

## Evaluation of forestry companies with differing administrative and production costs

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**Abstract.** This paper contributes to the ongoing discussion on the improvement of private forest management in Poland. It examines characteristics of various types of forestry companies encompassing either completely private forests or a mixture of private and state-owned forests. Different possibilities for operating private and state-owned forestry companies were examined.

The assessment of forestry companies was carried out for three categories based on forest inventory data and economic information. Each of the categories contained three different types of forestry companies classified as follows: I – companies managing private forests only, II – companies managing both private and state-owned forests (e.g. those managed by a state-run forest district), III – the same as in II but assuming minimal costs. The different types of forestry companies were then subjected to a more detailed analysis with respect to the following factors: A – only their own administrative costs, B – administrative costs and overheads assumed to be the same as in the State Forests, C – overheads assumed to be the same as in the State Forests but administrative costs are calculated as in A. For each of the scenarios, income, costs and revenues were calculated. The different types of forestry companies established above also allowed for an assessment of the used data and their collection.

In conclusion, incomes of the forestry companies were generally low due to forest stands being managed by companies. Only in scenario A, which assumes very low management costs, did each of the company types gain revenues. This means that the main direction for the development of forestry companies should be to maintain low management costs.

**Keywords:** company, private forests, state forests, management

### 1. Introduction

Privately owned forests are irregularly distributed in Poland, which is partially a result of various historical events. The smallest percentage of private forests is observed in the areas of the Recovered Territories, in the parts which went to Prussia after the Partition of Poland (the 1700s), and in south-eastern Poland. Then again, the share of private forests in the regions of the Podlasie and Lublin (Lubelszczyzna) Voivodeships is much higher (Wysocka-Fijorek 2014). The characteristic feature of Poland's forests of this form of ownership is their high differentiation, both in terms of the size of compact forest complexes and the average area owned by one owner.

The present paper is a continuation of the article by Wysocka-Fijorek (2013) on the concept of forestry company owned private–state owners and is a voice in the discussion on im-

proving management of non-state forests in Poland. The work includes a description of the proposed rules for the operation of different types of forestry companies, administered by private forest owners or by private and state forest owners jointly.

The aim of the study was to evaluate the functioning of different types of forestry companies under the conditions of changeable administrative and forest production costs, which formed the basis for seeking solutions to increase the efficiency of private forest management in Poland.

### 2. Company concept

#### 2.1. General assumptions

The concept of a forestry company assumes that the property value adjustment, as well as the number of shares, the num-

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ber of votes and the dividend value are determined after the approval (at maximum every 10 years) of a new forest management plan for private forests (simplified FMP) and FMP for the forest district. Furthermore, it is assumed that the update is also carried out in the situations when forest land area owned by the company changes (i.e., after entering or leaving a shareholder).

One of the essential elements of the assessment of forestry companies' activities is choosing the optimum interest rate. The characteristic feature of forest economy is a long period between incurred costs and achieved income. Hence, it is suggested to accept 1–3% interest rates (Ostrowski 1976; Klocek 2000; Podgórski et al. 2001; Begg et al. 2007).

In Finland, in spruce and pine stands, the forest rent amounts up to 4% at the maximum yield determination (Hyytiäinen, Tahvonen 2003; Hyytiäinen, Penttinen 2008). Different forest rent values were tested (calculated) in beech stands located in Germany. The results showed that at the optimal rotation, the forest rent was about 2% (Hampicke 2001). In turn, the calculated rent for German forests (as a whole, not selected tree species) amounted to approximately 1.3% (Möhrling 2001). In Lithuanian forestry, the assumed level of the forest rent rate is 2% (Hjortsø, Straede 2001). In Russia, the forest rent rate ranges from 1.5% to 3% (Petrov 1996; Počinkov 2004; Czuprov 2005, 2007).

Partyka and Parzuchowska (1993) made use of the interest rate  $p = 5\%$ . They pointed out, however, that this was only an estimated value, in view of the fact that detailed studies on interest rates had been lacking. Żylicz (2005, 2008) noted that in Poland, in a range of calculations, the interest rate for forests was often assumed as 4%. This is not a good value, as under Poland's geographical conditions, a rate of augmentation of forest resources of commercial importance is approximately 1.5%. Therefore, accepting the higher interest rate is not justified. As a matter of fact, the interest rate of 1.5% was used by Zajac et al. (2008).

In the present study, the interest rate  $p = 1.5\%$  was used as well to calculate the value of plots of forest land.

