UDC 630*5: 633.877
PRODUCTIVITY OF PINE PLANTATIONS OF PRYDNIPROVSKYI LEFT-BANK STEPPE

V.M. Lovynska, Candidate of Biological Sciences
Dnipropetrovsk State Agrarian-economic University

Comparative analysis of productivity of plantations of Pinus sylvestris L. of different age groups of Kirovske forestry of Dnipropetrovsk state forestry locating in the area of left-bank steppe was carried out. The distribution of forests of the researched forestry was made under the types of forest growth conditions. The compliance of created forest plantations of Pinus sylvestris with forest and forest inventory indices was analyzed. The actual and potential productivity of pine plantations was found and their potential depending on the type of forest was mentioned.

Key words: pine stands, type of forest site terms, forest type, trophotop, hygrotop

In light of the requirements regarding strengthening of environmental functions of forests the coniferous plantations of left-bank steppe of Ukraine are of significant interest having essential water securing and ground improving value. In order to implement the principles of sustainable development in forestry of this region it is necessary to solve the complex issues regarding growth of productivity and improving of qualitative content of forest plantations [1, 5, 6].

According to the comprehensive zoning of forests of Ukraine, the territory of Dnipropetrovsk state forestry that belongs to the left-bank steppe is characterized by predominance of pine, acacia and oak forests and the need for widespread introduction of protective, water conservation and recreation system of forestry [1].

The features of creation of forest plantations, growth and productivity of pine plantations of different regions of Ukraine are widely covered in scientific literature [2-5, 7, 8]. However, the issue of creation of high-productive and stable artificial pine plantations in conditions of Steppe with the previous analysis within their individual state enterprises remains vital.

The aim of research is to determine the actual and potential productivity of pine plantations of Kirovske forestry on the basis of forest typological analysis.

Materials and methods of research. Analysis of forestry and forest inventory characteristics was made under commonly accepted methods according to the data of basic forest management [9]. During the typological analysis of productivity of plantations of *Pinus sylvestris* the forest inventory sectors were grouped in terms of forest types and the set of indices was determined: the average actual reserve and actual average growth of age groups per 1 ha, the average actual reserve and average actual growth of plantations of forest types. The age groups: 2 – the young-

growth stands of I class, 3 – the young-growth stands of II class, 4 – middle-aged plantations. The etalon plantation was selected for each age group with the highest possible productivity per unit area of plantations, the best age of forest stand and high class of bonitet.

Research results. The quarterly analysis under the basis of forest management of Kirovske forestry [9] locating in the area of left-bank steppe found the wide typological range of pine plantations in the researched area. 11 types of forests were identified belonging to the six types of growth terms – dry bir, dry and fresh subir, dry, fresh and moist suhrud (fig. 1).

There are seven dominated types of forest growth terms (FGT) – A_1P (35,6 %), B_1OP (24,3 %), C_1H (3,9 %), A_2P (10,3 %), B_2H (9,3 %), C_2H (10,5 %), C_2FP (4,4 %), that's exactly why they were chosen to determine the productivity of pine plantations and establish the use of forest potential (table).
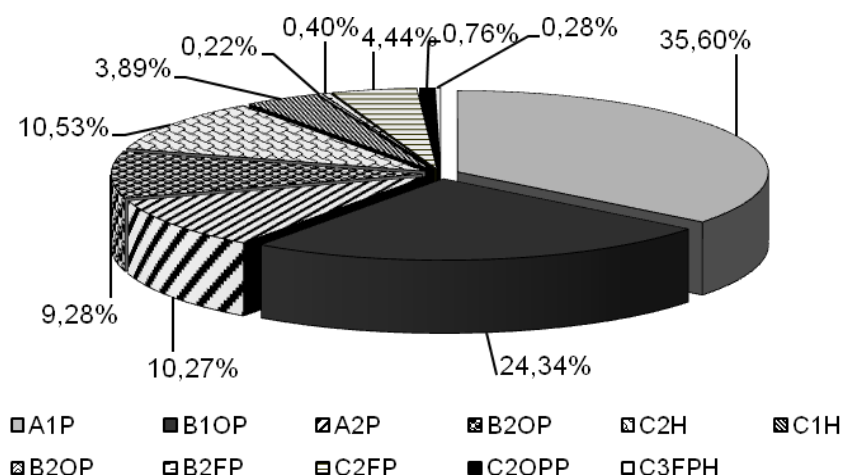

