

## Analysis of some dynamic series of forest production and trends of forest economics in the Czech Republic

V. KUPČÁK

*Faculty of Forestry and Wood Technology, Mendel University of Agriculture and Forestry Brno, Brno, Czech Republic*

**ABSTRACT:** Functions of wood production in forestry are historically determined by felling possibilities of forest resources. Revenues from timber sales create a financial space for silvicultural operations thus providing for management continuity. These determinations have however recently shown a rather negative trend of development due to the development of timber prices on the one hand and due to increasing inputs on the other hand, last but not least also due to the projections of near-natural forest management methods and increasing area under special management regimes. In their synergy, all these factors lead to economic impacts reflected not only in the profit of forest owners but also in economic results of other entities. The paper presents an analysis into the trends of forest management primary economic variables in the Czech Republic in the period from 1998–2004.

**Keywords:** production in forestry; economics of forest management; dynamic (time) series; trend

Forest production has recently become an important factor of the socio-economic development of society and there are ever greater expectations that the forest will also meet a certain standard with respect to multi-purpose management. However, to simultaneously meet all requirements and demands imposed on the forests depends to a certain extent on the creation of profit from timber sales (according to 2001 Report on the Condition of Forests and Forestry in the Czech Republic).

In general, wood-producing functions express a maximum achievable production volume at the effective use of available production factors – resources. The investigation of production functions is one of the basic tasks of economics as a scientific discipline, namely of its application – i.e. economics at national, sectoral and corporate levels.

In the conditions of forestry the wood-producing function [The division of forest functions into wood-producing and non-wood-producing functions is laid down in § 2 of the Forest Act currently in force. The Forest Act also contains the specification of for-

est functions expressed by means of the forest categorization (§ 7, § 8) which classifies forests according to their prevailing functions into the categories of protection forests, special-purpose forests and commercial forests.] is historically determined by felling possibilities of forest resources with the achieved revenues from timber sales having demarcated from time immemorial in a complementary way the space for the implementation of silvicultural operations and hence the forest future. However, the two determinations have recently developed dynamically and adversely affected each other – both with respect to the development of commercial forest production and in terms of the implementation of the strategy of sustainable life and application of principles of near-natural forest management methods (KUPČÁK 2005).

According to BARTUNĚK (1994), the production of forestry is a complex of produced and assured utility values, i.e. products and services; the term however includes also non-productive services ensuring non-wood-producing functions of the forest. The reason

is that the two activities mostly cannot be matter-of-factly and in terms of values properly distinguished, and for the non-wood-producing functions of the forest also due to the fact that they are provided to their users (community) by forestry free of charge. Costs of their reproduction are included at a decisive measure in the costs of material production (mainly timber production) with the exception of state participation in the process of reallocation (e.g. in the form of subsidies and supports to forest owners).

The issue of assessing the wood-producing and non-wood-producing significance of the forest for the society is very complicated not only due to the fact that the forest itself is a complex object with many-sided effects for the society but also because the forest and the system of its utility values have continually developed along with the development of society's needs. Thus the expression of the social significance of forest functions becomes a socio-economic category and as such a component part of social sciences, namely economic and sociological disciplines (ŠIŠÁK et al. 2003).

Apart from the forest production "for the owner", timber production has a broader economic and sociological context that may reach as far as the framework of raw-material policy of national economy (including energy policy).

In the Czech Republic forestry belongs to the sector of the Ministry of Agriculture (MZe ČR, 16,000 Section of Forestry and Water Management, 16,200 Department of Forestry). According to the status ranking of industries and their economic activities (NACE) it belongs to Section A Agriculture, game management, forestry; Sub-section 02 – Forestry and related activities. The position of forestry within the national economy is expressed by means of macroeconomic indicators the most important of which are indicators of the creation of gross national product (GNP) and forestry's share in it, more recently the share of the industry in the value added, indicators of employment and wages, etc.

The share of forestry in the creation of GNP in the Czech Republic is based on the natural conditions, economic measures in forestry and on the country's industrial potential. The main reason for a relatively low share (0.6–0.7%) and hence low quantified benefits of forestry for national economy consists in the hitherto unresolved issue of appraisal of the above-mentioned non-wood-producing, all-society forest functions and their ranking in the economic environment. The potential significance of forestry for the national economy is increasing by virtue of the supplier of ecological raw material from the renewable natural resource – timber, both

for manufacturing industries (wood-processing industry, paper and pulp industry) and as a source of energy. The interconnection of forestry with rural development acquires an ever greater socio-economic significance within the European Union while to meet all social demands and requirements imposed on the forests in fact depends only on timber felling and sales.

