PFR SPTS No. 24207

Transplanting mature grapevines into pots

Mundy D

June 2023

1 Introduction

The grapevine trunk diseases (GTD) that we are interested in studying develop over a number of years as the vine ages. Symptoms in spur pruned vines often are not seen until vines are at least 8 years old and cane pruned vines can be at least 14 years before external symptoms can be detected. Within the new Experimental Future Vineyard (EFV) we would like to study vines with GTD without having to set up experiments decades before the trial starts. While visiting Bordeaux in 2020, Dion Mundy was shown 23-year-old vines with and without GTD symptoms that had been transplanted from the field into a small potted system for experimentation. Based on the ability of the French researchers to successfully transplant vines with symptoms into small pots, the New Zealand Institute for Plant and Food Research Ltd (PFR) team in Marlborough investigated the logistics and other limiting factors of transplanting mature Marlborough grown Sauvignon blanc vines into prototype modules under development for the EFV.

The aim of the work was to develop a method for moving vines and associated soil cores from vineyards to the modules and then inserting the core with minimal disturbance.

2 Methods and results

The project team investigated a range of possible methods of vine and soil extraction. We consulted experienced tree movers before settling on the use of a small digger and manual digging to extract vines and surrounding soil. We contacted a number of wine companies and were provided with a site by Pernod Ricard at the Fairhall vineyard for development of our extraction method. The site had already had the posts, wires and irrigation line removed, making access with the digger easy.

Before extraction, selected vines were marked for removal that had visual symptoms of GTD.

On the day of removal the first vine selected had a trench dug parallel to the row with the digger. Staff then manually removed soil in strips back towards the vine, recording the mass of roots in each strip, until the hole was within 30 cm of the trunk (Figure 1). At this stage, the soil was dug around the vine in a square on all four sides 30 cm from the trunk and the soil column then undercut at a depth of 50 cm (Figure 2). The soil column was wrapped with silage wrap to hold the structure while the vine was manually transferred into a 1-tonne sugar sack for lifting out of the hole (Figure 3). The vine in the sugar sack was then lifted with the digger (Figure 4) and placed on a pallet on the utility truck.

Figure 1. A wooden stick with 10-cm bands painted on it was used to visualise the root distribution parallel to the row while digging back to 30 cm from the trunk.

Figure 2. A combination of a digger and hand digging was used to remove soil from around the core containing the soil and roots of the vine to a depth of 50 cm.

Figure 3. Bailage wrap was used to hold the soil core before undercutting and lifting into the sugar sack.

Figure 4. Following the undercutting of the vine, a sugar sack was place under the vine on a pallet and the wrapped soil core and vine lifted from the hole using the digger.

Figure 5. The second vine removed had a modified method of extraction with the sugar bag inserted into the bucket so that the vine and soil were removed in fewer steps (with less soil disturbance) than the first vine.

The second vine was dug out in a 30 cm square around the trunk using the digger. A 1-tonne sugar bag was placed inside out in the digger bucket before manually pushing the vine over into the bucket (Figure 5). Once the vine was in the in the bucket, the bag was turned back around the vine allowing the vine to be lifted onto the trailer for transport.

The third vine had a plastic rubbish bin with the bottom cut out placed at its base and the soil manually dug out around it in sections (Figure 6). When 5–10 cm of the surrounding soil had been removed the rubbish bin was pushed down (Figure 7) and the next layer of soil was manually removed until a depth of 50 cm of soil and roots within the bin was achieved (Figure 8). Once the desired depth of soil was in the bin the vine was undercut and a second bin with the bottom intact was placed under the core so that the soil and vine could be lifted from the hole (Figure 9).

During the day, the digger was also used to remove other vines without attached soil to better understand root structure and mass. These vines confirmed that most of the roots were within 30 cm of the trunk and in the top 50 cm of soil.

At the end of the day the digger was used to fill all holes and leave the vineyard area flat.

Once the vines on pallets were returned to the Marlborough Research Centre (MRC) campus they were stored until prototype pots based on the design for the EFV were ready for filling and the transplanted vines could be inserted as part of the filling process. The vine removed using the rubbish bin method was placed into the first protype pot such that there was space at the top of the pot for turf or a cover crop and soil to be added (Figure10). The vine from the rubbish bin extraction is now in the pot ready for experimentation (Figure11). Vines from all three methods will be maintained in the pots and scored at bud burst for shoot growth to confirm the vines have transported and transplanted successfully. Details of the pot filling are reported separately in the “MRC EFV Prototype planter pots” report.