Fig. 1. Relative division of areas of pine forest stands of Kirovske forestry under the types of forest:

A_1C – dry pine bir; B_1OP – dry oak-pine subir; A_2P – fresh pine bir; B_2H – fresh subir halogen version; C_2H – fresh suhrud halogen version; C_1H – dry suhrud halogen version; B_2OP – fresh oak-pine subir; B_2FP – fresh flood poplar subir; C_2FP – fresh flood poplar suhrud; C_2OPP – fresh oak and pine poplar suhrud; $C_3T3\Gamma$ – moist flood poplar suhrud halogen version

Typological potentials of productivity of *Pinus sylvestris* L.

| Age group	Total area of the group, ha	Actual stock on the group area, m³	Average actual stock per 1 ha, m³	Average actual growth m³/ha	Existing typological etalon content	den-sity	stock per 1 ha m³/ha	growth per 1 ha, m³/ha	Potential stock, m³	Use of typology-cal potential, %
					A₁P – dry pine bir					
3	219,9	48280	219,6	5,8	10P+A	0,91	271	7,1	59593	**81,0**
4	105,9	23210	219,2	6,1	10P	0,83	438	8,8	46384	**50,0**
Total	**325,8**	**71490**							**105977**	
					B₁OP – dry oak-pine subir					
2	36,0	1500	41,7	3,1	10P	0,80	85	6,1	3060	**49,0**
3	13,8	3270	237,0	6,3	10P+A	0,86	332	8,7	4581,6	**71,4**
4	173,1	43890	253,5	4,5	10P+O	0,80	438	6,8	75817,8	**57,9**
Total	**222,9**	**48660**							**83459,4**	
					C₁H – dry suhrud halogen version					
2	8,1	240	29,6	2,3	10P	0,40	30	2,3	243	**98,7**
3	5,6	1600	285,7	7,8	10P	0,83	307	8,5	1719,2	**93,1**
4	21,9	5310	242,5	5,7	10P	0,91	298	7,3	6526,2	**81,4**
Total	**35,6**	**7150**							**8488,4**	
					A₂P – fresh pine bir					
2	18,0	520	28,9	2,0	10P	0,40	30	2,1	540	**96,3**
3	76	14990	197,2	5,6	10P+A	0,87	211	5,5	16036	**93,5**
Total	**94**	**15510**							**16576**	
					B₂H – fresh subir halogen version					
2	9,3	100	10,7	0,75	10P	0,50	20	1,4	186,0	**53,7**
3	57,3	11059	193	5,1	10P	0,82	272	7,0	15512	**71,3**
4	18,4	4890	265,7	5,5	10P+A	0,90	429	9,3	7893,6	**61,9**
Total	**85**	**16049**							**21591,6**	
					C₂H – fresh suhrud halogen version					
2	15,8	690	43,7	3,6	10P	0,90	60	4,3	948	**72,8**
3	16,2	2770	171	4,75	10P	0,83	298	8,1	4827,6	**57,4**
4	64,4	15280	237,3	5,4	10P	0,85	316	6,8	20350,4	**75,1**
Total	**96,4**	**18740**							**26126**	
					C₂FP – fresh flood poplar suhrud					
2	27,5	670	24,4	1,4	10P+PC	0,50	40	2,2	1100	**61,0**
3	13,2	3070	232,6	6,5	10P	0,82	270	3,5	3564	**86,1**
Total	**40,7**	**3740**							**4664**	