Increment and allowable cut are the determinant production variables in forestry. Increment, as a dynamic indicator, is to express the change of growth variables within the function of growth. Productivity of forests (and also for a comparison with felling possibilities) is most frequently expressed by total mean increment. Allowable cut is to express the resulting volume of timber that can be extracted from the forest in the given period of time with respect to the sustainability and continuity of felling and taking into account the current division of forests, namely into age categories.

Regarding the supranational significance of forests there are new ecological approaches applied in using their produce e.g. by means of forest certification but also through the certification of linked manufacturing industries – consumer chains, which however induces further costs.

The outlined circumstances clearly show an urgent need to analyze production functions of forests – their hitherto development and prediction of future prospects. In these intentions the paper will discuss some dynamic series of forest production and their trends including official production characteristics of timber felling and forest regeneration, being particularly focused on the analysis of hierarchy and trends of primary economic variables.

## METHODOLOGY

### Disposition of data

Data on Czech forestry are based on statistical surveys guaranteed by the Czech Statistical Office; some data are provided by Ministry of Agriculture of the Czech Republic (e.g. by means of annual income statements – statement Forest (MZe) 1-01). Although it is a complex data set, in fact it is the only official set of data on forestry, composed of regular reports on the situation of forests and forestry in the Czech Republic for the respective years (systematically since 1996) – so called "Green Reports".

Primary characteristics analyzed in this paper were taken over from the above database of reports on the situation of forests and forestry in the Czech Republic in order to be further studied in ordered

time and dynamic series according to the character of variables.

### Dynamic (time) series

So called dynamic (time) series are useful statistical procedures by means of which it is possible to study mass phenomena in time. They are also essentially important for the analysis of causes that affected these phenomena and influenced their behaviour in the past, being no less important for predicting their future development.

The time series is the ordering of observations of a certain indicator in time – according to the character and time sequence of the studied variable (feature) and interval. Studied variables are classified by their character as extensive and intensive, by the time interval length as momentary and interval, by the course of values as periodical and non-periodical, etc. In addition to current values, the time series may exhibit variations (such as changes of seasonal character) or incidental fluctuations (accidental and irregular effects) (KUPČÁK 2003).

According to SEGER (1988), it is possible to consider three primary types of time series: interval indicators, momentary indicators, derived characteristics.

Trend and mean coefficient of growth are basic indicators to express the development of time series. The trend is to express the course of the variable (indicator) and the basic procedure to detect a trend is an analytical adjustment of time series, i.e. a substitution of actual data with a series of theoretically calculated data or by the replacement of actual data with a mathematic function. In most cases, the adjustment is made by means of a linear function, and by means of an exponential, logistic, cyclic, etc. function if the course is of non-linear character.

The time series adjustment by means of linear function can be elementarily expressed by the following relation:

$$y_i = a + bt_i \quad (1)$$

the exponential trend will be

$$y_i = a \times b^t \quad (2)$$

where:

$$a = \frac{\sum y_i}{n}, b = \frac{\sum y_i t_i}{\sum t_i^2}$$

and in the case of mass phenomena

$$\sum y_i = n \times a + b \sum x_i \quad (3)$$

$$\sum x_i y_i = a \sum x_i + b \sum x_i^2 \quad (4)$$

where:  $y_i$  – fitted values for the  $i$ -th time period,  
 $a$  – constant equal to the mean of fitted values,  
 $b$  – constant specifying the mean change (increment, drop) for the time period,  
 $t_i$  – time variable for the  $i$ -th time period with  $\sum t_i = 0$ ,  
 $y_i$  – to-be-fitted values,  
 $n$  – number of time periods.

Measures of the dynamics of studied phenomena can be tested by means of elementary indicators – absolute increment (including mean and relative increments), mean coefficient of growth, etc. Mean coefficient of growth ( $k$ ) is in principle constructed as the  $n - 1$  root of the series marginal links, or of the trend (marginal links of fitted time series –  $k'$ ), where

$$k = \sqrt[n-1]{\frac{y_n}{y_1}}, k' = \sqrt[n-1]{\frac{y_n'}{y_1'}} \quad (5)$$

or more precisely

$$\bar{k} = \sqrt[n-1]{k_1 \times k_2 \dots k_n} = \sqrt[n-1]{\frac{y_2}{y_1} \times \frac{y_3}{y_2} \dots \frac{y_n}{y_{n-1}}} = \sqrt[n-1]{\frac{y_n}{y_1}} \quad (6)$$

Analyses were done of selected technical indicators of the production such as timber felling (total felling, of this conifers, broadleaved species, felling intensity) and forest regeneration (total, of this natural, artificial regeneration). Economic indicators of particular focus were as follows:

- Mean cost of silvicultural operations (including forest regeneration, tending of forest plantations, juvenile thinnings, forest protection);
- Mean cost of logging operations (timber felling, skidding, haulage, repair and maintenance of forest roads);
- Revenues from timber sales in the Czech Republic at current costs including average supply costs of selected raw timber assortments to domestic customers;
- Trading income of forest owners (also in the classification according to the respective categories of owners);
- Trading income of business entities engaged in forestry according to selected activities.

