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IMPLEMENTATION OF THE „BUSINESS ADVISOR“ INFORMATION SYSTEM FOR OPTIMIZING THE ECONOMIC RELATIONSHIPS BETWEEN SUBJECTS IN WOOD CUTTING ACTIVITY

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ABSTRACT

The sustainable develpoment of forestry is closely related to the rational distribution of the income obtained from the wood use, the main part of it being cutting. For the successful and foresight regulation of the relationships between economic subjects that maintain and perform cutting activity both reliable legal base and intime operarational information are required. Current investigation aims to support the right management decision making by implementing the “Business advisor” information system for the precise definition of the production expenses when determining the initial prices in auction procedures for cutting assignment in the state forests.

Key words: information system, cutting auction, production expenses

INTRODUCTION

The „Business advisor“ information system [Stoenchev, Rozeva et al., 2012] was designed for supporting managers from private forestry firms in the calculation of offer price when applying in public auctions for lumbering in state forests. The system provides for the calculation of the exact amount of production expenses when performing lumbering in the assigned site by entering as input parameters the type and amount of stumpage, the slope and remoteness of the cutting site from a temporary wood warehouse, the presence of obstacles and difficulties as well as specific data for the firm as personnel wages, management expenses, type of equipment and supplies for it, etc. Having the production expenses calculated when the profit percentage is entered the system generates variants of offer prices for the auction application.

The aim of the current investigation is to explore the functionality of the information system for calculating the initial auction price given by the state forest enterprise in order to improve its precision and to achieve more fair distribution of the income obtained from the forest between the state and the private economic subjects.

RELATED WORK

The initial price for stumpage obtained with the calculation method implements departmental norms of time and the rates for cutting one cubic meter of timber depending on its kind and amount [Departmental norms and rates in wood use, 1991]. The norms of time are realistic enough because they have been established by multiple measurements of the time consumed in the working operations and besides that the degree of mechanization doesn’t change fast. This is not the case for the cutting rates since the payment level for the work of the personnel needs to be changed. When an information system is designed to support a single private lumbering firm the amount of payment established for it has to be entered into the system as input parameter. For the purpose of calculating the initial prices for auctions by information system the average value of the wages in lumbering can be entered which can be taken from the statistics for the pre-

vious year. So far as fuel prices are concerned the current actual values can be entered or the expected ones for the future period when the cutting is planned to happen. When running these calculation procedures the information system has the advantage that it works with the actual average amount of personnel wages. There is also a disadvantage consisting in the fact that it's possible the amount of the expenses in statistical reports to be decreased by the respondents in order to save expenses for payments to the insurance system. The degree of precision is lowered also by using average values for the wages which means that the differentiations in the wages of qualified, unqualified and management personnel cannot be taken into account.

After data from the National Statistics Institute (NSI) for 2005 the average annual wage in forestry was 2 774 BGN which equals to 231,17 BGN monthly [Markov, Glushkov, 2008]. The authors calculate the average monthly gross wage for 2007 to be 308,70 BGN by adding the expected annual inflation rate and the insurance payments of 18,85 % due by the employer. It's worth noticing that this is the average level of wages in forestry in general which includes the cutting. A new classifier of economic activities has been introduced in 2008 where cutting is reported separately from other forestry activities. This provides for improving the calculation precision.

According to data supplied by NSI after our inquiry for 2010 and code 20.20 from the classifier of economic activities referring to forestry (lumbering) the average annual expense for a single person was 6 892,79 BGN.

EXPERIMENTS WITH THE „BUSINESS ADVISOR" SYSTEM

1. Input data

An experiment has been performed with the "Business advisor" information system for testing its applicability to support state forestry enterprises and their regional divisions as well. Data for the experiment have been taken from real auction procedure [1] held in 2010. Two items from the auction offer have been considered, i.e. big-size poplar wood (timber above 30 cm for sawing) and medium-size poplar wood (thin timber), as shown in table.1

[1] Auction announced at 12.11.2010 from the state forestry Orjahovo for assignment the cutting of wood at site 111101, its transportation to a temporary warehouse and arrangement by assortments.