As we can see from the above table, the average actual growths of the existing plantations in the young-growth stands of I class are close to potential meanings in such types of forest growth terms as C_1H (2,3 m³/ha) and A_2P (2,0 m³/ha). The average actual stock per 1 ha in this age group are still very low and make from 10,7 m³/ha (B_2H) to 43,7 m³/ha (C_2H). However, for some FGT the typological potential in this age group is rather high and makes 98,7 % (C_1H) and 96,3 % (A_2P) (fig. 2).
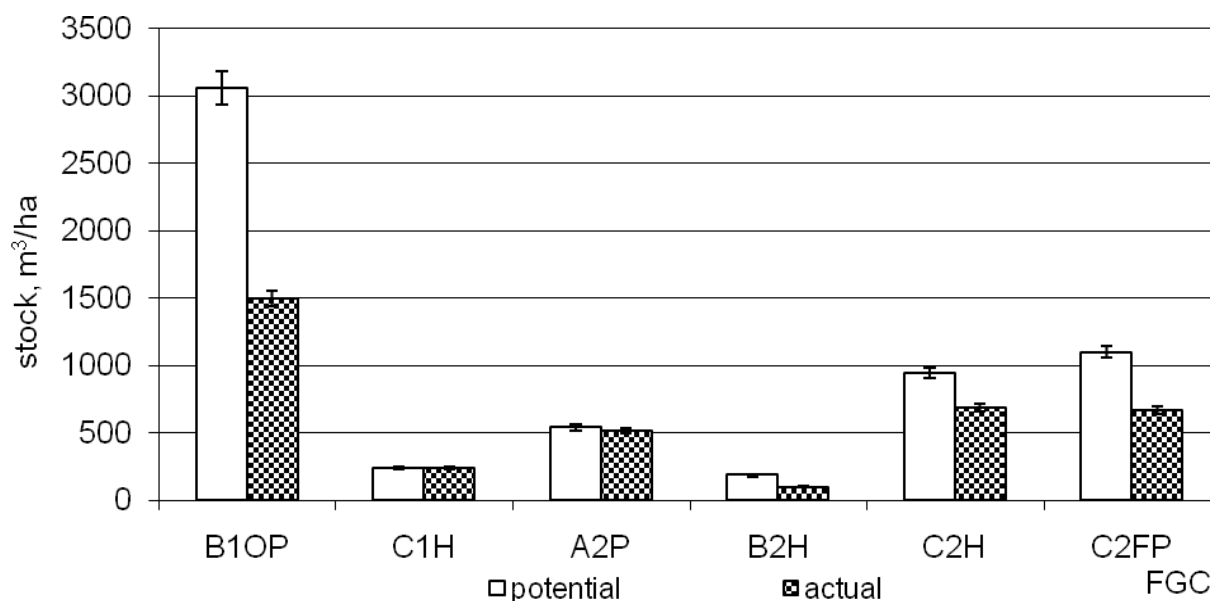
**Fig. 2. Actual and potential stocks of *Pinus sylvestris* L.
in young-growth stands of the I class depending on FGT**

For the same age group the potential growth of the wood in such FGT as В₁ДС and В₂Г exceeds the actual growth twice and the use of typological potential is accordingly implemented just by half – by 49,0 % and 53,7 %. In fresh suhrud halogen and flood poplar types the indices of actual growth and the extent of use of typological potential fall in between the considered types and use the typological potential approximately by third (C₂H – 72,8 %, C₂FP – 61 %).