The basic reference period of analyses was constructed for 5 years (2000–2004), in economic indicators for 7 years (1998–2004). Longer time frameworks are presented in some series of indicators for a better interpretation (namely with respect to the long-term character of forest activities).

The pivotal informative value of analyses follows from the tables and diagrams constructed by means of standard software products.

Table 1. Timber felling and total mean increment

Timber felling	Unit	1985	1990	1995	2000	2001	2002	2003	2004
Conifers	mil. m <sup>3</sup>	12.82	12.17	11.31	12.85	12.68	13.01	13.66	13.92
Broadleaves	mil. m <sup>3</sup>	1.09	1.16	1.06	1.59	1.69	1.53	1.48	1.68
Total	mil. m <sup>3</sup>	13.91	13.33	12.37	14.44	14.37	14.54	15.14	15.60
Intensity	m <sup>3</sup> /ha forest	5.29	5.07	4.70	5.48	5.45	5.50	5.73	5.90
CPP	m <sup>3</sup> /ha forest	6.20	6.30	6.40	6.50	6.50	6.50	6.60	6.60

Source: Ministry of Agriculture of the Czech Republic

## RESULTS

### General production characteristics of Czech forestry

Primary indicators of forest condition that in a way predict the forestry size and the intensity of management measures are: forest coverage and development of forest land area, species composition and age structure of the forests including their categorization. Production indicators proper are development of timber supplies and increments, and consequently regeneration felling and forest regeneration including silvicultural operations as a whole.

The species composition of Czech forests is dominated by conifers – 75.5% (of this Norway spruce 53.2%, pine 17.3%) with the broadleaved species proportion of 23.4% (of this oak 6.5% and beech 6.5%).

The current categorization of Czech forests is as follows: commercial forests – 75.4%, protection forests – 3.1%, special-purpose forests – 21.6%.

Total timber supplies (timber volumes are reported as the mass of timber to the top of 7 cm outside bark, i.e. at a minimum diameter of 7 cm) amount approximately to 658 mil. m<sup>3</sup> with the average standing volume (mean standing volume per forest stand area without clearcuts) being about 250 m<sup>3</sup>/ha. Total mean increment (CPP) is about 17 mil./m<sup>3</sup> per year, which is 6.6 m<sup>3</sup>/ha (according to Report on

the Condition of Forests and Forestry in the Czech Republic, 2004).

### Timber felling

In the whole post-war period, annual timber felling in the forestry of Czech Republic exhibited an increasing trend until the mid-1980s (13.91 mil./m<sup>3</sup> in 1985). During the restitution of forest properties in 1991–1992 it recorded a temporary decrease but since 1993 the felling volumes have constantly been increasing and recently exceeded 15 mil./m<sup>3</sup>. The proportion of coniferous timber ranges around 90% (of this spruce ca 75%).

Figures of timber felling, felling intensity and total mean increment per 1 ha forest stand area (CPP) are presented in Table 1 with the development of timber felling being illustrated in Fig. 1.

The composition of extracted timber is dominated by roundwood assortments (ca 8 mil./m<sup>3</sup>) and pulpwood (ca 4.5 mil./m<sup>3</sup>). The remaining supplies consist of other utility timber products including chips and fuel wood. The percentage representation of assortments is as follows: coniferous wood mass: roundwood 54%, pulp 30%, chips 1% and other assortments 6%; deciduous wood mass: roundwood 43%, pulp 46%, other assortments 11%. The decisive assortment with an essential influence on the devel-

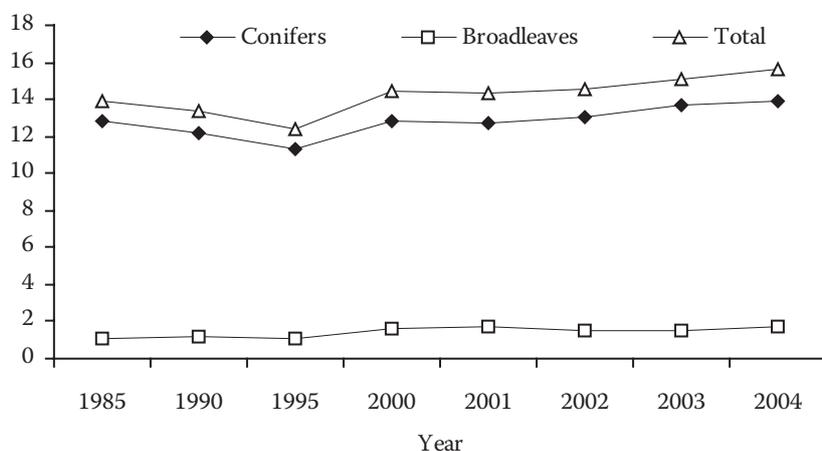


Fig. 1. Development of timber felling (mil. m<sup>3</sup>)