Figure 6. Third vine and soil extraction. During this extraction, a rubbish bin that had the bottom cut out was placed on the soil surface and the soil around it dug out by hand. When 10 cm had been dug out, the top of the bin was pushed down, protecting the core of soil around the roots.

Figure 7. Third vine and soil extraction were conducted with repeated digging and pushing down of the rubbish bin ring.

Figure 8. When the bin was covering 50 cm depth of roots and soil the pot was undercut by hand so the core could be removed.

Figure 9. A second rubbish bin with the bottom intact was inserted under the first bin to enable lifting of the vine and core.

Figure 10. During the filling of the protype pot with layers of packed silt, sensor tubes and the transplanted vine were inserted into the pot leaving space for a final layer of topsoil and turf or other cover crop to be added.

Figure 11. The transplanted vine is now in the protype pot with sensor service points and on a pallet ready for experimentation.

3 Discussion and next steps

The most successful method of extraction of vines with an intact soil core was with the use of a rubbish bin turned into a ring. The other two methods resulted in considerable soil core break down during extraction or movement of the vine with less than desirable outcomes. The rubbish bin core stayed intact and was able to be transplanted into the protype pot following transportation from the vineyard to the MRC site. Consequently, PFR has engaged Cuddon Engineering to design a metal multi part sleeve system that can be driven into the soil around a plant to extract the core with the vine in it (the appendix contains the preliminary design drawings from Cuddon Engineering Ltd). Digging around the sleeve will most likely still be required but should provide the most practical way of extracting vines and soil cores for mature plants. We have asked for the design to include a feature that will allow both lifting the vine from the vineyard and lowering the vine and soil into the new pot system.

4 Acknowledgements

We would like to thank the team at Pernod Ricard for providing vines and access to the vineyard.

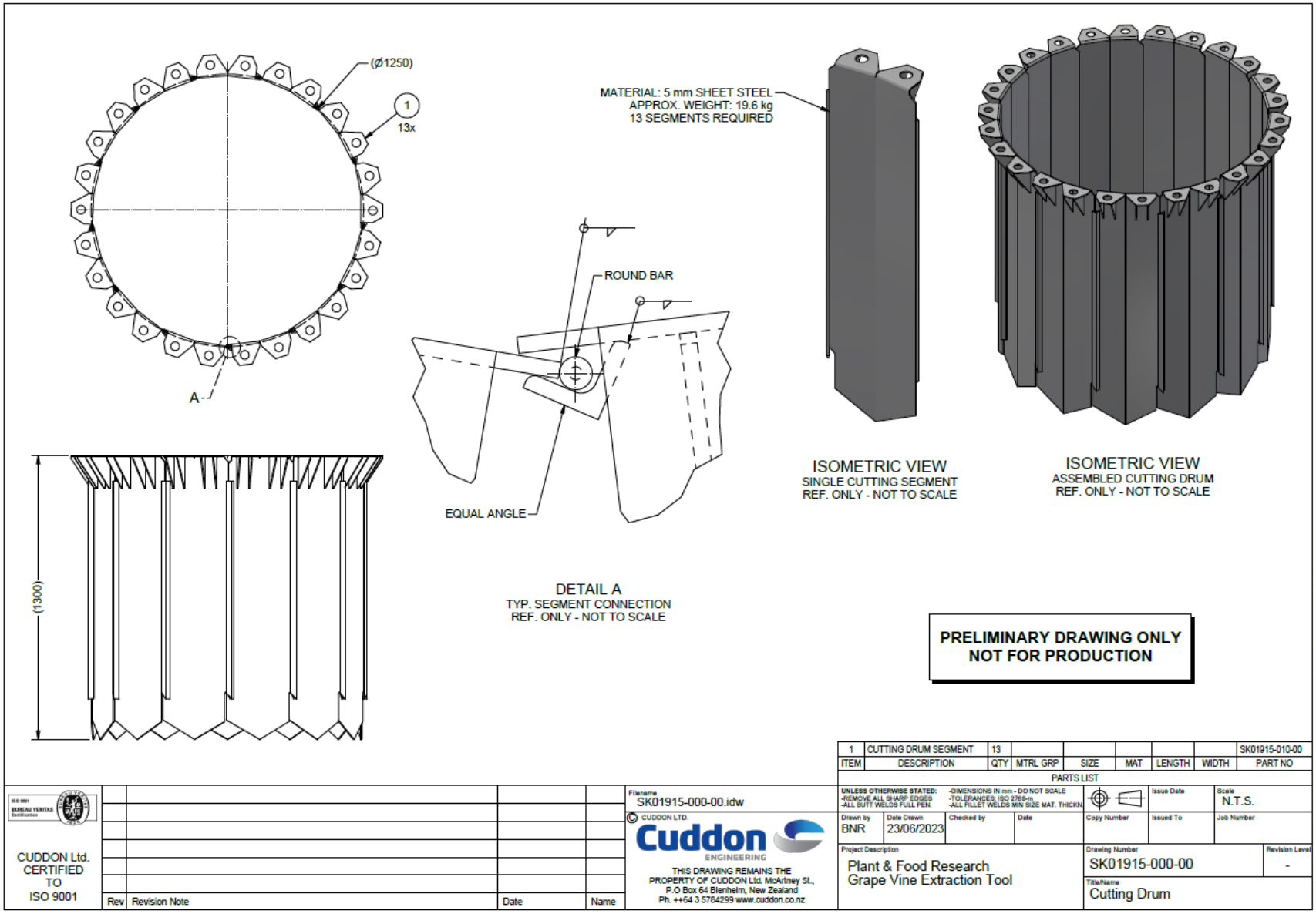
We would also like to thank David James for suggestions and advice on moving whole mature plants.

