

Non-chemical weed management using an autonomous tractor

Denny Hsieh¹, Simon Nordestgaard¹



¹The Australian Wine Research Institute, PO Box 197, Glen Osmond (Adelaide) SA 5064, Australia

Corresponding author's email: denny.hsieh@awri.com.au



Introduction

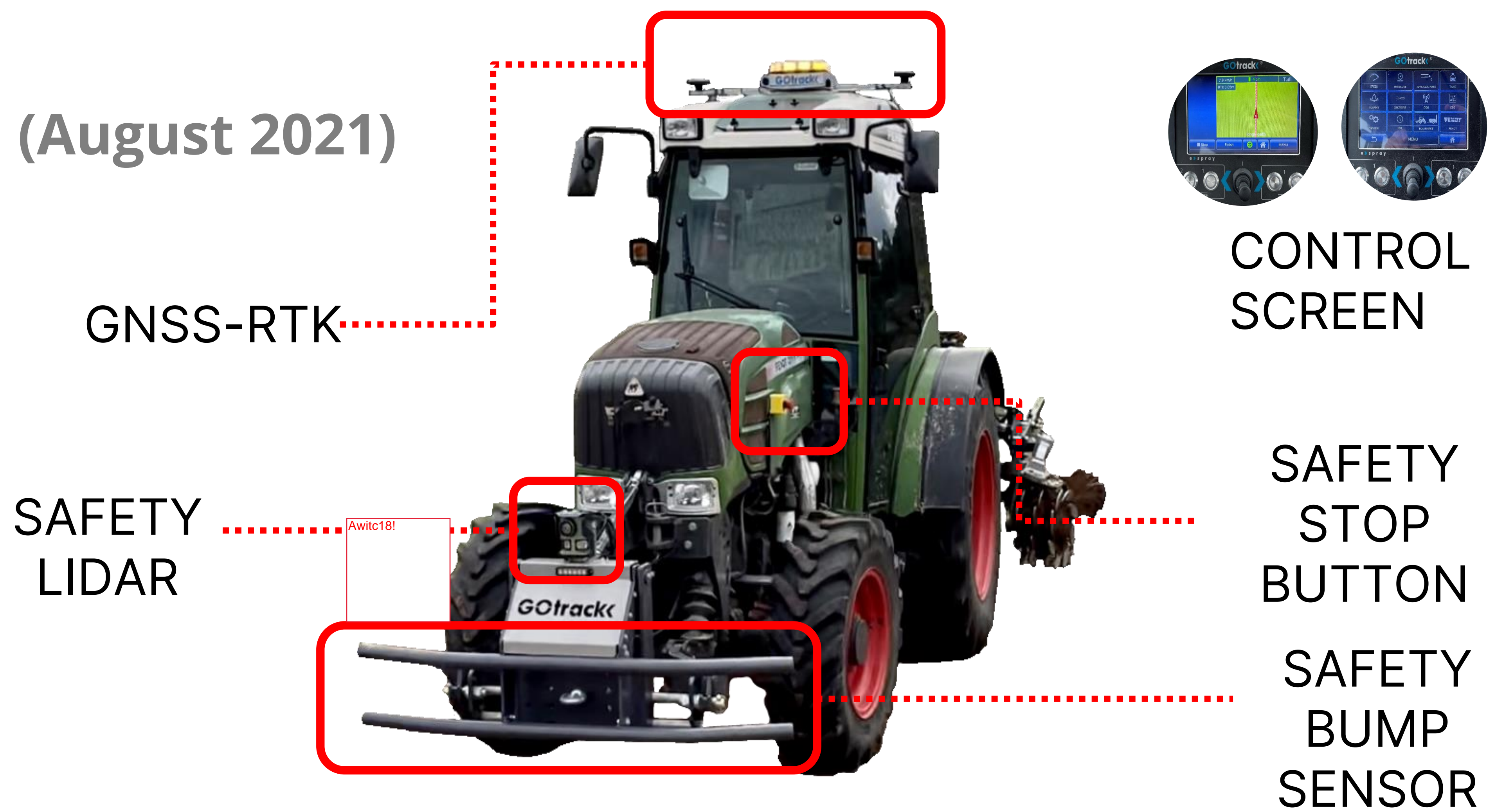
- Herbicides are commonly used to manage under-vine weeds in vineyards, but there is increasing pressure to reduce their use.
- Alternatives such as cultivation and mowing require more and slower tractor passes.
- Autonomous tractors are ideally suited to time-consuming tasks like this.
- A Fendt 211P tractor has been retrofitted with a GOtrack autonomy kit.
- It is being run with different under-vine weeding tools to understand how the equipment works, any modifications needed to facilitate autonomous operation and the impact of different under-vine weeding approaches on the vineyard.