Table 2. Forest regeneration (ha)

Regeneration method	1985	1990	1995	2000	2001	2002	2003	2004
Artificial	33,555	33,615	30,128	21,867	19,109	17,013	16,481	18,618
– of this repeated	9,569	9,635	12,760	4,371	3,934	3,212	3,284	2,766
Natural	594	908	1,163	3,422	2,956	2,936	2,728	3,401
Total	34,149	34,523	31,291	25,289	22,421	19,949	19,538	22,234

Source: Ministry of Agriculture of the Czech Republic

Table 3. Mean working costs of silvicultural operations (CZK/unit of measure)

Operation – activity	Unit	1998	1999	2000	2001	2002	2003	2004
Forest regeneration	ha	56,300	59,743	56,724	61,386	58,300	60,074	58,603
Tending of plantations	ha	7,005	7,143	7,127	7,444	7,720	7,859	7,964
Juvenile thinnings	ha	6,220	6,809	7,221	7,285	7,079	7,597	7,508
Forest protection	ha	97	85	89	85	69	128	108
Silvicultural operations in total	ha	1,802	1,796	1,757	1,705	1,646	1,639	1,614

Source: Ministry of Agriculture of the Czech Republic

opment of timber prices in the Czech Republic is roundwood (Rundholz).

### Forest regeneration

The long-term development of forest regeneration according to individual regeneration methods is pre-

sented in Table 2 and Fig. 2. In contrast to the above-mentioned increasing felling volumes, the area of forest regeneration shows a decreasing trend despite the consideration of regeneration methods to be changed to the benefit of the shelterwood system and natural regeneration and the known problems of methodology in recording the natural regeneration (delay).

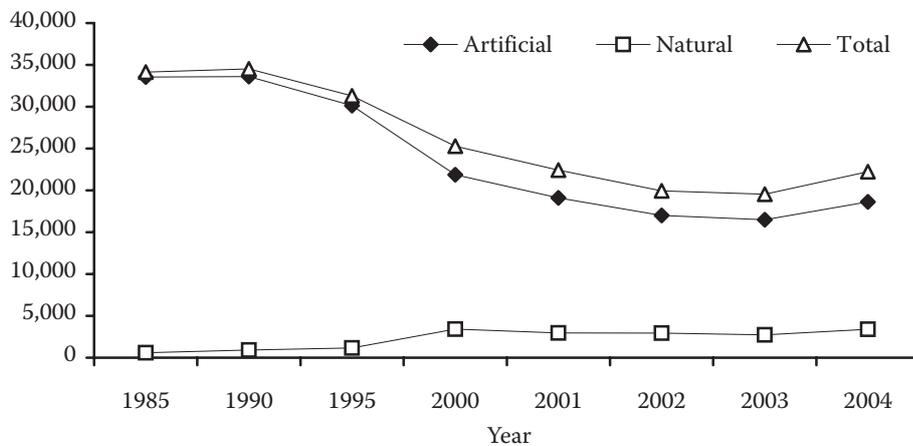


Fig. 2. Forest regeneration development (ha)

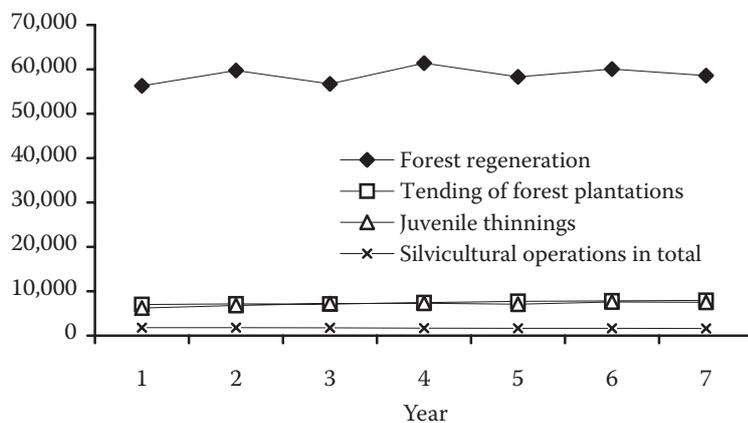


Fig. 3. Development of costs of silvicultural operations (CZK/ha)

Table 4. Mean working costs of felling operations (CZK/unit of measure)

Operation – activity	Unit	1998	1999	2000	2001	2002	2003	2004
Timber felling	m <sup>3</sup>	141	143	148	154	145	142	160
Skidding	m <sup>3</sup>	184	196	200	187	202	200	196
Haulage	m <sup>3</sup>	138	151	149	152	146	162	156
Repair and maintenance of forest roads	ha	541	597	510	503	462	429	367

