

THE STRUCTURE AND DISTRIBUTION OF HARVESTERS AND FORWARDERS IN INDIVIDUAL REGIONAL DIRECTORATES OF THE STATE FORESTS IN POLAND IN THE EARLY 2010'S

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Abstract. In Poland, the demand and availability of high efficiency machines such as harvesters and forwarders has been increasing in the last decade. On the one hand, forestry needs technologies safe for the environment, soil, water, and people. On the other hand, Polish forestry investors and service companies are constantly buying both new and second-hand harvesters and forwarders. The main aim of this paper was to determine the actual number of machines currently used in Poland. The secondary objective was to describe the ownership structure of these machines. Information on the number of forest machines is very important for economic reasons. The Key Performance Indicator (KPI) informs us “where we are” and what tendency and trends we may expect. The number of forest machines needs to be monitored on a regular basis.

Key words: harvester, forwarder, distribution of harvesters and forwarders in Poland

INTRODUCTION

The history of use of forest machines for timber harvesting, i.e. harvesters, and for timber forwarding, i.e. forwarders, is relatively short in case of Poland in comparison to other countries, particularly in western Europe. This results partly from the political and economic situation of Poland up to the late 1980's and from the common approach to machine timber harvesting methods.

The determination of the number of harvesters and forwarders in Poland has never been easy. According to Moskalik [2004], in 1987, for the first time in the history of the State Forests National Forest Holding, three Makeri 34T harvesters were purchased. A little earlier, in the early 1970's, a Kokums processor was purchased to clear whole stands for the coal mine in Belchatów. Around that time in Polish forestry a new type of

machines was introduced, i.e. fellers mounted on Ł-34 loaders with ND-600 heads for trees with cutting diameter of 52 cm and N-5 heads mounted on farming tractors for trees of max. 30 cm in cutting diameter. They were knife heads and despite the fact that their designer Więsik introduced a revolutionary solution consisting in cutting with a simultaneous sidewise movement of knives they were not commonly used. As it was claimed by the opponents of this solution, such felling could cause microfractures of felled trees [Wojtkowiak and Żabierek 2011]. Over a longer time perspective it may be stated that centrally planned economy of that time blocked any attempts aiming at improvement of mechanization by district foresters. In 2004 in Poland a total number of 15 harvesters were operating [Moskalik 2004]. For comparison, according to Borchert and Kremer [2007] in Germany the first harvesters and forwarders started to be introduced to German forests on a wide scale in the 1990's. The last and probably the most significant aspect making forest multifunction machines so specialised or even niche products is the compliance of their technical solutions with EU requirements concerning environmental protection. Every system and subassembly of presently produced forest machines has to meet currently binding regulations, starting from TIER III a or TIER IV exhaust emission standards and regulations concerning oil quality, unit pressure on forest soil up to standards connected with noise emissions.

MATERIAL AND METHODS

In order to precisely determine the number of forwarders and harvesters currently used in Poland, special questionnaires were developed. In the first stage of data collection the questionnaires were sent to all Regional Directorates of the State Forests. Data collected from these questionnaires concerned machines owned by forest service companies.

What is essential, the questionnaires contained information on accurate address data of every forestry entrepreneur and the number of forest machines owned, with information on their producers and types. Such a form of data collection eliminates the risk of the so-called double accounting for machines in a situation when one entrepreneur leases a machine to another one in order to realise a task connected with timber harvesting or is realising tasks in several forest districts at the same time.

The second stage was to collect information on the number of working machines owned by the State Forests National Forest Holding. This information is presented in the form of an Excel spreadsheet as an extract from SILP. The third stage of comprises data processing.

According to the authors of the study, such a method of data collection on the number of forest machines in Poland is the most reliable. The Regional Directorates of the State Forests are state institutions and employees responsible for this information act according to established procedures, including those connected with responsibility for their quality. Thus the risk of recording erroneous data may result only from negligence of a given employee. Reliable information may not be provided by quantity lists obtained from dealers of these machines in Poland. Firstly, reliability of data may hardly be expected in the business community facing strong competition and operating on a relatively new, developing market. Binding rules of competition prevent publication of such data, since they may be used by aggressive competitions. Thus there is a risk of receiving biased data. These observations are based on almost 20-year professional

experience in the industrial and business environment, gathered by one of the authors of these analyses.

