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PROBLEMS OF LOGGING OPERATIONS IN NON-STATE-OWNED FORESTS OF THE CZECH REPUBLIC

Resulting from political changes in 1989, forests in the Czech Republic started to be re-allocated, re-divided and returned to their original owners, natural persons or their heirs, municipalities and to other legal entities. In ten years the government gave back to non-state subjects about 39 % of the forest area. Ownership changes affected some 2 643 000 hectares of the Czech forests, bringing about a necessity to find a solution for the effective and professional management of predominantly small forest properties. New forest owners are normally missing technical education and they are not equipped with forest machines, not speaking of their professional knowledge of timber market. The government supports association of small forest owners and municipal forest estates into co-operative forms of management. The paper deals with the problems in the non-state-owned forests, with the professional management of non-state forests, government forest policy and forestry allowances, machines and technologies used in the non-state forests, problems of their use, partial technical parameters and achieved technical and economic results, paying attention also to the problems of timber market.

Keywords: non-state forests, management, machines and equipments, technologies, operating data

Інж. Йозеф ПЕКЛ – Ун-т сільського та лісового госп-ва ім. Менделя в Брно, Чеська Республіка

Проблеми лісозаготівлі в недержавних лісах Чеської Республіки

Внаслідок політичних змін 1989 року, ліси Чеської Республіки почали повертатися до своїх колишніх власників, фізичних осіб чи їх спадкоємців, муніципалітетів та до інших юридичних осіб. Протягом десяти років уряд повернув недержавним суб'єктам близько 39 % лісових площ. Зміна власності стосувалася 2 643 гектарів чеських лісів. Це викликало необхідність розробити принципи ефективного господарювання на переважно малих лісових масивах. Нові власники лісу, головню, не мають професійної технічної освіти та не володіють лісовими машинами. У формі співпраці уряд старається підтримати спілки приватних та муніципальних власників лісу. У статті досліджуються проблеми управління лісами недержавної форми власності, організації лісової охорони, використання машин і технологій, їх економічні та технічні досягнення, а також проблеми збуту деревини.

Ключові слова: ліси недержавної форми власності, управління, машини та обладнання, технології, операційні дані.

Introduction

Forestry is one of the Czech industries in which the tradition is passed over generations. Forest owners have developed a proper relation to the forest and its production potential. Forests have become a source of timber and financial income for their owners. They were originally tended by forest managers, owners, often also by forest cooperatives. The historically developed proprietary relations, methods of management and forest use were in the past several times severely disturbed for long periods of time, which had a particularly severe impact on the small forest owners. The continuity of generations of the former owners and their

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offsprings to the private forest property, to the knowledge of practical professional and economic forest management and maintenance of the productive capacity of the forest was interrupted for a long time. The historical ownership changes relate to the years of 1918 (end of World War I and constitution of Czechoslovakia)/1/, 1948 (establishment of the Communist regime and extinguishment of private property), 1989 (end of the Communist era and restitution of private property). New owners are not sufficiently equipped with the technical knowledge on the employment of machines, technologies, working procedures, their orientation on the timber market is poor. Manufacturers and suppliers are not prepared to provide technologies suitable for the refined methods of work in the non-state sector of industry, small forest estates in particular.

Methodology

1. Impacts and reasons to problems in non-state forests
 - Ownership changes after 1989
2. Management and operations control in non-state forests
 - Economic and social position of non-state forests
3. Non-state sector and government forest policy
4. Machinery and technologies in non-state forests
5. Timber market and its utilization
6. Conclusion, evaluation, discussion

1. Impacts and reasons to problems in non-state forests

One of reasons why the problems of management, silvicultural and logging operations arise in non-state-owned forests consists in the historical changes of forest ownership.

Ownership changes after 1989

The year of 1989 brought a change of the political and economic system in the Czech Republic. Acts of Law (Nos. 172/91, 229/91 Gaz.) altered the 40-year old socialist practices, rules and relations. Nearly 39 % of the forest land was re-allocated to new owners. Forest estates were returned to former forest owners or their heirs, municipalities and other legal entities. The process of transformation applied to about 2 643 000 *ha* of Czech forests (as at 31 December 2002) and became a primary tool for the establishment of non-state forests. (5)

In the category of private forests – physical persons, the forest land was re-distributed to former forest owners in retiring age, or to their descendants. The average area of forest estates of private owners (often disconnected) is about 3 *ha* at present. The state forest policy supports association of non-state forest owners into effective and viable units. The forest area, unbalanced age structure of stands, tree species composition, nearly no needed machines, low professional knowledge of timber market, are too the factors of management problems.