Source: Ministry of Agriculture of the Czech Republic

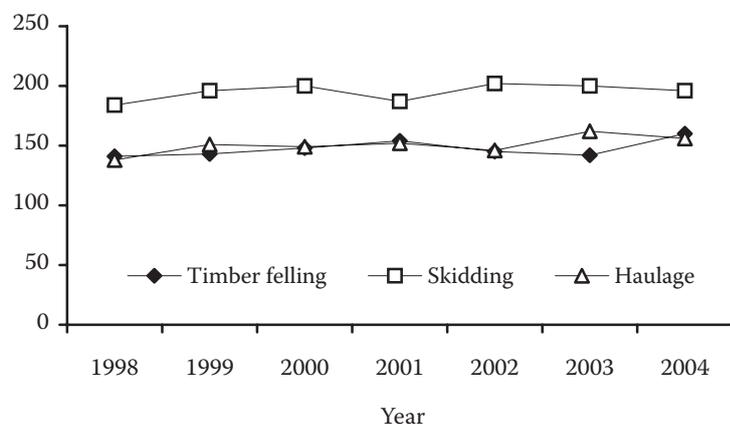


Fig. 4. Development of unit costs of felling operations in the Czech Republic (CZK/m<sup>3</sup>)

### Forest economics in the Czech Republic

Analyses into forest economics usually deal with the situation of forest owners and entrepreneurs in forestry, most frequently expressed by means of incurred – so called working costs by respective activities. However, income from operations (trading income) is the resulting and central economic variable at all times.

The structure and development of mean working costs in selected silvicultural operations are illustrated in Table 3 and Fig. 3. Analogically, mean manufacturing costs according to selected felling operations are presented in Table 4 and Fig. 4.

Although the unit costs grow, the costs of silvicultural operations show an evident continually decreasing trend in the indicator of total silvicultural operations per 1 ha of forest (Table 3).

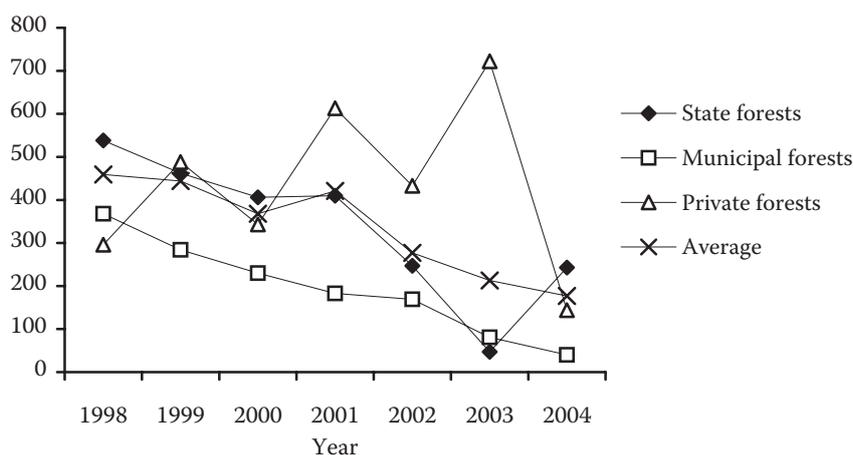


Fig. 5. Development of forest owners' profit before tax (CZK/ha)

Table 5. Revenues from timber sales in the Czech Republic in current prices

Indicator	Unit	1998	1999	2000	2001	2002	2003	2004
Timber supplies in total	mil./m <sup>3</sup>	13.99	14.20	14.44	14.37	14.54	15.14	15.60
Marketable production volume	mld. CZK	18.58	19.60	20.00	19.68	17.91	18.54	18.50
Mean conversion to money	CZK/m <sup>3</sup>	1,328	1,380	1,385	1,369	1,232	1,225	1,186
Profit per 1 m <sup>3</sup> of supplies	CZK/m <sup>3</sup>	86	82	67	77	50	37	19

Table 6. Mean prices of the supplies of selected raw timber assortments for domestic customers (CZK/m<sup>3</sup>)

Assortments	1998	1999	2000	2001	2002	2003	2004
<b>Coniferous</b>							
Logs Class III. A	1,846	1,889	1,887	1,865	1,710	1,656	1,683
of this: spruce	1,948	2,004	2,000	1,974	1,799	1,763	1,746
pine	1,524	1,533	1,533	1,488	1,338	1,282	1,412
Logs Class III. B	1,472	1,527	1,538	1,509	1,352	1,536	1,383
of this: spruce	1,570	1,627	1,642	1,613	1,441	1,635	1,462
pine	1,268	1,275	1,274	1,236	1,102	1,189	1,135
Logs Class V	902	911	907	857	760	675	633
of this: spruce	943	942	922	874	766	684	641
pine	843	875	868	837	735	631	626
<b>Broadleaved</b>							
Logs Class III. A	1,653	1,719	1,746	1,754	1,697	1,895	2,139
of this: oak	1,943	1,970	2,070	2,057	1,948	2,194	2,595
beech	1,639	1,741	1,765	1,770	1,627	1,818	1,796
Logs Class III. B	1,312	1,340	1,379	1,382	1,308	1,633	1,531
of this: oak	1,548	1,572	1,615	1,614	1,501	1,891	1,872
beech	1,326	1,368	1,377	1,358	1,201	1,567	1415
Timber Class V	587	605	592	570	514	467	527