## 2.2. Forest plot value

The calculations were performed using the “Tables of forest stand indicators” as developed by Zajac et al. (2008) for calculating the forest value based on tree species and tree site class, as well as the age of dominant species in a given tree stand. For the purpose of the present study, this method was modified in order to calculate the stand value on the basis of data on the dominant species in the tree layer. Thereby, it was assumed that the economic value of admixture species is close to that of the main tree species in the forest evaluated. The following formula (1) was used:

$$W_g = Wk_g (\vee Ws_g) \cdot Zd \cdot P \cdot C \quad (1)$$

where:

$W_g$  is the value of trees of species  $g$  [PLN]

$Wk_g$  is the indicator value of expenditure incurred to establish and manage 1 ha of the stand with tree species  $g$ ,

$Ws_g$  the indicator value of 1 ha of tree species  $g$  on the trunk,

$Zd$  the standing crop factor,

$P$  the forest plot area [ha]

$C$  the weighted average of wood price achieved by the forest district in the last year,

$\vee$  – “or.”

When calculating the value of the forest plot, the value of forest land was not taken into account. It was presumed that the ground constituted an indispensable part of the stand. Moreover, it was assumed that all the objects evaluated had comparable economic, social and natural conditions; therefore, the ground values were analogous. When properties other than forests or lands for afforestation are to be incorporated into the company, then there are recommended valuation methods included in the Standard V06 adopted by the National Council of the Polish Federation of Valuers' Associations, used in accordance with the type of the property valued.

## 2.3. The number of shares of a given partner

The own way of assessing the share size in the company was proposed. The effect of stand age on the number of shares was levelled. In order to standardize and introduce comparability of stands with different species composition, age and other biotic (valuation) parameters, the index value called ‘initial share’ ( $Uw_g$ ) was calculated for each plot (2):

$$Uw_g = Du_g \cdot P \cdot Zd \quad (2)$$

where:

$Du_g$  is the differentiating factor for species  $g$  (Table 1)

$P$  the forest plot area [ha]

$Zd$  the standing crop factor.

**Table 1.** Factors differentiating species ( $Du_g$ ) to the calculation of the shares in the company (for use in the formula 2) – own elaboration

Main tree species	Main tree species site class index					
	Ia	I	II	III	IV	V
pine	1.5	1.3	1.0	0.6	0.5	0.4
fir		2.7	1.9	1.4	1.1	0.9
spruce		2.4	1.8	1.3	0.9	0.6
beech		1.4	1.0	0.8	0.6	0.5
oak		1.8	1.5	1.1	0.9	
alder		1.1	0.8	0.5		
aspen		1.1	1.0	0.6	0.4	
birch		0.7	0.6	0.4	0.3	
hornbeam		1.0	0.9	0.8	0.6	0.3

When developing the indexes, which differentiate species (factors differentiating species,  $Du_g$ ), the tree species site class, which corresponds to the potential production capacity of a given habitat, and is a factor with low variability for the duration of a long period of time was taken into account. The species differentiation index (Table 1) is the result comprising the value of the stand with the dominant species  $g$  and its site class, as well as the indexes  $Wk_g$  and  $Ws_g$ , at the time of plantation establishment, at the age of 50 years and at the stand cutting age. The table is constructed so that the sum of the index values is 41 (so many are the plots), and the average value of the index is 1. After calculating the “initial share”  $Uw_g$ , the partner’s “fixed share”  $Uu_g$  was calculated, done by dividing each calculated  $Uw_g$  value by the smallest  $Uw_g$  value in the company.

#### 2.4. The number of votes of a given partner

For the purpose of calculations, it was assumed that the divisor of the votes is the smallest fixed share ( $Uu_g$ ). In addition, fractions were not included in the calculation of votes, and the final number was determined after mathematical rounding. If, as a result of preliminary calculations, it turned out that the number of votes of one owner exceeded  $2/5$  of the total, then it was reduced to  $2/5$ . The decrease in the number of shares resulted from the concern as regards the possibility of taking over the power of the company by one (main) shareholder.

#### 2.5. The dividend of a given partner

The dividend and participation in company losses are to be paid in proportion to the fixed share values  $Uu_g$  (and not to the value of the forest property contributed to the company). The more shares the partner has, the proportionally higher is the dividend obtained. This implies that when the company makes a loss, the partner participates in the settlement in proportion to the shares held.