Under-vine treatment	Mid-row treatment
Herbicide	Sward
No treatment	Sward
Mowing	Sward
Dodge plough	Cultivated
Blades-rotary tillers	Sward
Finger rollers-hoes	Sward

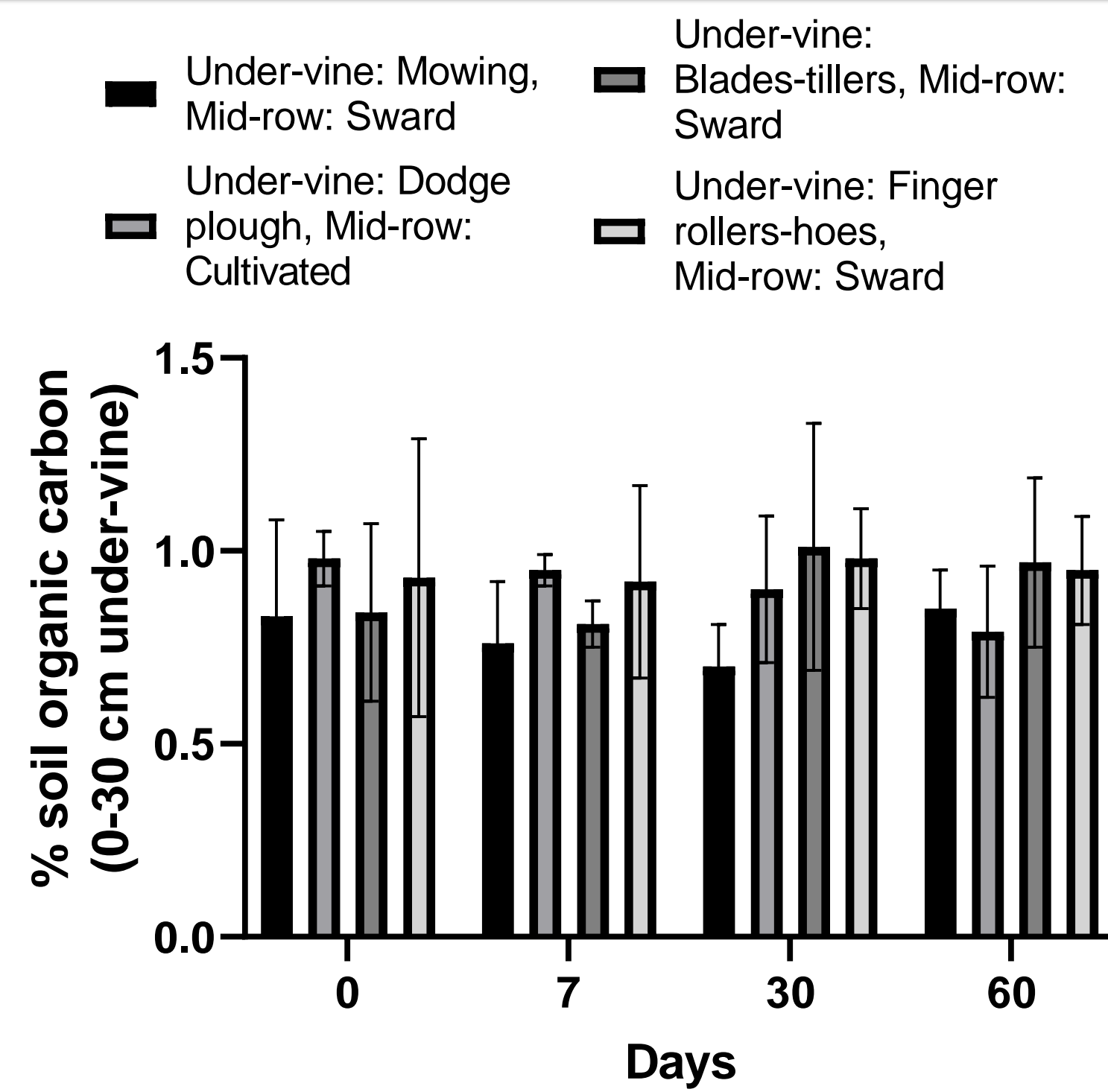
1st installation in Australia (August 2021)