Source: Czech Statistical Office

Mean unit working costs of logging operations exhibit a mostly stagnating trend except for the significantly decreasing costs of repair and maintenance of forest roads per 1 ha forest (see Table 4).

Revenues from timber sales and profit per 1 m<sup>3</sup> of timber supplies, conversion into money and development of mean prices of major raw timber assortments for domestic customers are presented in Tables 5 and 6 and in Fig. 5.

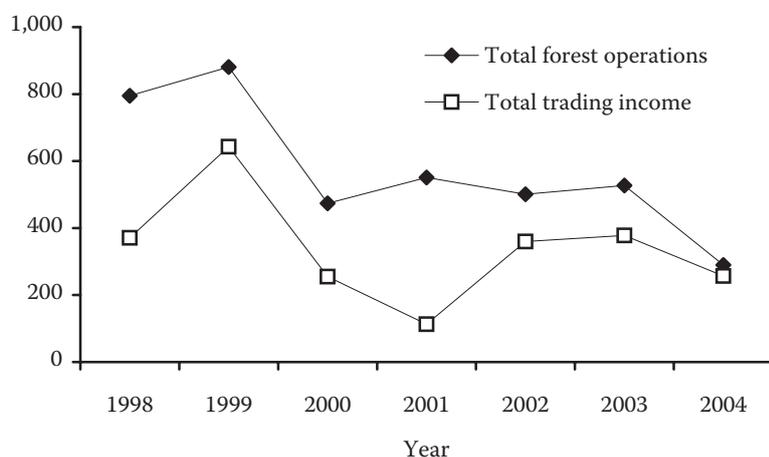


Fig. 6. Trading income of business entities engaged in Czech forestry (CZK/ha)

Table 7. Trading income of forest owners (CZK/ha)

	1998	1999	2000	2001	2002	2003	2004
Profit before tax							
State forests	538	462	406	410	247	47	243
Municipal forests	368	284	230	183	169	81	40
Private forests	296	488	343	613	433	722	144
Average	459	444	368	421	277	213	177

Source: Ministry of Agriculture of the Czech Republic

Table 8. Trading income of business entities according to selected operations (CZK/ha)

Operation	1998	1999	2000	2001	2002	2003	2004
Silvicultural operations	128	187	154	90	138	145	151
Logging	718	705	345	516	432	455	146
Nursery	-72	-93	-103	-81	-60	-63	6
Game management	-21	-15	-36	-1	-20	-21	-20
Small-scale forest production	15	-2	26	19	17	18	1
Other forest operations	27	99	88	8	-6	-7	6
Total forest operations	795	881	474	551	501	527	290
Other activities	-424	-238	-219	-438	-141	-149	-33
Total trading income	371	643	255	113	360	378	257

Source: Ministry of Agriculture of the Czech Republic

Yields from timber sales – mean conversion into money show an evident influence of the development of prices culminating before 2,000 and significantly falling since that year with a corresponding decrease in profit per 1 m<sup>3</sup> of supplies (see Table 5). A more detailed view of revenues – mean prices according to assortments (including the weight of “price-forming” coniferous assortments) is shown in Table 6.

Trading income of forest owners (without allowances for the forest management) is shown in Table 7. Financial results of the management of business entities in forestry are presented in Table 8. The development of trading incomes is also illustrated in Figs. 5 and 6.

The above figures show that the average income of forest owners from their operations recorded a considerable and continual decrease in the period from 1998 to 2004 (Table 7). Similarly, the financial outcome from the operations of business entities in forestry showed a decreasing trend, namely in the income from forest operations (Table 8).

## DISCUSSION

Expecting the forest to fulfil multiple functions for the society, its production has recently become an ever more discussed factor of socio-economic character. However, the concurrent fulfilment of all roles and requirements imposed on the forests by the society unambiguously depends on the creation of profit from timber sales.

Economic preconditions for the regular and continual fulfilment of forest functions were analyzed by BLUŽOVSKÝ (1996), who among other things forecasted an expected growth of costs at a simultaneous stagnation of revenues from timber sales and possible economic consequences for Czech forestry already in the early 1990s.