Municipal forests

A greater part of the today's municipal forests (78.4 %) are forests of up to 50 hectares. These forest properties are not imposed a legal obligation of having a professional forest manager of their own. Municipal forests usually also fulfil some non-commercial functions. Average area of municipal forest properties is 78 *ha* (6).

2. Management and operations control in non-state forests

Assurance of the professional management namely in small forests is one of the most urgent issues of the Czech forest policy. There are no models of small-scale production technologies with a sufficient technical equipment and suitable machinery developed for small forests in Czech conditions. *Owners of forest properties up to 50 ha* are provided with the Forest Management Guidelines (FMG) whose validity is 10 years, elaborated at government costs. Forest owners often hire private firms, joint-stock companies or other entities to do forest operations, which unfortunately cannot provide the guaranteed quality of work and high technical standard.

In forest properties over 50 ha, it is the forest owner who pays for the execution of the professional forest manager function.

Large-scale municipal forests are often managed by companies established for the purpose by local authorities. Management of these forests is frequently influenced by attitudes of the municipal authorities and by the composition of supervisory boards whose manning and opinions change at regular intervals of four years after communal elections. The changes and alternation of local authorities also bring about different requirements for the management of the municipal forests.

Economic and social position of non-state forests

The rapidly decreasing numbers of employed persons after the year 1989 showed in forestry, too. Both private and communal forests reduced own costs and increased labour productivity. According to the information from the Ministry of Agriculture of the Czech Republic issued on 20 May 2004, the adopted measures resulted in the following values of inter-annual (2002/2003) profit per 1 hectare:

- from 433 to 722 CZK in private owners
- from 169 to 81 CZK in municipal forest properties which also include forest cooperatives
- from 247 to 47 CZK in state forests.

Economic problems of small non-state properties:

Management according to the principle of sustainability and balance of all forest activities and functions is difficult; Achievement of sustained and well-balanced volumes felled and yields from the forest is difficult with the decreasing prices of timber; Small forest properties achieve a generally much lower timber production both in the Czech Republic and elsewhere in the world; It is impossible to have a full-time paid skilled staff employed; Solution of economic problems of non-state small forest properties is a necessary pre-requisite for the assurance of their sustained management. One of starting points may be the forest cooperatives.

3. Non-state sector and government forest policy

Government forest policy respects private ownership and promotes professional management for the conservation and effect of forest functions, in extensive forest complexes in particular. Fragmented non-state forest properties provide no guarantee for a full effect of the forest functions.

Supporting association

Support to the association of forest owners and to the management of joint estates of small forest owners is anchored in the Forest Law (§ 46, par. 1Gaz.) and is differentiated by the size of the associated forest property and according to crite-

ria for the allowance provision. Financial contributions to support the management in all forest ownership categories existing in the Czech Republic amounted to:

- 567.2 mil. CZK in 2000
- 359.1 mil. CZK in 2001
- 387.5 mil. CZK in 2002

A prominent organization which associates owners of municipal and private forests, and legal entities established or appointed for the management of municipal forests is the Association of Municipal and Private Forest Owners in the Czech Republic (SVOL: Sdružení vlastníků obecních a soukromých lesů v ČR). An important member of the SVOL association is the organization Forest Cooperatives of Communities and Association of Communities. Some municipal forests, especially those of small acreages, are entrusted to SVOL by municipalities for tending. (5)

4. Machinery and technologies in non-state forests

Logging operations in Czech forests are dominated by whole-stem methods with their technological variants, short-wood and full-tree logging systems being represented to a lesser and least extent, respectively. Logging methods prevailing in the non-state forests and especially in small forests are those of short-lengths and full-trees in the descending order. Decisive factors affecting the choice of mechanization means and proposal of concrete technologies to be used in private forests are as follows:

phytotechnical and silvicultural requirements; terrain conditions; special requirements for the use of machines and equipments; size of the forest property; concentration of labour; processed timber volume; assurance of the sales of manufactured and by timber market demanded assortments, etc.

Some 90 % of the timber volume are felled in terrains with a gradient up to 40 % (moderate), 10 % are steep terrains. Some 10 % of the timber volume are felled and used by forest owners themselves (applies namely to small forest owners), 25 % are felled by organizations of forest owners or by contractor firms, 65 % by timber buyers responsible for felling. The felling methods of short and full lengths are employed at about 65 % and 35 % felled timber volumes, respectively. Motor/manual felling and subsequent manual measurement of timber volumes are reported to be practiced in the stands at 98-99 %. Big owners use mechanized cutting methods by harvestors and timber volume gauging by devices installed on them. Skidding is made by horses (ca. 20 %), farm tractors (51 %), skyline systems (3 %), forwarders (17 %) and other means of mechanization (9 %). (3)

Felling

The machine most used for cutting in both tending and regeneration operations is power saw (PS); its use covers about 98-99 % of the timber volume felled. Proper logging operations on smaller plots are usually carried out by forest owners together with their families or by hired forest labour or logging contractor companies such as forest corporations. The use of felling machinery and harvestors can be expected only in the owners of large forest estates with respect to the efficiency of their use, achievable only at a high concentration of the felled timber.

