Appendix 8. Some results of numerical simulation and comparison of results

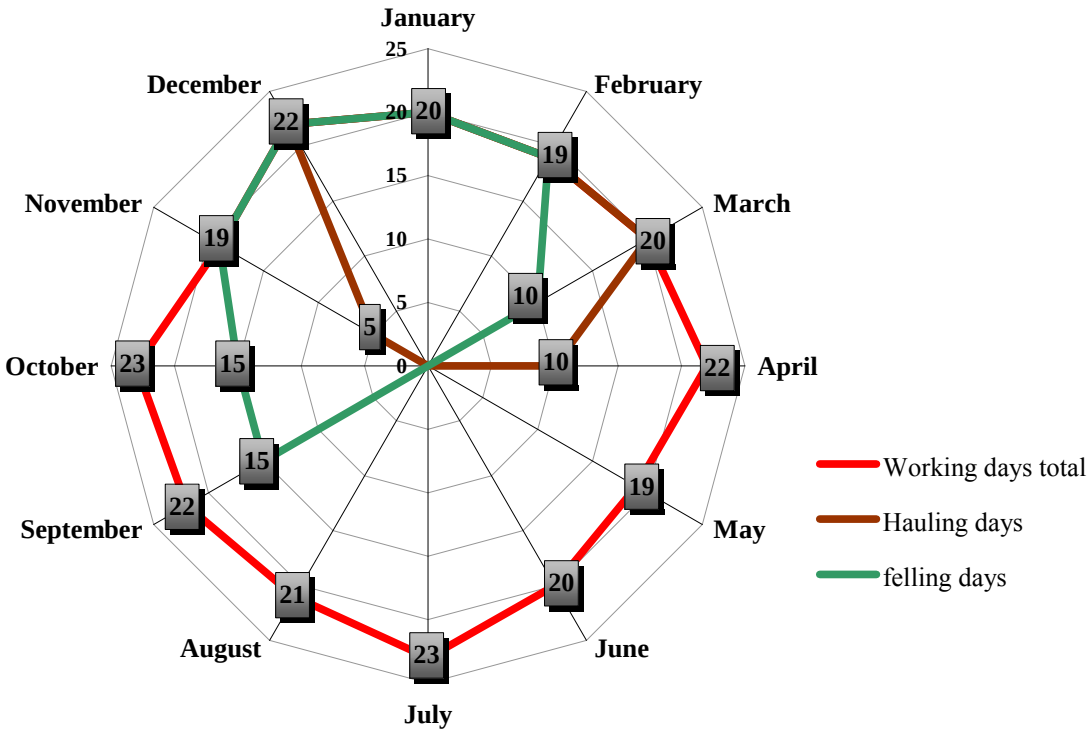
Input data and used limitations

In the majority of cases it is enough to carry out a careful analysis of one working day or one production cycle for prediction of working of an enterprise. Then you multiply the result by number of working days in one year or by number of production cycles and receive all economic parameters of the enterprise.

In this respect woodcutting is standing out against a background of general line. First, it strongly depends on season even at all-the-year-round work of the enterprise. Secondly, productivity of various sections, brigades and engineering can strongly vary on various sequential production phases. Besides, dependence on the season is different for various sites.