Secondly, in the course of field work connected with forest machines and concerning e.g. their condition, origin or age, it turned out that used forest machines appeared on the Polish market, imported directly by Polish forest entrepreneurs. Such a situation prevents an objective determination of the number of machines in Poland based on information collected from dealers.

As it was reported by Kusiak [2008 a, b] in 2008 in Poland 157 harvesters and 262 forwarders were used. Based on cautious estimates it may be assumed that in the middle of 2008 the share of harvesters in timber harvesting in Poland was 8% and the share of forwarders in extraction operations was approx. 13%.

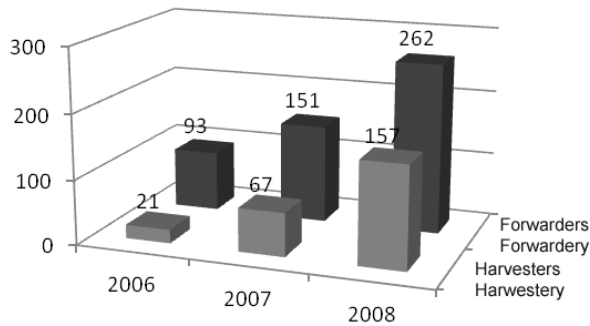


Fig. 1. Number of harvesters and forwarders in 2006-2008 by Kusiak [2008 b]

Rys. 1. Zestawienie liczby harwesterów i forwarderów w latach 2006-2008 według Kusiaka [2008 b]

As it was reported by the author, this number was determined on the basis of information supplied by dealers of these machines. It needs to be stressed here that the division of machines applied at that time concerned three categories of machines, i.e. forwarders, miniharvesters and harvesters.

RESULTS

It results from the latest studies conducted at the turn of 2011 and 2012 by the authors of this paper that currently 836 machines are used in Poland. Of this number 42 machines are owned by the State Forests National Forest Holding, while 794 machines are property of forest service companies. Highly interesting data are supplied by the number of machines owned by forest service companies in individual Regional Directorates of the State Forests.

As it results from this list, the highest number of harvesters is used by private forest entrepreneurs from the area administered by the Regional Directorate of the State Forests in Szczecin. There are 61 machines in that area. In contrast, the lowest number of these machines is used in the area of the Regional Directorates of the State Forests in Krosno and Krakow (with 1 machine in each).

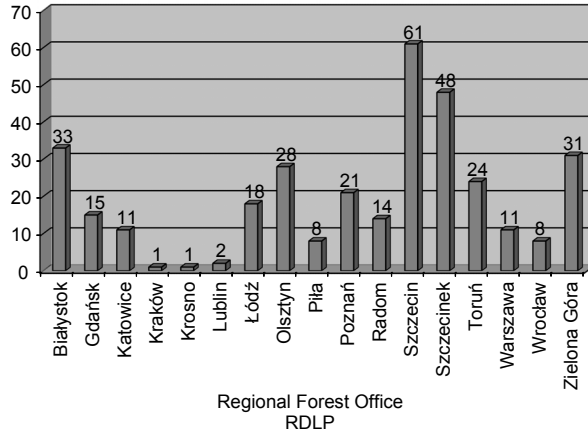


Fig. 2. Number of harvesters belonging to private forest services contractors in successive the Regional Forest Offices in 2011/2012

Rys. 2. Liczba harwesterów należących do zakładów usług leśnych w poszczególnych RDLP w Polsce na przełomie 2011/12

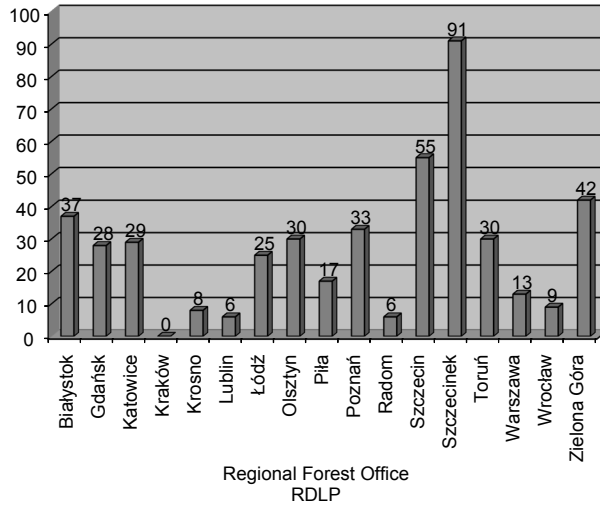


Fig. 3. Number of forwarders belonging to private forest services contractors in successive the Regional Forest Offices in 2011/2012

