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ASSESSMENT OF ACCURACY OF "VOLUME INCREMENT TABLES FOR PINE" BY ALBERT DUDEK IN PINE STANDS OF THE MUROWANA GOŚLINA FORESTRY EXPERIMENTAL STATION

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Abstract. The study was an attempt to assess the accuracy of "Volume increment tables for pine" by Albert Dudek in pine stands aged 35, 50 and 88 years, from the Forestry Experimental Station Murowana Goślina. In the 35-year old stand the smallest secondary percentage error in the determination of current volume increment of the stand for a 5--year growth period was obtained using variant IV of the tables (–2.69%) and in case of a 10-year period for variant I (1.62%). In the 50-year old stand for the shorter growth period it was variant II (–2.21%), while for the longer period it was variant V (–7.94%). In the oldest stand it was table variant III (12.60%) and IV (–6.77%), respectively. Using variants II, IV and V of the tables in the analysed stands current volume increment was determined in diameter subclasses. Irrespective of the applied table variant (in individual diameter subclasses), both positive and negative errors, and the biggest errors (absolute values) were found for trees from the lowest and higher diameter subclasses. In most cases the accuracy of the determination of current volume increment in the analysed stands using tables was consistent with the accuracy expected by their author. Variant V of the tables makes it possible to most accurately estimate volume increment of the stand, irrespective of its age and the length of the growth period.

Key words: volume increment, tables, accuracy, pine

INTRODUCTION

The value, which should primarily determine the amount of cut and planning management and silviculture measures, is current volume increment of the stand. This value may be established using two methods. The first requires periodical measurements of stand volume and the calculation of the difference between these values, taking into consideration the volume of trees felled in that period. The other method consists in the

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measurements taken at the end of the growth period. In this case it is only possible to determine the increment on trees being measured (it is impossible to determine the volume increment of trees which were felled in the growth period). After World War II the problem of accuracy of results for both these methods was investigated by Grochowski [1953]. He showed that the most accurate methods of backward determination of current volume increment are those using mean sample trees and the accuracy is proportional to square roots of the number of adopted mean sample trees. Borowski [1954] contributed considerably to the development and improvement of methods determining current volume increment of the stand thanks to his introduction of the concept of volume increment intensity. Extensive studies carried out by Borowski on the relationship of volume increment intensity with different characteristics of trees and stands [1958, 1961 a, b, 1964] constituted the basis for the development of a new method to determine current volume increment of the stand based on mean sample trees. It is an accurate method, but very labour-intensive. Bruchwald [1971] developed a method which does not require such a tremendous amount of labour and is based on the appropriate form factor $f_{1/3}$. However, also in this case it is necessary to cut down mean sample trees, which is not always feasible in practice. Borowski [1971] proposed the application in forestry practice of "Tables of stem volume increment for pine trees of older age classes". However, the use of these tables in young and middle-aged stands results in systematic errors being committed. In pine stands on coniferous forest sites, after the introduction of appropriate corrections [Borowski and Rekosz 1974] based on the determination of average growing space, they may be applied irrespective of the age of stand. Accuracy of these tables was investigated e.g. by Lemke [1974]. In an 88-year old pine stand at the joint measurement for the 5-year growth period the error was –9.6%, while for the 10-year period it was –6.1%. Almost 75% results for single trees were lower than actual values. A bigger accuracy of tables was found for higher trees and those exhibiting bigger diameter breast high increments. No effect was reported of tree diameter on accuracy. Accuracy of tables developed by Borowski was also investigated by Bruchwald and Michalak [1984], who stated that in stands with small breast height diameters and heights the tables gave too low results, while positive errors were recorded at high values of both these characteristics. The authors proposed corrections dependent on mean diameter breast high of a stand, which results in the mean error of 1-2%. The application of corrections makes it possible to use these tables in forest sites irrespective of the age of stand. Despite the proposed corrections increasing their accuracy, those tables are rarely used in practice. This might result from the necessity to determine diameter breast high increment, and to do so on a relatively large number of trees. An interesting proposal for the determination of current volume increment in pine stand was presented by Dudek [1994] in the form of "Volume increment tables for pine". The tables were prepared on the basis of an extensive body of empirical material (7080 pines). The author proposed five different variants of tables (dependent on the amount of information collected on the stand):

I. Stand quality – B (top height at the age of 100 years), age of stand – W and breast height basal area of trees in 1 ha – G.