#### 2.6. Rules on withdrawal from the company

The fee  $O_m$  paid by the partner who withdraws from the company amounts to:

$$O_m = x \cdot p + K - P + L + d \cdot w_d \quad (3)$$

where:

$K$  is the cost of management activities performed on lands owned by the partner

$P$  the income derived from timber obtained from plots owned the partner

$L$  the difference in the value of forest stand(s) that occurred in the period from entering the company and exiting

$x$  the fixed payment equal to the average price of  $10 \text{ m}^3$  of pine timber (type WB0 – large size, quality class B, for general use), achieved in the local forest district (per 1 ha)

$p$  the area of stand(s),

$d$  the total value of the dividend received by the partner,

$w_d$  the payment index depending on the period between entering and exiting the company (Table 2).

**Table 2.** Indicator of charges  $w_d$  (to correct a dividend in the formula 3), depending on the period between the entrance to the company, and leaving her – own elaboration

Feature	The period between the entrance to the company and leaving [years]					
	1–5	6–10	11–20	21–50	51–100	>100
$w_d$	0.95	0.85	0.8	0.7	0.4	0.1

The value of timber, the cost of management treatments and the dividend value are given in prices prevailing at the time of exit from the company. If, for important reasons, the partner applied for payment calculation based on the updated value of the factual costs and benefits, 1.5% rate would be assumed.

### 3. Research Material

#### 3.1. General characteristics of study objects

Evaluation of the performance of different types of forestry companies was verified using information pertaining to three objects (municipalities). The choice of the study objects resulted from availability of data. This connotes that for the forest tree stands analysed in this study, updated (by 2010) numerical versions of simplified FMPs (prepared for privately owned forests) exist, in line with the standard FMP Valuator, with digital map layers. In the selected municipalities, supervision of private forests was performed by the Forest District Manager.

The study assumed that data as regards the description of forest stands, included in simplified FMPs as well as in FMPs for the Forest Districts, would be updated in relation to one management year. Forest objects located in the following three municipalities were selected:

- Joniec (Mazowieckie voivodship, Płońsk township)
- Klonowa (Łódzkie voivodship, Sieradz township)
- Sieradz (Łódzkie voivodship, Sieradz township).

The study sites selected were rural communities, with a predominant share of agricultural lands, and differ in terms of the area and population density. There are also differences with regard to forest areas and their ownership structure. The Klonowa municipality is dominated by forests owned by the state forests – 79% of the total forest area (private forests – 21%). In the Sieradz municipality, the state forests

own 58% of forests (private forests – 41%). In the Joniec municipality, 12% of forests are owned by the state forests (private forests – 88%).

At the time of the study, in the Klonowa municipality, all the private forests were owned by natural persons. In the Sieradz municipality, 1581.20 ha of forests belonged to natural persons, 2.00 ha to land communities, and 4.00 ha were private forests of other forms of ownership. In the Joniec municipality, 1205.00 ha of private forests belonged to natural persons, 12.00 ha to land communities and 10.00 ha to other proprietors.

The discrepancies between the area of private forests reported to the Central Statistical Office and that incorporated into a forestry company could be due to several reasons. The first of these was the fact that the authorities of a given district formulate in a different ways contracts for the implementation of FMPs for private forest. It is possible that only the land recorded in the register as a forest was valued or a real state taxation has been made on the ground. Another reason could be that for the companies there were selected only forest stands with taxonomic descriptions.

The Sieradz and Joniec municipalities comprise similar areas (more than 1500 ha) of forest land owned privately, whereas the Klonowa municipality more than half less. In the Klonowa and Joniec municipalities, there were over 1300 private forest tree stands (at the assumed generalization that the number of those was equal to the number of forest owners), and in the Sieradz municipality, there were over 1000 forest stands (private owners) more. The average forest stand size varied between the municipalities, and ranged from 0.49 ha in Klonowa (the largest 7.78 ha) to 1.16 ha in Joniec (the largest 25.88 ha). The average stand age ranged from 40 years (Sieradz) to 45 years (Klonowa). The average stand volume ranged from 92 m<sup>3</sup> ha<sup>-1</sup> in the Sieradz municipality to 140 m<sup>3</sup> ha<sup>-1</sup> in the Joniec municipality (Table 3).

In each municipality studied, Scots pine was the most common species in forest stands. In total, pine stand shares ranged from 71% in the Sieradz municipality to 87% in the Klonowa municipality. In private forests, the area of stands with birch as a dominant species ranged from 8% in Klonowa to 18% in Sieradz. Alder occurred as a dominant species in relatively few stands, from 1% in the Joniec municipality to 4% in the Sieradz municipality. Also, as prevalent species, pedunculate oak, locust, aspen and hornbeam were sparsely present.