Technical problems related to cutting with a power saw in private forests have much to do with the non-observance of binding regulations of health protection at work and labour safety. The non-observance is seen both in loggers with trade licence and in private owners who do the logging operations themselves. The most frequently recorded infringements are as follows:

no repeated courses for power-saw operators, whose organization is obligatory; excessive wear of power saw cutting parts; non-existence of auxiliary implements; transportation of fuels in the forbidden packaging; non-observance of cut geometry at felling; unpermitted methods of taking down hung-up trees; gross infringement of the principles of safe branching; non-observance of the ban of individual work in felling; unpreparedness of woodcutters to provide the first aid, etc. (8)

Cross-cutting (sorting)

With their low volumes of whole-stem logs small forest owners do this operation usually by using power a saw both in the improvement and in the regeneration fellings. Processors mounted on general-purpose tractors can be expected to appear with the small forest owners soon as they cannot afford to use harvestors, their leasing or purchase. Unlike harvestors, a processor adapter does not require a whole-year employment. Processor technologies are good for:

reduced labouriousness and improved labour productivity in debranching and cross-cutting; use on plots and in stands with a low timber concentration which is economically not profitable for harvester technologies; wood mass processing in tending operations up to 40 years of stand age where the use of harvester technologies is clearly unprofitable; owners in whose properties a whole-year operation of harvesting processor is not required.

Machinery used for skidding

The issue of the choice and use of concrete machinery has to take into consideration the following factors:

economic strength of the forest owner; production conditions in the stand; technical equipment of the owner or contractor; technical parameters of machines, etc.

Live horse is used both in the private sector of small forests and by big forest owners for skidding large volumes of timber. The horse is used over a whole year in all terrain types of non-state forests in tending and regeneration operations for direct skidding of tree-length logs from the locality of stump/P/ to the roadside landing/OM/, or in the "horse + UKT (general-purpose wheeled tractor)" combination, exceptionally in the "horse + SLKT (wheeled forest skidder tractor)" combination. Compared in terms of labouriousness and direct costs for skidding 1 cubic meter of tree-length logs in tending operations, the use of the animal comes out more costly in time and money than the "horse + UKT" combination.

Wheeled machines employed in non-state forests represent a range of machines from the professionally made up to home-made means of mechanization. They are represented by small farm tractors, general-purpose wheeled tractors (UKT) with adapters for skidding and skidders (SLKT). Small private and municipal forest properties are worked with small farm tractors of both domestic (MT 8-150) and foreign production (AGT 830, Slovenia) being originally designed to

work on small, irregular and hard-to-access plots where large wheeled tractor would not be economical to use. The machines are equipped for forest operations with a skidder shield with a single- or twin-drum winches and with a front-located hydraulically controlled blade. They are used mainly in advance fellings, in main fellings for skidding timber of lower stem-volume and in the method of short-lengths. They can be usually remote-controlled by radio and meet requirements imposed on off-road machines. They are equipped with a lower protective trough, kingpin or joint steering, 4×4 drive, differential lock, undercarriage clearance of about 24 cm, small machine width (1.1-1.4 m), wheelbase 1.2-1.4 m. Track circle radius ranging from 2.2-3.4 m provides a very good manoeuvrability. Rated pressures onto soil (50-80 kPa) are favourable. A low-situated centre of gravity assures a slope accessibility of 10-14°. Volumes of skidded loads amount to 0.7-1.2 m³ in dependence on the terrain, its surface condition, timber volume weight and other factors. Performance of small tractors converted per 1 hour effective time, skidding distance of 100 m and with the inclusion of other impacts reaches a range from 1.1-2.0 m³. Prices of these machines are fairly low. Costs invoiced for 1 cubic meter of skidded timber range between 110-250 CZK. (7)

General-purpose wheeled tractors (UKT) equipped with superstructures are used by most forest owners directly or through contractors. UKTs with farm implements are used mostly on small and municipal forest properties by forest owners or by contractors.

SLKTs are used only by owners of large non-state forest complexes as their operating requirements, necessary site preparation, concentrated volumes of felled timber, their efficiency and the costs of post-manufacture treatment of working sites put limitations onto their effective use by small forest owners.