II. Mean diameter breast high basal area of stand – DG, mean stand height – H and breast high basal area of trees in 1 ha – G.

III. Mean diameter breast high basal area of stand – DG, mean stand height – H, breast high basal area of trees in 1 ha – G, quality class – B and age of stand – W.

IV. Mean diameter breast high basal area of stand – DG, mean stand height – H, breast high basal area of trees in 1 ha – G, and mean breast height diameter increment of stand – ZD.

V. Mean diameter breast high basal area of stand – DG, mean stand height – H, breast high basal area of trees in 1 ha – G, quality class – B, mean breast height diameter increment of stand – ZD and age of stand – W.

Tables were developed as user-friendly computer software. The program after the determination of the scope of measurements taken in the stand and their introduction makes it possible to calculate current volume increment of stand for a 5- or 10-year period (or for both). It is also possible to optionally obtain information on standard errors of the calculated volume increment.

This study was an attempt to assess the accuracy of proposed tables in three pine stands from the Murowana Goślina Forestry Experimental Station.

MATERIAL AND METHODS

Material used in the preliminary analysis of accuracy of "Volume increment tables for pine" by Dudek [1994] came from three experimental cutting areas established in pure pine stands by the Department of Dendrometry, the Agricultural University of Poznań, in the Forestry Experimental Station in Murowana Goślina. The first cutting area (0.1 ha) was established in a 35-year old pine stand, with the following characteristics: forest site type – fresh coniferous forest, average breast height diameter of 11.73 cm, mean height of 13.65 m, site quality class I, degree of stocking of 1.16, and the number of trees of 302. The second cutting area (0.25 ha) was established in a 50-year old stand with the site type of fresh mixed coniferous forest. The average breast height diameter was 17.84 cm, mean height of 19.16 m, site quality class I, degree of stocking of 0.91 and the number of trees of 274. The last cutting area with an area of 1 ha was located in an 88-year old stand in the fresh coniferous forest site type. The average breast height diameter in this stand was 28.34 cm, mean height was 21.82 m, site quality class $II_{0.2}$, degree of stocking was 0.94 and the number of trees was 474. The age of stands was calculated as the arithmetic mean of the age of all trees, the average breast height diameter was calculated from the basal area, while the mean height was determined using the Lorey formula. The site quality class and the degree of stocking were established according to the tables by Szymkiewicz [1961]. In the 88-year old stand volume increment of each stem was determined using the sectional method. For this purpose the diameter inside bark and increment in diameter for the last 5 and 10 years were measured in the centre of each section with the length of 1 m. In both younger stands volume increment for both growth periods was determined on the basis of stem analysis, using also the sectional Huber's formula. Volume increments for the period of 5 and 10 years were established from the difference of the final and initial stem volume, rounded to 0.0001 m^3. Apart from the already established stand characteristics such as age (W), average breast height diameter (DG), and mean height (H), the following were also calculated: breast height basal area in 1 ha (G), quality class (B) [Bruchwald 1979] and mean increment of breast height diameters of trees in the stand (ZD). For each variant of the tables volume increment was determined for both growth periods and it was compared with the sectional volume increment, which was adopted as the actual value. The secondary percentage error was used to assess the accuracy of analysed tables.

RESULTS

In the first table variant in the youngest stand the secondary percentage error for the 5-year period was 13.48%, while for the 10-year period it was 1.62% (Table 1). Similarly, positive errors, but with higher values were found for the oldest 88-year old stand. In case of the 50-year old stand negative values of the secondary percentage error were obtained and its absolute value was bigger for the longer than for the shorter growth period. In variant II of the tables lower values of secondary percentage errors were recorded than for variant I, except for the 10-year growth period in the youngest stand. The lowest value of the secondary percentage error was found in the 50-year old stand for the longer growth period (–2.21%), while the highest (16.33%) in the oldest stand for the 10-year growth period. This variant of tables in the opinion of their author is the least accurate of all the variants. However, in the analyzed stands it was slightly more accurate than variant I. In variant III of the tables, in the youngest and oldest stands

Table 1. Actual stand volume increment (Zv_{rz}) and stand volume increment calculated using tables by Dudek [1994] (Zv_t) expressed and the accuracy of its determination, $m^3 \cdot ha^{-1}$
Tabela 1. Rzeczywisty (Zv_{rz}) i obliczony tablicami Dudka [1994] (Zv_t) przyrost miąższości drzewostanów oraz dokładność jego określania, $m^3 \cdot ha^{-1}$