### 3.2. Acquisition of data on tree stands

The principal source of data were taxonomic descriptions, as part of the simplified FMPs for forests in the Sieradz, Klonowa and Joniec municipalities, which included descriptions of all forests located in the cadastral regions within a given municipality. Databases containing taxation descriptions from the Forest Districts Złoczew and Płońsk were obtained from the State Forest Information System (SILP).

### 3.3. Establishment of forestry companies

It was decided to form nine forestry companies, i.e., three company types (I, II, III) in each of the three study objects. These were as follows:

- Klonowa\_I (656.72 ha of private forests exclusively, located in the Klonowa municipality)
- Klonowa\_II (656.72 ha of private forests in the Klonowa municipality and 92.69 ha of state-owned forests, administered by the Forest District Złoczew)
- Klonowa\_III (656.72 ha of private forests in the Klonowa municipality and 92.69 ha of state-owned forests, administered by the Forest District Złoczew; in comparison to the Klonowa\_II variant with different costs of the implementation of some forest management treatments);

**Table 3.** Characteristics of private forests located in the municipalities Klonowa, Sieradz and Joniec as described in the simplified forest management plans

Feature	Unit	Community		
		Klonowa	Sieradz	Joniec
The area of private forests	ha	656.72	1 562.65	1 536.32
The numer of forest subcompartment	pcs	1 334	2 404	1 324
The smallest forest subcompartment	ha	0.01	0.01	0.03
The greatest forest subcompartment	ha	7.76	14.60	25.88
The average area of forest subcompartment	ha	0.49	0.65	1.16
The average age (weighted area)	lat	45	40	41
Average standing volume	m <sup>3</sup> ·ha <sup>-1</sup>	101	92	140
Standing volume	m <sup>3</sup>	66 155	143 697	214 409
The average site density index		0.71	0.72	0.79

- Sieradz\_I (1 562.65 ha of private forests exclusively, located in the Sieradz municipality)
- Sieradz\_II (1 562.65 ha of private forests in the Sieradz municipality and 691.83 ha of state owned forests, administered by the Forest District Złoczew)
- Sieradz\_III (1 562.65 ha of private forests in the Sieradz municipality and 691.83 ha of state-owned forests, administered by the Forest District Złoczew; in comparison to the Sieradz\_II variant with different costs of the implementation of some forest management treatments)
- Joniec\_I (1 536.32 ha of private forests exclusively located in the Joniec municipality)
- Joniec\_II (1 536.32 ha of private forests in the Joniec municipality and 164.15 ha of state-owned forests, administered by the Forest District Płońsk)
- Joniec\_III (1 536.32 ha of private forests in the Joniec municipality and 164.15 ha of state owned forests, administered by the Forest District Płońsk, in comparison to the Joniec\_II variant with different costs of the implementation of some forest management treatments<sup>1</sup>).

### 3.4. Modification of calculations with regard to company functioning

It was assumed that in each forestry company tested, the revenue was derived from the sale of wood harvested as part of forest management activities planned in the simplified FMPs or FMPs for the forest districts. In order to assess the profitability of the proposed solution, each company was analysed in three variants resulting from the company operation costs, i.e. based on (A) own administrative costs, (B) general administrative and general productivity costs, such as those determined in the state forests, (C) partly reduced general administrative costs such as those determined in the state forests.

Re: A – cost of own administration: In the simulation, the costs arising from the execution of works related to forest silviculture and harvesting (general production costs), planned in the relevant documents, as well as the cost of employment one office/field employee per 1500 ha of forests included into the company were taken into account. The duty of this member of staff was keeping detailed records of forest management activities (including expenditures and income earned from the work performed on forest properties of individual owners), checking in the field the quality of work performed by external contractors (Forest Service Units), as well as determining

<sup>1</sup> For each company of the type III, there was assumed that in the next 10 years, 50% of glades with scattered trees would be reforested, the Forest District would decrease seedling costs by 5% and precommercial thinning of young tree stands and tending of young tree stands costs would be reduced by 10% through participation of the owner in works.

forest management tasks. In addition, it was the employee's duty to apply for additional funding, which was possible to obtain from external sources. In order to calculate the labour costs, it was assumed that full-time employee receives remuneration of 2500 PLN/month gross (1808 net PLN); the annual cost of the employee incurred by the employer amounts to 36,384 PLN, including overheads; in the simulation, the value of forest tax was also taken into account<sup>2</sup>;

Re: B – general administrative and general production costs, such as those determined in the state forests. It was assumed that these costs are equivalent to those in the forest district (forests administered by the state forests)

Re: C – general administrative costs such as those determined in the state forests were partly reduced and general administrative costs such as those in the local forest district were included in the calculation. The general production costs were assumed as described in modification A.

