agric. et silvic. Mendel. Brun., 2007, LV, No. 3, pp. 85–96

The paper presents findings obtained in the exact evaluation of an average level and its predicative possibility, dynamics and the trend of indicators of an aggregate agricultural account as a fundamental methodological tool for measuring the economic size and effectiveness of agricultural basic industries within the national economy of the Czech Republic and a defined reference period. The basic part of the analysis consists of aggregates of the production of an agricultural period, intermediate consumption and gross added value and net added value produced by all agricultural units after deduction the consumption of fixed capital. Parameters of applied models of developmental tendencies of studied events for the assessed time period were used in their short-term extrapolation forecast.

aggregate agricultural account, aggregates, average level, variability, dynamics, trend, forecast, Czech Republic

The process of the transformation of centrally controlled economy to the market system becomes evident by marked changes both in the field of a business structure and in the efficiency of agricultural production as one of the basic elements of material production. If we include an achieved level both in plant and animal production and its intensity and productivity to characteristics of maturity of this sector of national economy then it is inevitable to pay particular attention to the study of the level, variability, dynamics and developmental trends of these events.

The conception of presented study aimed at the exact evaluation of an aggregate agricultural account (AAA) as a basic methodological tool for the objective assessing the economic intensity and effectiveness of agriculture or agricultural basic industry within national economy is based on the conception mentioned above. The basic intention of the paper is to present results achieved in the analysis of the volume of the agricultural sector production representing the sum of agricultural products and services produced by particular units of the sector including secondary activities and intermediate consumption measuring the value of products, goods and services consumed in the production process (without using fixed assets) and serving as one of the main indicators of the production intensity of the sector of agriculture. The resulting effect of agriculture measured by the difference of the agricultural sector production and intermediate consumption is quantified by gross added value serving for evaluation of the effectiveness of agriculture within national economy. In addition to specified basic aggregates (SBA) analytical activities were aimed at the study of net added value produced by the deduction of the fixed capital consumption from a value produced by all agricultural units.

MATERIAL AND METHODS

Empirical data of time series of basic components of an aggregate agricultural account (AAA) were obtained from the database of the Czech Statistical Office for the reference period 1998–2004.

The specification of aggregates of a summary agricultural account as a basic methodological tool for measuring the economic extent and effectiveness within national economy is enabled, in addition to indicators mentioned above, by values of plant and animal production, production of agricultural services and (non-detachable) non-agricultural secondary activities the summation of which quantifies the level of the volume of agricultural production.

Methodical procedures of processing the factual data of analysed time series are based on the methods presented in papers of Kovačka a Kontšeková (1962), Cyhelský, Kaňoková a Novák (1979), Seger, Hindls a Hronová (1998) and Minařík (2000).

Methodical procedures of processing and evaluating the studied indicators of an aggregate agricultural account´ components were aimed according to set objectives of the analysis. There were used the description of the average level ($\bar{y}$) and variability (V_y).

Methodical procedures of processing and evaluating the studied indicators of an aggregate agricultural account´ components were aimed according to set objectives of the analysis at the evaluation of dynamics and trends of assessed phenomena including their short-term extrapolation forecast.

Basic indices (i_b) are calculated by the expression

$$(i_b): \frac{q_k}{q_0} = \frac{q_1}{q_0} \cdot \frac{q_2}{q_1} \cdots \frac{q_{k-1}}{q_{k-2}} \cdot \frac{q_k}{q_{k-1}},$$

the chain indices (i_{ch}) by the expression

$$(i_{ch}): \frac{q_k}{q_{k-1}} = \frac{q_k}{q_0} / \frac{q_{k-1}}{q_0}.$$

Determination of analytical functions for the description of developmental tendencies results from the graphical representation of the trend and the logical analysis of time series of evaluated events under evaluation. In all cases where values of indicators assessed showed increasing (or decreasing) absolute increments and in principle constant second differences quadratic functions were used:

$$y' = a_{yt} + b_{yt} \cdot t + c_{yt} \cdot t^2.$$

Informative abilities and accuracy of applied analytical functions were tested by means of correlation indices I_{yt}.

The statistical significance of correlation indices was tested on the significance level P = 0.05 and P = 0.01.

RESULTS AND DISCUSSION

According to objectives and methodical procedures of the aggregate agricultural account as a basic time tool for measuring the efficiency of agricultural primary production, attention was paid to the quantification of an average level of its volume in the assessed reference period, its informative possibility and structure in the first stage of the analytical activity. Results enabling verbal, tabular and graphical interpretation of findings achieved are given in Tabs. I–V and Figs. 1–2.