Age of stand Wiek drzewostanu	Variant of table Wariant tablic	5-year period – Okres 5-letni				10-year period – Okres 10-letni			
		Zv_{rz}	Zv_t	P_w	standard error błąd standardowy	Zv_{rz}	Zv_t	P_w	standard error błąd standardowy
35 lat	I	42.914	48.697	13.48	6.314	87.761	89.179	1.62	9.549
35 years	II	42.914	47.771	11.32	8.244	87.761	79.016	–9.96	11.870
	III	42.914	50.239	17.07	6.183	87.761	95.477	8.79	9.343
	IV	42.914	41.758	–2.69	3.336	87.761	74.279	–15.36	3.825
	V	42.914	44.121	2.81	2.521	87.761	81.678	–6.93	3.349
50 lat	I	41.642	38.751	–6.94	5.303	84.598	71.967	–14.93	8.021
50 years	II	41.642	40.722	–2.21	6.925	84.598	72.645	–14.13	9.971
	III	41.642	39.663	–4.75	5.194	84.598	75.403	–10.87	7.848
	IV	41.642	39.369	–5.46	2.802	84.598	75.436	–10.83	3.213
	V	41.642	39.527	–3.87	2.118	84.598	77.096	–7.94	2.813
88 lat	I	24.339	29.773	19.56	5.787	48.339	57.107	18.14	8.752
88 years	II	24.339	28.551	14.65	7.556	48.339	56.231	16.33	10.880
	III	24.339	28.118	12.60	5.667	48.339	54.262	12.29	8.564
	IV	24.339	21.959	–13.70	3.058	48.339	45.079	–6.77	3.506
	V	24.339	21.608	–13.23	2.311	48.339	44.995	–6.92	3.070

positive percentage errors were obtained. In the 50-year old stand negative errors were recorded, amounting for the shorter growth period to –4.75% and for the longer period to –10.87%. In case of variant IV of the tables, negative percentage errors were found in the three analysed stands (both growth periods). In the two younger stands the calculated secondary percentage errors were lower for the 5-year growth period. In the 35-year old stand it was –2.69% and in the 50-year old stand it was –5.46%, respectively. For the longer growth period it was –15.36% and –10.83%, respectively. In the oldest stand the trend, found by Dudek in each variant of the tables that they are more accurate for the 10-year growth period, holds true. Using variant V of the tables and determining the 5-year current volume increment in the three analyzed stands the obtained errors were 2.81%, –3.87% and –13.23%, while for the longer growth period they were –6.93%, –7.94% and –6.92%.

If in the stand breast height diameters of trees were measured in diameter subclasses, then tables made it possible to determine current volume increment in the stand in these subclasses. Such a procedure was possible when applying variants II, IV and V of "Volume increment tables for pine" and in our further considerations they were referred to as variants IIa, IVa and Va. The biggest errors (Table 2) in the 35-year old stand were recorded for trees from the lowest diameter subclasses (in the diameter subclass of 6 cm for the investigated variants of the tables for the shorter growth period errors of over 100% were found). The size of errors (only positive) decreased with an increase in the breast height diameter in successive diameter subclasses up to the diameter subclass of 10 cm and each time it was bigger for the shorter growth period. Starting from the diameter subclass of 12 cm, apart from the 5-year period in variants IIa and Va, negative values of secondary percentage errors were obtained and absolute values of errors were

Table 2. Secondary percentage errors for the determination of current volume increment in diameter subclasses using tables in the 35-year old pine stand
Tabela 2. Wtórne błędy procentowe określania bieżącego przyrostu miąższości w stopniach grubości za pomocą tablic w 35-letnim drzewostanie sosnowym

Diameter subclass Stopień grubości	Number of trees Liczba drzew	Variant of table – Wariant tablic					
		IIa		IVa		Va	
		incremental period – okres przyrostowy					
		5 years 5 lat	10 years 10 lat	5 years 5 lat	10 years 10 lat	5 years 5 lat	10 years 10 lat
6	10	145.28	73.33	113.84	62.67	126.42	81.33
8	60	100.66	25.24	75.22	17.81	83.70	29.49
10	76	37.98	8.17	20.89	1.80	26.99	12.22
12	77	11.98	–8.99	–2.19	–14.62	3.21	–6.01
14	39	2.03	–14.55	–10.78	–19.72	–5.92	–11.85
16	28	0.05	–17.38	–12.01	–22.13	–7.12	–14.59
18	8	–6.91	–22.65	–17.95	–27.07	–13.49	–20.14
20	3	–0.20	–15.61	–11.82	–20.38	–7.21	–12.91
22	1	–8.49	–23.86	–18.93	–28.05	–14.90	–21.49