Caterpillars

Tracked machines are widely used and popular thanks to their general applicability even in difficult terrains and in all seasons of the year. They are friendly to environment with only minimum rated pressures on the subsoil. One of them that can be found in the forests of all ownership categories is a so called iron horse Husqvarna (tracked trailer) and a track-type forwarder TERRI Models 2020 and 2040. In the motor/manual technology these two machines are meant to transport whole-stem logs in full or short lengths from the stand to the hauling yard or roadside landing, or for the haulage of short logs to off-loading places. Investment costs are low, reliability high, fuel consumption low, applicability for all terrain types, minimum limitations in relation to the growing season and capacity to work in primary tending operations. Working space requirements of these machines are minimal. Problems of using caterpillars for skidding tree-length logs and damage to the standing stand are same as in other means of mechanization. Damage to standing trees in the stand is caused on average at 88.5 % by hauled timber while losses caused by skidding machines amount only to 11.1 %.

Wheeled and wheel-tracked machines are represented by the Vimek 606 TT forwarder whose efficiency and purchasing price predetermine the machine for use by owners of medium-sized forest properties or providers of forest servi-

ces in skidding timber from thinnings and from mature stands of lower stem volumes. In good terrain conditions the machines are capable of transporting log lengths of up to 5 meters. Average monthly production rate of the forwarder at a carrying capacity of about 2 tons is approximately 600 cubic meters. (4)

Harvestors and forwarders are represented in the non-state sector at about 1-2 % of the felled timber volume. In 2002, there were about 40 harvestors and 70 forwarders operating in Czech forests with their share in total logging being about 5 %. Requirements and conditions for their economical employment in thinnings and final fellings can be met only on extensive forest complexes. A minimum volume concentration is estimated to be 400 m³. Direct costs for the production of 1 m³ wood are usually higher than in the current motor/manual technologies but damages to stands and time consumption for the production of 1 m³ wood are lower (ca. 1/6 of the labour consumption as compared with the usual motor/manual technologies). Small and medium-sized forest owners and small contractor companies can be recommended motor/manual technologies of assortment method, which are less demanding in terms of investments. (2)

Timber haulage

Vehicles used in non-state forests to haul larger timber volumes, large-diameter assortments and stems from the last intermediate and final fellings are trucks with platform lorries or special forwarders with hydraulic cranes for the transportation of both long and short timber. Predominant are Czech made trucks TATRA and LIAZ. Timber haulage is carried out both by natural persons – private entrepreneurs, and by specialized firms including forest joint-stock companies (LAS). Private owners of small forests with low timber volumes use simple –often home-made trailers, platform and low-bed platform lorries of single- and twin-axle models for small tractors or original trailers for general-purpose wheeled tractors (UKT). (7)

Problems of machine manufacturers for the non-state sector

Czech engineering firms manufacturing machines and equipments for the sector of non-state forests, particularly for small and medium-sized forest owners, have recently been facing economic problems. The fall of timber prices, switch to the system of short lengths, environmental requirements in logging operations reflect in the decreased interest of forest owners to buy the forest machinery from the manufacturers. Manufacture of piece orders instead of bulk production results in the winding up of manufacturing facilities originally focused on the supplies of machines and implements for small forests.

5. Timber market and its utilization

Important pre-requisites for the achievement of good timber sales, generation of financial profit and hence income into the forest property can be considered cultivation of high-quality timber, its most profitable grading, a prepared road network and a favourable market situation. For this, forest owners and forest property managers need to have some trading skills. The position of small forest properties on the timber market is significantly impacted by the monopoly of state forests (61 % of total forest area in the Czech Republic). This is why the interest of tim-

ber-processing enterprises is focused on the forest joint-stock companies (LAS) which trade large timber volumes harvested in state forests, evenly distributed in time. These companies do timber cross-cutting into better marketable logs which are then forwarded by rail. Small- or medium-sized forest owners have no chance to compete with these companies in trading timber and the low timber price causes economic problems to them in particular.

6. Conclusion, evaluation, discussion

The Czech government forest policy respects private forest ownership and supports sustainable and well-balanced management of non-state forests. The rise of private forest properties induced some problems relating to their professional management, assurance of non-wood-producing functions of the forest, adherence to management according to the principle of sustainability and balance of all operations and forest functions, and achievement of sustained and even yields. Shortcomings have shown in technical education, experience and skills, poor knowledge of working procedures, missing machinery suitable for use in the non-state forests, interest in the association into larger operating units, lack of engineering firms manufacturing and supplying machinery especially designed for small forests. The reduction of employment in forestry resulted in the decrease of direct production costs and in the achievement of higher profit in private forests at a simultaneous reduction of costs invested into the forest structure. Machines and implements for small-scale logging technologies are far from covering the requirements of small- and medium-sized non-state forest properties in terms of their number and production rate.

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