Thank you to PFR Staff Damian Martian, LinLin Yang, Julian Theobald, Junqi Zhu and Sue Neal, and Stewart Field of Nelson Marlborough Institute of Technology for help in the field on the day of extraction.

5 Data and images

Images from this report can be found at K:\Grape and Wine Research Programme\MRC Funding & Rowley Vineyard Trials\EFV\Digging and relocating mature vines\Images.

Appendix


(Ø1250)
1
13x
A
MATERIAL: 5 mm SHEET STEEL
APPROX. WEIGHT: 19.6 kg
13 SEGMENTS REQUIRED
ROUND BAR
EQUAL ANGLE
(1300)
ISOMETRIC VIEW
SINGLE CUTTING SEGMENT
REF. ONLY - NOT TO SCALE
ISOMETRIC VIEW
ASSEMBLED CUTTING DRUM
REF. ONLY - NOT TO SCALE
DETAIL A
TYP. SEGMENT CONNECTION
REF. ONLY - NOT TO SCALE
PRELIMINARY DRAWING ONLY
NOT FOR PRODUCTION
1 CUTTING DRUM SEGMENT 13 SK01915-010-00
ITEM DESCRIPTION QTY MTRL GRP SIZE MAT LENGTH WIDTH PART NO
PARTS LIST
UNLESS OTHERWISE STATED: -DIMENSIONS IN mm - DO NOT SCALE -REMOVE ALL SHARP EDGES -TOLERANCES: ISO 2768-m -ALL BUTT WELDS FULL PEN. -ALL FILLET WELDS MIN SIZE MAT. THICKN
Issue Date
Scale N.T.S.
Drawn by BNR
Date Drawn 23/06/2023
Checked by
Date
Copy Number
Issued To
Job Number
Project Description
Plant & Food Research
Grape Vine Extraction Tool
Drawing Number SK01915-000-00
Revision Level -
Title/Name Cutting Drum
Filename SK01915-000-00.idw
© CUDDON LTD.
Cuddon ENGINEERING
THIS DRAWING REMAINS THE PROPERTY OF CUDDON Ltd. McArtney St., P.O Box 64 Blenheim, New Zealand Ph. ++64 3 5784299 www.cuddon.co.nz
CUDDON Ltd. CERTIFIED TO ISO 9001
Rev Revision Note Date Name
K:\Sketches\1900-9999\SK01915 Plant & Food Research Grape Vine Excavation Tool\Inventor Files\SK01915-000-00.idw

Confidential report for:

Marlborough Research Centre Trust
Project 4

PUBLICATION DATA

Mundy D. June 2023. Transplanting mature grapevines into pots. A Plant & Food Research report prepared for: Marlborough Research Centre Trust. Milestone No. 95996. Contract No. 40821. Job code: P/413003/16. PFR SPTS No. 24207.

KEYWORDS: Grapevine trunk disease, experimental future vineyard, Marlborough Research Centre Trust, sauvignon blanc, prototype modules, soil core and lifting drum.

Report prepared by:

Dion Mundy
Scientist/Researcher, Plant Protection Systems
June 2023

Report approved by:

Damian Martin
Science Group Leader, Viticulture & Oenology
June 2023

For further information please contact:

Dion Mundy
Plant & Food Research Marlborough
PO Box 845
Blenheim 7240
NEW ZEALAND

Tel: +64 3 984 4310
DDI: +64 3 984 4327

Email: dion.mundy@plantandfood.co.nz