

Directing the development of mechanised forest operations to meet changes in Polish forestry

Piotr S. Mederski¹, Mariusz Bembenek¹, Zbigniew Karaszewski², Martyna Gierszewska¹

¹Poznań University of Life Sciences, Department of Forest Utilisation

²Wood Technology Institute, Wood Science and Application Department

The first harvesters appeared in Poland in 1987 and were used for thinning operations. Since that time and until the end of the nineties, the number of harvesters did not exceed 20, although in the last fifteen years, rapid growth in the number has been observed. In 2006, there were 21 harvesters and a year later the number had tripled to 67. The last two surveys in 2008 and 2011/12 showed that 157 and 351 harvesters were in use in Poland. At the same time, two changes took place in Polish forestry: a growth in timber harvesting and an increase in broadleaved species. In 2011, timber harvesting amounted to 37.2 million m³, compared with 22.5 million m³ in 1995 (a growth of 65%). Broadleaved species cover in Poland is now 29% (26% by volume), compared with 13% in 1945 (15% by volume).

Both the increase in timber harvesting, a shift from manual, chainsaw-based operations to mechanised ones, and the increase in broadleaved species have brought new challenges to Polish forestry. In fact, nowadays harvesters are not only used in coniferous stands in lowlands, but also in mountainous areas and in broadleaved stands. However, as the latest research has shown, not all harvester heads are applicable and efficient for broadleaved species. Considering the above-mentioned changes in the forest sector, a detailed survey was carried out in January 2014. The aim of this survey was to gather information about the fleet of harvesters in use, paying particular attention to producers and distribution in different regions in Poland (compared with the stand species composition in these regions).

Information concerning harvesters was obtained through a survey sent by e-mail to all 430 forest districts of the Polish State Forests. Several questions related to the harvester, crane and head were formulated. Among those relevant for this research were: 1) number and make of harvesters in use, 2) serial number of each harvester, 3) machine hours (when bought and at present), 4) year of machine production and of purchase, 5) place of purchase (within the country or abroad), 6) status of the machine when bought (new or used), 7) machine owner.

In order to distribute the survey, the State Forest data base with e-mail addresses was used. After receiving the surveys back or answers (where there was no harvester) from all forest districts, final data juxtaposition was carried out with respect to the different makes. To avoid a double counting of the same harvester working in two or more forest districts, the serial number of each machine was used for identification. Some surveys were excluded from the further processing of machine hours as not all the required data were provided. Data processing was done in a way that the result could be comparable with the published data available from other countries.

According to the survey results, there were 368 harvesters in use in all the forest districts in Poland. The highest concentration of these machines was in the North-west and North-east regions of Poland. Further to the South and to the East a lower number of harvesters were observed. The most common make was John Deere (including Timberjack) followed by Ponsse, taking more than half the market between them, while Sampo and Valmet came next with ca. 10% of the market. Most of the harvesters were bought as used machines, although between 2004 and 2007 new machines were sold more often. This trend changed in 2008 and lasted until 2013. Between 2007 and 2012 the

number of new sold machines was fairly regular, fluctuating between 9 and 16 machines sold per year. 2011 was the most successful year for retailers when more than 50 machines were sold. The average harvester in Poland is ca. 7 yearsold, which is one year less than the age of the average harvester bought as used (either in Poland or abroad). Harvester use expressed in the number of machine hours per year amounted to ca. 1350 hours annually.

Statistical analysis has showed that the number of harvesters in a particular region is correlated with the total merchantable timber production of the coniferous species within the region (Spearman's correlation coefficient $r=0.75$). A stronger correlation was observed between the number of harvesters and the annual volume of merchantable coniferous timber planned for harvesting within a region ($r=0.78$).