I: *Economic accounts for agriculture (in million CZK, constant prices of 2000) of the Czech Republic during the period 1998–2004. Characteristics of an average value and variability.*

EAA[1)] code	Indicator	$\bar{y}$	V_y %	Proportion in the total volume	
				%	%
10	Crop output[2)]	51 005.3	9.62	100	48.54
01	Cereals (incl. seeds)	21 464.4	13.66	42.08	20.42
02	Industrial crops	11 735.4	10.21	23.00	11.17
03	Forage plants	8 227.0	10.19	16.12	7.83
04	Fresh vegetables	2 093.6	23.37	4.13	1.99
05	Potatoes (incl. seeds)	3 961.7	17.12	7.77	3.77
	Other commodities	·	·	6.90	3.36
13	Animal output [2)]	50 462.4	4.05	100	48.02
11.1	Cattle	6 865.8	14.05	13.60	6.53
11.2	Pigs	16 166.4	6.22	32.04	15.38
11.5	Poultry	5 067.1	17.01	10.04	4.82
12.1	Milk	19 178.4	4.13	38.00	18.25
12.2	Eggs	3 184.7	12.17	6.32	3.04

EAA[1)] code	Indicator	$\bar{y}$	V_y %	Proportion in the total volume	
				%	%
14	Agricultural goods output	101 467.7	4.22	x	96.56
15	Agricultural services output	1 197.0	33.68	x	1.14
16	Agricultural output	102 664.7	4.24	x	97.69
17	Non-agricultural secondary activities (inseparable)	2 421.3	16.00	x	2.31
18	Output of agricultural industry	105 086.0	4.16	x	100
19	Total intermediate consumption	69 620.1	36.80	100	x
19.01	Seeds and planting stock	2 661.8	30.54	3.82	x
19.02	Energy; lubricants	2 178.6	21.08	3.13	x
19.03	Fertilisers and soil improvers	3 882.8	11.66	5.56	x
19.04	Plant protection products, herbicides, insecticides and pesticides	4 313.3	17.34	6.20	x
19.05	Veterinary expenses	1 777.4	14.72	2.55	x
19.06	Feeding stuffs	36 371.4	7.13	52.24	x
19.07	Maintenance of materials	5 243.4	37.18	7.53	x
19.08	Maintenance of buildings	2 787.3	59.92	4.00	x
20	Gross value added at basic prices	35 465.9	9.63	x	x
21	Fixed capital consumption	12 734.3	7.26	x	x
22	Net value added at basic prices	22 731.6	16.02	x	x

[1)] Economics Accounts for Agriculture

[2)] Incl. subsidieson products; excl. taxes on products; incl. non-agricultural secondary activities in 2000

On the basis of these results it is possible to deduce the high informative potential of characteristics of the average level of studied events and possibilities of their use in quantifying the proportion of production of agricultural products, production of agricultural services and non-agricultural secondary non-detachable activities in the total volume of production of agriculture. They can be also used in the sphere of the study of the structure of total intermediate consumption measuring the value of actual products, goods and services consumed in the production process and serving as one of the main indicators of the production intensity of the sector of agriculture.

The order of particular components of studied indicators of the aggregate agricultural account ranks among important findings. In the volume of plant production, the highest values were achieved in cereals (including seed) 42.08%, in technical crops 23.00%, fodder crops 16.12%, potatoes (including seed potatoes) 7.77%, in other commodities of plant production 6.90% and 4.13% in fresh vegetables. In the total volume of animal production, the highest proportion was achieved in milk, namely 38.00% and then in the descending order followed: pigs 32.04%, cattle 13.60%, poultry 10.04% and eggs 6.32%. Results of the proportion of plant and animal production, production of agricultural services and non-agricultural secondary activities in the production of an agricultural sector as a whole show the same interpretation.

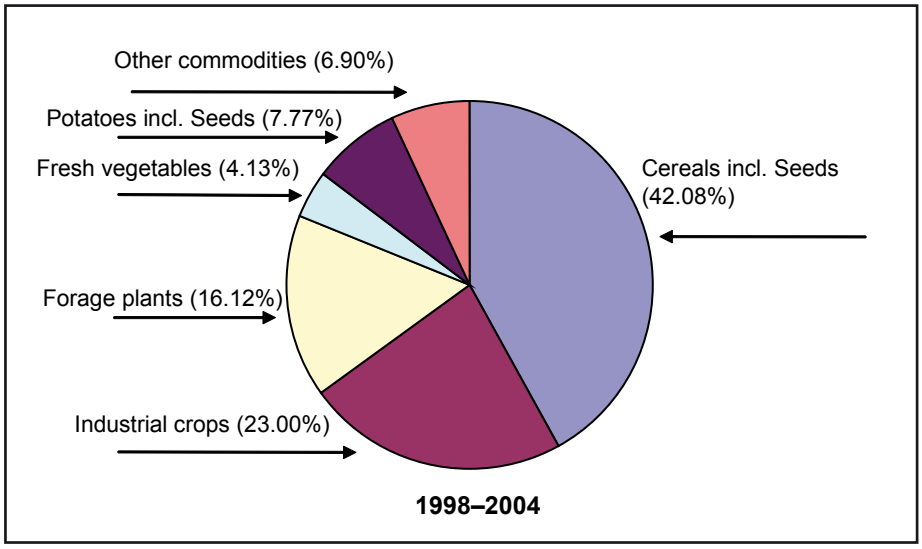
For the total time period under consideration, upwardly arranged values of the proportion in the total intermediate consumption reached in veterinary expenses 2.55%, in energy and lubricants 3.13%, in seeds and planting stock 3.82%, in maintenance and repairs of buildings 4.00%, in fertilisers and soil improvers 5.56%, in plant protection products 6.20%, in maintenance and repairs of machines and equipment 7.53% and in feeding stuffs 52.24%.

