Productivity of mechanized harvesting in coppice stands

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Introduction

Coppice is a traditional method of woodland management used all over the world. By providing a large variety of wood and non-wood products as well as other services, coppice forests are of special importance. In recent decades, in some parts of Europe, the management of coppice forests has been abandoned due to socioeconomic changes. This resulted in aged coppice stands, whose potential of providing wood products remains unutilized, in times where the demand for wood and wood-based products is constantly rising. A possible solution to this problem could be the introduction of small- and medium- sized harvesters in coppice stands. However, limited bibliography is available on the topic compared to SRC harvesting.

Materials and Methods

The study was carried at three coppice plots located in Lipowina, Northern Poland (Fig. 1) managed by the Polish State Forests Enterprise. After the plots were set, the research team started to mark the trees to be felled and morphological attributes of the trees to-be-felled were recorded (Table 1). A typical time study was carried out during the operation of a TBM 84V.II 6WD harvester, which was equipped with a Kesla 20 RH harvesting head.

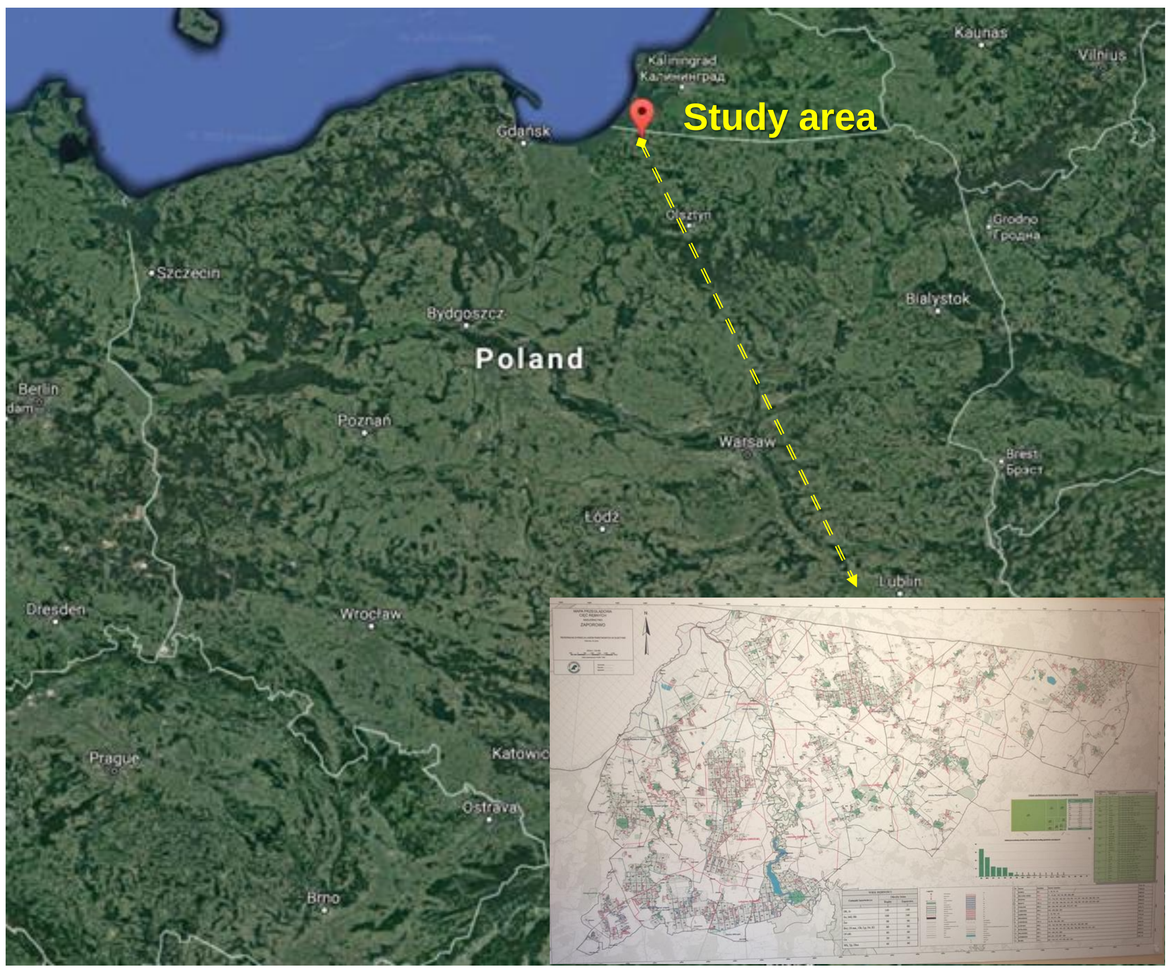

Figure 1. Map of the study area (Google 2017)

Figure 2. TBM 84V.II 6WD harvester (a), equipped with a Kesla 20 RH harvesting head (b)

	Site 1	Site 2	Site 3
Name	Kwidzyn	Zaporowo	Zaporowo
Stand number	6b	92 h	62 l
Species	Oak (80%) Pine (20%)	Alder (90%) Birch (10%)	Alder (90%) Birch (10%)
Age (years)	55	31	18
Standing Volume (m^3)	196	232	98
Felled trees (n)	216	173	103
dbh mean (cm)	18.06	14.69	14.65
dbh range (cm)	7 - 34	9 – 22	9 – 42
Tree height mean (m)	17.55	17.36	13.57
Tree height range (m)	7 - 29	11 - 21	9 - 19

Table 1. Description of the coppice plots

Results

A total of 492 trees were harvested. Productivity rates ranged from 3,76 - 10,43 m^3 h^{-1} (PMH_{15}) and production cost from 11,46 – 34,05 m^3 h^{-1} (based on PMH_{15}). Standing volume and stand trafficability exerted a significant impact on the efficiency of forest operations. Especially in sites 2 and 3, a lot of maneuvering was necessary, leading to lower productivity rates and increasing the production cost of more than two and three times, respectively.