It was found that in young-growth stands of the II class of the age of researched pine forests the indices of potential stock of forest stands are not considerably different in actual conditions in such types of C₁H and A₂P as in the case of the 2nd age group. So, the extent of use of typological potential in C₁H is 93,1 % and A₂P – 93,5 % (fig. 3).
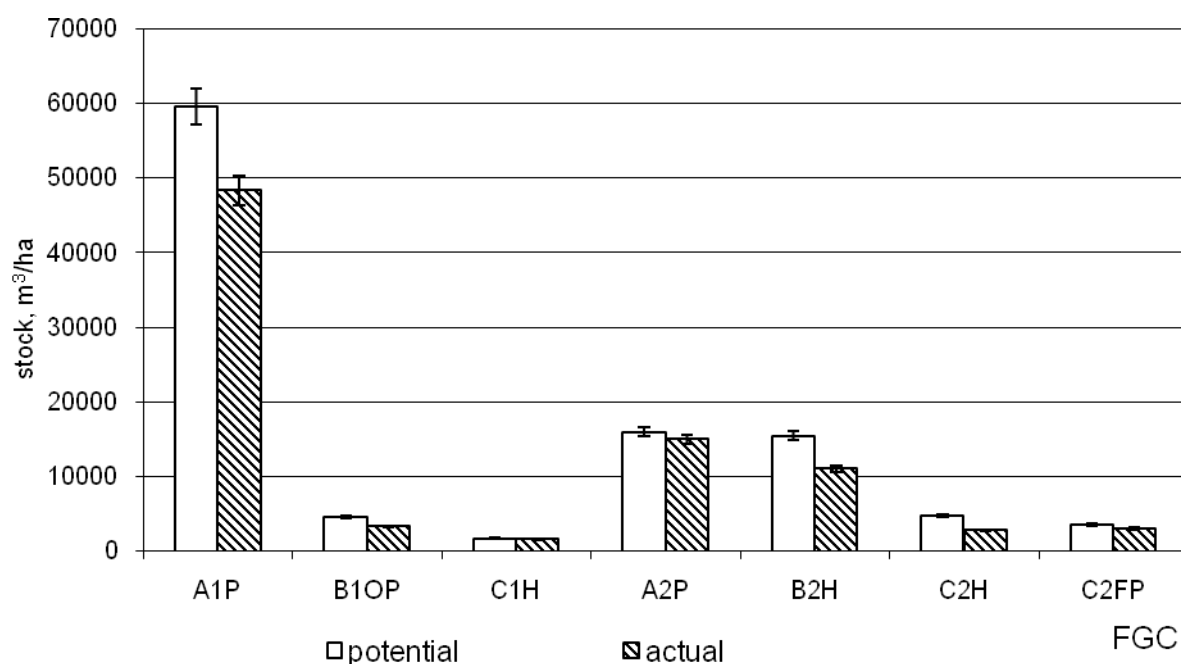
Fig. 3. The actual and potential stocks of *Pinus sylvestris* L. of the young forests of the II class of age depending on FGT

Typological potential is used least of all in such FGT as the fresh suhrud halogen version (C_2H), where the extent of its use equals to 57,4 %. The use of typological potentials in other forest types vary within the amount from 86,1 % to 73,1 %.

The indices of the extent of use of typological potentials in the middle-aged stands (the 4th age group) are rather low (fig. 4). It particularly concerns such types of forest growth conditions as A_1P, B_1OP and B_2H where the extent of use of typological potential is equal to 50,0 %, 57,9 % and 61,9 % respectively. Yet the average growth of the existing reference is also noticeably higher than the actual one (tab.). For the forest stands of the forest type C_2H the index of use of typological potential makes 75,1 % and C_1H is 81,4 %, i.e. the forest stands in dry hygrotop use typological potential better by 6,3 %.
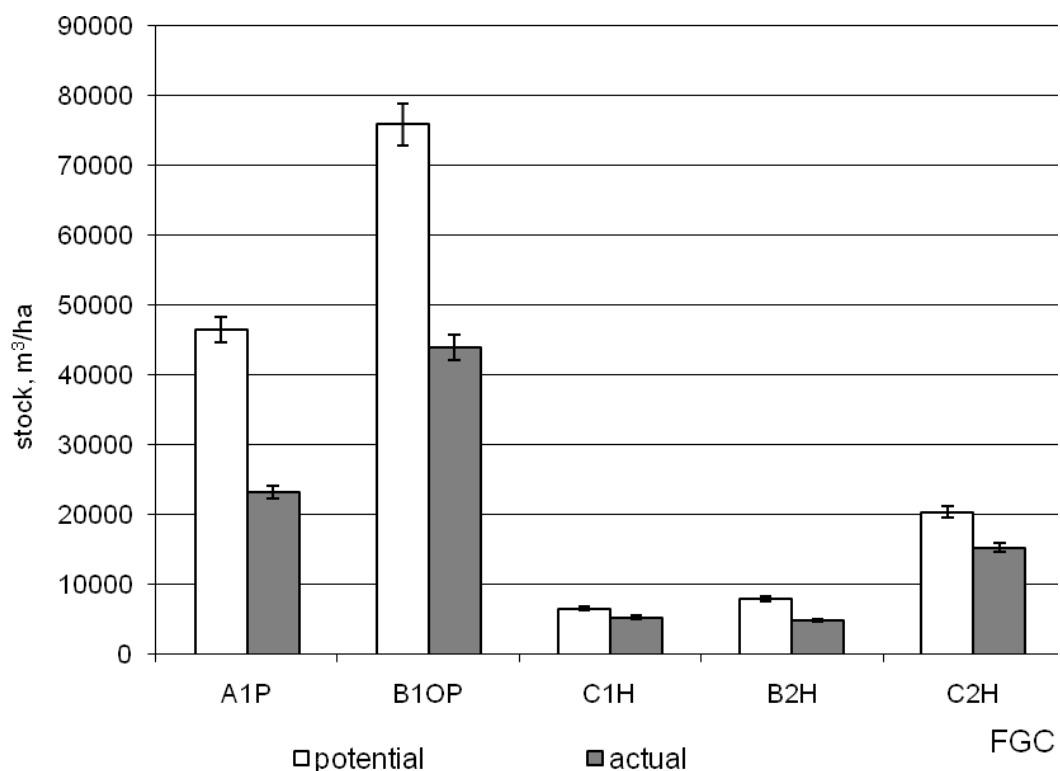
Fig. 4. The actual and potential stocks of *Pinus sylvestris* L. of the middle-aged forest stands depending on FGT