An objective image on the percentage structure of the crop and animal output can provide its graphic presentation given in Figs. 1–2 recording also the structure of the total intermediate consumption. In the evaluation of the dynamics of index series of indicators of economic accounts for agriculture given in Tab. II a differentiated decline was proved of the predominant majority of studied events in the final year 2004 as against 1993. The decline reached in the agricultural services output –38.3%, in cattle –32.7%, in eggs –30.2%, in pigs –17.7%, in fresh vegetables –11.6%, in animal output –10.6%, in potatoes (incl. seed potatoes) –6.9%, in milk –5.3% and in forage plants –1.9%. On the other hand, a marked increase occurred as against the basic period in poultry production, namely by 57.6%. In the subsequent descen-

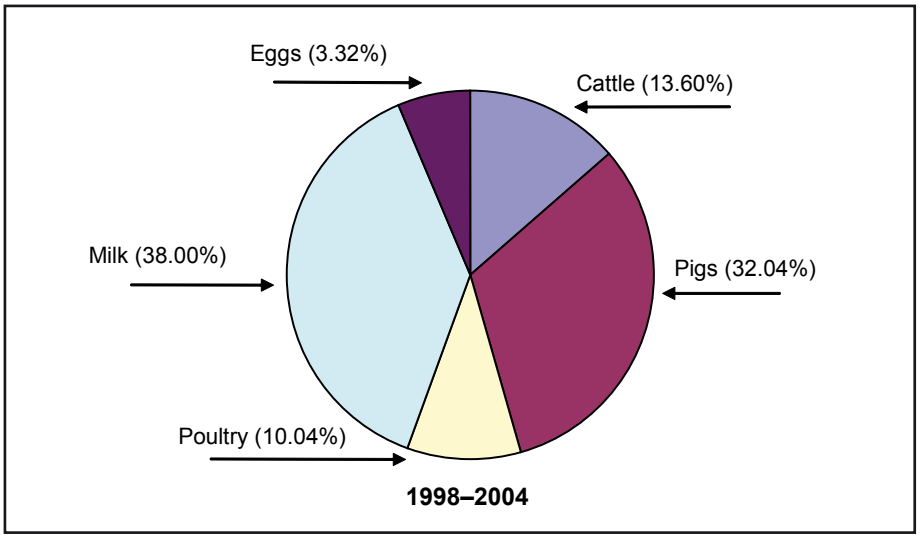
ding sequence, in cereals (incl. seeds) by 36.2%, in crop output by 25.4%, in industrial crops by 23.7%, in the output of agricultural industry by 8.0%, in agricultural goods output by 6.3% and in the volume of crop output by. 55%. The fall of the total intermediate consumption (–1.9%) can be considered to be positive although not marked. The consumption measures the value of products and services consumed in the production process (without the use of fixed assets) and serves as one of the main indicators of the production intensity of the sector of agriculture.

Here, it is possible to state a marked decline in the intermediate consumption of energy and lubricants (–39.5%), costs for the maintenance of machines (–38.9%), costs for fertilisers and soil improvers (–20.4%) and costs for feeding stuffs (–7.1%). An increase occurred as against the basic period in 2004 in the intermediate consumption of seeds and planting stock (67.6%), in plant protection products, veterinary expenses (46.7%) and enormously, namely more than tenfold, in costs for the maintenance of buildings.

In evaluating the final effect of the sector measured by the difference between the agricultural sector production and intermediate consumption as an indicator of the efficiency of agriculture within national economy (gross value added at basic prices) an increase was demonstrated in the final year by 31.2% as against the basic period.



1: *Structure of an average value of crop output for the period 1998–2004*



2: *Structure of an average value of animal output for the period 1998–2004*

II: *Dynamics of indicators of an aggregate agricultural account of the Czech Republic (1998 = 100%)*

EAA[1] code	Indicator	1999	2000	2001	2002	2003	2004
10	Crop output [2]	108.4	104.9	113.3	105.2	92.8	125.4
01	Cereals (incl. seeds)	105.2	99.3	118.6	108.2	91.8	136.2
02	Industrial crops	113.1	96.2	113.8	103.4	94.0	123.7
03	Forage plants	102.9	96.7	99.6	91.3	74.4	98.1
04	Fresh vegetables	128.3	135.9	123.9	81.4	75.2	88.4
05	Potatoes (incl. seeds)	107.7	135.4	103.1	98.6	77.6	93.1
13	Animal output [2]	99.1	94.3	92.1	92.7	93.0	89.4
11.1	Cattle	94.9	90.7	79.4	77.0	76.3	67.3
11.2	Pigs	96.4	90.6	89.4	88.3	88.7	82.3
11.5	Poultry	111.3	121.8	139.3	153.5	151.7	157.6
12.1	Milk	102.7	95.3	91.2	93.6	94.4	94.7
12.2	Eggs	93.4	86.6	90.1	78.4	78.2	69.8
14	Agricultural goods output	103.4	99.3	102.0	98.6	92.9	106.3
15	Agricultural services output	99.8	45.4	48.2	40.8	61.5	61.7
16	Agricultural output	103.0	98.3	101.0	97.5	92.3	105.5
18	Output of agricultural industry	103.0	98.3	101.0	99.7	94.4	108.0
19	Total intermediate consumption	97.9	97.5	97.7	95.5	89.0	98.1
19.01	Seeds and planting stock	88.7	82.4	99.1	169.0	159.3	167.6
19.02	Energy; lubricants	77.9	78.3	64.3	59.3	59.7	60.5
19.03	Fertilisers and soil improvers	78.7	93.3	105.4	89.5	81.5	79.6
19.04	Plant protection products, herbicides, insecticides and pesticides	97.8	95.8	147.0	130.4	117.5	134.4
19.05	Veterinary expenses	132.1	155.6	139.2	151.2	162.8	146.7
19.06	Feeding stuffs	102.4	103.2	93.8	94.0	83.7	92.9
19.07	Maintenance of materials	104.8	46.3	56.8	53.5	45.9	61.1
19.08	Maintenance of buildings	93.0	939.4	980.1	1001.0	779.9	1008.8
20	Gross value added at basic prices	114.9	100.3	108.8	109.5	107.1	131.2
21	Fixed capital consumption	107.2	100.9	91.6	93.5	89.0	88.9
22	Net value added at basic prices	119.6	99.9	119.4	119.5	118.2	157.2

