# SOLUTION FOR NORMALIZATION PRODUCTION FUND, DETERMINATION AND ANALYSIS EVOLUTION IN DIFFERENT ASSUMPTIONS

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***Abstract***

*A real production fund reaches the state of normality, respectively a normal production fund when the growth in volume of the forest becomes equal to the volume of wood mass exploited, both being reported at the same time period.*

*The normalization of the production funds by the method of the age classes is a desire which any responsible forest administration tends because it ensures the continuity in time of the crops and a better management of the forests in time without too much effort in certain periods of time. concerns the application of the respective care works and treatments. The paper presents the calculation algorithm respectively the solutions that are the basis of the normalization of the production funds.*

*The paper contains analyzes regarding the normalization of the production funds in different working hypotheses, with the presentation of the solutions that can be the basis of their normalization. An important thing regarding normalization is the time period required for normalization.*

**Key words**: production fund, normalization, age classes, normalization period

## INTRODUCTION

The forest as a forest ecosystem performs simultaneously several functions of both ecological and economic nature, the fulfillment of these functions in their fullness being conditioned by the achievement of the normal structure of the production fund (Leahu, 2000). Meeting the needs of wood under the current conditions is becoming more difficult due to the strong deviation from the structure of certain production funds on the one hand and the increased demand for wood on the other, which makes it difficult to find a sustainable balance between demand and offer. On the other hand, small steps have been taken regarding the replacement of wood still widely used as fuel which makes the pressure on the wood extracted from the forests of Romania extremely high (Dorog, 2007).

A real production fund that is actually the the mirror of the forest management reaches the state of normality, respectively normal production fund when the growth in volume of the forest reaches equal to the volume of wood mass exploited, both being reported at the same time period (Kevin, 1998). This fact is quite difficult to achieve in most situations due to the

deviations accentuated from the normal structure and on the other are the economic interests that reduce the possibilities of reaching the desired management goal (Giurgiu 1972).

The normalization of the production funds by the method of the age classes is a desire to which any responsible forestry administration tends because by this it ensures the continuity in time of the harvests and the fulfillment in good conditions of the ecoprotective functions (Giurgiu, 2004). Normalization is achieved in time by consistent application of care and treatments, the starting point being the forest structure at a given time, the calculation algorithm for normalization, deviations from the normal structure and the manifestation of disturbing factors during the normalization period (Leahu 1998, 2001). The latter may affect the structure of the fund to a greater or lesser extent and may increase the time period for normalization (Dorog, 2008).

The production funds have extremely different structures due to the seasonal conditions and the of forestry actions undertaken over time. The forestry interventions undertaken within the arboretums throughout their existence have as their primary role the approximation of the arboretum structure to the structures that best satisfy the assigned functions (Andrici A., et al., 2017).

## MATERIAL AND METHOD

Regarding the determination of the normal production fund, there are several cases of determination, from the simplest when the forest is made up of pure stands of the same productivity, the forest is made up of pure stands of different productivity, to the most complex case when the forest it consists of mixed stands with different productivity. The paper analyzes the most complex situation that we also find in nature.

The determination of the normal production fund was carried out by the method of the age classes, which implies the distribution of the surface of each species by production classes and age classes. After this distribution, the total areas will be determined by age classes, total production for each species and production class. The determination of normal production is made by dividing the total production into six because the production funds are generally structured into six age classes. The actual production by age classes will continue to be determined.

The production funds have different structures in relation to the natural conditions, vegetation and the household measures taken. The measures proposed by the forestry arrangements, both care works and treatments, have as main role besides the forestry nature the management of

the production fund towards the structure of maximum functional efficiency, ie the normal structure (Piticar et al., 2015).

Different structures of the production funds were analyzed with their evolution over certain periods of time in relation to the size of the differences between the real and the normal structure. Following the analyzes carried out, two situations are distinguished, one in which there is a surplus of exploitable stands in the 6th class of age and the other in which there is a deficit of exploitable wood mass.

To determine the normal surface by age classes was applied the relation:

$$S_n = \frac{P_n}{P_r} \times S_r \text{ in which:}$$

- $S_n$ represents the normal surface of an age class;
- $P_n$ represents normal production;
- $P_r$ represents real production by age classes;
- $S_r$ represents the real surface by age classes.

The determination of the normal distribution by age classes for the mixed stands is performed through the following steps:

- the distribution of each species by production classes and age classes;
- the total area for each age class is calculated;
- the total area for each production class and species is calculated;
- it is taken from the production tables by species and by the production class the normal production;
- the total production for each species and production class is calculated;
- the normal production by age classes is determined;
- the actual production by age classes is determined;
- the normal area for each age class is determined.

**RESULTS AND DISCUSSION**

Following the analysis of the situations presented above, the following discussions can be made. For production funds with exploitable timber surplus the normalization is generally easier due to the fact that only a part of the exploitable trees will be switched to cutting, while the others will complete up to the normalization of the V age class while the exploited areas will be they will join the 1st grade age group.

