44th International Symposium on Forestry Mechanization,
October 9-13, 2011, Graz, Austria

ONBOARD COMPUTING IN FOREST MACHINERY –

A PERSPECTIVE FROM AUSTRALIA AND SOUTH AFRICA

Martin Strandgard, Pierre Ackerman, Marco Pellegrini

University of Melbourne - CRC for Forestry

Stellenbosch University – Department of Forest and Wood Science

University of Padova – Forest Operations Management Group

Introduction

- OBCs: Tool to collect performance information on forest operation
- Field of application:
  - Improved utilisation and productivity (understand bottlenecks)
  - Optimization of logistics and planning (Reduced fuel consumption)
  - Monitor soil disturbance and treated area
- Implementation on the machine (Long-term measurements)

Types of onboard computers

FORMEC Austria 2011

Increased complexity. Increased possibilities

Vibration sensor

GPS

Purpose-built

Manufacturer design

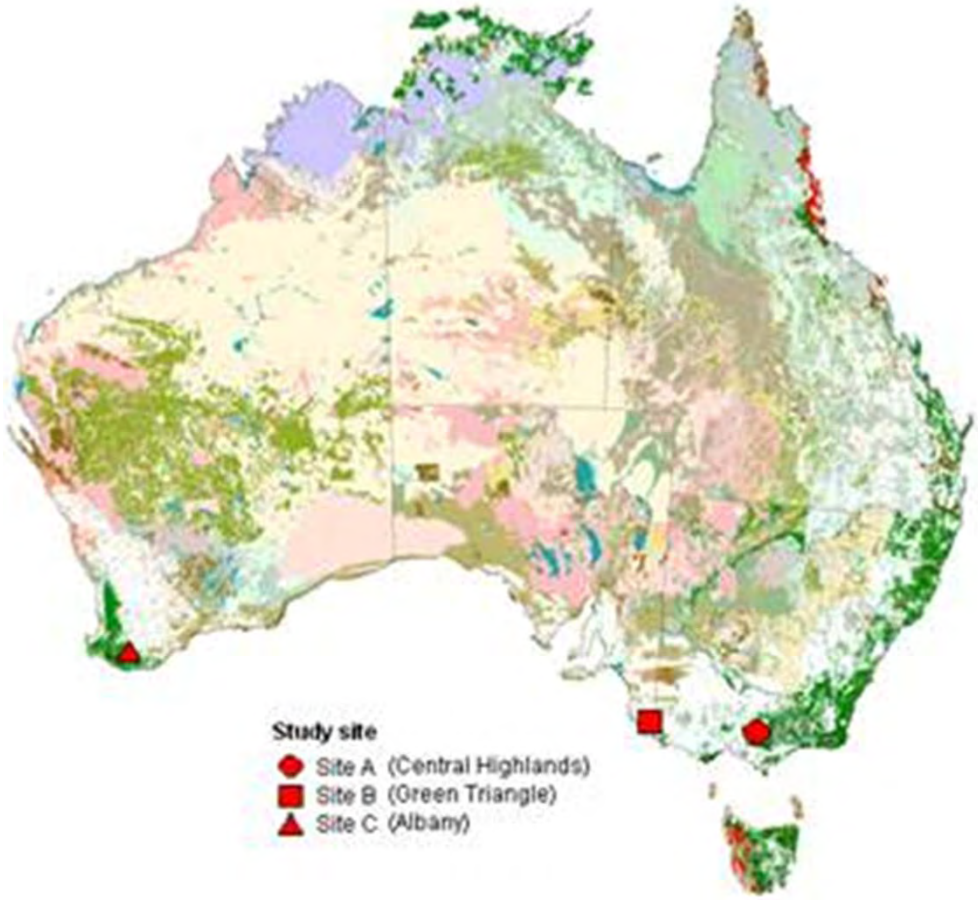
Aim of the study

- Test the use of on-board devices in Australian and South African forest operations.

