The methods of calculating stumpage prices and analysing Lithuanian forestry

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In Lithuania's forest enterprises market economy relationships are being formed gradually. Ever more important have become the objectives of economic efficiency and analysis. However, at present logging costs and profit are not calculated in forest enterprises. Without these indices economic analysis is impossible. Stumpage market is very limited. Thus, there is no market price on stumpage. The price-list used up till now is out-dated in many respects: it does not correspond to the existing market conditions, lacks differentiation, and fail to take into account factors predetermining stumpage prices. Besides, there are no methods to apply stumpage prices in economic analysis of forest enterprises. The paper presents a method for calculating stumpage prices under Lithuanian conditions by subtracting logging cost from market price of round wood. A project of stumpage prices is also presented. The paper provides methods for application of stumpage prices in economic analysis of forest enterprises by comparing forest growing costs with the stumpage value of stands to be felled, by estimating differentiated logging income and determining logging profitability. Results of economic analysis in Lithuanian forest enterprise based on stumpage value are discussed. It has been ascertained, that in 1998 stumpage price will make up 39% of round wood price. It was calculated how much additional (differentiated) income obtain forest enterprises, as compared to enterprises harvesting the worst stands.The mean logging profitability will comprise 6%. Meanwhile, logging in some enterprises has already become unprofitable.

Key words: stumpage price, economic analysis, forest enterprises.

Introduction

In Lithuanian forestry market economy relationships are expanding. Free market on round and sawn wood has already been formed. Demand and supply started affecting timber prices. Timber export has increased. Private forests and woodlot owners have appeared. A considerable portion of wood processing has been privatised. Under such conditions stumpage estimation and its functions change. In planned economy stumpage prices consisted of three parts: 1) forest regeneration, growing and protection cost; 2) logging profit; 3) differentiated rent.. The function of stumpage prices was to cover forest regeneration, growing and protection expenses as well as to promote rational utilization of forest resources. However, in most cases they failed to fulfill the function, for they were too little (Lazarev, 1988). In Lithuania stumpage prices used to cover only 20-25% of forest growing costs. Another part was financed from the state budget. Stumpage value within round wood price, for instance, in 1986 made up only 11% (Forestry ... ,1987).

Since 1991 stumpage prices in Lithuania were augmented 8.3 times (S.Mizaras, 1991). Income obtained from allowable cut volume estimated by stumpage price comprised forest growing fund for forest regeneration, growing and protection. Since 1995 this order has changed. Forest fund started to be formed from all income of timber sales (round wood and stumpage). These means were allotted both for forest growing and harvesting. Forest enterprises stopped defining stumpage prices and calculating logging costs and profit.

Without these indices it is impossible to conduct an economic analysis on forest enterprises. Stumpage prices is an important means for economic analysis in forest enterprises. By applying it, one can compare forest growing expenses with stumpage price, to estimate differential logging income, to ascertain logging profitability.

Stumpage price is widely applied in market economy countries. It is announced in statistic publications (Yearbook of ..., 1989). The portion of forest growing costs within stumpage income (Castren, Simula, 1995) as well as stumpage prices portion within roundwood sales price (Appelroth, 1986) are analysed. Stumpage value is applied by substantiating stand growing variants (Moberg, 1995). The dynamics of stumpage market

prices is simulated (Toppinen, 1996). The methods for investigation and implementation of stumpage prices taken from abroad cannot be applied directly in Lithuania. In the period of planned economy, work done in Lithuania concerning analysis of stumpage estimation and costs in forestry (Ancukevičius, 1970, Skarbalius, 1977) does not comply with the current situation. Methodical questions on stumpage prices and their application in the transitional period to market economy are under investigation (Mizaras, 1993, 1997, Stumpage ..., 1997).

Having no possibilities to fix stumpage market prices, their calculation methods in the paper are based on round wood market prices. The paper presents: a) stumpage price calculation method by subtracting logging expenses from round wood market prices; b) stumpage price list project; c) methodical basis for application of stumpage prices in analysis of forest enterprises.

Stumpage price calculating method

Calculating formula

In market economy stumpage price is often defined by the method of residual value, i.e. subtracting costs from market price of round wood or its production (for instance, boards) (Orlov, 1928, Robinson, 1987). The calculation may have the following expression:

$$t = \frac{r}{1 + \frac{p}{100}} - e$$

where: r – round wood market price; t – stumpage price; e – logging expenses; p – logging profit percentage.

Round wood market price

Round wood (large, average and small size commercial timber and fuelwood by species) prices on roadsides are defined according to the mean (basic) prices of saleable wood in Lithuanian forest enterprises (Table 1). The data is collected every month at the Forest Economics Centre. The prices of pine, spruce and birch small commercial timber are differentiated according to zones, because pulpwood produced from it is exported through Klaipeda port.