## 4. Methods

### 4.1. Forest plot value

Tree species in the upper floor were selected for the valuation of stands. The indexes  $Wk$  (index value of costs incurred for establishment and maintenance of 1 ha stand) and  $Ws$  (index value of 1 ha stand as a standing crop, at the age when is valued) were attributed as recommended by Zajac et al. (2008). The cutting age was assumed as the minimum age of felling set out in the regulation of the Minister of Environment of 12 November 2012 on detailed conditions and procedures for drawing up the Forest Management Plan, simplified Forest Management Plan as well as on forest status inventory (*Journal of Laws* 2012, item 1302) (Regulation 2012). The stand value was calculated based on the average price of 1 m<sup>3</sup> of timber, achieved by the local forest district in 2007. In the case where species site class was not provided, the most frequent one was used in valuations. Then, it was the second (II) class for pine, oak, alder, acacia and birch, and the first (I) class for aspen. The necessity of such rough calculations concerned a small number of stands (less than 5%). The indexes for tree species not included in the regulation of the Minister of Environment of 20 June 2002 on one-off compensation for premature cutting of a stand (*Journal of Laws* 2002, No. 99, item 905) (Regulation 2002), were determined based on the pertinent tables for: Scots pine in the case of larch; fir in the case of Douglas fir; beech in the case of maple, elm and sycamore; oak in the case of ash; black alder in the case of linden, locust and poplar.

<sup>2</sup> The value of the forest tax was calculated according to the Forest Tax Act (*Journal of Laws* 2002 No. 200, item 1682)

#### 4.2. Shares of the partner and the number of assigned votes

It was assumed that the number of stands in privately owned forests was equal to the number of owners, as information on which plots belonged to whom was not available. The lack of this data resulted from the regulations on the protection of personal data and privacy.

The number of votes and shares was allocated to individual forest estates (forest divisions in the *sub\_area* table). The calculation was done by appending the indicators included in Table 1 to the table used to determine the value of the property. The adopted method of allocating votes and shares could result in assigning a single owner separately to each of forest stands that were owned by this person.

#### 4.3. Dividend of a given partner

In order to calculate the dividend for each share, the simplified simulation of the company operation was carried out. The estimation of the size of advance felling<sup>3</sup> was based on data in “The tables for calculation of effectiveness of tending cuts” (1975).

In the simulation, the data on the cost of tending treatments in the analysed forest districts were used. With regard to principal cuts, if their intensity was not specified, the total

<sup>3</sup>In the *f\_arod\_cue* table for private forests, the intensity of the treatments was not given or was reported in a very unreliable manner, e.g. timber harvesting at early thinning – 60% of weight.

volume of the stand was estimated. In the case of species not included in the tables, data for Scots pine (calculations for larch), oak (for ash), alder (for locust) and birch (for aspen, poplar or hornbeam) were used. In the case when the area of treatments was not given, the total stand area was used in the simulation (most often these areas were the same).

Based on data provided by the forest district (including reports on supervision of private forests) and literature (Bruchwald, Kłapeć 2005, 2006), the structure of wood assortment obtained during forest management activities of different type was estimated. The value of harvested timber was estimated based on wood assortment prices acquired in the year 2007, in the forest district analysed. It was assumed that in the period analysed, revenue and expense changes would be uniform; therefore, the same ratio of incomes to expenses would be maintained.

#### 4.4. Exit from the company

How the receivables arising from the exit from the company evolve was demonstrated on the example of Klonowa\_I. The estimate was based on the assumption that the company is left by the owner of 1 ha of Scots pine stand, of the second site class, with standing crop 0.7, and the cutting age 100 years. Formula 3 was used for calculations that were performed for different cutting terms in the range of 5–100 years (at 10-year intervals), assuming that at the time of establishment of the company, the stand was 5, 10, 20, 30, ..., 100 years old, whereas the cutting area (not regenerated area) was 0-year-old.