42,102m
840mins | Operation

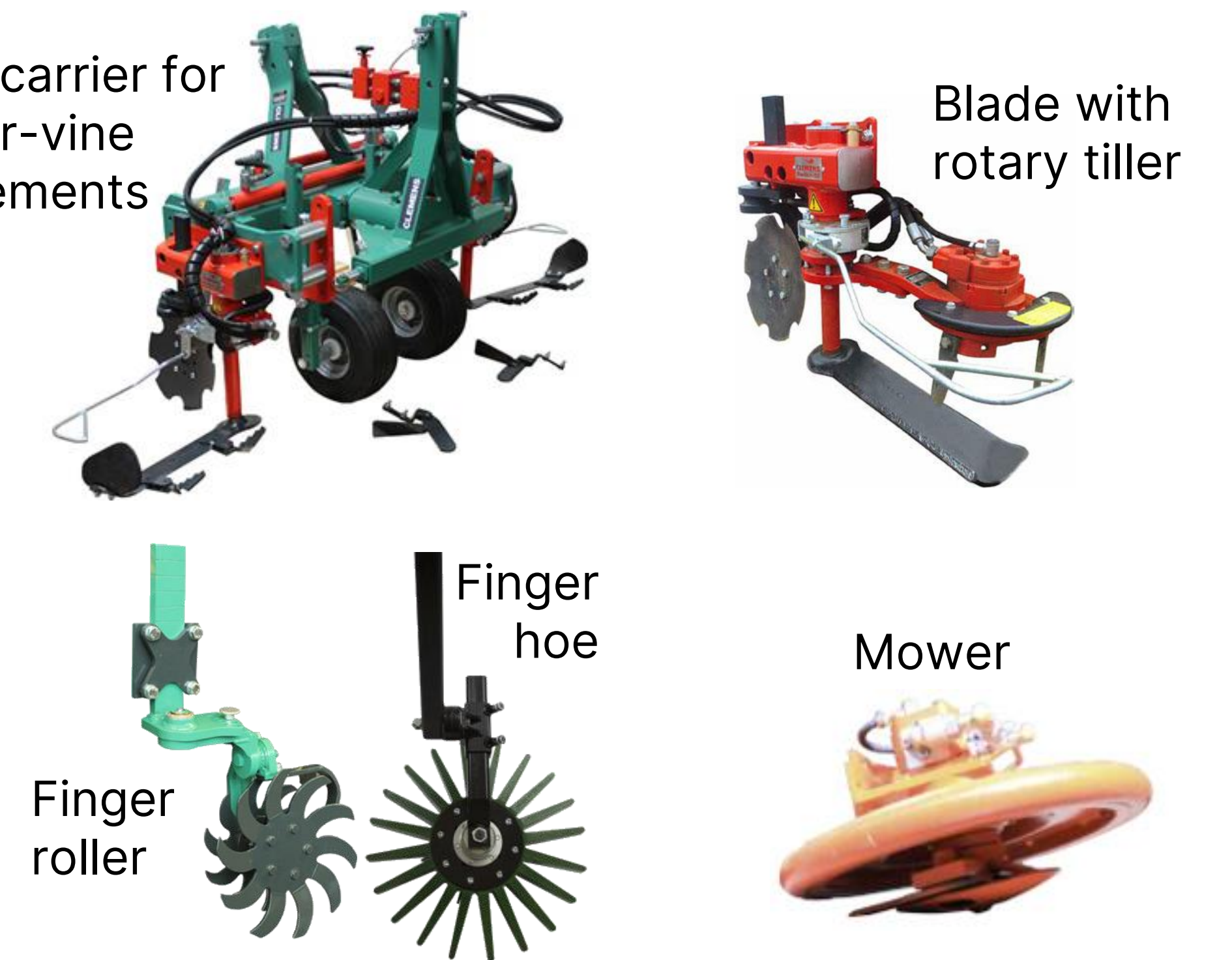
- Record routes and playback
- SMS command and app control



Vineyard results in first season



Tool carrier for under-vine implements

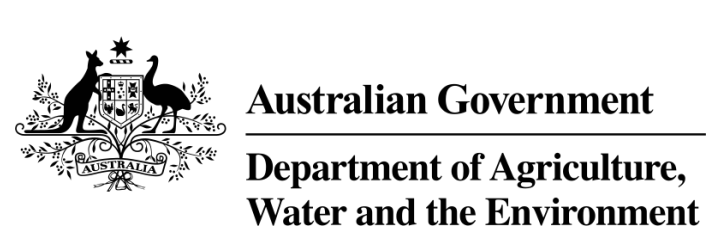


Under-vine tools for autonomous operation

- Tools that retract based on a sensor rod (e.g. blades or mowers) are better suited to autonomous operation than fixed tools (e.g. finger rollers and hoes) because they provide a greater safety margin during any temporary misalignment.
- Under-vine weeding tools are at some risk of snagging on low vineyard wires that hold irrigation hoses, even during manual operation. During autonomous operation nobody is there to stop the tractor until it is dragged off-line and stops itself, so lifting irrigation hose and wire to 450-500 mm may help to prevent unnecessary snags and stoppages.

Future work

- Continue monitoring vineyard responses to weed management in second year
- Run for longer and longer periods autonomously
- Work on strategies to detect/manage snags on wires, tool cleaning, people amongst long grass and sprawling canopies
- Evaluate electric weed control as an alternative to herbicide without the negative effects that some cultivation can have on soil structure
- Evaluate small autonomous electric lawnmowers as another means of vineyard floor management.



Acknowledgements

Tim McCarthy and Shaun McBeath from Pernod Ricard Winemakers, Phillip Rice and Zac Edwards from G&J East, Cam Clifford and Brenton Welk from AME Group, Marcin Lis from GOtrack and Jean Vittot and Cale Otto from Pellenc



The AWRI is a member of the Wine Innovation Cluster.

