A NEW VARIANT TO DETERMINE THE ANNUAL ALLOWABLE CUT FOR REGULAR HIGH FOREST SYSTEM OR GROUP SELECTION SYSTEM BY AGE CLASSES METHOD

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ABSTRACT

The procedure of establishing the annual allowable cut using the method of age classes for regular high forest system or the method of revocable periodic block for group selection system, which are recommended by the Romanian guidelines for forest management (Ministry of Silviculture, 1986) often seems not to assure good results.

The new variant proposed in this paper keeps the principle of the classical method of age classes, but it has a dynamic character comparing to the classic variant and it assures the continuity of wood volume.

Stand establishment in periodic block is based both on the differences between the actual age and exploitability one, and the regeneration period. After the normalization of the periodic block the annual allowable cut by volume, assuring the continuity of the production on the first rotation. The new variant results seem to be clearly more close to the forest reality.

Keywords: annual allowable cut, age classes, indicator increment, high forest, and group selection system.

INTRODUCTION

The classical way to establish the annual allowable cut for regular high system using the method of age classes is included in the national guidelines for forest management. It does not give satisfaction to the most of specialists in forest planning, being generaly out of reality. It is very necessary to fundament such an important indicator on base of more than one single viable method (in this case the method of indicator increment). Also, the annual allowable cut has to take into account both the normalisation of the growing stock and its structure (by age classes). All the stands that are an object of

wood yield have also (al least subsidiary) important functions of protection; therefore, their continuity is pursued only in secondary plan by the method of indicator increment.

The new variant try to eliminate the rigidity of the classic method, which is good only for the treatment on base of clear cuttings and it does not assure the continuity of the falls (harvest volumes). The new variant keeps all the benefits of the age class method in comparing with the method of indicator increment (Ministry of Silviculture, 1986): the calculation is mainly based on more sure elements: age and area, not on volume and increment; the expected target is more closer to the reality from the field, the structure normalization of the growing stock (on age classes) being a feasible objective, while the method of indicator increment builds up an suppositional model, difficult to achieve and often far-of to the normal growing stock (because it operates with the actual but not the optimal of the regeneration type, actual composition, density, and productivity; the continuity of bio-productive and eco-protective functions is a target for the whole rotation period and not on 60 yr.

The method of age classes is proposed to substitute the method of revocable periodic block because the second - used in present to determine the annual allowable cut to group selection system - is not sufficient grounded to assure the crop continuity.

CALCULATION OF ANNUAL ALLOWABLE CUT FOR REGULAR HIGH FOREST SYSTEM

Stage 1 - Stand distribution in periodic blocks

Starting to the idea that for each stand in regeneration period the fellings will be equal distributed in decades, an analysis of the difference (D) between the cutting age (TE) and the actual one (TA) has to be done. Taking into account the regeneration period (PR) the stand surface will be distributed in one or more periodic blocks. Thus, the distribution will be assured in each period exactly those parts of the stand area, which will be effectively regenerated.

For the stands with current regeneration cuttings and for the exploitable stands with reduced density the following judgment it is proposed:

- if the stand density is more than 0.6, two-thirds of stand area will be included in current periodic block (SPI) and one-third in the last periodic block;
- if the stand density is 0.4 - 0.5, half of stand area will be distributed in SPI and the other half in the last periodic block;
- if the stand density is less than 0.3, just one-third of stand area will be included in SPI and the other two-thirds will be founded in the last periodic block.

This kind of distribution intends to assure a strong correlation between the area and volume of felling in a period and also the continuity of the eco-protective capacity.

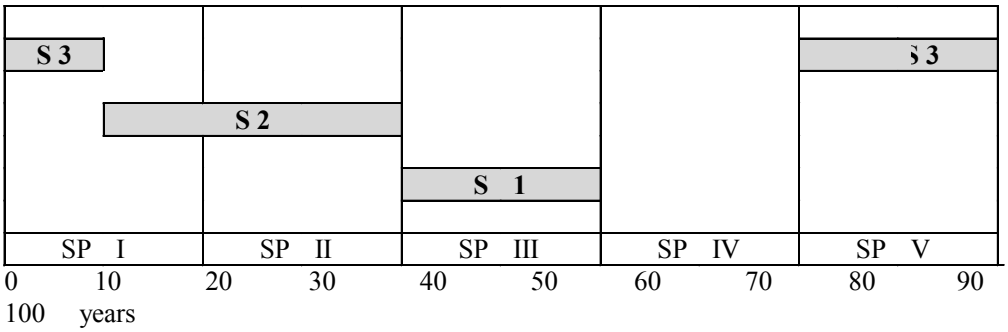
The example, presented in figure 1, has the following characteristics:

- rotation = 100 yr.; 5 periods of 20 yr.;
- stand 1: TE = 100 yr., TA = 60 yr., PR = 20 yr., area = S1;

- stand 2: TE = 100 yr., TA = 90 yr., PR = 30 yr., area = S2;
- stand 3: TE = 100 yr., TA = 110 yr., PR = 10 yr., density = 0,3 (regeneration process begun), area = S3;

In this way, the whole area of the stand 1 is establish in SP III, a third of the area of stand 2 is found in SP I and two-thirds in SP II, a third of stand 3 area is distributed in SP I and the rest in SP V.