Forest Economics Centre (G.Leliuga) has estimated (Stumpage ..., 1997) timber transportation tariffs by railways to the main points (Klaipėda, Šeštokai, Pagėgiai, Šakiai). On the basis of the "Lithuanian railways" tariff data, it was suggested to differentiate small size timber of pine, spruce and birch according to zones:

– to raise basic prices of forests belonging to the 1st zone (Kretinga, Mažeikiai, Plungė, Telšiai, Rietavas, Šilutė, Tauragė, Joniškis, Kuršenai, Šiauliai, Pakruojis, Tytuvėnai, Radviliškis, Panevėžys, Raseiniai, Jurbarkas forest enterprises and Žemaitija nacional park) by 3 Lt per m³.

– to apply basic prices in forests belonging to the 2nd zone (Biržai, Rokiškis, Kupiškis, Anykščiai, Kėdainiai, Jonava, Ukmergė, Kaunas, Šakiai, Kaišiadorys, Kazlų Rūda, Prienai, Marijampolė forest enterprises and Dubrava forest Experimental Enterprise);

– to reduce basic prices of forests belonging to the 3rd zone (Zarasai, Utena, Ignalina, Švenčionėliai, Nemenčinė, Vilnius, Trakai, Šalčininkai, Alytus, Valkininkai, Varėna, Veisiejai, Druskininkai forest enterprises, Dzūkija and Aukštaitija national parks) by 3 Lt/m³.

Table 1. The prices of round wood in forest enterprises (Lt/m³ without AVT) over the 1st quarter of 1997, (according to MEC data)

Tree species	Commercial wood (underbark)			Fuel-wood
	large, >26 cm	average, 14-24 cm	small, 3-13 cm	
Pine, larch	160	120	60	25
Spruce	160	120	60	25
Oak	370	245	120	40
Ash, maple	280	230	100	35
Birch	130	95	75	35
Black alder, elm, lime, hornbeam	105	80	30	30
Aspen, poplar	80	65	35	20
White alder, willow	65	50	25	25

Logging expenses

Logging costs are forecasted taking into account basic technology: pine stand, clear cutting, normal operation conditions, the mean volume 0.30-0.39, the average skidding distance – 300 m; logging operations: felling and delimbing by "Husquarna" chainsaw, stacking of branches and burning on the cutting site, extraction of stems by MTZ-82 tractor, crosscutting and piling of sortiments into stacks (Table 2). Basic logging costs are differentiated taking into consideration tree species and other conditions (cutting method, labour conditions, extraction distance), (Mizaras, 1997):

$$S = S_b[1 + \sum_{i}^{n}(K_i - 1)],$$

where: S – logging costs, Lt/m³; S_b – basic logging costs, Lt/m³; K_i – coefficient of factor i effect on logging costs; n – number of factors

The coefficients of impact on logging were ascertained according to expenses on logging, i.e. felling, limbing, skidding and machinery: the coefficients of tree species: P – 1.00; E, A, Uo – 1.2; Bt-1.25, J – 1.4 (where:

Table 2. Logging expenses

Logging stages	Kind of expenses	Lt/m³
Preparation of cutting areas, transportation of workers, maintenance of tools, safety equipment		2.82
Felling and limbing	Main wages	1.93
	Additional wages	0.29
	Social insurance	0.67
	Machinery	2.24
	Other (10 %.)	0.51
	Total:	5.64
Extraction of stems with MTZ-82 tractor, when the average skidding distance is 300 m	Main wages	1.85
	Additional wages	0.28
	Social insurance	0.64
	Machinery	9.68
	Other (10 %.)	1.25
	Total:	13.70
Bucking and piling	Main wages	3.20
	Additional wages	0.48
	Social insurance	1.10
	Machinery	1.82
	Other (10 %.)	0.66
	Total:	7.26
Total		*29.42*

P – pine, E – spruce, A – oak, Uo – ash, Bt – white alder, J – black alder); cutting method: clear cutting – 1.00; non-clear – 1.18; operation conditions: normal – 1.00; difficult – 1.26; skidding distance: up to 300 m – 1.00; 301-500 m – 1.11, 501-700 m – 1.20 (Mizaras, 1996, Stumpage ..., 1997).

With the help of statistical analysis programs, an equation of logging costs dependence on predetermining them factors was elaborated:

$$y=42.6309-0.0639\ x_1+0.1019\ x_2+0.3081\ x_3-0.0839\ x_4+0.1148\ x_5$$
$$R^2=0.9247$$

where: y – logging cost, Lt/m³; x_1 – percentage of pine stand volume within final felling; x_2 – percentage of black alder volume within final felling; x_3 – percentage of white alder volume within final felling; x_4 – percentage of clear cutting; x_5 – index on labour conditions (100-N hydrotop percent).