Although the economy of forest industries is formally based on the above-mentioned status ranking of industries and their economic activities, it is an essential fact that the economy is built-up by concrete economic agents – forest owners together with business entities engaged in forestry (taking into account the nature of the transformation of Czech forestry after 1990). Therefore it can be claimed to a certain extent that the economy of forestry as a whole is formed by a set of “corporate economies”.

Statistical surveys and green reports are sources of highly aggregated national data on forestry (and the only official sources at the same time) that may however significantly differ already at a regional level (not taking into consideration the statistical informative weight of data which is among other things affected also by the choice of respondents). Thus, there is a long-term lack of systematic data analyses in Czech forestry by means of which it would be possible to study the above-mentioned corporate economies – also for other purposes, similar to for example the FADN [FADN (Farm Accountancy Data Network) – a system of data collection that is used as a primary source of comparable data on trading income and economic situation of agricultural enterprises in the EU member countries (in the Czech Republic the survey was introduced already in 1995; in 2003, the FADN CZ network included 1,600 agricultural enterprises, of which 599 legal entities and 1,001 natural persons.)] accountancy data network in agriculture.

The share of forestry in GNP creation follows from the country's natural conditions and industrial potential. The main reason for the existing relatively low share and hence benefits for national economy consists in the so far unresolved issue of economic conception of non-wood-producing forest functions

which are in fact funded by forestry – i.e. which represent a component part of the economic environment but only on the part of costs. Concurrently with the significance of these forest functions it is also the importance of forestry for national economy as a supplier of timber as an environment-friendly raw material and renewable resource both to manufacturing industries (namely wood-working and paper & pulp industry) and for energy purposes. In this respect, the problematics of discussion have arisen questions of utilization of wood, in particular the degree of economic value added at inland processing.

The Czech timber industry exhibits an essential concentration with the dominant role in the market improvement of domestic raw timber being played by only a few corporations with available modern capacities thanks to a strong participation of foreign capital. Their activities have however been focused so far mostly on semi-products with a high proportion of raw material and low value added (sawn timber, pulp), especially with an aim of their export to investor countries or re-export to the third countries.

According to BLUŽOVSKÝ (2003), annual Czech exports of raw timber, sawn timber and pulp amount to about 3 mil./m<sup>3</sup>, 1.5 mil./m<sup>3</sup> and 250 thousand tons, respectively. The amounts of exported sawn timber and pulp roughly correspond to about 2.7 mil./m<sup>3</sup> and 1.3 mil./m<sup>3</sup> of raw timber, resp. Notwithstanding a certain simplification of the above calculation it can be stated that about a half of the annual raw timber production is currently exported from the Czech Republic as unprocessed and as relatively low-worked wood and paper semi-products.

Total round timber and sawn timber produced in 2004 was exported in the same year at 23% (in 1995–2003 at 11–20%) and 41%, respectively.

The situation of Czech forestry is complicated by the fact that the use of production potentials of the forest and forest wood-producing functions is to be further restricted in future. For example, in connection with the application of Act No. 114/1992 on Nature Conservation and Landscape Protection – by declaring the Natura 2000 areas from 2004, with no regard of the declared compensations of forest owner claims (see § 58). And it is not only the depreciation of actual yield from the forest that is concerned but also the frequently neglected detriment from the unused potential and production capacities of the character of “opportunity costs”.

It can be deduced in general terms that an ever greater part of the Czech forestry gradually becomes more and more dependent on budgetary resources, which may in principle result in the extinct substantiation of its existence as a branch

of national economy. Not that the subject of forestry would extinct, but it may become a matter of budgeting similarly like for example the administration of national parks, including the aspects of national economy arising therefrom (naturally provided that the budgetary resources would be available). All this with a certain ecological paradox that the production of environment-friendly raw material – timber would be substituted by a certainly less environment-friendly produce of national economy.

## CONCLUSION

Conclusions to be drawn from the above analyzed data on Czech forestry and their trends in the framework of dynamic series for 1998–2004 are as follows:

- Volume of timber felling increases,
- Reported regeneration area decreases,
- Unit costs of silvicultural and logging operations exhibit a relatively stagnating level,
- Mean conversion of timber and profit from 1 m<sup>3</sup> of supplies decreases,
- Income from the operations of forest owners and business entities per 1 ha of forest decreases.

The above facts indicate at the first glance that Czech forestry apparently faces economic problems. How and to what extent it is going to be the matter of objective impacts and what would be the result of “management” (including supranational impacts) is however a merit of the question and a subject of further necessary research.

These deductions are however opposed by the disposition, structure and prospects of using the renewable resources (as one of the prerequisites of sustainable life strategy), including the adopted concepts and strategies or development programmes (not only in the field of forestry but also in agriculture, landscape management, environment components, rural development, etc.) – see e.g. the Proposal of the National Energy Concept of the Czech Republic, in connection with the development and tendencies of using the wood raw material for energy purposes.