**Table 4.** The value of the plots and the number of shares and votes in the companies and their variants

Feature	Unit		
		Klonowa_I	Klonowa_II
Company area	ha	656.72	749.41
The value of parcels	thous. PLN	45 542.89	48 556.07
The average value of 1 ha of parcel	tthous. PLN·ha <sup>-1</sup>	69.35	64.79
Number of owners (forest subcompartment)	pcs	1334	1335 (1432)
The average value of forest subcompartment	thous. PLN	34.14	33.91
The value of the cheapest parcel	thous. PLN	0.09	0.09
The value of the most expensive parcel	thous. PLN	236.24	342.84
Number of shares (votes)	pcs	129 933	153 984
The largest number of shares (votes)	pcs	1695	24051
Shares of the largest partner	%	1.3	15.62
Number of partner / forest subcompartment	pcs· subcompartment <sup>-1</sup>	97	108
Number of shares	pcs·ha <sup>-1</sup>	198	205
2/5 shares	pcs	51973	61594

## 5. Results

### 5.1. The value of companies and the number of shares and votes

The value of 1 ha of forest was the highest in the forestry companies in the Klonowa municipality, where the average stand age was comparatively the highest and the lowest in the companies in the Sieradz municipality, with the stands of the lowest average age. In the companies in the Joniec municipality, the value of 1 ha forest plot showed no significant increase, even when private forests were joined together with the state forests managed by the forest district Płońsk. In the rest of the companies tested, the value of 1 ha of forest plot changed insignificantly (Table 4).

In all the companies tested, none of the owners had shares greater than 2/5. Consequently, the number of votes was not reduced and equal to the number of shares.

### 5.2. The result of operation of the companies

For all the companies in the study (9), the profit was generated only in the variant A. In other variants tested, considerably high general administrative and production costs contributed to company losses (Table 5).

The private–state forestry companies achieved the largest gain (per unit area), which reduced the cost of some forest management activities (in option A). This profit ran-

ged from 73.83 PLN ha<sup>-1</sup> year<sup>-1</sup> in the company Joniec\_III to 101.24 PLN ha<sup>-1</sup> year<sup>-1</sup> in Klonowa\_III. The lowest profits were achieved by the companies with private forests exclusively (except Joniec\_I). This was due to the fact that within state-owned forest area attached to the company (Joniec\_II and III), only a small number of management treatments were schedule, which could bring income; above all cuttings were planned only on one plot of 0.42 ha.

### 5.3. Calculation of costs of leaving the company

The costs of exit from the company incurred by the leaving partner, in the situation when the costs attributed to the plot of the partner in the period of his membership were equal to revenues obtained then by the company – amount to ± 30,000 PLN ha<sup>-1</sup>. Under some circumstances, the company should pay this amount to the account of the leaving partner; otherwise the partner has to pay such a fee. In the present study, the payment was the most dependent upon a change in the stand value (*L*). The amount paid by the partner depended on the number of years of membership in the company. If the latter was short-term, and the company with young tree stands was exited, the partner would receive compensation for the exit. The partner would bring charges in the case of long-term membership in the company with older tree stands.

The fixed cost of leaving the company would exist if the partner was a member of the company all through the production cycle, i.e. for 100 years. Then the cost would be

Company						
Klonowa_III	Sieradz_I	Sieradz_II	Sieradz_III	Joniec_I	Joniec_II	Joniec_III
749.41	1 562.65	2 254.48	2 254.48	1 536.32	1 700.47	1 700.47
48 556.07	27 662.88	50 601.75	50 601.75	35 583.01	39 920.44	39 920.44
64.79	17.7	22.44	22.44	23.16	23.48	23.48
1336 (1432)	2 405	2406 (2668)	2406 (2668)	1 324	1325(1410)	1325 (1410)
33.91	11.5	18.97	18.97	26.87	28.31	28.31
0.09	0.26	0.8	0.8	0.4	0.39	0.39
342.84	509.77	1 165.07	1 165.07	1 016.56	1 016.56	1 016.56
153 984	520 632	820 627	820 627	360 180	401 599	401 599
24051	6 327	299 995	299 995	7 570	41 419	41 419
15.62	1.2	36.56	36.56	2.1	10.31	10.31
108	217	341	341	272	285	285
205	333	308	308	234	236	236
61594	208 253	328 251	328 251	144 072	160 640	160 640