Table 1: Basic parameters of cutting

Parameters	Assortments	
	Big wood (broad-leaved soft) – timber above 30 cm for sawing	**Medium wood (broad-leaved soft) - thin timber**
Amount in cubic meters	600	96
Initial price for cutting and transportation per cubic meter in BGN	10,89	10,53
Initial price total BGN	6534	1011
Market price per cubic meter BGN	69	49
Norm of time in hours for cutting 1 cubic meter at the site	0,56	0,95
Hour productivity in cubic meters for cutting at the site (applies for the worker and the fuel motor saw)	1,79	1,05
Norm of time in hours per cubic meter for cutting and sorting at the site	0,8	1,32
Norm of time per cubic meter for the transportation 400 m out to a temporary warehouse by universal tractor and 2 workers	0,461	0,461
Shift productivity in cubic meters for the transportation 400 m out by universal tractor and 2 workers	36,86	36,86
Hour productivity in cubic meters for the 400 m out transportation by universal tractor and 2 workers	4,34	4,34

The information for the wood amount and the initial price for cutting are taken from the documents describing the auction. The market price for selling a cubic meter of the poplar wood being cut is taken from the data of the stated forestry unit. The norms of time for cutting, cutting and sorting, transportation and shift productivity [Departmental norms and rates in wood use, 1991] that have been practically used for calculations are extracted from the database of the “Business advisor” information system [Stoenchev, Rozeva et al., 2012] by the input module. The norms of time for cutting and cutting with sorting are presented separately for the sake of obtaining a more precise definition of the period of the fuel motor saw (FMS) operation. It’s accepted that the time is the same as the one of the worker performing the operations wedge-shaped cutting, felling, pruning and cutting out – table 2.

Table 2: Equipment parameters [Markov, Glushkov, 2008] and management expenses

Parameter	**Universal tractor**	**Fuel motor saw (FMS)**
Delivery price BGN	40000,00	1000,00
Interest rate %	8,00	8,00
Depreciation period in years	8,33	5,00
Annual load hours/year	1200,00	1200,00
Repair / % from depreciation /	80,00	60,00
Fuel consumption l/hour	3,50	0,50
Fuel price BGN/l	2,50	2,50
Motor oil - % from the fuel	70,00	70,00
Management expenses, % from the delivery price	2,00	2,00

The data concerning the equipment in [Markov, Glushkov, 2008] implement prices after year 2000 and are based on a thorough investigation of the practice in Bulgaria,

Germany and other European countries. The authors have performed the research for two periods of the annual load of the equipment, i.e. 1200 and 1800 working hours. The first period of load has been accepted for the universal tractors as the more realistic one. It equals to 65 % of the single shift working time. The second period of load is recommended when using specialized equipment – harvesters and forwarders. The fuel price is accepted on the basis of expert assessment at the time of cutting. The percentage for the expenses of motor oil consumption compared to the fuel consumption is defined in the following way: 10 % is for the expenses for the oil that is added to the fuel (its price is about 10 BGN) and the norm is that 25 g are added to 1l fuel/ and 60 % is for the expenses for the oil that is needed for greasing the chain. The expenses for the garage of the equipment and for Casco insurance aren't included because the number of forestry firms that make such expenses isn't known exactly and also the insurance amount varies depending on the depreciation degree and the insurance company. Expenses for transportation of the workers and equipment to the site aren't included as well because of the relatively plain surface and the vicinity to a settlement – table 3.

Table 3: Expenses for the equipment operation (BGN)

Permanent annual expenses	Universal tractor	FMS
Interest rates (supply price*rate%/2)	1600	40
Depreciation (supply price /depreciation period)	4800	200
Repairs (% from depreciation)	3840	120
Management expenses (2% from supply price)	800	20
Permanent expenses (total)	11040	380
Permanent expenses (per hour work of the machine and 1200 hours annual load)	9,20	0,32
Expenses for fuel and oil (for 1 hour work of the machine)		
Fuel expenses (l/hour)*(BGN/l))	8,75	1,25
Oil expenses (70% from the fuel expenses)	6,125	0,875
Total fuel and oil per hour	14,875	2,125
Total expenses for operating the equipment per hour	24,08	2,44

2. Variants for calculation of production expenses and profit

The calculations have been performed by the calculative approach with the basic types of predictable expenses included and implementing the method of calculations presented in [Markov, Glushkov, 2008]. The interest rate percentage has been calculated by the commonly implemented formula. The management expenses percentage has been determined by an expert assessment – table 4.