[1] Economics Accounts for Agriculture

[2] Incl. subsidieson products; excl. taxes on products; incl. non-agricultural secondary activities in 2000

It is not possible to ignore even the decrease of fixed capital by –11.1%, which became evident in the increase of net value added at basic prices by 52.7%.

If we come from a premise that the mean coefficient of growth, mean rate of growth and mean rate of increment are related to the size of the first and the last member of a time series and their calculation supposes the value of a time series increasing or decreasing continually, calculations of the statistics were not carried out.

Descriptions of relative changes in particular indicators of the aggregate agricultural account in the assessed reference period as against the previous period derived from applied chain indexes provide values presented in Tab. III.

Based on their comparison, the highest increase as against the previous period occurred in crop output in 2004 (35.12%) and the highest decrease (–11.78%) in 2003. Relative changes in cereals (incl. seeds) between particular years ranged from –15.20% (in 2003) to 48.40% (in 2004).

A marked variability in relative changes was also demonstrated in other indicators of crop output. In industrial crops –14.96% (in 2001) to 18.32% (in 2001), in forage plants from –18.55% (in 2003) to 31.90% (in 2004), in fresh vegetables from –34.25% (in 2002) to 28.31% (in 1999) and in potatoes (incl. seeds).

Evidently lower changes in inter-year values as against indicators of crop output were proved in the sphere of animal output. In the output of agricul-

tural products given by the sum of crop and animal output, relative inter-year increments ranged from 2.74% (in 2001) to 14.45% (in 2004) and decreases from –3.35% (in 2002) to –5.77% (in 2003). The highest inter-year increment (14.36%) was achieved in the agricultural sector output in 2004.

The highest inter-year increase in the total intermediate consumption (10.19%) occurred in 2004, of this amount seeds and planting stock 70.47% in 2002, energy and lubricants 1.37% in 2004, plant protection products 53.57% in 2001, fertilisers and soil improvers 18.55% in 2000, feeding stuffs 10.96% in 2004, veterinary expenses 32.06% in 1999, maintenance of materials 32.12% in 2004 and maintenance of buildings 29.35% in 2004.

Upwardly arranged inter-year increments of the gross value added at basic prices reached 22.48% (in 2004), 14.87% (in 1999), 8.54% (in 2001) and 0.61% (in 2002). An inter-year decrease in this indicator occurred only in 2000 (–12.77%) and 2003 (–2.20%).

In the net value added at basic prices, which represents a value produced by all agricultural units after the deduction of fixed capital, the highest value of an inter-year increment 32.95% was reached in 2004. Parameters of trend functions included in Tab. IV are a tool of the description of developmental tendencies of time series of studied events as the fundamental stage of analytical activities.

III: *Year changes (increments/decrements in %) of indicators of an aggregate agricultural account of the Czech Republic in relation to the previous period 1998–2004*

