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**INCREASE FOREST PRODUCTIVITY
OF NEGORELSKY FOREST ENTERPRISE**

In Negorelsky forest enterprise pine stands occupy 60.2%, birch – 15.6%, alder – 11.5%, spruce – 10.4% of the forested area. The average class of bonitet – I,1, average density – 0.74. Average rating stands equal to 41, and soils – 75 points. Evaluation stands at less than the maximum 59 points from which to site conditions accounted for 25, due to reduced completeness – 19 and species composition – 15. May increase stand productivity improvement of the species composition and density by 34 points.

Effective measures to improve the productivity of forests is the reconstruction by clearcut stands growing at any age and the subsequent development of forest plantations of pine. Reconstruction undergo low-productivity pine stands on an area 797.7 ha, spruce – 1,036.1 ha, oak – 113.1 ha and stands of low value species: birch – 2,316.4 ha, aspen – 167.0 ha, hornbeam – 16.3 ha, willow – 5.5 ha and black alder – 930.2 ha. The total area of reconstruction is 5,382.3 ha, or 33.9% of the forested area. On the area of reconstruction of forest productivity will increase by 3.6 times.

Key words: assessment of forest stands, stand productivity, reconstruction, site conditions.

Introduction. The forest structure and productivity are caused by soil conditions at the regional scale. The leading role there belongs to the water-air regime of soils. In addition, forest productivity depends on the overall impact of business practices. With such a vast variety of important factors in the decision of the main task of foresters has valuation of forest stands and soils, which are set by the main causes of reduced productivity and subsequent development of measures to improve forest productivity.

Main part. Characteristics of the forest fund of the Negorelsky-experimental forestry is Forest Management according to the 2004. Forestry total area is 17,190 ha, 15,876.7 ha (or 92.4%) are forested. There are 11 tree species. Pine stands occupy 60.2% of the forest area, birch – 15.6%, alder – 11.5%, spruce – 10.4%, oaks – 1.0%, aspen – 1.0%. Each of the other species (larch, ash, hornbeam, poplar, willow) represents less than 1.0%. Some tree species (pine, oak, ash) hold 71.8% and others (deciduous) – 28.2%. The majority of the area broadleaved species (15.2%) is concentrated in Litviansky forestry. In Negorelsky forestry on this group of trees has to 5.6%, and in the Central – 7.4% of the forest area forestry. The more favorable species composition of forest stands has Negorelsky forestry in which the first species occupy 85.6% of the forest area of forest. The Central share of forestry species in this group is 70.7%, and in Litviansky is only 57.2%.

Terms of habitat forests in Negorelsky forestry are very diverse. There are plantations belonging to 15 series of forest types. The share of first-class forest, growing in conditions of insufficient humidifying and related cranberry, heather, moss, and Kislichnaya of oak forest type, is 75%. The second-class forests with abundant moisture occupy 25%. Polytric, ledum, sedge, sedge-sphagnum,

prirucheyno-grass, nettles, fern and tavolgovogo forest types are formed under conditions of excessive moisture blueberry plantations,

The stands of all nine site class can be found in Negorelsky forestry due to its variety of habitat conditions.

The average value stands class of Negorelsky forestry is I,1. In general, the forestry enterprise dominated stands are of I quality class. They accounted for 64.8% of the forested area. The smaller the area is occupied by the adjacent site class: Ia – 15.7% and II – 15,8%. In class III accounting for 2.5%. The rest of the site class is slightly represented.

The average value class pine stands is equal to I,1, spruce and listvyagov – I,0, oak – I,8, ash – Ia,7, hornbeam – II,0, birch – I,0, aspen – Ia,3, poplar – Ib,7, alder – I,3 and willow – I,9.

Medium body stands of Negorelsky forestry is 0.74. In Litviansky and Negorelsky forestries it is 0.72, and in the Central – 0.78. The most common stands completeness 0.7 (41.2% of the forested). Second place in the area is necessary for completeness 0.8 (26.6%). Stands completeness occupy 0.9 to 12.4%, the fullness of 0.6 – 12.0%, the fullness of 0.5 – 3.8%, and the fullness of 1.0 – 2.6% of the forested. The area under the low-density stands (0.3–0.4) is only 1.4%. Medium body pine stands is 0.75, spruce – 0.72, larch – 0.73, oak – 0.70, ash – 0.72, hornbeam – 0.76, birch – 0.71, aspen – 0.76, poplar – 0.91, black alder – 0.72 and willow – 0.60. Valuation of forest stands and soil is carried out on the basis of materials of forest management on each highlighted. Appraisal methods are described in [1] and other thematic papers. The main results of the scoring stands and soil (Table), and the fullness of the tree layer, are used to identify the causes of forest stands of low productivity.