bigger for the longer growth period. In the 5-year old stand (Table 3) the biggest secondary percentage errors (positive) were also recorded for the lowest diameter subclasses (10, 12 and 14 cm), with a markedly bigger accuracy observed for the longer growth period. Starting from the diameter subclass of 16 cm there was a change in the sign of errors to negative ones up to the diameter subclass of 24 cm. In variants IIa (in diameter subclasses from 16 to 24 cm) and IVa of the tables (in subclasses from 16 to 22 cm), each time errors for the longer growth period were bigger than those for the shorter period. In variant Va of the tables (in diameter subclasses from 16 to 24 cm) such a situation occurred only for the diameter subclass of 18 cm. For the other diameter subclasses from this range the tables are characterized by a bigger accuracy for the shorter growth period. In diameter subclasses above 26 cm no distinct trend may be observed in the accuracy of individual table variants (errors with the plus and minus signs) and the tables are sometimes more accurate for the longer growth period and sometimes for the shorter one. In most diameter subclasses variant IIa of the tables was most accurate for the 5-year growth period, while variant Va – for the 10-year period.

In the oldest 88-year stand (Table 4) variant IIa of the tables is characterized by the fact that for each diameter subclass only positive errors were obtained, and the biggest values of these errors were recorded in the highest diameter subclasses. In most diameter

Table 3. Secondary percentage errors for the determination of current volume increment in diameter subclasses using tables in the 50-year old pine stand
Tabela 3. Wtórne błędy procentowe określania bieżącego przyrostu miąższości w stopniach grubości za pomocą tablic w 50-letnim drzewostanie sosnowym

Diameter subclass Stopień grubości	Number of trees Liczba drzew	Variant of table – Wariant tablic					
		IIa		IVa		Va	
		incremental period – okres przyrostowy					
		5 years 5 lat	10 years 10 lat	5 years 5 lat	10 years 10 lat	5 years 5 lat	10 years 10 lat
10	2	59.71	44.40	53.96	50.18	55.40	53.07
12	27	58.54	3.83	52.66	7.76	53.64	10.26
14	44	23.89	7.28	20.00	11.30	20.56	13.98
16	59	–0.30	–8.31	–3.68	–4.84	–3.00	–2.75
18	53	–3.96	–23.31	–7.01	–20.36	–6.75	–18.65
20	42	–5.10	–12.84	–8.31	–9.53	–7.91	–7.56
22	28	–13.04	–20.16	–15.90	–17.22	–15.45	–15.36
24	11	–10.92	–16.64	–13.73	–13.55	–13.35	–11.66
26	6	11.47	–1.24	7.96	2.39	8.37	4.54
28	1	–15.63	–22.00	–18.32	–19.14	–17.97	–17.46
30	0	0.00	0.00	0.00	0.00	0.00	0.00
32	1	10.19	–6.94	6.79	–3.65	7.22	–1.66

Table 4. Secondary percentage errors for the determination of current volume increment in diameter subclasses using tables in the 88-year old pine stand
Tabela 4. Wtórne błędy procentowe określania bieżącego przyrostu miąższości w stopniach grubości za pomocą tablic w 88-letnim drzewostanie sosnowym

Diameter subclass Stopień grubości	Number of trees Liczba drzew	Variant of table – Wariant tablic					
		IIa		IVa		Va	
		incremental period – okres przyrostowy					
		5 years 5 lat	10 years 10 lat	5 years 5 lat	10 years 10 lat	5 years 5 lat	10 years 10 lat
18	6	25.65	22.28	–3.66	–0.30	–5.24	–2.64
20	26	23.39	20.12	–5.27	–1.93	–6.94	–4.19
22	48	14.92	16.27	–11.58	–4.92	–13.17	–7.22
24	73	18.63	17.92	–8.96	–3.57	–10.34	–5.80
26	69	8.94	9.32	–16.25	–10.57	–17.76	–12.66
28	66	11.79	13.29	–14.07	–7.17	–15.40	–9.33
30	64	15.77	18.20	–10.95	–3.08	–12.32	–5.39
32	42	15.94	19.81	–10.67	–1.69	–12.18	–3.98
34	33	8.79	12.92	–16.16	–7.28	–17.53	–9.44
36	26	22.38	24.76	–5.60	2.47	–7.09	0.09
38	9	19.00	22.57	–8.19	0.77	–9.61	–1.55
40	4	10.45	11.88	–14.73	–7.97	–16.09	–10.07
42	5	36.19	37.89	5.24	13.48	3.61	10.89
44	3	39.25	37.79	7.64	13.52	5.94	10.93