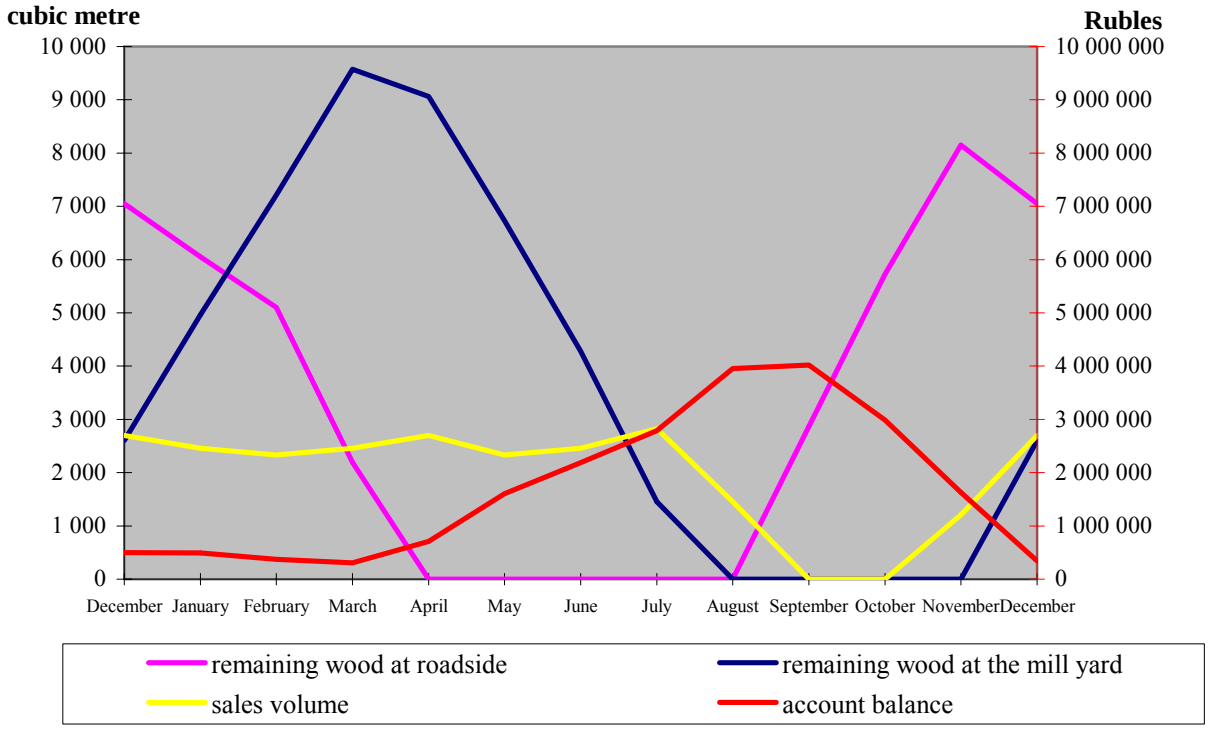
The offered model takes into account structure of the enterprise, dependence of productivity of sites on the period of year/month. The model summarizes results of work of the enterprise in each month. Calculation in the next month rests upon the total result of the previous.

Quantity of working days depending on a month and an industrial section for model of the existing experimental enterprise is given below.



In this case harvesting could be conducted on other days too, but at our enterprise the constraining factor is tree hauling.

At simulation we accept only such models, which keep equality of initial and final conditions on warehouses of production, otherwise imbalance between sites of manufacture will be observed. The diagram of production change on warehouses and money on the settlement account is given below.



The given model was checked up in practice during 2003-2004 harvesting season and has shown the 10% divergence on a level of the cost price of production in comparison with the data of the enterprise.

The program allows simulating plenty of various on structure logging enterprises. It can be simply reconstructed and allows counting plenty of variants in short time.

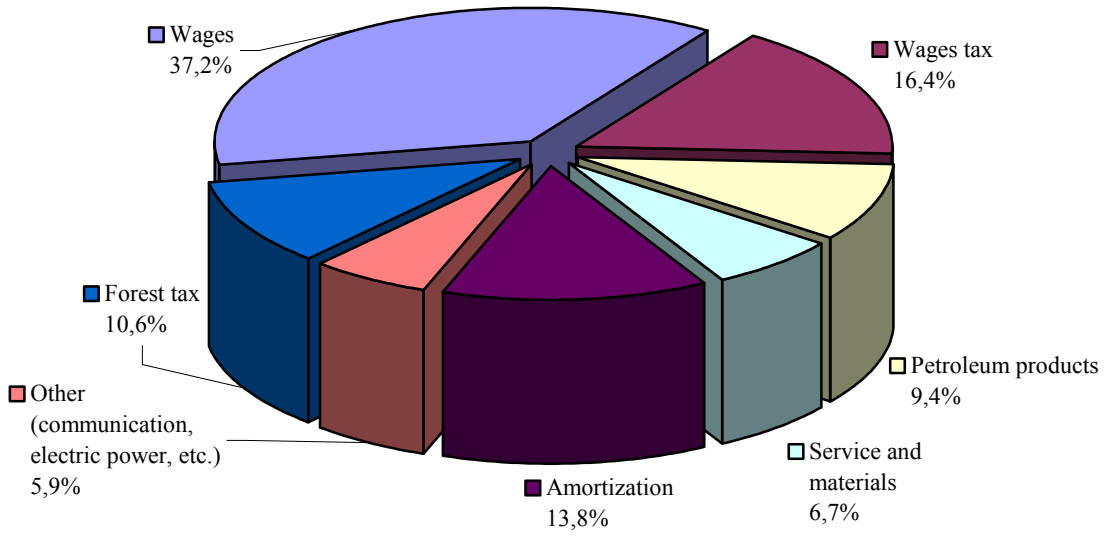
Summing up results, the calculated models are given descriptively, and their structure is portrayed at the end of the present Appendix.