Table 4: Production expenses

Parameters	Assortments	
	Big wood (broad-leaved soft) – timber above 30 cm for sawing	Medium wood (broad-leaved soft) – thin timber
FMS operation expenses per cubic meter for cutting	1,37	2,33
Universal tractor operation expenses for the transportation of 1 cubic meter wood 400 m out by 2 workers (total expenses per hour/hour productivity in cubic meters)	5,55	5,55
Average month expenses for 1 person in private forest enterprises according to the statistics for 2010	574,40	574,40

Table 4: Continued

Parameters	Assortments	
	Big wood (broad-leaved soft) – timber above 30 cm for sawing	**Medium wood (broad-leaved soft) – thin timber**
Hour wage rate for 1 person (month expense/(21.3*8.5))	3,17	3,17
Rate for cutting and sorting per cubic meter at the site (time norm*hour rate)	2,54	4,19
Rate for the transportation of 1 cubic meter 400 m out by universal tractor and 2 workers	1,46	1,46
Total expense for cutting and sorting per cubic meter (FMS expense + labor expense)	3,91	6,51
Total expense for the transportation of 1 cubic meter 400 m out by universal tractor and 2 workers (equipment expense + labor expense)	8,48	8,48
Total expense for cutting, sorting and the transportation of 1 cubic meter 400 m out by universal tractor and 2 workers	12,38	14,99
Initial auction price (BGN) per cubic meter	10,89	10,53
% of variation from the initial auction price	-12,05	-29,75

The hour wage rate per person has been calculated by dividing the total month expense by the product of the average number of working days per month obtained from the ones per year and the number of working hours per shift.

It’s worth noticing that the calculation doesn’t include the usual 10 % for the entrepreneur’s profit.

It turns out that despite of this the calculated initial price for cutting of 1 cubic meter poplar wood and its transportation to a temporary warehouse is significantly lower than the one that covers the real expenses of the enterprise for buying a tractor on bank credit and plan some expenses for depreciation and repairs. Expenses for garage of the equipment and Casco insurance haven’t been planned as well.

For the purpose of identifying the circumstances that provide the private forestry enterprise with a possibility to decrease the production expenses with which it can perform the cutting without sustaining a loss, it has been proposed to limit the expenses for personnel to the minimum level allowed by the regulations, i.e. minimal wage value. In order to provide for the employment of more qualified workers this wage has been increased by 15 % for favoring the period of service and another 18,85 % for the insurance payments due by the employer. The later value has been determined according to an expert assessment – table 5.

Table 5: Production expenses based on the minimal wage rate for 2011 when the cutting will start (270+15 % for period of service+18,85 % insurance due by the employer = 361,40 BGN)

Parameters	Assortments	
	Big wood (broad-leaved soft) – timber above 30 cm for sawing	**Medium wood (broad-leaved soft) – thin timber**
Minimum wage with the insurance payments and 15% for service period for 2011	361,40	361,40
Hour rate per person (month expense/(21.3*8.5))	2,00	2,00
Rate for cutting and sorting of 1 cubic meter at the site (time norm*hour rate)	1,60	2,63

Table 5: Continued

Parameters	Assortments	
	Big wood (broad-leaved soft) – timber above 30 cm for sawing	**Medium wood (broad-leaved soft) – thin timber**
Rate for the transportation of 1 cubic meter 400 m out by universal tractor and 2 workers (time norm*hour rate)	0,92	0,92
Total expense for cutting and sorting of 1 cubic meter (expense for FMS +expense for work)	2,96	4,96
Total expense for the transportation of 1 cubic meter 400 m out by universal tractor and 2 workers (expense for equipment + expense for work)	7,39	7,39
Total expense for cutting, sorting and the transportation of 1 cubic meter 400 m out by universal tractor and 2 workers	10,36	12,35
Initial auction price per cubic meter (BGN)	10,89	10,53
% of variation from the initial auction price	5,15	-14,75

It turns out that by applying such restrictions on the terms for payment the contractor will have a profit of 5,5 % from the expenses made with the big-size wood only. Part of it is to be used for covering the losses caused by cutting the medium-size wood because the application for the auction concerns all assortments at the site and not only particular ones. Another part of the calculated profit is to be used for covering unpredicted expenses and the rest is the real profit amount. The cutting activity will be actually profitable in case that the relative share of big-size timber exceeds significantly the medium- and the small-size wood which are non-profitable in general.

