

## Metadata form of Silva Fennica

This form is designed for writing the elements of metadata, which are used in the description of research materials such as data and codes. The form is based on the work done in the Work Group “Description of research materials” under the Finnish Open Science Coordination.

Item	Description	Responsible
<i>Name of the data / code</i>	Planting time data based on automated data collection.	Author
<i>Author &amp; ORCID</i>	Kemppainen, Kalle: 0009-0000-6184-8812; Kärhä, Kalle: 0000-0002-8455-2974; Sairanen, Antti: 0009-0008-8632-3797	Author
<i>Authors' affiliation(s)</i>	Kemppainen, Kalle <sup>1,2</sup> ; Kärhä, Kalle <sup>1</sup> ; Sairanen, Antti <sup>1</sup> <sup>1</sup> School of Forest Sciences, University of Eastern Finland (UEF), P.O. Box 111, FI-80101 Joensuu, Finland ( <a href="https://ror.org/00cydd11">https://ror.org/00cydd11</a> ) <sup>2</sup> Natural Resources Institute Finland (Luke), Yliopistokatu 6, FI-80100 Joensuu, Finland ( <a href="https://ror.org/02hb7bm88">https://ror.org/02hb7bm88</a> )	Author
<i>Owner of the material</i>	UEF, <a href="https://ror.org/00cydd11">https://ror.org/00cydd11</a>	Author
<i>Publisher</i>	Zenodo	Author
<i>Funder</i>	UEF, <a href="https://ror.org/00cydd11">https://ror.org/00cydd11</a> ; Luke, <a href="https://ror.org/02hb7bm88">https://ror.org/02hb7bm88</a>	Author
<i>Description</i>	The objective of the study was to investigate the productivity and costs of mechanized excavator-based planting of tree seedlings based on the time information collected by the Risutec Asta documentation system. The data consisted of nine planting sites in western Finland (40,6 ha). The Asta data contained the time information of each mechanically planted seedling (72,711 seedlings). The timestamps of planted seedlings were in chronological order within the data, including the start and end time of work. The time information was presented in the format “HH:MM:SS” and included the date of planting work (YYYY-MM-DD).  The data was used to determine the production time consumption on worksites (hours), the planting time consumption per seedling (seconds seedling <sup>-1</sup> ), the loading time consumption of the seedling cassette of 160 seedlings (minutes), and the operating hour productivity (including short [ $<15$ min] delays, seedlings G <sub>15</sub> -h <sup>-1</sup> ) based on the timestamps of planted seedlings.	Author
<i>Methods</i>	The planting time per seedling was calculated by subtracting the timestamp of the previously planted seedling from the timestamp of the planted seedling. All calculations of productivity and time consumption in the study are based on the calculated planting times per seedling (s seedling <sup>-1</sup> ). Further details regarding the calculations and employed methodologies can be found in the article (Kemppainen et al. 2025). Note: In the study, all planting times of less than 4 s were excluded from the final dataset. Following the correction of the data, a total of 71 903 seedlings included in the final dataset.	Author
<i>Variables</i>	In the dataset, the variables “Seedling”, “Date”, “Timestamp” and “Planting time (s)” describe a single mechanized planting event. Dates and Timestamps are presented in the format “DD.MM.YYYY” and “HH:MM:SS”, respectively (planting observations are in chronological order and organized by planting site [Site 1–9]). The unit of the variable “Planting time (s)” is a second (s).	Author
<i>Author keywords</i>	Risutec Asta; Machine data; Mechanized planting; Planting time	Author

<i>Vocabulary keywords (community standard)</i>	-	Author
<i>Discipline</i>	Forest science	Archive/Repository/Publisher
<i>Type of material</i>	Research data	Author
<i>Language</i>	eng	Author
<i>Time range covered</i>	2019-07-01–2020-08-05	Author
<i>Geographic region</i>	FIN. The coordinates of the study area are 60°41'52"N–61°59'38"N and 21°36'24"E–23°48'49"E.	Author
<i>Version</i>	-	Author
<i>File format(s)</i>	CSV & XLSX	Author
<i>Availability of the materials (open, embargo, registration, limited, registration required)</i>	The data are available upon request from Kalle Kemppainen or through the open research repository Zenodo.	Author
<i>Justification for access restrictions</i>	The research data will be available to everyone.	Author
<i>Licence</i>	CC BY 4.0 <a href="#">Creative Commons licences</a> .	Author
<i>Connections with other research materials</i>	No	Author
<i>Access to the connected research materials</i>	-	Author
<i>Codes only: hardware/software requirements for running the code</i>	-	Author
<i>Connections to other products of research</i>	Kemppainen K, Kärhä K, Laitila J, Sairanen A, Kankaanhuhta V, Viiri H, Peltola H (2025) Evaluation of the productivity and costs of excavator-based mechanized tree planting in Finland based on automated data collection.	Author
<i>Personal data</i>	No	Author
<i>Confidential or secret data</i>	No	Author
<i>Publication date</i>	30.10.2024 (Zenodo)	Archive/Repository/Publisher
<i>Preservation policy</i>	Permanent	Author
<i>Permanent identifier (PID)</i>	<a href="https://doi.org/10.5281/zenodo.13986113">https://doi.org/10.5281/zenodo.13986113</a>	Archive/Repository/Publisher