Rys. 3. Liczba forwarderów w zakładach usług leśnych w poszczególnych RDLP w Polsce na przełomie 2011/12

As it results from Figure 3, the biggest number of forwarders is used by companies based in the Regional Directorate of the State Forests in Szczecinek. In that area there are as many as 91 forwarders. What is interesting, in the area administered by the Regional Directorate of the State Forests in Krakow there are no forwarders.

It may not be determined from the information published to date on the numbers of machines in Poland how many of these machines were owned by the State Forests National Forest Holding and how many belong to private owners. The numbers of enterprises owning these machines was not supplied, either. It is a highly significant economic index, carefully investigated and analysed in western European countries. Such studies are conducted in Finland every 5 years. As it was reported by Penttinen et al. [2008], studies were performed in order to estimate the number of service companies working for forestry, the number of owned forest machines, the number of employees as well as their annual turnover, costs and income. It results from the analyses that in Finland, which in 2006 harvested 56 million m³ round wood and in the record-holding year of 2007 as much as 64 million m³ round wood, approx. 1600 forest enterprises are operating, conducting e.g. timber harvesting operations. Additionally, approx. 1300 farmers offer services in this field, which is treated as an extra source of income. Financially the annual potential of the forest market in Finland is estimated at approx. 520 million Euro. What is of interest, entrepreneurs owning only 1 machine constitute over 1/3 all entrepreneurs, but their annual turnover accounts for only 13% turnover of all entrepreneurs. Entrepreneurs, owning at least seven forest machines, constitute only 10% of all entrepreneurs and their annual turnover accounts for over 20% turnover of the whole sector. It also results from the conducted investigations that 4059 people are professionally connected with this sector and there are 2975 all types of forest machines in Finland. A continuous analysis of these data makes it possible to respond to a situation when any of the indexes considerably diverges from the trend.

It results from the investigations conducted by Wojtkowiak and Żabierka that at the end of 2011 in Poland there were 359 private forest enterprises (forest service companies) owning harvesters and forwarders.

As it results from Table 1, in Poland at the turn of 2011-2012 a total number of 364 forest service companies used 459 forwarders and 335 harvesters, which gives a total number of 794 specialist forest machines.

Figure 4 presents the number of forest service companies owning forwarders or harvesters in the Regional Directorate of the State Forests in Szczecinek. There are 81 companies having such machines in the area administered by this directorate. The lowest number of private companies having such multifunction machines is found in the Regional Directorate of the State Forests in Krakow. There was only one enterprise, which purchased 1 harvester.

Figures 5 and 6 present the distribution structure of harvesters and forwarders owned by the State Forests. It results from the collected data that the State Forests National Forest Holding has 42 machines, of which 16 are harvesters and 26 are forwarders, with the former based in 7 Regional Directorates of the State Forests. One is found in each of the areas administered by the Directorates in Poznań, Szczecin and Wrocław, two in that based in Zielona Góra, 3 – in Toruń and 4 each in Białystok and Katowice. In turn, forwarders are also found in the Lublin directorate (1) and in the Łódź directorate (four forwarders).