The Model of the Existing Enterprise

The purpose of the modeling is to define a strategy of development of the enterprise. At present we have the following picture.

The initial enterprise consists of two logging brigades (each is based on two tractors one chopping machine), a tree-hauling brigade, a lower timber landing (including bucking and loading brigades), administrative machine, maintenance staff and other.

Costs items	*Roubles per m^3*
Wages	275,80
Wages tax	121,35
Petroleum products	69,86
Service and materials	49,48
Amortization	102,38
Other (communication, electric power, etc.)	44,09
Forest tax	78,57
Total:	741,54
Total without amortization	639,16



In spite of the fact that our enterprise was bought for a song, in the models it is more logical to take into account the sum of money, which you would pay if to buy all equipment new and at the real prices. The equipment at the majority of logging enterprises is extremely worn out, that is why nobody counts expenses for amortization correctly. At models accounting it's logical to lay them with the account of real updating terms of park of engineering. Profitability is accepted as the most important economic parameter ((profit / loss - inputs) - inputs). We count one more parameter - yield (ratio of profit / loss to laid-down capital). It is possible to ignore a yield parameter only in case when the enterprise is bought very cheaply at the depreciated cost. If the enterprise is created anew, the yield parameter is the most important for the potential investors.

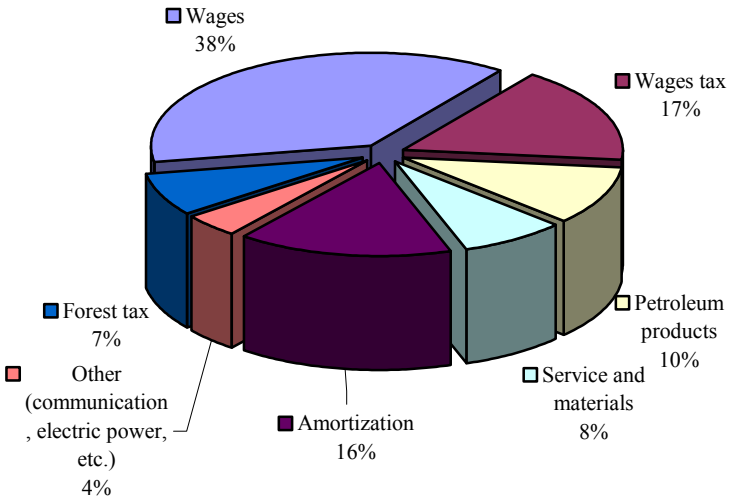
In the present moment for the existing lespromchoz the situation is following:

Parameter	*Value*
Profitability	-15,0 %
Profitability without amortization	-1,0 %
Yield	-7,0 %
Investment per m^3	1 532,0 roubles
Enterprise's value	35 107 000,0 roubles

The Model of Extensive Way of Development

Let's consider a variant of improvement of the situation by a method of increase of volumes of manufacture at the expense of purchase of missing equipment and increase of quantity of brigades. We'll receive the following result:

Item of expenses	*Roubles per m^3*
Wages	228,15
Wages tax	100,39
Petroleum products	61,37
Service and materials	46,50
Amortization	96,17
Other (communication, electric power, etc.)	25,25
Forest tax	45,00
Cost price	602,83
Cost price without amortization	506,66