- Australia:
  - Long-term studies on multiple machines to monitor system efficiency
  - Development of an onboard computer selection and implementation guide

- South Africa:
  - Short-term studies on single machines to understand the accuracy and the potential use of detailed information

Australian trial sites locations



Range of:

- Forest types
- Harvest systems
- Onboard computer systems

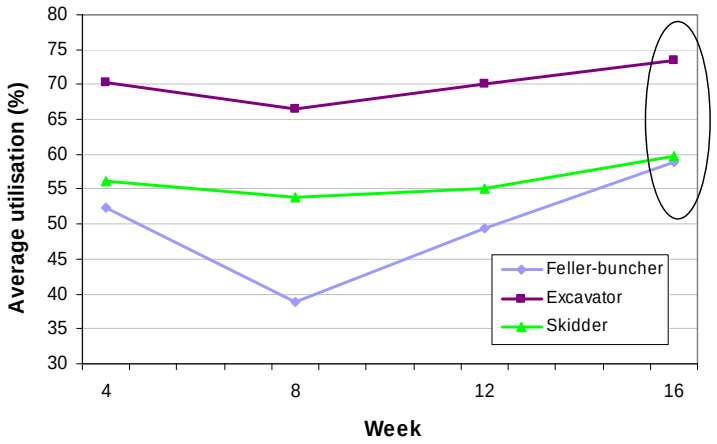
Trial site A – Central Highlands

Background

- Victorian Central Highlands native forest logging (*Eucalyptus*)
- MultiDATs in harvester, skidder and one excavator (8 months)
- Garmin GPS in harvester and skidder

Results:

- Harvester & skidder underutilised (<55%)
- Excavator on landing well-utilised (>70%)
- Bottleneck on log landing
- Improvement of the log landing system



Trial site B – Green Triangle

FORMEC Austria 2011

Background

- South Australian *Pinus radiata* plantation
- **Dasa 4** *(www.dasa.se)* in harvester and forwarder
- GPS in both machines

Results:

- Harvester utilisation >70%
- Forwarder - OBC: implementation problems
- GPS recording log locations - Transferred from harvester to forwarder (planning routes)