As it results from Table 2, all these machines are distributed in the area of nine Regional Directorates of the State Forests. The biggest number, i.e. as many as 9 machines

Table 1. Number of harvesters and forwarders belonging to private forest services investors in relation to the Regional Forest Offices in 2011/2012

Tabela 1. Liczba harwesterów i forwarderów będących w posiadaniu zakładów usług leśnych z podziałem na RDLP na przełomie 2011/12

Regional Directorates of the State Forests RDLP	Entities Podmioty	Forwarders Forwardery	Harvesters Harwestery
	pcs – szt.		
Białystok	32	37	33
Gdańsk	18	28	15
Katowice	19	29	11
Kraków	1	0	1
Krosno	8	8	1
Lublin	5	6	2
Łódź	24	25	18
Olsztyn	22	30	28
Piła	15	17	8
Poznań	23	33	21
Radom	10	6	14
Szczecin	35	55	61
Szczecinek	81	91	48
Toruń	26	30	24
Warszawa	9	13	11
Wrocław	8	9	8
Zielona Góra	28	42	31
Total – Razem	364	459	335

each, is owned by the Regional Directorates of the State Forests in Białystok and in Katowice, of which four each are harvesters and five are forwarders. The lowest number, i.e. only one forwarder, is owned by the Regional Directorate of the State Forests in Lublin.

Very interesting conclusions may be drawn from the number of machines belonging to forest service companies and the State Forests National Forest Holding in terms of the division into individual Regional Directorates of the State Forests. Based on these data we may gain insight into progress in mechanization of timber harvesting technological processes nationwide.

We need to mention here the fact that sales of forest machines in Europe in the years 2006-2007 were unprecedented in the entire history of forestry mechanization. This could have been caused by the disproportionately growing demand for timber. A market analysis conducted in Bavaria by the Technical University in Munchen evidently indicates a predominance of sales of new machines by John Deere. The share of this company in the sales of machines in 2007 amounted to 32% harvesters and 35% forwarders [Borchert and Kremer 2007].

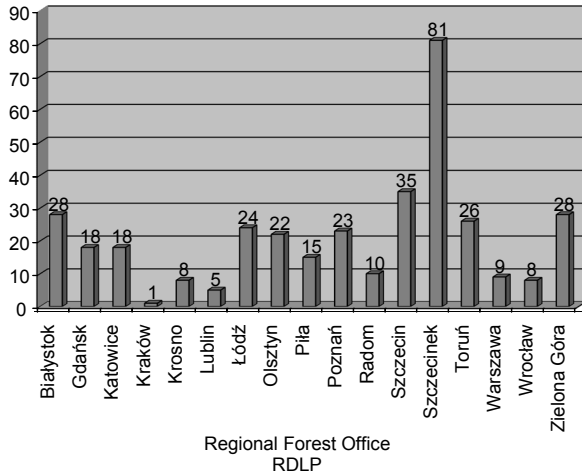


Fig. 4. Number of Entrepreneurs with harvesters and forwarders in relation to the Regional Forest Offices in Poland

Rys. 4. Liczba zakładów usług leśnych posiadających harwestery lub forwardery w poszczególnych RDLP w Polsce

Table 2. Number of harvesters and forwarders belonging to the State Forests in 2011/2012

Tabela 2. Liczba harvesterów i forwarderów będących w posiadaniu Lasów Państwowych z podziałem na RDLP na przełomie 2011/12

Regional Directorates of the State Forests RDLP	Harvesters, pcs Harwestery, szt.	Forwarders, pcs Forwardery, szt.
Białystok	4	5
Katowice	4	5
Lublin	0	1
Łódź	0	4
Poznań	1	1
Szczecin	1	1
Toruń	3	3
Wrocław	1	4
Zielona Góra	2	2
Total – Razem	16	26

The economic prosperity of 2007 caused a situation when in Europe the predominant trend was connected with the purchase of heavy and sturdy harvesters. In as many as 74% cases owners decided to buy harvesters with engine power of over 140 kW. What is of interest, 25% of harvester sales recorded in 2007 were crawler machines by Atlas Kern/Impex (Germany).

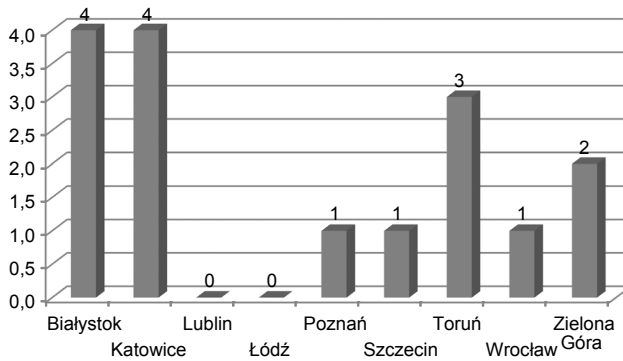


Fig. 5. Number of harvesters belonging to State Forests in relation to the Regional Forest Offices in Poland in 2011/2012