subclasses bigger errors were found for the longer growth period. Variant IVa of the tables is characterized by the occurrence of negative errors in most diameter subclasses and in subclasses from 18 to 40 cm higher accuracy was found for the longer growth period. A similar trend was recorded for variant Va, where a markedly bigger number of negative errors and a bigger accuracy were found for the longer growth period (with the exception of the diameter subclasses of 42 and 44 cm, where only positive errors were recorded and the obtained accuracy was bigger for the shorter growth period). Out of the three analysed variants of tables in this stand, most often the biggest accuracy in individual diameter subclasses was found when applying variant IVa.

In "Volume increment tables for pine", prepared in the form of computer software, there is also an option making it possible to calculate the limits of error for the calculated volume increment (result ± standard error of volume increment, which is caused by the variation in the volume increment intensity in relation to the regression line applied in a given variant of the tables). In case of the 5-year growth period (Table 1) the actual volume increment for each table variant, except for variant III, falls within the limits defined by the table increment ± standard error of volume increment. In case of the 10-year growth period this condition is not met by variants IV and V. In the 50-year old stand for the 5-year growth period the actual volume increment fell within the limits defined by the increment and standard error calculated for each variant of the tables. No such regularity was found for the 10-year growth period in each variant of the tables. In turn, in the oldest stand the actual volume increment for both growth periods fell within the calculated limits (calculated result ± standard error) for variants I, II, III and IV of the tables. A slight deviation from the above mentioned rule may be observed for variant V of the tables.

DISCUSSION

In "Volume increment tables for pine" their author gave percentage standard errors for the determination of stand volume increments for different table variants. For variant I of the tables the error amounted to 16.9% for the shorter growth period and 14.7% for the longer period. In the analysed stands the calculated percentage error was smaller in the youngest stand for both growth periods (13.48% and 1.62%, respectively) and in the 50-year old stand for the 5-year growth period (–6.94%). The calculated error for the longer period in this stand was –14.93% and it was higher than that assumed by the author of the tables, similarly as in the oldest stand, where the errors were 19.56% and 18.14%. Standard error for variant II of the tables, the least accurate according to their author, was 22.2% for the 5-year growth period and 18.3% for the 10-year growth period. In each of the stands from the Murowana Goślina Forestry Experimental Station secondary percentage errors were smaller (for the 35-year old stand 11.32% and –9.96%, for the 50-year old stand –2.21% and 14.13%, and for the 88-year stand 14.65% and 16.33%). In variant III of the tables expected errors given by A. Dudek were 16.7% and 14.4%, respectively. Only for the shorter growth period in the 35-year old stand a bigger percentage error was obtained (17.07%). For the 10-year growth period the error was smaller and amounted to 8.79%. In both older stands, when using this table variant a higher accuracy was obtained than that assumed by the author of the table (the 50-year old stand –4.75% and –10.87%, for the 88-year old stand 12.6% and 12.29%). Using variant IV of the tables, according to their author, standard error of 8.9% is to be expected for the 5-year period and 5.9% for the 10-year period. In the 35- and 50-year old stands for the shorter growth period calculated percentage errors were smaller (–2.69% and –5.46%, respectively), while for the longer period they were bigger (–15.36% and –10.83%) than the expected accuracy of the tables. In the oldest stand (both growth periods) bigger errors were obtained (–13.7% and –6.77%) than those expected by the authors of the tables (8.9% and 5.9%). A similar situation occurs when using variant V of the tables. When determining volume increment for the 5-year growth period in the 35- and 50-year stands the calculated error were smaller (2.81% and –3.87%) than those contained in the tables (6.8%), while for the 10-year period they were bigger (–6.93% and –7.94% vs. 5.2%, respectively). In the 88-year old stand obtained percentage errors for both growth periods were bigger (–13.23% and –6.92%) than those given by the author of the tables. Thus, in the youngest stand for the 5-year growth period a smaller accuracy was found than that assumed by the author of the tables only when applying variant III of the tables and for the 10-year growth period – for variants IV and V. When determining volume increment of each table variant in the 50-year stand for the shorter growth period a bigger accuracy was recorded than that assumed by the author. In the same stand for the 10-year growth period a similar trend occurred when applying variants II and III. In the oldest stand (both growth periods) this principle was observed when applying variants II and III of the tables. The hypothesis on the bigger accuracy of the tables for the 10-year growth period was not fully confirmed. Such a situation was not found in any variant of the tables in the 50-year old stand, and variants IV and V in the 35-year stand and II in the 88-year old stand. On the basis of the conducted investigations it is difficult to select only one variant of the tables, which would always determine most accurately the current volume increment of the stand, irrespective of the age of the stand. It is not possible to indicate a variant of the tables characterized by the smallest accuracy, although variant I in the 50- and 88-year old stands was least accurate for both growth periods. However, it seems that variant V of the tables determines stand volume increment most accurately, irrespective of the age of the stand and the length of the growth period. Taking into consideration the huge variability of growth conditions, both for individual trees and for stands, the conducted investigations are preliminary in character and a thorough assessment of accuracy of the tables needs to be based on measurements taken in a large number of stands.