EAA[1)] code	Indicator	1999	2000	2001	2002	2003	2004
10	Crop output [2)]	8.41	–2.23	4.47	–7.09	–11.78	35.12
01	Cereals (incl. seeds)	5.25	–5.69	19.47	–8.74	–15.20	48.40
02	Industrial crops	13.10	–14.96	18.32	–9.16	–9.04	3.61
03	Forage plants	2.89	–5.98	2.96	–8.31	–18.55	31.90
04	Fresh vegetables	28.31	5.89	–8.84	–34.25	–7.62	17.49
05	Potatoes (incl. seeds)	7.71	25.68	–23.82	–4.40	–21.28	19.95
13	Animal output [2)]	–0.93	–4.77	–2.40	0.73	0.27	–3.81
11.1	Cattle	–5.07	–44.4	–12.45	–3.07	–0.89	–11.85
11.2	Pigs	–4.60	–5.03	–1.36	–1.24	0.48	–7.22
11.5	Poultry	11.26	9.45	14.42	10.16	–1.15	3.84
12.1	Milk	2.70	–7.20	–4.33	2.70	0.82	0.34
12.2	Eggs	–6.56	–7.36	4.11	–12.98	–9.34	–10.68
14	Agricultural goods output	3.45	–4.01	2.74	–3.35	–5.77	14.45
15	Agricultural services output	–0.20	–42.48	5.96	–15.26	50.83	0.25
16	Agricultural output	3.00	–4.56	2.76	–3.46	–5.33	14.27
18	Output of agricultural industry	3.00	–0.46	2.76	–1.32	–5.26	14.36
19	Total intermediate consumption	–2.08	–0.48	0.22	–2.04	–6.76	10.19
19.01	Seeds and planting stock	–11.30	–7.12	20.32	70.47	–5.74	–3.39
19.02	Energy; lubricants	–22.10	0.50	–17.88	–7.70	0.55	1.37
19.03	Fertilisers and soil improvers	–21.28	18.53	12.95	–15.08	–8.96	–2.98
19.04	Plant protection products, herbicides, insecticides and pesticides	–2.18	–2.12	53.57	–11.33	–9.91	14.45
19.05	Veterinary expenses	32.06	17.79	–10.51	8.61	7.66	–9.90
19.06	Feeding stuffs	2.45	0.71	–9.07	–0.03	–10.76	10.96
19.07	Maintenance of materials	4.77	–55.79	22.53	–5.80	–14.20	33.12
19.08	Maintenance of buildings	–7.04	–89.90	4.33	2.13	–22.09	29.35
20	Gross value added at basic prices	14.87	–12.77	8.54	0.61	–2.20	22.48
21	Fixed capital consumption	7.17	–5.89	–9.21	2.06	–4.79	–0.15
22	Net value added at basic prices	19.56	–16.47	19.57	0.00	–0.96	32.95

[1)] Economics Accounts for Agriculture

[2)] Incl. subsidieson products; excl. taxes on products; incl. non-agricultural secondary activities in 2000

Values of correlation indexes included in this table show to what extent changes of endogenous variables (indicator of the aggregate agricultural account) were explicable by applied quadratic functions and an endogenous time variable providing values of correlation indexes included in this tabular survey. The distinctive degree of dependency on the level of significance P = 0.05 was demonstrated of forage plants in the field of crop output and in animal output milk production. The very high degree of dependency of both variables on the level of significance P = 0.01 was proved in the total animal output of cattle, pigs, poultry and eggs. The dependency of the agricultural services output on a time variable was demonstrated as very high on the level of significance P = 0.01.

The high informative potential of significant models of trend functions can be deduced in their use in the field of extrapolation prediction. In addition to already specified indicators the argumentation refers to point estimates of the intermediate consumption of seeds and planting stock, energy and lubricants, veterinary expenses, costs for feeding stuffs, maintenance of machines and maintenance and repairs of buildings.

IV: *Parameters of models of developmental trends of the indicators of an aggregate agricultural account of the Czech Republic in the period 1998–2004*

EAA[1)] code	Indicator	Model parameters of developmental trends of the type: $y` = a_{yt} + b_{yt} t\, c_{yt} t^2$			I_{yt}
		a_{yt}	b_{yt}	c_{yt}	
10	Crop output[2)]	50 706.1	–1 202.7	246.547	0.39
01	Cereals (incl. seeds)	21 281.6	–945.1	198.155	0.59
02	Industrial crops	12 120.0	–520.6	84.880	0.39
03	Forage plants	9 418.1	–442.4	28.917	0.82*
04	Fresh vegetables	2 065.0	251.6	–48.880	0.72
05	Potatoes (incl. seeds)	3 789.1	386.7	–28.714	0.64
13	Animal output [2)]	55 405.1	–1 773.1	113.071	0.94**
11.1	Cattle	8 797.3	–558.7	15.166	0.99**
11.2	Pigs	18 362.1	–732.8	30.774	0.95**
11.5	Poultry	21 352.7	–1 044.1	100.107	0.81*
12.1	Milk	3 064.3	731.1	–43.071	0.99**
12.2	Eggs	3 840.4	–149.6	–2.857	0.97**
14	Agricultural goods output	106 110.8	–2 975.7	359.619	0.32
15	Agricultural services output	2 599.6	–758.6	81.595	0.95**
16	Agricultural output	108 710.0	–3 811.8	441.167	0.49
18	Output of agricultural industry	108 547.4	–3 811.8	514.631	0.47
19	Total intermediate consumption	74 400.7	–2 095.6	180.095	0.61
19.01	Seeds and planting stock	1 816.7	56.7	30.917	0.82*
19.02	Energy; lubricants	3 062.0	–367.0	26.808	0.90**
19.03	Fertilisers and soil improvers	3 932.6	91.9	–23.000	0.48
19.04	Plant protection products, herbicides, insecticides and pesticides	2 889.6	561.9	–41.202	0.70
19.05	Veterinary expenses	984.0	381.2	–36.559	0.90**
19.06	Feeding stuffs	30 978.6	–860.6	–8.238	0.78*
19.07	Maintenance of materials	10 913.1	–2 718.8	260.274	0.86**
19.08	Maintenance of buildings	–1 965.9	2 182.8	–198.904	0.88**
20	Gross value added at basic prices	34 147.9	–1 716.8	334.607	0.74*
21	Fixed capital consumption	12 450.0	–267.3	–7.000	0.87**
22	Net value added at basic prices	21 697.7	–1 449.5	341.595	0.84**

[1)] Economics Accounts for Agriculture

[2)] Incl. subsidieson products; excl. taxes on products; incl. non-agricultural secondary activities in 2000

Correlation index I_{yt} significant on the level: * α = 0.05 ** α = 0.01

Considerable informative estimates of short-term point extrapolation projections can be also expected in gross value added at basic prices, fixed capital consumption and net value added at basic prices.