Rys. 5. Liczba harwesterów w Lasach Państwowych w poszczególnych RDLP na przełomie 2011/12

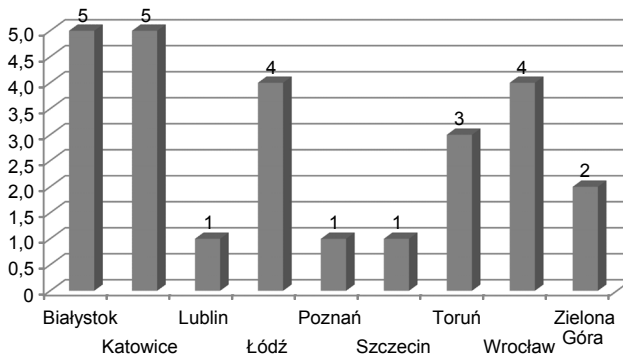


Fig. 6. Number of forwarders belonging to State Forests in relation to the Regional Forest Offices in Poland in 2011/2012

Rys. 6. Liczba forwaderów w Lasach Państwowych w poszczególnych RDLP na przełomie 2011/12

Due to the problem of forest soil protection, highly publicised in Europe by the Kuratorium für Waldarbeit und Forsttechnik, the sales of 8-wheel harvesters increased considerably to 86% total sales. What is of interest, in Austria 50% of harvesters are crawler machines. As it was reported by Harbauer*, for several years now the number of forwarders and harvesters in Germany has remained stable. The number of forwarders is estimated at 1800 and the number of harvesters – at 1300 machines. From the economic point of view this market is considered by experts to be saturated.

*Harbauer P., 2012. E-mail of 15.03.2012.

Table 3. The total amount of harvesters and forwarders used in Poland with reference to the Regional Forest Offices in 2011/2012

Tabela 3. Liczba harwesterów i forwarderów użytkowanych w Polsce z podziałem na RDLP na przełomie 2011/12

Regional Directorates of the State Forests RDLP	Number of entities Liczba podmiotów	Forest service companies Zakłady usług leśnych			State Forests Lasy Państwowe			Total number of machines in forest service companies and the State Forests Łącznie maszyny w ZUL z LP
		forwarders pcs forwardery szt.	harvesters pcs harwestery szt.	total number of machines for forest service companies łącznie maszyn w ZUL	forwarders pcs forwardery szt.	harvesters pcs harwestery szt.	total number of machines for the State Forests łącznie maszyny w LP	
pcs – szt.								
Białystok	32	37	33	70	5	4	9	79
Gdańsk	18	28	15	43				43
Katowice	19	29	11	40	5	4	9	45
Kraków	1	0	1	1				1
Krosno	8	8	1	9				9
Lublin	5	6	2	8	1	0	1	9
Łódź	24	25	18	43	4	0	4	47
Olsztyn	22	30	28	58				58
Piła	15	17	8	25				25
Poznań	23	33	21	54	1	1	2	56
Radom	10	6	14	20				20
Szczecin	35	55	61	116	1	1	2	118
Szczecinek	81	91	48	139				139
Toruń	26	30	24	54	3	3	3	57
Warszawa	9	13	11	24				24
Wrocław	8	9	8	17	4	1	5	22
Zielona Góra	28	42	31	73	2	2	4	77
Total Razem	364	459	335	794	26	16	42	836

DISCUSSION AND CONCLUSIONS

On the basis of the conducted investigations it may be stated that in recent years a considerable increase has been observed in the numbers of multifunction machines (harvesters) and extraction machines, such as forwarders, working in Polish forests.

Forest service companies, despite the relatively unstable situation resulting from the requirement to enter into annual bid tenders for the performance of services for the State Forests, with increasing frequency they turn to modern machines capable of performing heavy operations. However, it needs to be mentioned here that such purchases very often are not based on rational economic calculations. For this reason the policy of the State Forests administration seems surprising. It seems that the purchases are typically rather irrational. They do not meet the gap resulting from a lack of machine purchases by private users, but rather accumulate greatly on an already saturated area.