CONCLUSIONS

1. Using variant V of the tables it was possible to determine volume increment of the stand most accurately, irrespective of its age and the length of the growth period.

2. When determining current volume increment of the stand using variants IIa, IVa and V (current volume increment of the stand calculated in diameter subclasses) the biggest secondary percentage errors occurred in the smallest and biggest diameter subclasses.

3. In most cases the actual volume increment of stands fell within limits defined by the volume increment calculated in the tables ± standard error. Exceptions in this respect are the 10-year growth period for all variants of the tables in the 50-year old stand and in case of the 35-year old stand variants III (the 5-year period), IV and V (the 10-year period), and in case of the 88-year old stand – variant V (both growth periods).

4. The performed analysis of accuracy of the tables in three pine stands shows that they meet the expectations of practitioners. In practice the method to determine current volume increment of the stand should not be labour-intensive and at the same time it needs to be accurate enough to at least show the direction of changes occurring in the stand under the influence of performed interventions.

5. The huge variability of growth conditions for both individual trees and stands results in a situation when the conducted investigations are preliminary in character and the thorough assessment of accuracy of the tables needs to be based on measurements taken in a large number of stands. Studies in this respect need to be continued.

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OCENA DOKŁADNOŚCI „TABLIC PRZYROSTU MIĄŻSZOŚCI DLA SOSNY" ALBERTA DUDKA W DRZEWOSTANACH SOSNOWYCH LZD MUROWANA GOŚLINA

Streszczenie. W pracy podjęto próbę oceny dokładności „Tablic przyrostu miąższości dla sosny" Alberta Dudka w drzewostanach sosnowych w wieku 35, 50 i 88 lat, pochodzących z LZD Murowana Goślina. W drzewostanie 35-letnim najmniejszy wtórny błąd procentowy określania bieżącego przyrostu miąższości drzewostanu za 5-letni okres przyrostowy uzyskano, stosując IV wariant tablic (–2,69%), a za okres 10-letni z wykorzystaniem I wariantu (1,62%). W drzewostanie 50-letnim dla krótszego okresu przyrostowego był to wariant II (–2,21%), a dla dłuższego – V wariant (–7,94%). W najstarszym drzewostanie to odpowiednio III (12,60%) i IV (–6,77%) wariant tablic. Stosując wariant II, IV i V tablic, w analizowanych drzewostanach ustalono bieżący przyrost miąższości w stopniach grubości. Niezależnie od zastosowanego wariantu tablic (w poszczególnych stopniach grubości) uzyskano błędy zarówno dodatnie, jak i ujemne, a największe błędy (wartości bezwzględne) wystąpiły dla drzew pochodzących z najniższych i najwyższych stopni grubości. W większości przypadków dokładność określania bieżącego przyrostu miąższości badanych drzewostanów za pomocą tablic była zgodna z dokładnością, którą przewidywał ich autor. Wariant V tablic pozwala na najdokładniejsze określenie przyrostu miąższości drzewostanu, niezależnie od jego wieku i długości okresu przyrostowego.

Słowa kluczowe: przyrost miąższości, tablice, dokładność, sosna

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