**Table 5.** The result of the operation of companies and their variants

Feature	Unit	Company								
		Klono- wa_I	Klono- wa_II	Klono- wa_III	Sieradz_I	Sie- radz_II	Sieradz_ III	Joniec_I	Joniec_II	Joniec_III
Income	thous. PLN·year <sup>-1</sup>	201.03	223.68	222.52	445.05	759.81	757.19	317.56	341.48	340.4
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	306.11	298.48	296.92	284.8	337.02	337.02	206.7	200.82	200.18
The results achieved on the basis of its own administration (Option A)										
Total expenses	thous. PLN·year <sup>-1</sup>	167.01	181.01	146.64	360.27	594.31	552.98	246.76	268.5	214.86
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	254.31	241.54	195.68	230.55	263.61	245.28	160.62	157.9	126.35
Profit	thous. PLN·year <sup>-1</sup>	34.02	42.67	75.88	84.78	165.5	204.21	70.8	72.98	125.54
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	51.8	56.94	101.24	54.25	73.41	90.58	46.08	42.92	73.83
Dividend per 1 share	PLN·year <sup>-1</sup>	0.26	0.28	0.49	0.16	0.2	0.25	0.2	0.18	0.31
Dividend largest partner	thous. PLN·year <sup>-1</sup>	0.59	8.68	13.87	1.33	60.5	74.65	1.49	7.53	12.95
Results after taking into account administrative costs and production such as in state forests (variant B)										
Income	thous. PLN·year <sup>-1</sup>	304.63	347.62	347.62	724.85	1045.76	1045.76	840.61	930.43	930.43
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	463.86	463.86	463.86	463.86	463.86	463.86	547.16	547.16	547.16
Zysk / Profit	thous. PLN·year <sup>-1</sup>	-103.6	-123.94	-125.1	-279.8	-285.95	-288.57	-523.06	-588.95	-590.03
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	-157.75	-165.38	-165.38	-179.06	-126.84	-126.84	-340.46	-346.34	-346.98
Dividend per 1 share	PLN·year <sup>-1</sup>	-0.8	-0.8	-0.8	-0.54	-0.35	-0.35	-1.45	-1.47	-1.47
Dividend largest partner	thous. PLN·year <sup>-1</sup>	-1.35	-19.36	-19.36	-3.4	-104.53	-105.5	-10.99	-60.74	-60.85
Results after taking into account administrative costs, such as the local forest district, while production costs such as indicated in option A (variant C)										
Income	thous. PLN·year <sup>-1</sup>	343.71	384.87	350.5	789.41	1243.86	1202.51	727.55	831.71	778.07
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	523.37	513.56	467.7	505.17	551.72	533.39	473.57	489.11	457.56
Profit	thous. PLN·year <sup>-1</sup>	-142.67	-161.2	-127.98	-344.36	-484.03	-445.32	-410	-490.23	-437.67
	PLN·ha <sup>-1</sup> ·year <sup>-1</sup>	-217.25	-215.08	-170.78	-220.37	-214.7	-197.53	-266.87	-288.29	-257.38



Feature	Unit	Company								
		Klono- wa_I	Klono- wa_II	Klono- wa_III	Sieradz_I	Sie- radz_II	Sieradz_ III	Joniec_I	Joniec_II	Joniec_III
Dividend per 1 share	PLN·year <sup>-1</sup>	-1.1	-1.05	-0.83	-0.66	-0.59	-0.54	-1.14	-1.22	-1.09
Dividend largest partner	thous. PLN·year <sup>-1</sup>	-1.86	-25.18	-19.99	-4.18	-176.94	-162.79	-8.62	-50.56	-45.14

7,100 PLN ha<sup>-1(4)</sup>. If the partner pre-empted the company's membership before or after the end of the entire production cycle, then the costs would differ, depending on the time of the exit.

As a general rule, with a short period of membership, the partner would be obliged to pay a fee to the company. With longer membership (over 20 years), the fee would greatly depend on the age of the tree stand at the time of payment as well as the number of years of membership of a given partner. If at the time of leaving the company, the partner received back the forest part covered with a stand at the age close to that planned for cutting or at the cutting age, then a substantial payment to the company would have to be made.

## 6. Discussion

Based on data with reference to forest management planning and economic sources, the concept of different types of forestry companies was evaluated: private and mixture of private and state-owned forests. The study undertaken allowed for reviewing the quality of data, possibilities of data collection and its availability. Among others, the results indicated a necessity to introduce a novel regulation on the substance of simplified FMPs and improved recommendations on private forest inventory. The regulation should state that the inventory of forests should be conducted not for forest complexes, but for cadastral regions, for which the areas designated for the inventory to be carried out should be determined. It is also advisable to introduce electronic versions of forest management plans (e.g. in the standard "PU Taksator" program), along with the numerical map with the

geodetic background. Data inconsistency was also pointed out by Widawska (2007). Another issue is the order of ownership (including the conduct of inheritance proceedings) and updating land use categories. At present, it is difficult to identify the plots in the area in the way that did not cause unintended use of other property (Remuszko 2009; Łukasik 2009). The latter problem is less relevant in the case of establishing a forestry company in a given area.