Therefore, the index of use of typological potential in the pine forest stands of the young-growth stands of the I class and the middle-aged groups of plantations is the lowest while the young-growth stands of the II class use the typological potential to the bigger extent.

Figure 5 shows the change of indices of use of typological potentials (UTP) with the age depending on the type of forest growth conditions. As we can see from the above tables, the fullest extent of use of typological potential in each represented age group occurs in such types of forest growth conditions as C_1H and A_2P where this parameter is within 81,4–98,7 %.

Thus, the index of use of typological potential in the forest stands *Pinus sylvestris* of artificial origin of Kirovske forestry in such FGT as B_1OP, B_2H, C_2H is very low subject to recalculation of the reserve of forest stands, that can be lost by forestry due to the small use of typological potential, so the total loss over all area only in dry oak and pine subir of Kirovske forestry can be 34800 m^3.
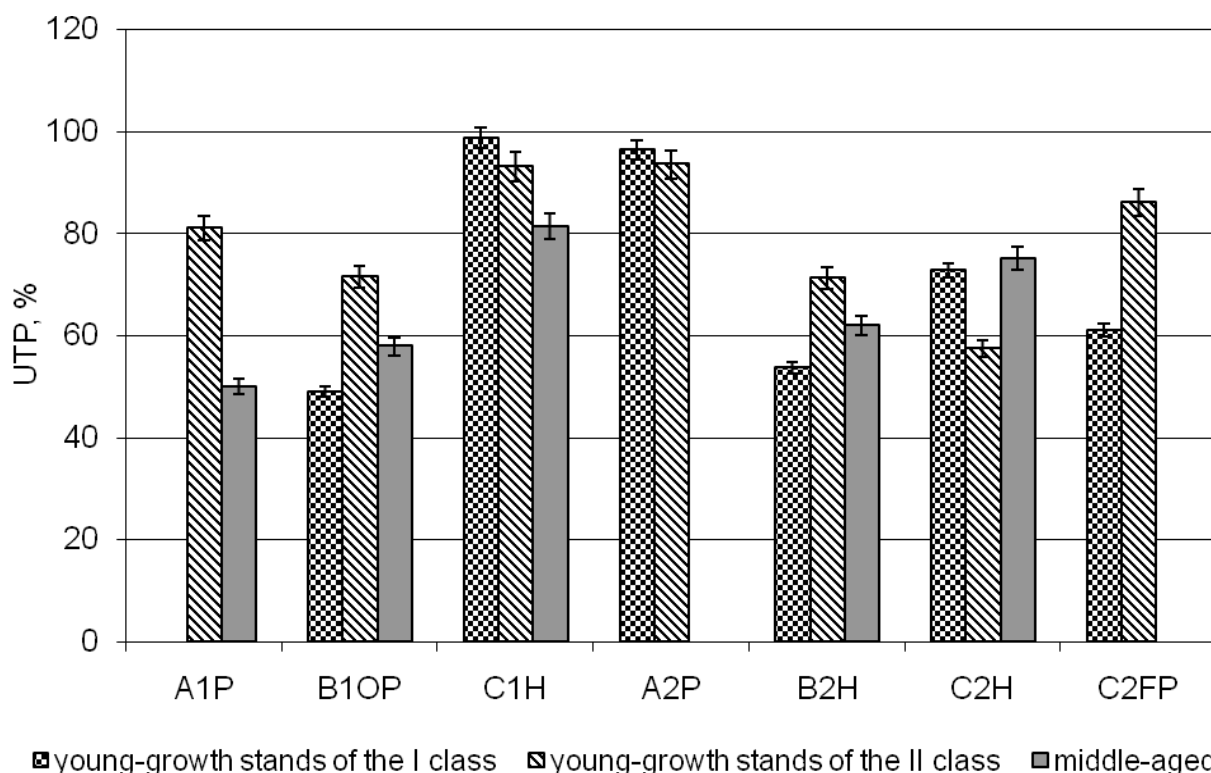
Fig. 5. Changes of index of use of typological potential of *Pinus sylvestris* L. depending on the age in different FGT, %