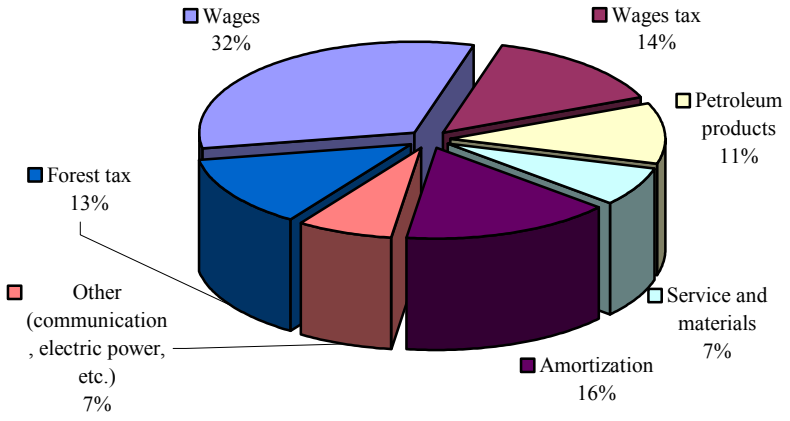
The shares of wood assessments and other expenses reduced in total essentially, but a great deal of money has not improved the situation appreciably:

Parameter	*Existing value*	*Counted value*
Total investment, roubles	35 107 000,00	54 857 000,00
Investment per m^3	1 532,45	1 371,42
Necessary to add, roubles	0,00	19 750 000,00
Optimal volume of production, m^3	22 909,09	40 000,18
Profitability without amortization	-1,00 %	25,00 %
Profitability with amortization	-15,00 %	5,00 %
Yield	-7,00 %	2,00 %

The Model with the Finnish Technology

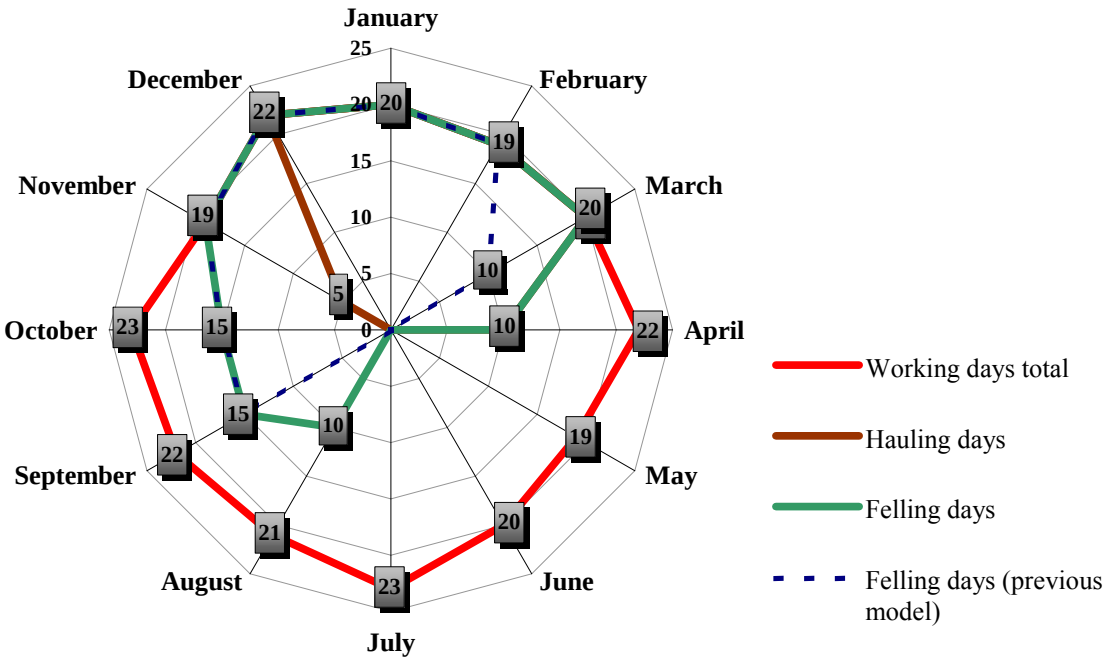
Let's consider another variant. Recently it has become fashionable to introduce mechanization and automation in logging enterprises (for example, to buy harvesters). New engineering will allow to remove expenses for wages of harvesting brigades, to leave administration, railway impasse and, naturally, to pay for wood fund. By calculations results of purchasing one harvester are the following:

Parameter	*Existing value, roubles/m^3*	*Counted value (1 harvester), roubles/m^3*
Wages	275,80	220,71
Wages tax	121,35	97,11
Petroleum products	69,86	74,69
Service and materials	49,48	47,82
Amortization	102,38	107,08
Other (communication, electric power, etc.)	44,09	49,38
Forest tax	78,57	88,00
Cost price	741,54	684,79
Cost price without amortization	639,16	577,71