In order to illustrate the company operation, it was particularly important to use the cost of its operation to evaluate its performance. In the first modification (A), it was assumed that this cost resulted from expenditure on forest works and on employment of one worker per 1500 ha of forest. Is this approach right? It can be compared with solutions in Austria. There, the Forest Act of 1975 mandated forest management in farms larger than 500 ha at the expense of forest owners. In addition, there was ordered employment of a forester who had passed a state examination. One forest sub-district manager was responsible 1800 ha, but on the area greater than 1800 ha, at least one forester was obliged to have academic education (Gołos, Głaz, April 2003). In the Austrian forests (ÖBfAG), for about 1000 ha of forest land, one member of office staff is employed and on average 1.3 physical workers are involved in wood harvesting. In Poland for the forest district (about 4300 hectares), one member of office staff is employed, whereas forest management activities are performed by private companies (Klocek, Płotkowski 2010).

The positive financial result of the forestry companies under the study was obtained when the cost modification A was considered in the calculation. On the other hand, the negative financial result was caused by taking into account the costs incurred by the local forest district (modification B) or in the case when general administrative costs were calculated as it was in the forest district, while the general production costs included those of the implementation of planned management activities (modification C). Therefore, two questions arise: (1) were the general administrative and production costs calculated in the forest district too large? (2) in this context, is establishment of a private–state forestry company by any means profitable?

<sup>4</sup> This result is related to the assumed parameters of the stand and to estimated costs of the company. It practically means that within the whole production cycle, the calculated and paid dividend was too small. In reality, in the case of settlements made every 10 years, the dividend would be corrected (in this case increased). As a result, a shareholder (his heir), who wants to leave the company after 100 years, would have to make a relatively small contribution.

The answer to the first question, albeit very important, exceeds the scope of this article. Regarding the second issue, the following interpretation can be presented. First, the state of forests included in the company was so unsatisfactory that it could not allow to achieve high revenue. Second, quite large average costs of the forest district were probably associated with more intense management, and this in turn, enabled achieving greater revenue per unit area of the forest.

From the above, there follow essential effects for the functioning of a private–state forestry company. To begin with, first, it seems crucial to separate the cost of management of the company’s forests, as taking into account the forest district’s average costs can significantly distort the economic account. Second, improving the condition of the forest would involve a transitional period of disproportionate expenditure. Then, it would be advisable to look for external sources of funding. Third, taking into consideration only the economic aspect could point to the need for extensive management. This is confirmed by the results of Głaza (1998) and Gołosa et al. (2003). Fourth, this study confirmed that forest management, regardless of the ownership form, can be profitable (Zajac 1998, Klocek 2000, 2009a, b, c, d; Gałęzia 2009, Gołos 2009).

## 7. Conclusions

The results of the study carried out allow for drawing the following conclusions:

1. Before establishing a real private–state forest company, it is not only necessary to estimate its economic effects, but also social and natural impact (mainly possibilities of improved nature protection, clarity of recreational access, equality of owners’ income, improvement of forest condition and as a result increasing profitability). These effects, partly immeasurable and to varying degrees of appeal to the partners, can determine the success of a company.

2. The rules for the payment in the event of leaving the company were designed to discourage departing. The financial disincentive is constantly present, even though, there occur periods when the partner could receive compensation at the time of leaving the company (which depends on the period of membership and age of the forest stand).

3. The presented rules for the payments in the case of leaving the company by a shareholder are an example of practical solution to the typical problem that arises when the company is established. Depending on the nature of the site or social conditions, there may be a need to design other solutions, such as those for the company’s members who illegally harvest wood.

4. In terms of profitability, state-owned forests on dispersed plots or those in ownership mosaics (apart from compact forest complexes) were similar to adjacent privately owned

forests. Assuming that the profitability status is unsatisfactory, it becomes an argument to seek possibilities to improve the condition of forests of both forms of ownership.

5. The financial effectiveness of the companies under the study was largely influenced by the administrative costs. At the assumption that administrative costs were the same as in the state forests, the companies tested suffered a loss. This implies both the need to reduce administrative costs and to account them separately in a given private–state forestry company, and not based on the average costs obtained at a level of the forest district within the state forests.

## Conflict of interest

The author declares no potential conflicts.

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