If we proceed from a premise that extrapolations of time series are based on the description of the present development of assessed indicators by suitably selected analytical functions of time we can expect good point estimates of their future development in case of realized analysis.

Dynamics of fitted values of indicators of an aggregate agricultural account of the Czech Republic are presented in Tab. V.

V: *Dynamics of fitted values of indicators of an aggregate agricultural account of the Czech Republic in the period 1998–2004 (1998 = 100%)*

Indicator	1999	2000	2001	2002	2003	2004	Predikce 2006
Crop output [1)]	99.07	99.13	100.18	102.22	105.26	109.28	120.30
Cereals (incl. seeds)	98.29	98.51	100.67	104.75	110.76	118.70	140.38
Industrial crops	97.72	96.90	97.53	99.61	103.15	108.14	122.47
Forage plants	96.04	92.74	90.07	88.05	86.67	85.84	86.38
Fresh vegetables	104.62	104.94	100.92	92.64	80.03	63.10	16.31
Potatoes (incl. seeds)	104.40	105.45	103.16	97.52	88.53	76.19	41.49
Animal output [1)]	97.33	95.08	93.26	91.85	90.87	90.30	90.44
Cattle	93.78	87.93	82.45	77.33	72.59	68.21	59.82
Pigs	96.48	93.37	90.68	88.40	86.54	85.10	83.47
Poultry	116.30	130.27	141.90	151.22	158.18	162.80	165.07
Milk	96.35	93.69	92.00	91.31	91.59	92.85	98.31
Eggs	95.71	91.26	86.66	81.91	77.00	71.93	61.34
Agricultural goods output	98.17	97.02	96.59	96.84	97.78	99.42	104.80
Agricultural services output	73.27	55.03	45.30	44.02	51.24	66.96	123.86
Agricultural output	97.71	96.26	95.65	95.88	96.94	98.84	105.14
Output of agricultural industry	97.84	96.67	96.47	97.25	99.00	101.74	110.14
Total intermediate consumption	97.85	96.21	95.05	94.40	94.24	94.58	96.75
Seeds and planting stock	107.85	118.96	133.30	150.89	171.74	195.85	253.72
Energy; lubricants	89.46	80.90	74.32	69.70	67.05	66.36	70.90
Fertilisers and soil improvers	100.51	100.00	98.27	95.40	91.38	86.20	72.38
Plant protection products, herbicides, insecticides and pesticides	112.87	123.31	131.32	136.92	140.12	140.88	135.20
Veterinary expenses	120.48	135.36	144.81	148.72	147.14	140.07	109.37
Feeding stuffs	97.73	95.43	93.08	90.69	88.26	85.78	80.71
Maintenance of materials	77.07	60.31	49.70	45.25	46.95	54.82	89.01
Maintenance of buildings	89.11	155.11	199.05	220.83	220.55	198.19	86.88
Gross value added at basic prices	97.82	97.69	99.60	103.54	109.54	117.58	139.78
Fixed capital consumption	97.62	95.15	92.55	89.83	87.00	84.07	77.83
Net value added at basic prices	97.93	99.19	103.76	111.66	122.86	137.39	176.40

[1)] Incl. subsidieson products; excl. taxes on products; incl. non-agricultural secondary activities in 2000

With respect to the length of the analysed time series the extrapolation forecast was carried out for a short period until 2006. According to the forecast it is possible to expect changes in the volume of assessed indicators of the aggregate agricultural account in millions CZK of fixed prices of 2000. As against 2004 (mean level of 1998–2004), it is possible to expect following percentage changes in the predicted year: crop output 0.60 (17.34), cereals 6.96 (34.30), industrial crops 4.80 (21.94), forage plants

–8.72 (–5.45), fresh vegetables –79.08 (–82.35), potatoes (incl. seeds) –52.78 (–57.00), animal output 1.40 (–3.68), cattle –9.46 (–27.21), pigs 0.49 (–8.79), poultry 1.99 (20.29), milk 6.02 (4.62), eggs –13.30 (–28.97), agricultural goods output 0.96 (6.87), agricultural output 2.05 (7.96), agricultural sector output 4.27 (10.31), total intermediate consumption –0.90 (0.73), seeds and planting stock 43.62 (81.50), energy and lubricants 4.61 (–11.50), fertilisers and soil improvers –15.88 (–25.41), plant protection products, herbicides, insecticides and pesticides –6.56 (6.87), veterinary expenses –21.37 (–18.25), feeding stuffs –10.53 (–13.21), maintenance of materials 57.22 (43.53), maintenance of buildings –60.94 (–43.74), gross value added at basic prices 13.31 (29.14), fixed capital consumption –9.06 (–25.58) and net value added at basic prices 21.07 (59. 78).