Trial site C – Albany

FORMEC Austria 2011

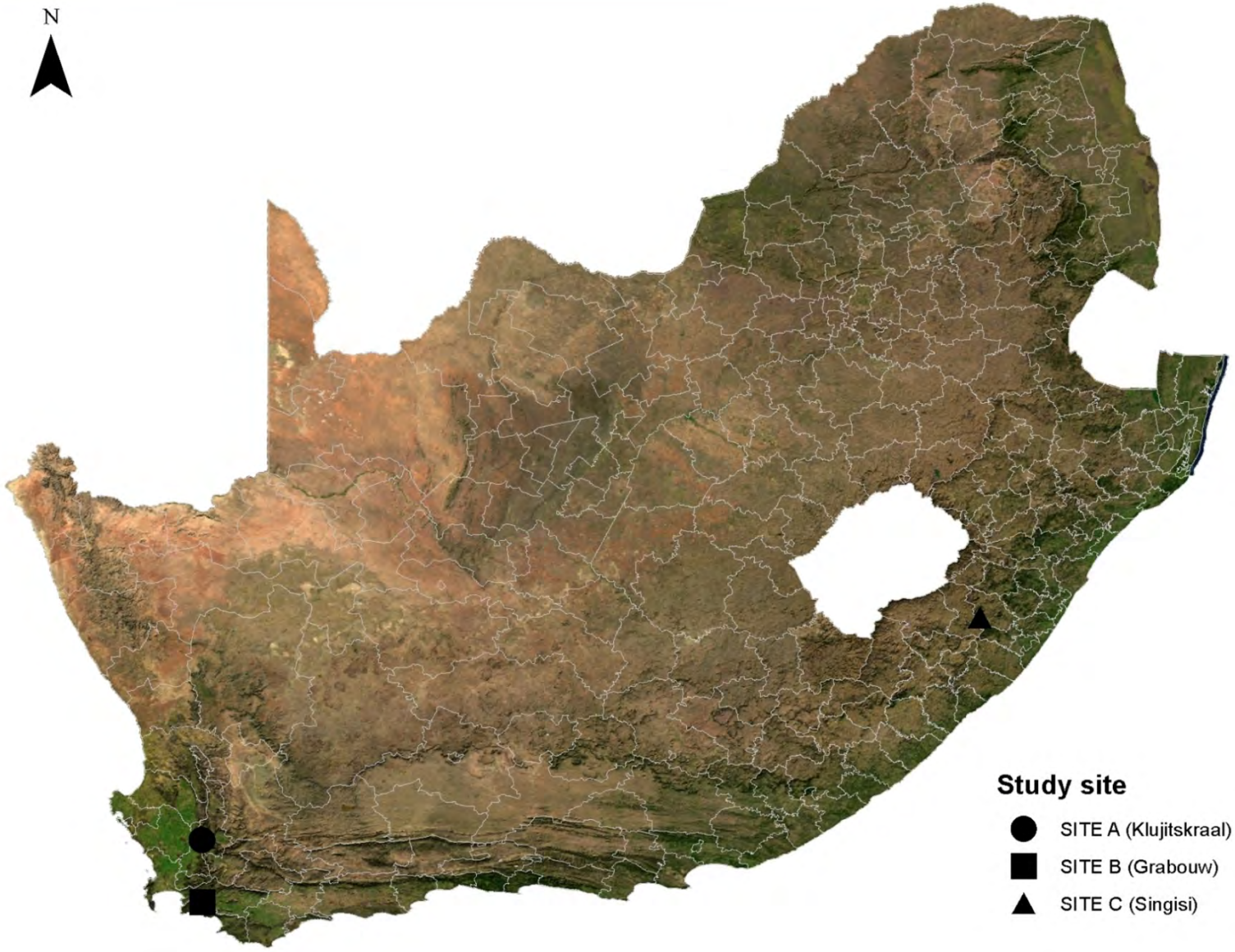
Background

- West Australian blue gum plantation
- **RouteHawks** *(www.strongeng.com)* in feller-buncher, skidder and chipper
- **Multidat**s in 3 chippers (9 months)
  - Recording delay causes

Results:

- Chipper utilisation variable
  - Need more time to get good figures
- Major delay causes are (operator input):
  - Breakdowns
  - Waiting for trucks

South African trial site locations



Trial site characteristic

Location	Site A (Kluijtieskraal)	Site B (Grabouw)	Site C (Singisi)
Machine type	Timberjack 380C + motor-manual processing at landing	Timberjack 380C + motor-manual processing at landing	Tigercat 625C + processor at landing
Species	*Pinus radiata*	*Pinus pinaster*	*Pinus elliotti*
Mean slope (%)	0	23	16
Soil moisture	Dry	Dry	Partially wet
N (number of cycles)	33	64	68



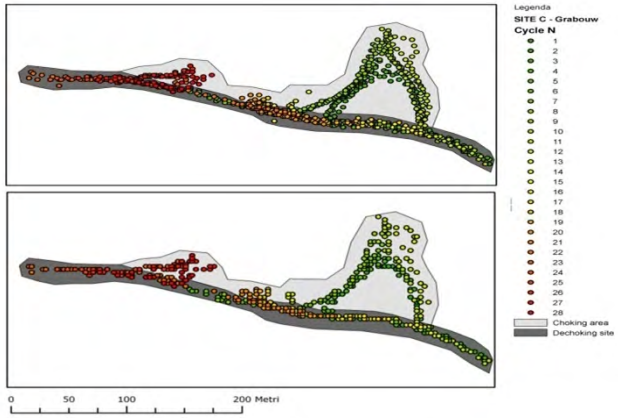
Methods

FORMEC Austria 2011

- Skidders were equipped with two different OBDs, **Fleet Manager Professional** (*www.mixtelematics.com*) and **MultiDAT** *(www.feric.ca)*