Scoring stands and soils results in Negorelsky forest enterprise

The name of indicators	Forestry name			Forestry
	Litviansky	Negorelsky	Central	
Forest stands evaluation, point	34	45	43	41
Soil evaluation, point	74	75	77	75
Average bonitate	I,1	I,1	Ia,9	I,1
Stands completeness	0.72	0.72	0.78	0.74
Hight point stands (coniferous, oak, ash), % from forestry area	57.2	85.6	70.7	71.7

The following analysis order is applied. In the Belarusian forest stands the highest score is 100 points. This value is the normal pine tree stand in the best conditions of habitat (Ib value class). The same tree stand is a reference in the evaluation of soil, and therefore in terms of site class Ib soil is estimated as 100 points. Average rating stands Negorelsky forestry is 41 points, which is 59 points less than the maximum (100 – 41). Let's consider the reasons for such a low valuation.

For soil scoring normal reference stands, reaching maximum productivity under specific conditions are used. Their rank on a scale depends on the site conditions. It is the soil point estimate. Since the average site class stands forestry is I,1, not Ib site class, average soil is less than 100, and it has 75 points. Consequently, the share of habitat conditions in the scoping stands forestry accounts 25 points (100 – 75). In assessing the soil using the normal reference stands, i.e. having the fullness of 1.0, and the score is 75 points. But the average fullness of native stands of forestry is 0.74. With this fullness of average standard stands is 56 points (75 · 0,74). Therefore, we have 19 points (75 – 56) in the assessment of forest stands in the fullness share.

A variety of native stands on species composition has a definite impact on their score points. For example, if the reference breed in the area is pine, but, for example, the birch is grown, the numerical score of the stand will be considerably less. On average, the effect of species composition in the scoping stands forestry is 15 points (56 – 41).

Thus, the numerical score of forestry stands is 59 points less than the maximum, of which the share of habitat conditions is 25, because of the low completeness is 19 and the share of species composition is 15 points. To improve the forest site conditions in the first class, when growing shortage of moisture irrigation is required, and the second class in forests growing in excess moisture requires draining.

Today these activities are technically possible but impractical from an economic point of view, since the cost of their implementation exceeds the cost of additional products obtained. Consequently, the productivity-forestry stands can be in-

creased at 34 points, of which the completeness of the accounts and 19 species composition is 15 points. The forestry productivity is expected to be increased by 1.8 times (82%), and the wood cost annually will be increased by 350,200 rub./ha (34 points · 10,300 rub.), and in forestry enterprise by 5,560.1 mln. rub. (350,200 rub./ha · 15,877 ha). It explains the usefulness of these measures, especially of the reconstruction.

Using the same order of analysis, we see that the share of Litviansky forestry site conditions accounts 26, of Negorelsky forestry – 25 and Central one – 23 points. These values are consistent with the yield class. Middle bonitet stands in Litviansky and Negorelsky forest areas is I,1, and in the Central – Ia,9, i.e. above 0.2 of grade.

These values are consistent with the assessment of rock forest structure. So, in Litviansky forestry high-point stands (pine, oak, ash) take 57.2% of the forest area, in Central – 70.7%, and in Negorelsky – 85.6%. The larger area is occupied with low-point broadleaved species, the lower is the numerical score stands.

With an average increase in forests productivity at 34 points, separate stands vary considerably. So, the Birch Kislichnaya with Ia value class completeness of 0.7 is estimated at 14 points in the soils evaluation of 89 points. The assessment of this stand is below the maximum of 86 points, of which the share of habitat conditions for 11, due to the low completeness – 27 and the share of species composition – 48 points.

In such circumstances, the 50-year-old tree stand 8P2B with fullness of 0.7 is estimated at 52 points, which is 48 points less than the maximum. Of these habitat conditions for 11, due to the low completeness – 27 and species composition – 10 points. Increasing productivity in the birch forest area can be achieved by cutting it at any age, with the subsequent creation of a pine forest crops. Replacing the mixed pine forest on more productive suitable in 50 years, i.e. after the final felling. These examples show that the problem of increasing forest productivity is the daily care of foresters in forest growing over a long period.

The immediate and effective measures to improve the productivity of forests is the reconstruc-

tion. Reconstruction should be realized with low-point (<50 points) stands of pine, spruce and oak trees of any age, as well as stands of broadleaved species without considering its age and completeness. Keep in mind, the sooner the reconstruction is implemented, the less the loss of forests as a reserve for, and on the cost of wood taksovoy.

Total reconstruction area is 5,382.3 ha, or 33.9% of the forest area forestry. In Litvyansky forestry the reconstruction area covers 44.7% of the forested stands. The Central share of such forestry stands is 34.1% and in Negorelsky forestry is 24.0%.

Reconstruction is planned with stands growing on sod-podzolic soils, where it is possible to create cultures of a pine.