For production funds with exploitable timber shortage the normalization of the production fund is extremely difficult due to the fact that it involves a long period of time that can reach or even exceed the value

of the production cycle. Most often during these extremely large periods, unforeseen situations may arise which again modify the structure of the age classes with implications of course on the normalization of the production fund.

*Table 1*

Variance, standard deviation, Anova and Bartlett's Test in different calculation hypotheses

| Calculation variant | Variance | | Standard deviation | | Bartlett's Test | Anova |
|---|---|---|---|---|---|---|
| | Initial | After applying the normalization algorithm | Initial | After applying the normalization algorithm | | |
| I | 1037.5 | 21.11 | 32.2 | 4.59 | 111.577 *** (P<=0.001) 0.000667 | 0.3008 N.S. (P>0.05) 0.9814 |
| II | 1037.5 | 21.06 | 32.2 | 4.61 | 111.588 *** (P<=0.001) 0.000663 | 0.3034 N.S. (P>0.05) 0.9804 |
| III | 1037.5 | 20.08 | 32.2 | 4.72 | 111.572 *** (P<=0.001) 0.000659 | 0.3038 N.S. (P>0.05) 0.9817 |
| IV | 1037.5 | 19.89 | 32.2 | 4.67 | 111.568 *** (P<=0.001) 0.000657 | 0.3035 N.S. (P>0.05) 0.9812 |
| V | 1037.5 | 20.03 | 32.2 | 4.69 | 111.574 *** (P<=0.001) 0.000665 | 0.3036 N.S. (P>0.05) 0.9817 |
| VI | 1037.5 | 19.97 | 32.2 | 4.68 | 111.564 *** (P<=0.001) 0.000655 | 0.3034 N.S. (P>0.05) 0.9809 |
| VII | 1037.5 | 20.05 | 32.2 | 4.63 | 111.566 *** (P<=0.001) 0.000654 | 0.3035 N.S. (P>0.05) 0.9806 |
| VIII | 1037.5 | 21.11 | 32.2 | 4.59 | 111.577 *** (P<=0.001) 0.000667 | 0.3008 N.S. (P>0.05) 0.9814 |

Regarding the surfaces by age classes that exist before normalization and those that are determined in the normalization process, some details can

be made based on the table below obtained from the statistical processing of type Anova. What is interesting to note from the table below is that the standard deviation has values over 32 for the surfaces by age classes before normalization and values close to 5 after applying the normalization algorithm. By applying the Bartlett test to verify the homogeneity of the variant in several hypotheses, it was concluded that the results are insignificant (see table 1).

## CONCLUSIONS

In the case of production funds where there is a surplus of timber that can be exploited, the normalization operation is relatively easy as some of the stands will be switched to exploitation and the rest will start balancing in the five age class. What is important to mention is the fact that the possibility of main products plays an active role in the normalization of the production funds.

In the case of production funds where there is a deficit of exploitable timber, the normalization operation is performed relatively harder as in the previous case because it involves a relatively long period of time that can reach or exceed the value of the production cycle, which does not guarantee that this period will not produce disturbing phenomena that again affect the structure of the production fund.

Applying the Anova statistic in the five calculation hypotheses by comparing the statistical ranges of data formed by the surfaces by age classes the differences are insignificant in all cases, which suggests that the production fund normalization can be achieved in a relatively long time. The insignificant differences between the data ranges that represent the distribution of the surfaces by age classes from the initial moment and after the application of the calculation algorithm show that in a period of 10 years the differences regarding the normalization of the effects are extremely small.

## REFERENCES


1. Andrici A., Duduman G., Nichiforel L., 2017, Management of small scale private forests and impacts over the structure of the growing stock and the current economic value: a case study in northeastern Romania. Bucov. For. 17(2): 131-148.
2. Dorog S., 2007, Noţiuni teoretice şi practice de amenajarea pădurilor, Editura Universităţii din Oradea
3. Dorog S., 2008, Biostatistică forestieră, Editura Universităţii din Oradea
4. Giurgiu V., 1972, Metode ale statisticii matematice aplicate în silvicultură, Editura Ceres, Bucureşti

5. Giurgiu V., 2004, Silvologie III B, Gestionarea durabilă a pădurilor României, Editura Academiei Române
6. Kevin O. L., 1998, Silviculture for Structural Diversity: A New Look at Multiaged Systems, Journal of Forestry, Vol. 96, Number 7 , p. 4-10, 1998
7. Leahu I., 2001, Amenajarea pădurilor, Editura Didactică şi Pedagogică, Bucureşti
8. Leahu I., 1998, O expresie matematică a legăturii dintre valorile relative ale unor caracteristici biometrice în arboretele echiene, Revista de silvicultură a studentului Transilvaniei nr. 2(8) anul III
9. Leahu I., 2000, Un model de simulare pentru determinarea efectului măsurilor silvotehnice aplicate, Buletinul Ştiinţific, Universitatea din Oradea
10. Piticar T. M. , Rusu E., 2015, Recent structural evolutions in the forests of lowland basin of Moldova river between Sadova and Prisaca Dornei