The most prominent world and European forums on forests (e.g. Rio de Janeiro 1992; Helsinki 1993; Montreal 1993; Lisbon 1998; Johannesburg 2002; Vienna 2003, etc.) usually refer to three blocks of forest functions – ecological, economic and social – that are not distinguished in terms of their meaning (value), i.e. they are in a broader sense of equal importance. An emphasis is put on the concurrent sustainable provision of all these three blocks of functions, i.e. on the fact that the creation and provi-

sion of these functions must be sustainable both in ecological, economic and social terms, which is in harmony with the global concept of the strategy of sustainable life (ŠIŠÁK et al. 2004).

The paper is to bring attention to the existence and acceleration of actual economic aspects dominating the Czech forestry in the last 7 years and to related consequences, with deriving new impulses for a further study – not only within the framework of forest economic research but also to be taken into consideration in practical activities such as on the occasion of preparing a new forest law.

The very conclusion of this paper is to remind the 3<sup>rd</sup> Ministerial Conference on the Protection of European Forests held in Lisbon 1998 to have stated in the L1 resolution, Part II (Future activities) that the signatory states undertake (in Item 9) to provide for a further research into social and economic aspects of sustainable forestry, particularly as far as the assessment of forest products and services is concerned with the aim to obtain reliable data for planning, decision-making and public dialogue.

#### References

BARTUNĚK J., 1994. *Ekonomika lesního hospodářství*. Brno, VŠZ.

BLUĐOVSKÝ Z., 1996. Ekonomické předpoklady rovnoměrného a trvalého plnění funkcí lesa. *Lesnická práce*, 75: 178–180.

BLUĐOVSKÝ Z., 2003. Poznámka k současnému využívání zdrojů dřeva v České republice. *Silva bohemica*, 13: 16.

Český statistický úřad (<http://www.czso.cz/csu/edicniplan.nsf/aktual/ep-7>)

KUPČÁK V., 2003. *Ekonomika lesního hospodářství*. Brno, MZLU.

KUPČÁK V., 2005. Produkce lesního hospodářství ČR a možnosti aplikace kapacitních úloh. In: *Zborník z medzinárodnej vedeckej konferencie Logisticko-distribučné systémy*. Zvolen, TU: 108–113.

SEGER J., 1988. *Statistické metody pro ekonomy průmyslu*. Praha, SNTL.

ŠIŠÁK L., ŠVIHLA V., ŠACH F., 2003. Oceňování společenské sociálně-ekonomické významnosti základních funkcí lesa. Praha, Ministerstvo zemědělství ČR.

ŠIŠÁK L., ŠACH F., KUPČÁK V., ŠVIHLA V., PULKRAB K., ČERNOHOUS V., 2004. Vyjádření společenské efektivity existence a využívání funkcí lesa v peněžní formě v České republice. [Projekt MZe č. QF 3233.] Praha, ČZU, FLE: 101. *Zprávy o stavu lesa a lesního hospodářství České republiky (1998–2004)*. Praha, MZe ČR.

Received for publication September 11, 2006

Accepted after corrections October 5, 2006

## Analýza vybraných dynamických řad produkce lesa a trendy ekonomiky lesního hospodářství České republiky

**ABSTRAKT:** Produkční funkce v lesním hospodářství jsou historicky determinovány těžebními možnostmi lesního fondu. Tržby za realizované dříví pak vytvářejí prostor pro pěstební činnost a zajišťují tak kontinuitu hospodaření. Tyto determinace se však v posledních letech vyvíjejí spíše negativně – na straně výnosů v důsledku vývoje cen dříví, na straně nákladů díky narůstajícím vstupům, v neposlední řadě však také vzhledem k průmětům přírodě blízkých způsobů hospodaření a nárůstu území se zvláštními režimy hospodaření. Vše tak synergicky vede k ekonomickým dopadům, promítajícím se nejen do hospodářských výsledků vlastníků lesů, ale i dalších ekonomických subjektů. Příspěvek se zabývá analýzami vybraných dynamických řad ukazatelů produkce lesa, zejména však analyzuje trendy základních ekonomických veličin lesního hospodářství České republiky v letech 1998–2004.

**Klíčová slova:** produkce v lesním hospodářství; ekonomika lesního hospodářství; dynamická (časová) řada; trend

---

*Corresponding author:*

Doc. Ing. VÁCLAV KUPČÁK, CSc., Mendelova zemědělská a lesnická univerzita v Brně, Lesnická a dřevařská fakulta, Lesnická 37, 613 00 Brno, Česká republika  
tel.: + 420 545 134 078, fax: + 420 545 211 422, e-mail: [kupcak@mendelu.cz](mailto:kupcak@mendelu.cz)

---