Results of the study of time series of indicators of agricultural accounts in the Czech Republic interpreted in a verbal, tabular and graphical form for the period 1998 to 2004 and their short-term point extrapolation forecast demonstrated the high informative potential of applied methodical procedures. Findings obtained correspond to determined objectives of the presented paper and can be used both in the field of economics and practice.

SOUHRN

Vývoj ekonomické výkonnosti českého zemědělství v letech 1998–2004 a její krátkodobé extrapolační predikce

Příspěvek prezentuje poznatky získané při exaktním hodnocení průměrné úrovně a její vypovídací schopnosti, dynamiky a trendu indikátorů souhrnného zemědělského účtu (SZÚ) jako stěžejního metodologického nástroje pro měření ekonomické velikosti a výkonnosti zemědělské prvovýroby v rámci národního hospodářství České republiky a definovaného referenčního období. Základní součástí předmětné analýzy tvoří agregáty produkce zemědělského období, mezispotřeba, hrubá přidaná hodnota a čistá přidaná hodnota, vytvořená veškerými zemědělskými jednotkami po odečtení spotřeby fixního kapitálu. Parametry aplikovaných modelů vývojových tendencí zkoumaných jevů za posuzované časové období byly využity při jejich krátkodobé extrapolační predikci.

Byly stanoveny charakteristiky průměrné úrovně posuzovaných jevů a možnosti jejich využití při kvantifikaci podílu produkce zemědělských výrobků, produkce zemědělských služeb a nezemědělské vedlejší neoddělitelné činnosti na celkovém objemu produkce zemědělského odvětví. Uplatnění nacházejí i ve sféře studia struktury celkové mezispotřeby, měřící hodnotu vlastních výrobků, zboží a služeb spotřebovaných ve výrobním procesu a sloužící jako jeden z hlavních indikátorů produkční intenzity odvětví zemědělství.

K významným poznatkům patří z uváděného hlediska i pořadí jednotlivých složek hodnocených indikátorů souhrnného zemědělského účtu. Toto dosáhlo v objemu rostlinné produkce nejvyšší hodnoty u obilovin (vč. osiva) 42,08 %, v následném sestupném pořadí u technických plodin 23,00 %, krmných plodin 16,12 %, u brambor (vč. sadbových) 7,77 %, u ostatních komodit rostlinné produkce 6,90 % a 4,13 % u čerstvé zeleniny. Na celkovém objemu živočišné produkce se nejvýrazněji podílelo mléko 38,00 %. V následném sestupném pořadí prasata 32,04 %, skot 13,60 %, drůbež 10,04 % a vejce 6,32 %. Shodnou interpretaci mají i výsledky studia podílu rostlinné a živočišné produkce, produkce zemědělských služeb a nezemědělské vedlejší činnosti na produkci zemědělského odvětví jako celku.

Vzestupně uspořádané hodnoty podílu na celkové mezispotřebě dosáhly za totální posuzované časové období u veterinárních nákladů 2,55 %, u energie a maziv 3,13 %, u osiva a sadby3,82 %, u údržby a oprav budov 4,00 %, u hnojiv a prostředků zlepšujících půdu 5,56 %, u prostředků na ochranu rostlin 6,20 %, u údržby a oprav strojů a zařízení 7,53 % a u krmiv 52,24 %.

Při hodnocení dynamiky indexních řad indikátorů souhrnného zemědělského účtu byl prokázán diferencovaný pokles převážné většiny zkoumaných jevů ve finálním roce 2004 proti roku 1993. Ten u zemědělských služeb dosáhl snížení o –38,3 %, u produkce skotu –32,7 %, u produkce vajec –30,2 %, u produkce prasat –17,7 %, u čerstvé zeleniny –11,6 % u živočišné produkce –10,6 %, produkce brambor (vč. sadbových) –6,9 %, produkce mléka –5,3 % a produkce krmných plodin –1,9 %. K výraznému zvýšení proti bazickému období došlo na straně druhé u produkce drůbeže o 57,6 %. V následném sestupném pořadí u obilovin (vč. osiva) o 36,2 %, u rostlinné produkce 25,4 %, u technických plodin 23,7 %, u produkce zemědělského odvětví o 8,0 %, u produkce zemědělských výrobků o 6,3 % a u objemu rostlinné produkce 5,5 %. Za pozitivní, i když nevýrazný lze považovat pokles celkové mezispotřeby (–1,9 %),