- Parallel, manual time studies using a Trimble palm device running dedicated time study software (WorkStudy+)

- Elaboration and comparison of the collected utilisation and GPS data using GIS software (Arc-GIS 9.3)



Results: GPS Data analysis

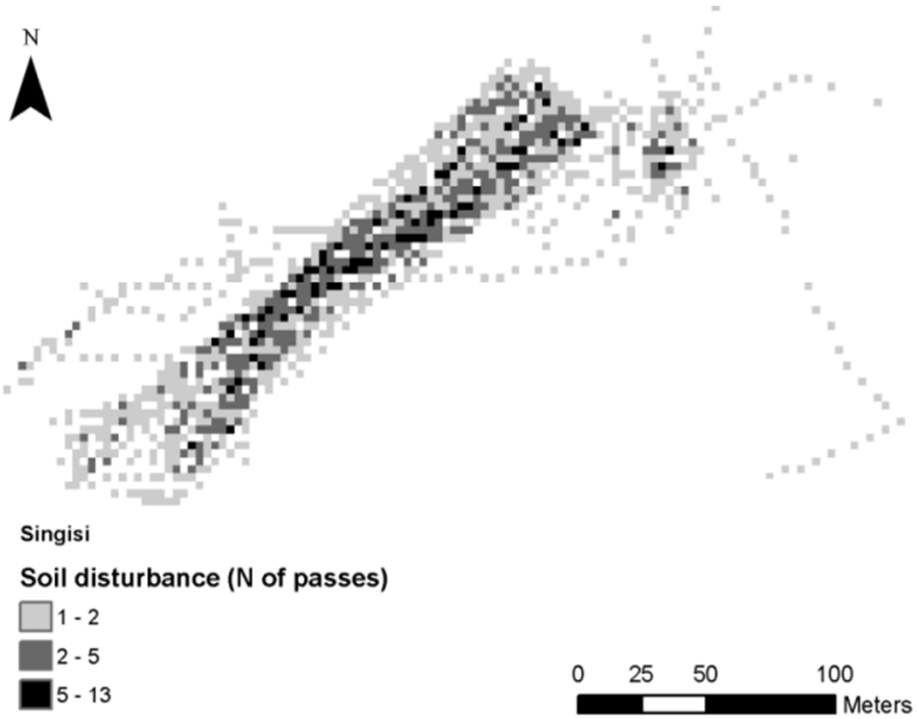
source	Site	Driving	Choking	Dechoking	Inactive
MultiDAT	Site A % error	0.59	2.83	1.56	-4.29
	Site B % error	-5.33	1.35	2.69	1.29
	Site C % error	-1.74	2.05	4.40	-4.70
FleetManager	Site A % error	1.36	1.34	2.64	-5.34
	Site B % error	-0.01	-4.33	1.15	3.19

Identified error sources:

- Definition of the speed threshold used to detect when the skidder is moving (choking/dechoking over-estimation)

- Length of the time interval used to detect when the machine was not working (inactivity under-estimation)

Possibility to use the data for other analyis (eg. Soil disturbance patterns)



Discussion and Conclusions

- Vibration sensors can be used to measure machine utilization but needs the input of the operator to have a correct evaluation

- Automated time study, using GPS-OBCs data worked quite well in evaluating the working time of skidders. Analyses are time-demanding.

- Potential benefits of new approaches in improving working process can be relevant(15% working time)

- Forestry organizations in some cases do not have the resources or expertise to resolve the issues that can arise from implementation of complex technologies (Dasa, RouteHawk eg.)

- **Gradual introduction of OBCs on machinery can be successfully implemented in operations to provide data to review and improve machine performance.**

THANK YOU FOR YOUR ATTENTION