Price-list project

While working out the price-list project, it was impossible to prove by calculations the impact of all factors. Therefore, assessment by experts were taken advantage of: namely, the price of large and average size commercial timber in pine stands of the 4th and less height is reduced by 15%, large and average size timber from improvement and sanitary cuttings – 20%, windthrown and broken trees – by 7 Lt/m³; N hydrotop site is attributed to normal operational conditions; Š, U, P, P^n – to difficult, L – average conditions; the least price corresponds fuelwood stumpage price. Basic profit norm is 15%. Stumpage price-list project is given in Table 3. It is differentiated depending on the main predetermining round wood price factors: tree species, diameter of logs, cutting method, production conditions.

Table 3. Stumpage price-list project

Tree species	Commercial wood (underbark)			Fuel-wood
	large, >26 cm	average, 14-24 cm	small, 3-13 cm	
Pine, larch	105	69	17	4
Spruce	100	67	14	3
Oak	278	162	60	6
Ash, maple	199	156	43	6
Birch	78	48	30	5
Black alder, elm, lime, hornbeam	56	4	4	4
Aspen, poplar	34	21	2	2
White alder, willow	21	8	2	2

Notes:

1. Large-sized commercial timber has top diameter 26 cm and more, average — 14-24 cm, small — 3-13 cm.
2. The price of large and average size timber in IV and less height pine stands is reduced by 15%.
3. The price of large and average size timber from thinning and sanitary cuttings is reduced by 20%.
4. The price of small size pine, spruce, birch timber in Joniškis, Jurbarkas, Kretinga, Kuršėnai, Mažeikiai, Pakruojis, Panevėžys, Plungė, Radviliškis, Raseiniai, Rietavas, Šiauliai, Šilutė, Tauragė, Telšiai, Tytuvėnai forest enterprises and Žemaitija nacional park is raised by 3 Lt per m³. In Alytus, Druskininkai, Ignalina, Nemenčinės, Šalčininkai, Švenčionėliai, Trakai, Utena, Valkininkai, Varėna, Veisiejai, Vilnius, Zarasai forest enterprises, Dzūkija ir Aukštaitija nacional parks it is reduced by 3 Lt per m³.
5. From stumpage price calculated taking into account notes 2-4 reductions on logging conditions are subtracted:

5.1. Non-clear cutting — 6 Lt/m³.

5.2. If windthrown trees or whole area is being cut — 7 Lt/m³.

5.3. Logging conditions:
medium (L) — 4 Lt/m³;
hard (Š, U, P, P_n) — 8 Lt/m³.

5.4. Skidding distance:
301-500 m — 3 Lt/m³;
501-700 m — 6 Lt/m³;
more than 700 m — 9 Lt/m³.

6. When the value of cutting area is less than that of fuelwood, the whole volume is estimated by fuelwood prices of the corresponding tree species.
7. All data on stumpage prices calculation are included in special documents which are handed in to each buyer separately.

Methods and results of economic analysis in forest enterprises

Forest growing expenses compared to stumpage value

Forest growing covers activities from forest regeneration to felling of mature stand: preparation of seeds and growing of seedlings, afforestation, tending of stands, sanitary protection and fire prevention, drainage network and its maintenance, road construction and maintenance; special regulation measures on non-wood resources, protection of forests, general economic measures. Forest growing costs are ascertained in forest enterprises. Summarized data over the country are obtained every quarter at the General Forest Enterprise.

Allowable for cutting volume in forest enterprises is not evaluated by stumpage prices. For this evaluation the methodology and personal computer programs have been worked out. Final cutting volume is distributed into large, average, small size commercial timber and fuelwood according to the standards (Stumpage ... 1997). Based on data characterizing cuttings in forest enterprises and stumpage price-list, stumpage price in forest enterprises is calculated:

$$P_i^P = \sum_{i}^{i=8} \sum_{j}^{j=4} V_{ij}^P t_{ij} - N^P,$$

where: V^P – final cutting volume, m³; i – index of tree species;

i=1÷8; P, M -1, E-2, A-3, U, Kl-4,B-5, J, Lp, Gb, Skr-6, D-7, Bt-8

(where: P – pine, M – larch, E – spruce, A – oak, Uo – ash, Kl – maple, B – birch, J – black alder, Lp – lime, Skr – hornbeam, Gb – elm, D – aspen, Bt – white alder);

t – stumpage price, Lt/m³; j=1÷4; 1 – large, 2 – average, 3 – small, 4 – fuelwood. N^P – correction of stumpage price in final cuttings.