In the case examined so far the total amount of big-size wood is 600 cubic meters and the one of medium-size is 96 cubic meters. After the distribution of expenses as discussed previously the total amount obtained is 7 401,6 BGN and the total income on the basis of the initial auction price is 7 544,88 BGN. The expected profit is 143,28 BGN which is 1,94 %. The result isn't trustworthy enough because the stated assortments are structural, not all of them have been taken into account in the cutting offer and it's known in advance that the contract will be concluded at a price that is lower than the initial auction price.

Despite of all this variant is considered risky enough therefore a proposal for designing a more profitable one has been made. It explains the fact that there are contractors who have applied to this auction and similar ones, have performed the cutting activity successfully and have obtained a profit with an offer price that is lower than the initial auction price.

In the next variant the calculation is performed by excluding all permanent expenses without the ones for repairs on the equipment. They turn out to be inevitable because it's evident that the expected profit doesn't allow to set aside funds for investments. Tthat's why the work is usually done with old and depreciated equipment – table 6.

Table 6: Expenses for cutting, sorting and the transportation of 1 cubic meter 400 m out by universal tractor with expense for personnel equal to the minimal wage value of 270 BGN for 2011 plus insurances and 15 % increase for labor service period and permanent expenses including just equipment repairs

Parameters	Assortments	
	Big wood (broad-leaved soft) – timber above 30 cm for sawing	Medium wood (broad-leaved soft) – thin timber
Expenses for fuel and oil for the fuel motor saw + expenses for repairs for cutting 1 cubic meter	1,25	2,11
Expenses for fuel and oil for universal tractor + expenses for repairs for 400 m transportation of 1 cubic meter with 2 workers	4,17	4,17
Total expenses for cutting and sorting of 1 cubic meter (fuel and oil and repairs + labor expenses)	2,84	4,75
Total expenses for 400 m transportation of 1 cubic meter with universal tractor and 2 workers (fuel and oil and repairs + labor expenses)	6,01	6,01
Total expenses for cutting, sorting and 400 m transportation of 1 cubic meter with universal tractor and 2 workers	8,85	10,76
Initial auction price (BGN) per cubic meter	10,89	10,53
% of variation from the initial auction price	23,03	-2,13

The variant discussed so far provides for the profit required but it’s rather hypothetical because it doesn’t involve expenses for a manager and licensed forester. Without them the enterprise will not be able to get registration in the Public Register of the Executive Forest Agency and will not be admitted to take part in this type of auctions. The following expenses are not considered, i.e. allowances for depreciation, office maintenance, office equipment, Internet, software, guard of the timber at the temporary warehouse until by a written statement it’s delivered to the assigning entity, etc. It becomes clear that the too low initial auction price hinders the forestry enterprises to set aside funds for new machines and for improving the equipment of the workers to meet the safety requirements. Thus they are forced to complement their incomes by performing illegal lumbering or illegal sells of parts of the timber to the native population. In this way valuable assortments turn into wood for burning, the workers become low wages and the enterprises economically survive very hard.

CONCLUSIONS AND RECOMMENDATIONS

The “Business advisor” information system can be easily adapted to support state forest enterprises in the calculations of realistic initial auction prices. It provides for the input of the actual prices for the fuel and oil, which have very dynamic nature and outputs the profit that is to be obtained by the contractors for cutting the wood at the site offered in the auction by complying with all regulations and practices. The system enables the input of correction coefficients to the time norms in case that there are certain obstacles and difficulties at the cutting site, i.e. slopes, non flatness, vegetation under the trees, inclined trees, deep snow or remoteness from roads and settlements.

The results obtained from the calculations undoubtedly show that the management of the state forest enterprise has taken the right decision to offer the cutting of wood to private contractors by auction procedure since it has realized that it’s not quite probable to guarantee low production ex-

penses on its own. It's considered that private enterprises have lower permanent expenses and more flexible management. Still the objective market realities cannot be discarded. The price of the fuel is growing; the labor force and equipment need reproduction. The very low initially stated auction prices force the private enterprises to limit the amount of expenses for investments and wages, which in turn provides for economic uncertainty in the future and may lead at some moment to their withdrawal from the market.

Managers in the state forest enterprises need objective information in order to make the correct assessment of the minimal needed and realistic production expenses and to make the right decision. The information system that has been tested provided sufficient results about this. Whether it will be upgraded and implemented to perform this task depends to high extent on the interest of the state forest enterprises and their regional divisions.

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