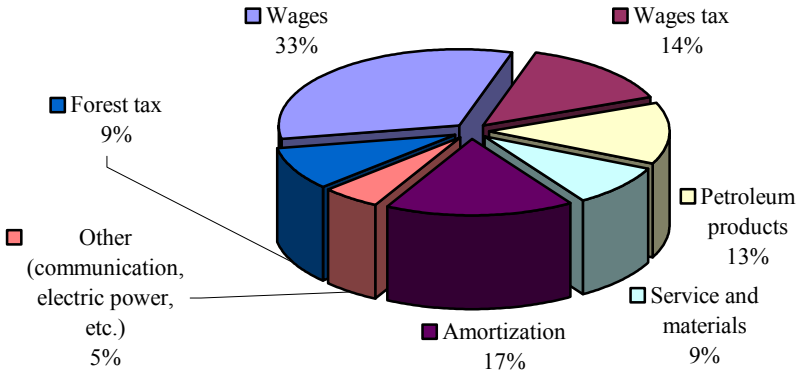
Parameter	*Existing value*	*Counted value (1 harvester)*
Total investment, roubles	35 107 000,00	37 805 000,00
Investment per m^3	1 532,45	1 848,23
Necessary to add, roubles	-	29 805 000,00
Optimal volume of production, m^3	22 909,09	20 454,73
Number of workers	95	67
Output, m^3 per head	241,15	305,29
Profitability without amortization	-1,00%	9,00%
Profitability with amortization	-15,00%	-8,00%
Yield	-7,00%	-3,00%

Such model hasn't improved the situation essentially too. Main reason is seasonality of harvesting. Quantity of logging days has increased, but hauling period as in the previous model is limited by weather.



Let's consider variant of purchasing two harvesters. Calculated results are the following:

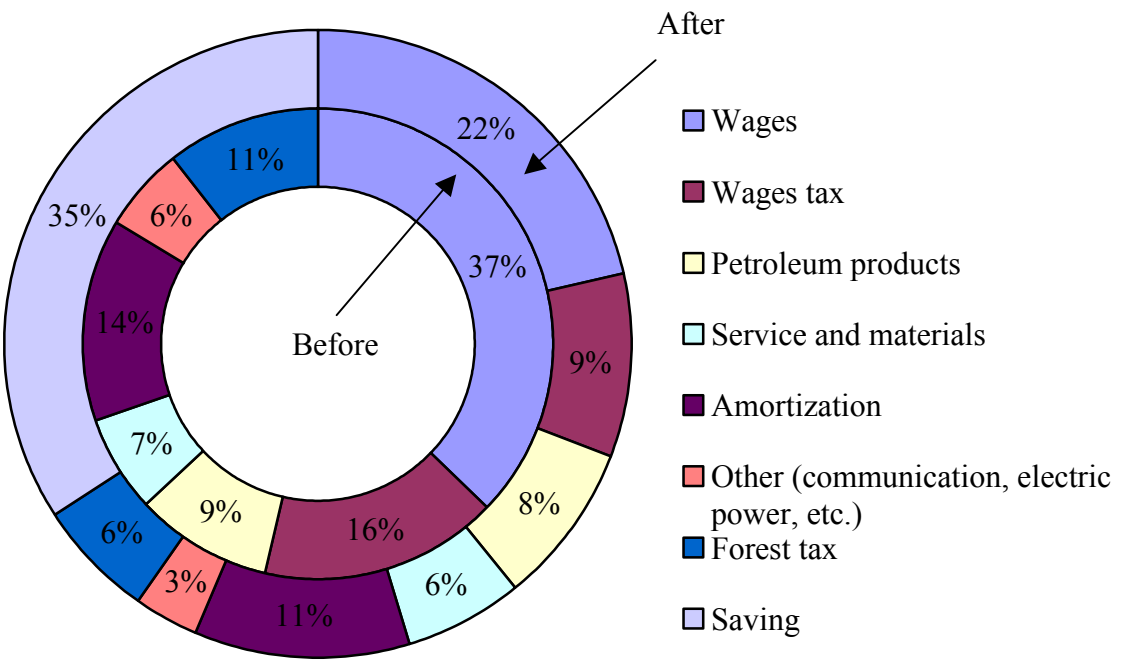
Parameter	*Existing value, roubles/m^3*	*Counted value (2 harvesters), roubles/m^3*
Wages	275,80	158,56
Wages tax	121,35	69,77
Petroleum products	69,86	62,63
Service and materials	49,48	44,00
Amortization	102,38	83,08
Other (communication, electric power, etc.)	44,09	25,25
Forest tax	78,57	45,00
Cost price	741,54	488,28
Cost price without amortization	639,16	405,20