As a result, the productivity of forest stands in the Litvyansky forest area will be increased by 4, in Negorelsky by 3.3, in Central by 3.3 and in total forestry enterprise by 3.6 times. The greatest increase in productivity (14.2 times) is observed on the areas of willow, and the lowest (2.4 times) in the pine forests.

In forestry the most fertile soils (value class Ib) occupy 53 ha, including pine – 14.1 ha, birch – 14.1 ha, aspen and poplar – 24.8 ha. Average rating data stands has only 27 points. Growing stands are aged over 40 years. It is difficult to accept that forest plantations were not created under such conditions. The current technology for creating forest plantations is far from perfect. Especially the fertile soils of plantings have a complex structure in connection with the formation of the second tier and undergrowth. The most notable peculiarity of felling can be considered the large number of stumps. However, even PKL-70A plow is very hard for being used for the soil preparation. In addition, the presence of stumps excludes work tree-planting machines. Forestry needs some tool able to lose the soil to a depth of 15 cm with a bandwidth of at least about 1 m with the simultaneous destruction of the stumps. This tool allows using tree-planting and sowing machines.

Mechanized planting allows excluding the roots bend, when the tap root is not restored. It reduces wind resistance stands in the future. With the bend the root system of seedlings is placed in the surface layer of soil. They are dried. Lack of moisture causes the desiccation of seedlings. For manual planting under Kolesov sword seedling root system must be tightly clamped in the soil to avoid voids, otherwise it may dry out the lower part of the roots and the plant will die. The important point is to supplement reforestation plantations. Therefore, the Manual [2] is provided with some tips to carry out this work in the spring in the second and third year after the establishment of crops. Delays and poor addition causes low completeness of the stand. Snow and intense thinning

contribute the formation of reduced stands and forest completeness.

The soil loosening with simultaneous destruction of weeds in crop rows and between rows; the destruction of unwanted vegetation around cultivated plants; mowing or packing of unwanted vegetation between rows are the basic principles of the forest cultures care [2].

Researches have shown [3] that in order to reduce the evaporation of moisture from the soil loosened layer does not matter much, as stocks of available moisture in the forest area in crops with care and no care is different. For pine and fir trees the need of mechanical hoeing care has not been proved. The 1.4 times decrease of pine cultures growth has been noted in the process of soil loosening by the CLB-1.7.

The paper [4] shows that the mechanized care of crops cultivator CLB-1.7 cuts off the roots of pine trees, since the latter are distributed mainly in the direction of mezhhaborznyh spaces. With abundant sprawling grassy CLB-1.7 vegetation cultivator does not destroy it, but only tramples grass cover lifting the number of turf, but cutting off the roots of established plants. This means that the use of the cultivator CLB-1.7 for the care of forest plantations is meaningless and at the same time quite a costly affair.

The development of herbaceous vegetation depends on the site conditions. On sandy soils, furrows, stripes and platforms in the early years are not overgrown with grassy vegetation, and therefore it makes no sense to plan treatments [5]. Sandy soils, depending on the development of herbaceous vegetation, may need to be cared for once every second and third year by mechanical cutting. On the loamy soils of the treatments can be carried out more frequently. At the same time costs of establishing forest plantations can be increased by 2–3 times [6].

The need for such departures is highly questionable, since the abundant herbaceous vegetation is a kind of adjusting, which prevents the proliferation of the crown to the side and thereby contributes to growth in height. For example, we noted that the 3-year-old oaks with free standing relation plant height to the diameter of the crown is 1.3, and with abundant herbage – 2.5. In the latter case the annual increment in the height of individual oaks reached 0.65 m. Silvicultural treatment (clarification) should be carried out even before the transfer of forest cultures in a wooded area. Such care allows removing the single copies of softwood trees. It is sufficient to hold two treatments, i.e. the third or fourth year after the establishment of plantations and the seventh year before the transfer of forest cultures in a wooded area. Broadleaved species cultures silencing can be observed in the future. Therefore, a timely clarification and

tassel should regulate the species composition of forests. Mistakes made in the process of forest growing can lead to a reduction of production and even to the formation of low productive stands of broadleaved species.

Conclusion. Stands forestry have average value class I,1 and the average completeness of 0.74. Average stands rating equals to 41, and of the soil – 75 points. Evaluation stands is 59 points less than the maximum one. It includes 25 points for the habitat conditions, 19 because of low completeness and 15 due to species composition. The pro-

ductivity improvement of the species composition of forest stands and completeness by 34 points may be increased. An effective measure to increase the productivity of forests reconstruction is clear felling stands growing at any age, with the subsequent creation of forest cultures of a pine. Low productive stands of pine, spruce, oak and stands of low value species, regardless of age and completeness should be reconstructed. The total area of reconstruction is 5,382.3 ha, or 33.9% of the forested area. The forest productivity will be increased by 3.6 times in the area of reconstruction.

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