která měří hodnotu vlastních výrobků a skužeb spotřebovaných ve výrobním procesu (bez využití fixních aktiv) a slouží jako jeden z hlavních ukazatelů produkční intenzity zemědělského odvětví.
Konstatovat lze na tomto místě výrazný pokles mezispotřeby energie a maziv (–39,5 %), výdajů na údržbu strojů a zařízení (–38,9 %), hnojiv a prostředků zlepšující půdu (–20,4 %) a výdajů na krmiva (–7,1 %). Ke zvýšení proti bazickému období došlo v roce 2004 u mezispotřeby osiva a sadby (67,6 %), u prostředků na ochranu rostlin, veterinárních nákladů (46,7 %) a enormně, více než desetinásobně u výdajů na údržbu a opravu budov.
Při hodnocení výsledného efektu odvětví, měřeného rozdílem produkce zemědělského odvětví a mezispotřeby, jako ukazatele výkonnosti odvětví zemědělství v rámci národního hospodářství (hrubá přidaná hodnota v základních cenách), byl proti bazickému období ve finálním roce prokázán nárůst o 31,2 %.
Opomenout nelze ani snížení fixního kapitálu o –11,1 %, které se projevilo v nárůstu čisté přidané hodnoty v základních cenách o 52,7 %.
Deskripce relativních změn jednotlivých indikátorů souhrnného zemědělského účtu v hodnoceném referenčním období proti předcházejícímu období byly odvozeny z aplikovaných řetězových indexů.
Vzestupně uspořádané meziroční přírůstky hrubé přidané hodnoty v základních cenách dosáhly 22,48 % (v roce 2004), 14,87 % (v roce 1999), 8,54 % (v roce 2001) a 0,61 % (v roce 2002). K meziročnímu poklesu došlo u tohoto indikátoru pouze v roce 2000 (–12,77 %) a (–2,20 %) v roce 2003.
U čisté přidané hodnoty v základních cenách, představující hodnotu, která byla vytvořena veškerými zemědělskými jednotkami po odečtení fixního kapitálu, dosáhl nejvyšší hodnoty meziročního přírůstku 32,95 % v roce 2004.
Nástrojem popisu vývojových tendencí časových řad zkoumaných jevů, jako stěžejní etapy analytické činnosti, jsou parametry trendových funkcí.
Do jaké míry byly změny endogenních proměnných (indikátorů souhrnného zemědělského účtu) vysvětlitelné aplikovanými kvadratickými funkcemi a exogenní časovou proměnnou, poskytují hodnoty korelačních indexů.
Vycházíme-li v této souvislosti z předpokladu, že extrapolace časových řad založené na vystižení dosavadního vývoje posuzovaných indikátorů vhodně volenými analytickými funkcemi času, můžeme očekávat v případě realizované předmětné analýzy dobré bodové odhady jejich budoucího vývoje.
S ohledem na délku analyzovaných časových řad byla extrapolační predikace na krátkodobé období do roku 2006. Podle ní lze očekávat změny objemu posuzovaných indikátorů souhrnného zemědělského účtu (v mil. Kč, stálých cen roku 2000).
Proti roku 2004 a (průměrné úrovni let 1998–2004) lze očekávat v predikovaném roce následující procentuální změny: rostlinná produkce 0,60 (17,34), obiloviny 6,96 (34,30), technické plodiny 4,80 (21,94), krmné plodiny –8,72 (–5,45), čerstvá zelenina –79,08 (–82,35), brambory vč. sadbových –52,78 (–57,00), živočišná produkce 1,40 (–3,68), skot –9,46 (–27,21), prasata 0,49 (–8,79), drůbež 1,99 (20,29), mléko 6,02 (4,62), vejce –13,30 (–28,97), produkce zemědělských výrobků 0,96 (6,87), zemědělská produkce 2,05 (7,96), produkce zemědělského odvětví 4,27 (10,31), mezispotřeba celkem –0,90 (0,73), osivo a sadba 43,62 (81,50), energie; maziva 4,61 (–11,50), hnojiva a prostředky zlepšující půdu –15,88 (–25,41), prostředky na ochranu rostlin, herbicidy, insekticidy a pesticidy –6,56 (6,87), veterinární náklady –21,37 (–18,25), krmiva –10,53 (–13,21), údržba a oprava strojů a zařízení 57,22 (43,53), údržba a oprava budov –60,94 (–43,74), hrubá a přidaná hodnota v základních cenách 13,31 (29,14), spotřeba fixního kapitálu –9,06 (–25,58) a čistá přidaná hodnota v základních cenách 21,07 (59,78).
Výsledky studia časových řad indikátorů zemědělského účtu v České republice za časové období let 1998 až 2004 a jejich krátkodobá, bodová extrapolační predikce prokázaly vysokou vypovídací schopnost aplikovaných metodických postupů.

souhrnný zemědělský účet, agregáty, průměrná úroveň, variabilita, dynamika, trend, predikce, Česká republika

ACKNOWLEDGEMENT

The paper was prepared thanks to the support from MSM 6215648904.

REFERENCES

CYHELSKÝ, L., KAŇOKOVÁ, J., NOVÁK, I.: Základy teorie statistiky pro ekonomy. Praha: 1979, SNTL/ALFA, 363 s.

KOVAČKA, M., KONŠEKOVÁ, O.: Štatistické metódy. Bratislava: 1962, SNTL, 255 s.

SEGER, J., HINDLS, R., HRONOVÁ, S.: ETC Publishing Praha: 1986, 636 s. ISBN 80-86006-56-5.

Statistické ročenky České republiky 2002, 2005. ČSÚ, Scientia Praha. ISBN 80-7223-760-8, ISBN 80-250-1080-5.

Address

Prof. Ing. Milan Palát, CSc., Ing. Božena Bodečková, Ústav statistiky a operačního výzkumu, Mendelova zemědělská a lesnická univerzita v Brně, Zemědělská 1, 613 00 Brno, Česká republika, e-mail: palat@mendelu.cz, Doc. Ing. Erich Maca, CSc., Kotlářská 44, 602 00 Brno, Česká republika