Comparison of both variants with purchasing harvesters:

Parameter	*Existing value*	*Counted value (1 harvester)*	*Counted value (2 harvesters)*
Total investment, roubles	35 107 000,00	37 805 000,00	56 953 000,00
Investment per m^3	1 532,45	1 848,23	1 423,83
Necessary to add, roubles	0,00	29 805 000,00	48 953 000,00
Optimal volume of production, m^3	22 909,09	20 454,73	39 999,91
Number of workers	95,00	67,00	85,00
Output, m^3 per head	241,15	305,29	470,59
Profitability without amortization	-1,00 %	9,00 %	56,00 %
Profitability with amortization	-15,00 %	-8,00 %	30,00 %
Yield	-7,00 %	-3,00 %	10,00 %

Let's compare structures of the cost price:



Reduction of all charges per m3 of products, including amortization, is visible distinctly. However a great deal of initial investments is required.

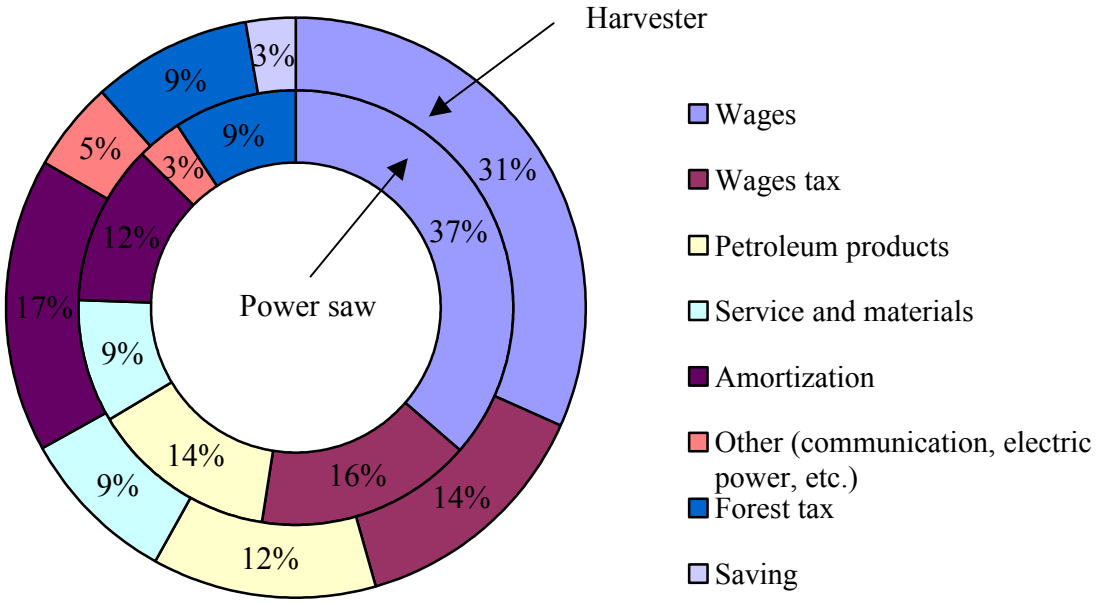
The Model with Intermediate Tree Hauling

Let's consider a variant, which provides transition to all-the-year-round preparation with use of intermediate removal of logs without purchasing harvesters. Thus it is required to train only four men. Basically training to work on an import timber-carrying vessel is much easier, than training of a harvester's operator. For the enterprise it's possible to come out to a new performance level for the smaller period of time. Let's compare parameters of the given model with the previous one:

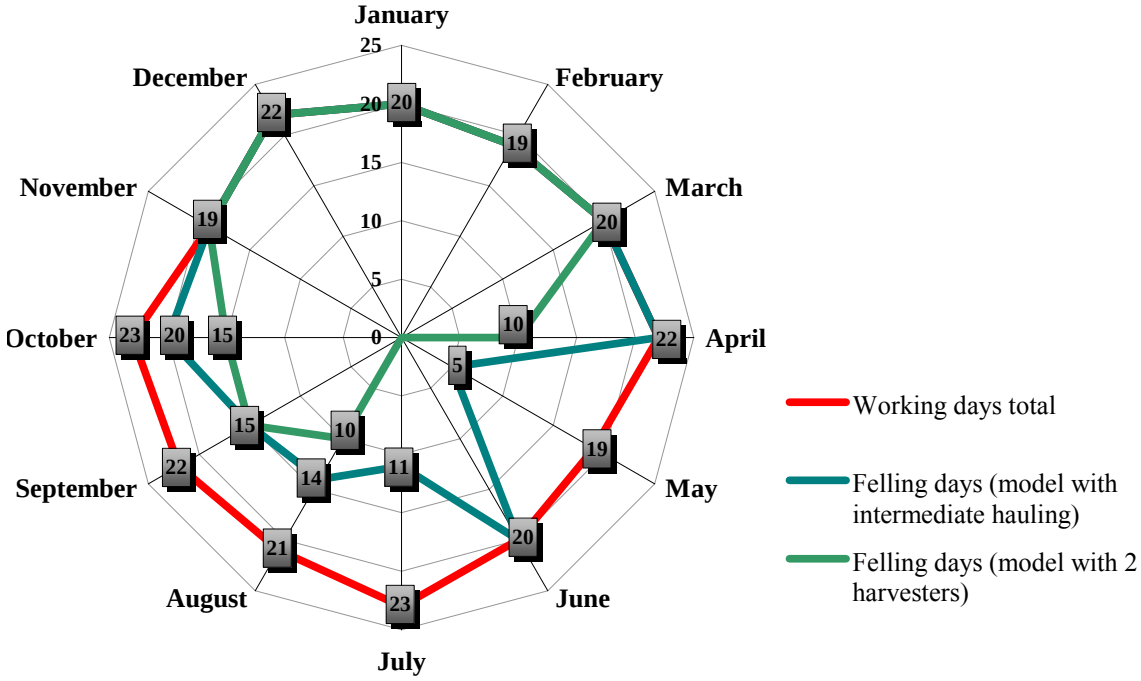
Parameter	*Existing value*	*Counted value (2 harvesters)*	*Counted value (intermediate tree hauling)*
Total investment, roubles	35 107 000,00	56 953 000,00	56 906 000,00
Investment per m^3	1 532,45	1 423,83	960,00
Necessary to add, roubles	0,00	48 953 000,00	21 799 000,00
Optimal volume of production, m^3	22 909,09	39 999,91	59 277,27
Number of workers	95,00	85,00	124,00
Output, m^3 per head	241,15	470,59	478,04
Average salary, roubles per head	5 542,48	6 218,01	7 280,18
Profitability without amortization	-1,00%	56,00%	43,00%
Profitability with amortization	-15,00%	30,00%	26,00%
Yield	-7,00%	10,00%	14,00%

The result has exceeded all expectations. Let's compare the final cost prices of two models, noting that the cost price of a cubic meter of ready production at the Finnish technology (with two harvesters) is lower, and the yield of the project with intermediate tree hauling is

higher. It looks like a paradox, though it is simply explained: volume of investments in the project with intermediate tree hauling is less, and the result is almost the same.



The reason of such success is certainly in competent use of working hours. Comparison of time structures for these models of development:



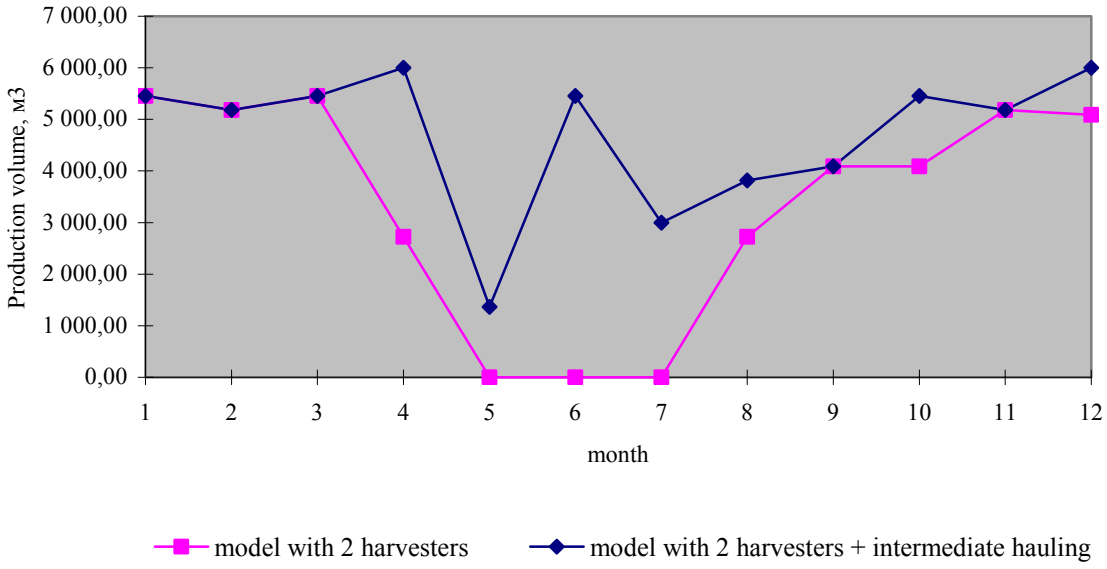
The Model with the Finnish Technology and Intermediate Tree Hauling