$$N^P = 0.15 V^P_{IV\,i=1,j=1} t_{i=1,j=1} + 0.15 V^P_{IV\,i=2,j=2} t_{i=2,j=2} + 3^* \sum_{i}^{i=1,2,5} V^P_{j=3}$$

$$- 3^{**} \sum^{i=1,2,5} V^P_{j=3} - 6 V^P_{np} - 7 V^P_{i\check{s}} - 4 V^P_{L} - 8 V^P_{\check{S}UPPn} - 3 V^P_{300} - 6 V^P_{500} - 9 V^P_{700},$$

where: $V^P_{IVi=1,j=1}$ – large size commercial timber volume in pine stands IV and in these of less height; $V^P_{IVi=1,j=2}$ – the same for average size; * – applied in forest enterprises of the 1st zone; ** – applied in forest enterprises of the 3rd zone; V^P_{np} – volume in non-clear final fellings; $V^P_{i\check{s}}$ – volume of windthrown trees; V^P_L – volume of cutting areas on site L; $V^P_{\check{S}\,UPP_n}$ – volume of cutting areas on Š U P P$_n$ sites; V^P_{300}, V^P_{500} and V^P_{700} – volume of final cuttings with skidding distances 301-500 m, 501-700 m and over 700 m, respectively.

Forest growing costs in 1997 were 90.5 mln. Lt and evaluation of timber felled in forest enterprises by stumpage prices are 132.5 mln. Lt. It may be seen, that in 1997 the means allotted for forest growing comprised less than the stumpage price of stands felled.

Differentiated logging income

Forest enterprises, situated closer to market places, having more favourable logging conditions and better cuttings, obtain differentiated income. Stumpage price takes into account all the mentioned factors. Thus, differentiated income is calculated:

$$D = (t_{m.u.} - t_{min})V,$$

where: $t_{m.u.}$ – average stumpage price of allowable cut in a forest enterprise, Lt/m³; t_{min} – minimal average stumpage price in all forest enterprises, Lt/m³; V – allowable volume.

The least average stumpage price in 1998 is in Tytuvėnai forest enterprise – 27.3 Lt/m³, biggest – in Druskininkai – 56.8 Lt/m³. In comparison to Tytuvėnai forest enterprise, the remaining enterprises obtain additional (differentiated) income from 1.1 to 34.8 Lt/m³.

Logging profit

Logging profit per m³ in forest enterprises is determined:

p = r - e - t ,

where: p – logging profit, Lt/m³; r – round wood price, Lt/m³; e – logging expenses (without stumpage price), Lt/m³ ; t – stumpage price of timber felled, Lt/m³.

Standard logging profit is calculated. Stumpage prices smooth down profitability differences between enterprises distinguished for the best and worst cuttings. The proportion of profit within round wood price on average makes up 6%. In some forest enterprises logging is becoming unprofitable.

Conclusions and suggestions

Suggestions encompass: stumpage price calculation method adapted to Lithuania's conditions; stumpage price-list project; economic analysis methods for forest enterprises by applying stumpage assessment in stands to be cut: comparison of forest growing expenses with stumpage value, finding out of differentiated income and logging profit.

It has been ascertained, that since 1998 stumpage price in round wood price will comprise 39%, differentiated income from logging in forest enterprises-48.2 mln.Lt; the mean logging profitability will make up 6%, while logging in some forest enterprises may become unprofitable.

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МЕТОДЫ ОПРЕДЕЛЕНИЯ ЦЕНЫ ЛЕСА НА КОРНЮ И ЕЁ ПРИМЕНЕНИЯ ДЛЯ АНАЛИЗА ЛЕСНОГО ХОЗЯЙСТВА ЛИТВЫ

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Резюме

В лесных предприятиях Литвы постепенно формируются рыночные отношения. Актуальными становятся задачи экономической эффективности и экономического анализа. Однако, в государственных лесных предприятиях в настоящее время себестоймость заготовки древесины и прибыль не определяется. Без этих показателей нельзя выполнить экономический анализ. Рынок леса на корню очень ограничен. Рыночные цены леса на корню отсутствуют. Действующий прейскурант леса на корню устарел: не соответствует условиям рынка, мало дифференцирован, не учитываются многие факторы ценообразования. Отсутствуют методы применения цен леса на корню для экономического анализа лесных предприятий. В статье представлен метод определения цен леса на корню применительно к условиям Литвы и проэкт прейскуранта цен. Также представлены методы применения цен леса на корню для экономического анализа путём сравнения затрат на лесовыращивание со стоймостью вырубаемого леса, оценки дифференциального дохода лесозаготовок, определения её прибыльности.

Обсуждаются результаты экономического анализа лесных предприятий. Установлено, что в 1998 г. стоймость леса на корню в цене заготовленной древесины составит 33%.

Ключевые слова: цена леса на корню, экономический анализ, лесные предприятия.