Summing up it needs to be stressed that an increase in the number of forest machines observed in recent years in Poland is disproportionately high in comparison to the previous years. It results from data reported by Kusiak [2008 a] that in August 2008 the total number of forest machines was 385. As it is presented by the latest studies, over a period of approx. 3.5 years the number of machines in Poland increased to 836. Undoubtedly it is one of the fastest increases in the numbers of these machines in Europe. Such a great increase shows a trend and illustrates the great potential for prospective dealers of forest machines exhibited by the Polish market of forest machines. Thus the degree and level of customer service by dealers of these machines has to improve. This also concerns training for operators of these complicated machines.

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STRUKTURA I ROZMIESZCZENIE W POSZCZEGÓLNYCH REGIONALNYCH DYREKCJACH LASÓW PAŃSTWOWYCH HARWESTERÓW I FORWARDERÓW W POLSCE NA POCZĄTKU DRUGIEJ DEKADY XXI WIEKU

Streszczenie. Celem pracy było stwierdzenie liczby harwesterów i forwarderów w Polsce na początku drugiej dekady XXI wieku. Bardzo istotne jest, aby na bieżąco monitorować liczbę i rodzaj maszyn, którymi pozyskuje się drewno w Polsce. W jakim kierunku i jak

rozwijają się mechanizacja pozyskiwania drewna? Od czasu ostatniej analizy z 2008 roku zmieniło się bardzo dużo na rynku zarówno polskim, jak i europejskim. W latach 2008 i 2009 nastąpił kryzys gospodarczy, wprowadzono nowe rozporządzenia i zalecenia w różnych krajach Europy Zachodniej, traktujące o ochronie podłoża leśnego. Niemniej interesujące jest rozmieszczenie, w zależności od podziału administracyjnego Lasów Państwowych (LP), siedzib podmiotów gospodarczych mających na stanie wysokowydajne maszyny. W pewien sposób można to odnieść do lesistości poszczególnych regionów. W pracy zestawiono stan harwesterów i forwarderów w zakładach usług leśnych i będących własnością Lasów Państwowych. Niewątpliwie europejski rynek maszyn leśnych jest interesujący dla ich producentów. Liczby corocznie sprzedawanych harwesterów i forwarderów są gruntownie mierzone i analizowane przez wszystkich uczestników tego rynku. Trzeba pamiętać, że ze względu na specyfikę pracy i zastosowania należą one do grupy maszyn specjalistycznych, a to z kolei sprawia, że naprawdę niewielu jest fachowców znających się na ich doborze do odpowiednich zastosowań. Specyfika omawianych maszyn polega też na tym, że ich technologiczny rozwój oraz stosowane systemy dorównują najnowszym wynalazkom z mechaniki, hydrauliki, elektroniki oraz informatyki. Ich producenci prześcigają się w wykorzystywaniu coraz to nowszych podzespołów, które sprawiają, że maszyny są wydajniejsze, lżejsze i oszczędniejsze. Z przeprowadzonej analizy wynika, że w Polsce 364 podmiotów gospodarczych nie podlegających strukturalnie PGL LP posiada 335 harwesterów i 459 forwarderów. Bardzo interesująco przedstawia się struktura w zależności od liczby maszyn w poszczególnych RDLP. Jeśli porównamy liczbę maszyn w RDLP w Szczecinku, gdzie 81 firm ma na stanie 91 forwarderów i 48 harwesterów z RDLP w Krakowie gdzie 1 ZUL ma jedynie 1 harwestera, powstaje w pewien sposób obraz rozmieszczenia specjalizowanych maszyn na terenie polskich lasów.

Słowa kluczowe: liczba harwesterów, liczba forwarderów, rozmieszczenie harwesterów i forwarderów na terenie Polski

Accepted for print – Zaakceptowano do druku: 8.10.2012

For citation – Do cytowania: Żabiarek R., Wojtkowiak R., 2012. The structure and distribution of harvesters and forwarders in individual Regional Directorates of the State Forests in Poland in the early 2010's. Acta Sci. Pol., Silv. Colendar. Rat. Ind. Lignar. 11(4), 67-77.