In this regard the measures should be taken to increase the productivity of the pine forest stands.

Conclusions

It is established that on 45,9 % of the areas of Kirovske forestry the *Pinus sylvestris* grows in typical forest growth conditions – bir (A_1 and A_2), the smaller (34,2 %) share of pine plantations falls to the dry and fresh subirs and subtypes – oak and pine, halogen and poplar inundated versions. The fullest extent of use of typological potential by the pine forest stands – 81,4 % i 98,7 % – is fixed in such types of forest growth conditions as C_1H and A_2P; this parameter is very low in B_1OP, B_2H, C_2H and the loss at forestry are close to 51,0 %.

Bibliography

1. Генсірук С.А. Ліси України / С. А. Генсірук. – К.: Наук. Думка, 1992. – 408 с.

2. Гордієнко М.І. Культури сосни звичайної в Україні/ М.І. Гордієнко, В.П. Шлапак, А.Ф. Гойчук та ін. – К.: Ін-т аграр. економіки УААН, 2002. – 872 с.

3. Гузь М.М. Статистична оцінка лісівничо-таксаційних особливостей географічних культур сосни звичайної у ДП «Шацьке УДЛГ» / М.М. Гузь // Науковий вісник НЛТУ України, 2007. – Вип. 17.7. – С. 10–16.

4. Лавриненко Д.Д. Наукові основи підвищення продуктивності лісів Полісся / Д.Д. Лавриненко. – К.: Вид-ва УАСГН, 1960. – 194 с.

5. Лакида П.І. Фітомаса лісів України [монографія] / П. І. Лакида. – Тернопіль: Збруч, 2002. – 256 с.

6. Лосицький К.Б. К вопросу об оптимальной лесистости / К.Б. Лосицький // Лесн. хоз-во. – 1961. – № 11.– С. 44–49.

7. М'якушко В.К. Первинна біологічна продуктивність соснових лісів Українського Полісся / В. К. М'якушко // Укр. ботан. журн. – 1972. – Т. 29, № 3. – С. 328–339.

8. Мякушко В.К. Сосновые леса равнинной части УССР / В.К. Мякушко. – К.: Наук. думка, 1978. – 256 с.

9. Проект організації та розвитку лісового господарства ВЧ ДЛГО «Дніпропетровськліс» державного лісогосподарського об'єднання «Дніпропетровськліс» // Т. II, Книга I. – Таксаційний опис, поквартальні суми площ та загальних запасів насаджень Кіровського лісництва. – Ірпінь, 2004. – 146 с.