Figure 1: Example of stand establishment into periodic blocks



Stage 2 - Normalization of the periodic blocks

This operation is done similar with classic procedure. The higher economical flexibility of age classes method in comparing with indicator increment method has to be emphasized. Thus in normalization, in function of the wood market trends, a higher or lower allowable cut by volume would be chosen.

Stage 3 - Calculation of annual allowable cut indicator

The annual cut is calculated using the stand volume and increment from SPI, with the formula (for a period I = 20 yr., but it can be adapted for 30 yr., too):

$$P1 = (V11 + V21 + V12): 20 + V22: 40 + (2V31 + V32): 60 \quad (m3/yr),$$

where:

- V11, V21, V31 - volume of exploitable stands which can be felled and regenerated in the next decade, with a regeneration period of 10, 20, respectively 30 yr., plus their increment in 5 yr.;
- V12, V22, V32 - volume of exploitable stands which can be felled and regenerated in the decade 2, with a regeneration period of de 10, 20 or 30 yr., plus their increment in 5 yr.

To assure that the management unit does not have a deficit of exploitable stands in

the first decade of the first period (I), the following relation can be used:

P2 = V11: 10 + V21: 20 + V31: 30 (m3/yr),

The value of annual allowable cut indicator will be equal with the minimum between the two results (P1, P2) obtained.

Observation.

Theoretically speaking, the increments of the main stand till the half of the regeneration period should be used in calculation. But, because on exploitation age the increments are rather low and they continuously diminish, only the 5 current increase of the total stand are considered sufficient (in this way the calculation methodology is maintained not complicate). From our calculation the registered differences are maxim 4% from the stand volume on exploitation.

Results

This procedure has been tested in two working units: in the hilly zone of Forest District Târgu Mures and in the mountain zone of F.D. Falcau. The illustrating results, including the comparison between the method of indicator increment and the classic variant (method of age classes) are presented in the table 1:

Table 1: Comparison between the method of indicator increment and the classic one

Working unit	Management sub-unit			Allowable cut indexes obtained by:					
	type	area	rotation	indicator increment method		age class method			
						classic variant		new variant	
		ha	yr.	m^3/yr	%	m^3/yr	%	m^3/yr	%
IX Corneşti	regular high forest	1314,4	120	2000	100	3200	160	2200	110
IV Nisipitu	regular high forest	5402,8	120	13000	100	24400	188	13200	102

Calculation of annual allowed cut for group selection system

Stage 1 - Stand establishment in periodic blocks

The procedure is similar to those for regular high forest system. The exception will be the stands in process of regeneration (one or more fellings have been done) and the exploitable stands with a low density. It these cases, they can be distributed as follows:

- if the density is higher than 0.7, four-fifths of stand area will be included in SP I and one-fifth in the last period block;
- if the density is 0.5 - 0.6, three-fifths will be distributed in the first period and the rest in the last one;

- if the density is 0.3 - 0.4, two-fifths will be included in SP I and three-fifths in the last period block;
- if the density is less than 0.2, only one-fifth will be distributed in the current period block, the rest will be found in the last period block.

Stage 2 - Normalization of the periodic block

The distribution will be similar to the high forest system.

Stage 3 - Determination of the annual allowable cut indicator

Annual allowable cut could be calculated on base of the following formula (for period I of 40 yr., but it can be also used for 60 yr.):

P1 = (V11+V21+V31+V41+V12+V22+V32+V13+V23+V14): 40 + (V43+V24): 80
+ (2V33+V34): 120 + (3V42+ V44): 160 (m3/yr),

where:

- V11, V21, V31, V41 - volume of exploitable stands which can be a subject for fellings beginning with the next decade, having the regeneration period of 10, 20, 30, or 40 yr., plus their increment in 10 yr.;
- V12, V22, V32, V42 - volume of exploitable stands which can be a subject for fellings starting to the decade 2, with the regeneration period of 10 - 40 yr., plus their increment in 10 yr.;
- V13, V23, V33, V44 - volume of exploitable stands which can be a subject for fellings starting to the decade 3, with the regeneration period of 10 - 40 yr., plus their increment in 10 yr.;
- V14, V24, V34, V44 - volume of exploitable stands which can be a subject for fellings starting to the decade 4, with the regeneration period of 10 - 40 yr., plus their increment in 10 yr..

To be sure that the management unit will not have a deficit of exploitable stands, in first planning decade, the following relation would be used:

P2 = V11: 10 + V21: 20 + V31: 30 + V41: 40 (m3/yr),

To verify if the continuity of the production process will be assured in the next 20 yr., the following formula would be used:

P3 = (V11 + V21 + V12): 20 + (V41 + V22): 40 + (2V31 + V32): 60 + V42: 80 (m3/yr),

The terms of the two anterior relations keep their former signification, with the mention that only the increment in 5 yr. will be taking into calculation.

The value of allowable cut index will be equal with the minimum between the three results (P1, P2, P3) obtained in this way.

Observation.

The same mention concerning the increments should be included into calculation. In the most favorable case the differences are maximum 7% from the volume registered by the exploitable stands.

Reference

*** (1986) Norme tehnice pentru amenajarea padurilor, Ministerul Silviculturii, Romania.