

# An Autonomous Mobile Multipurpose Platform for use in Kiwifruit Orchards

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## Abstract

Other uses may be mechanical weed removal, targeted spraying, and crop scouting.

*Keywords:*

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## 1. Introduction

Short-term labor requirements within the New Zealand kiwifruit industry peak twice a year corresponding pollination and harvesting cycles (Timmins, 2009). These spikes in short-term labor requirements can make it difficult to source workers, occasionally leading to labor shortfalls. Being New Zealand's largest horticultural export, kiwifruit lends itself well to automation; primarily in the areas of pollination and fruit harvesting (Statistics New Zealand, 2015). Previous work on automated harvesting of kiwifruit (Scarfe, 2012).

Stress robustness required of vehicles designed for in-field use. High cost associated with conversion of a tractor to an autonomous vehicle.

## 2. Mechanical design

Skid steering inappropriate for orchard environments due to soft ground. Pivoting front axle used to maintain three points of contact at all times; no suspension. Limited to  $10 \text{ km h}^{-1}$  by the choice of motor and gearboxes on the drive-system. Ackermann steering geometry with the ability to pivot about the centre of the rear wheels.

## 3. Hardware and sensors

Forward and upwards facing LiDAR are used for navigation and detection of canopy. GPS has been unreliable in kiwifruit orchards, probably due to

the canopy itself and surrounding wind-breaks.

#### **4. Software architecture**

ROS used as the basis for platform control.

#### **References**

- Scarfe, A. J. (2012). *Development of an Autonomous Kiwifruit Harvester*. Ph.D. thesis Massey University.
- Statistics New Zealand (2015). Annual fruit exports hit \$2 billion for first time.
- Timmins, J. (2009). *Seasonal Employment Patterns in the Horticultural Industry*. Technical Report August Statistics New Zealand.