We'll also see the effect if to unite two last considered technologies. Let's compare two turned out models.

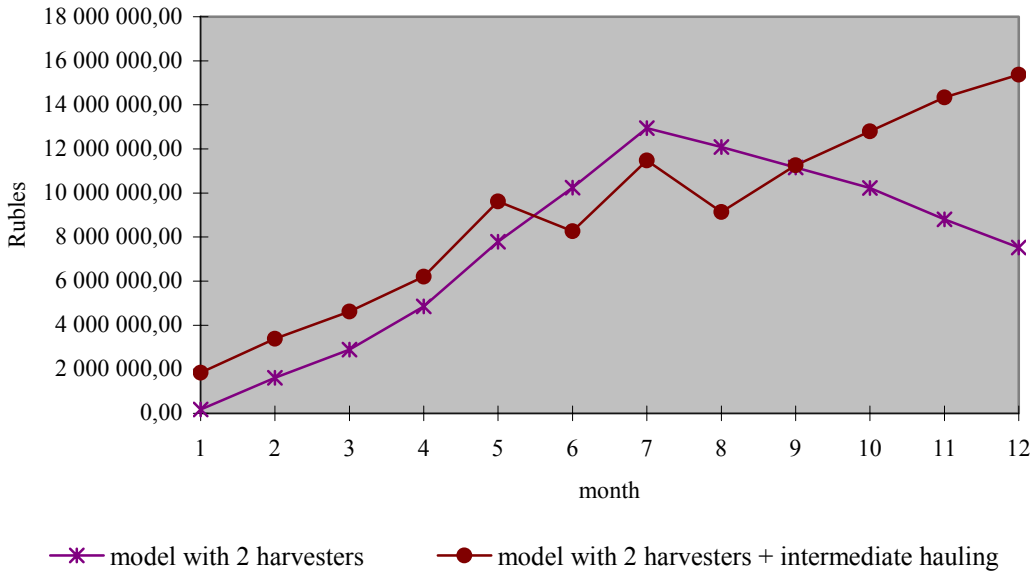
Parameter	*Counted value (2 harvesters)*	*Counted value (2 harvesters + intermediate tree hauling)*
Total investment, roubles	56 953 000,00	71 453 000,00

Investment per m^3	1 423,83	1 265,67
Optimal volume of production, m^3	39 999,91	56 454,55
Number of workers	85,00	85,00
Output, m^3 per head	470,59	664,17
Average salary, roubles per head	6 218,01	6 893,16
Profitability without amortization	56,00%	76,00%
Profitability with amortization	30,00%	47,00%
Yield	10,00%	16,00%

The enterprise will work more stable in this case. It can be seen on the following diagrams:



Movement of the means on the settlement account:



Some seasonality at use of intermediate removal still remains. It is connected with holidays and necessity to balance commitment of the wood sites. However it will be less expressed with growth of production volume of the enterprise.

All models base on the same initial data, which are received from the empirical results or from literature. All data on productivity of engineering, fuel consumption, costs of labour, etc.

are given in the appropriate Appendixes of the Report. Within the limits of a model it is possible to carry out similar account for any logging enterprise, in view of its parameters, parameters of external environment and territorial infrastructure.

In conclusion it is necessary to say, that if the tree hauling machine projected by us is not lost at the first opportunity, success is not far off.