

All Division 3 (Forest Operations Engineering and Management) Meeting

**78 - Forest Operation and Ergonomics: Challenge and Solutions.**

KG I - 1228 (Uni Freiburg)

**IUFRO17-811 Hand Planter Ergonomics: Characterizing Physically Demanding Work in the Southeastern United States**

Granzow, R.\* (1); Schall, M. (1); Smidt, M. (2)

(1) Auburn University, Department of Industrial and Systems Engineering, Auburn, Alabama, United States; (2) Auburn University, School of Forestry and Wildlife Sciences, Auburn, Alabama, United States

**Abstract:** Low back and neck/shoulder musculoskeletal disorders (MSDs) are prevalent among reforestation hand planters. While previous investigations have documented the intense cardiovascular demands of manual planting, limited information is available regarding exposures to physical risk factors associated with the development of MSDs among hand planters. This study employed surface electromyography (EMG) and inertial measurement units (IMUs) to characterize the muscle activation patterns, upper arm and trunk postures, movement velocities, and physical activity (PA) of reforestation hand planters in the Southeastern United States over one entire work shift. Results indicate that hand planters are exposed to higher muscle activation patterns and more extreme upper arm and trunk postures and movement velocities than workers in several other occupational groups that commonly report a high prevalence of MSDs, including construction, automotive manufacturing, and healthcare workers. The findings indicate a need for continued field-based research among hand planters to identify and/or develop maximally effective intervention strategies and tools.

MSDs; posture; physical activity; muscle activity

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**IUFRO17-3446 Studying work in tropical forests: the need for integrative research approaches**

Lewark, S.\* (1)

(1) Chair Forest Work Science, University Freiburg, Freiburg, Germany

**Abstract:** Social sustainability is a major issue of SFM, strongly based on ergonomically sound forest operations. Therefore ergonomic study and valuation are essential for development of forest operations. This commitment of work scientists is expressed with the motto "fitting the task to the human". An adequate work design is needed for forest operations in industrialized countries, but even more so in developing tropical and subtropical countries, where by trend working conditions are more severe and work even more heavy. Often forest operations, working systems and tools are less standardized. Introduction and use of appropriate technology are pivotal. Development of forest operations should be accompanied by stress and strain study, together with time study. But this is not sufficient. Ergonomists have to understand and integrate findings from other relevant disciplines, like rural sociology, regional research or development studies. Ideally interdisciplinary cooperation is done and research questions and methods are included into work study from the beginning.

In many countries we observe outsourcing, work done by contractors, not by employees of the forest enterprises themselves. This means that forest work science has to look on the specific characteristics of smaller or larger contracting enterprises, especially their working conditions as well as the underlying factors, at an operational level and in the societal environment. This must include all traditional tasks of forest work, like nursery work, planting, tending, pruning, harvesting, forest road construction and maintenance and also those connected with ecosystem services.

Research according to the traditional objectives and themes of work science, i.e. the design of work places and methods, will be continued. But the strategy of work science in future is oriented towards an inclusion of social and economic conditions as well as regional chains of added value into the sectoral research.

forest work, integrative work study, tropics

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**IUFRO17-3114 The Effect of Slash Reinforcement of Strip Roads on Rutting, Forwarder's Fuel Consumption, Driving Speed and Whole Body Vibrations**

Mohtashami, S.\* (1); Jonsson, R. (1); Eliasson, L. (1); Ring, E. (1)

(1) The forestry research institute of Sweden, Skogforsk, Uppsala, Sweden

**Abstract:** Tree tops and branches, i.e. slash, extracted in final fellings can be used as forest fuel or to reinforce strip roads to prevent or reduce rutting. In a randomized block trial, fuel consumption, driving speed, proportion of strip road with rutting and operator's whole body vibrations during forwarding were studied when driving a laden forwarder on strip roads with and without slash reinforcement. The weight of the laden forwarder was 44 Mg. The study was carried out in south-central Sweden during fall 2014.

The driving on slash reinforced strip roads showed indications to lower diesel consumption compared with unreinforced roads. Driving speed and whole body vibrations was not affected by slash reinforcement. The proportion of rutting was 20 percent higher on roads without slash cover than on slash-reinforced roads and positively correlated with number of passages. Slash reinforcement increases the evenness of the strip road, and may thus affect both travel speed and fuel consumption. Travel speed is expected to increase and fuel consumption to decrease. However, as these factors interact, further studies of speed and fuel consumption are required.

logging operations, slash reinforcement, forwarder

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