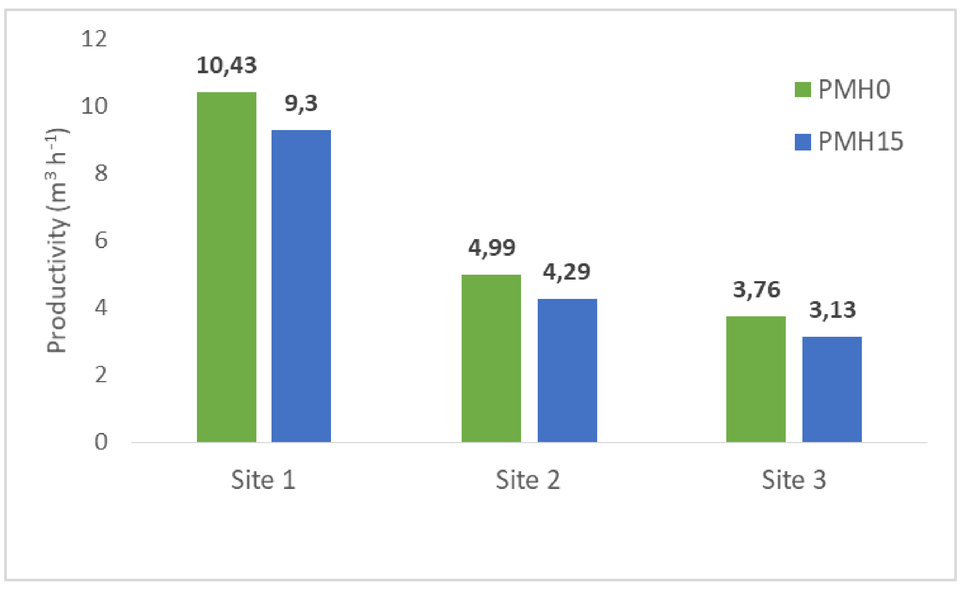

Figure 3. Productivity rates in the three stands

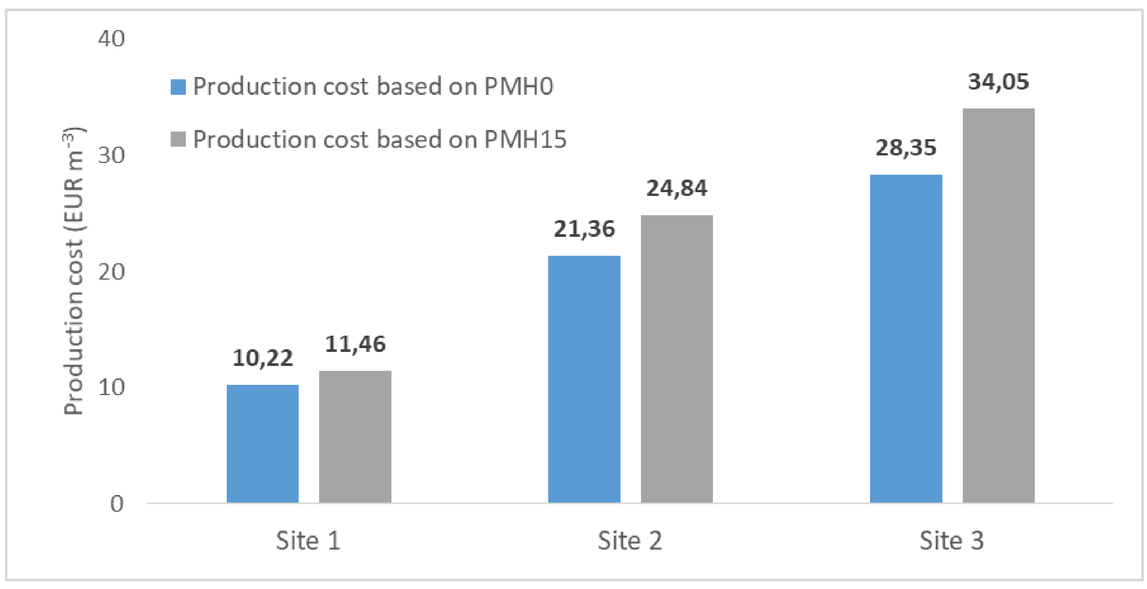

Figure 4. Production cost of 2.5 m long logs

Conclusions and recommendations

- Stand conditions were found to have a strong impact on the efficiency of forest operations.
- Reduced stand trafficability, due to increased soil moisture is linked to higher work time consumption and costly machine breakdowns. The ecological impacts of soil compaction on future stand productivity should be also examined.
- Similar technology could be introduced to coppice forests in Greece. However, the purchase of such equipment should take into consideration the wood volume to be processed, otherwise might entail dangers for the viability of the forest enterprises.

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

This study was carried out during the STSM of Petros A. Tsioras in the context of the COST ACTION FP1301 "EUROCOPPICE". Special thanks to the Wood Technology Institute in Poznan, the Polish State Forests Enterprise and in particular to Marcin Janowski for his invaluable help during the field data collection.