Optimising fertiliser for profitable carrot production

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Final Report
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INTRODUCTION

Ohakune carrot growers wish to improve fertiliser forecasting methods for growing better quality export grade Koyo table carrots. Nutrient supply is known to affect Koyo carrot yield and quality but the extent of the interactions between soil and fertiliser nutrients on these factors is unknown. In this project funded by Agmardt, VegFed, Ravensdown Fertiliser, Sunrise Coast and the growers for Mountain Carrots Ltd, a Koyo carrot calculator will be developed that forecasts crop yields and is a decision support tool for determining fertiliser requirements. We also acknowledge the substantial input from ENZA Foods Ltd.

METHOD

Over the past two years we have conducted fertiliser experiments in Ohakune. In year one (2001-2002) we found no yield responses to fertiliser N, P or K as heavy rain nearly washed away the trial plots and may have leached much of the fertiliser nutrient out of the soil, thus affecting yield responses. In the following year (2002-2003) we conducted five fertiliser trials in commercial carrot crops. Significant yield responses were obtained by applying fertiliser, and total and harvestable carrot yield was increased by 20 and 29 % respectively by the application of fertiliser.

RESULT – THE MOUNTAIN CARROT CALCULATOR

Using results from year two fertiliser trials and potential yield trials conducted in Hawke's Bay in year one, we developed a carrot calculator for Koyo table carrots, based on the calculator already available for process carrots. The process carrot calculator is available for downloading on the internet at

https://ssl.crop.cri.nz/distribution/carrot/

An initial draft of the Koyo carrot calculator was supplied to and reviewed by Sunrise Coast and carrot growers for Mountain Carrots during October 2003. After review of the calculator, a final version was released in November 2003. The key features of the Mountain Carrot Calculator are outlined below.

- A wide range of input variables are possible including
  - Sowing time
  - Initial soil nutrient status
  - Planting configuration (rows per bed, single/double/triple rows)
  - Weather data (% variation from 30 year average for Ohakune)

- Predicted yields are based on these above input variables and
  - Estimated marketable % of the crop
  - Target root size
  - Last acceptable date for harvest

- A yield graph is always on the desktop and automatically updated as input variables are changed. The axis of these graphs can be altered
  - X axis can be date, days after sowing of growing degree days
  - Y axis can be total yield, marketable yield or root size

- A cost benefit analysis of fertiliser application is provided. By using yield and soil nutrient status, the most cost effective fertiliser combination (product and rate, and as kg N, P and K) is recommended. The economic thresholds for fertiliser applications are based on value of the carrots and the price of fertilisers.

Growers do not have control over some variables that affect yield (e.g. weather and initial soil nutrient status). However they can determine the effect of altering variables they do have control over such as planting configuration or sowing time. A decision support tool such as the Mountain Carrot Calculator can be used by growers to run various scenarios to determine which is most profitable management option.

EXAMPLES OF THE MOUNTAIN CARROT CALULATOR

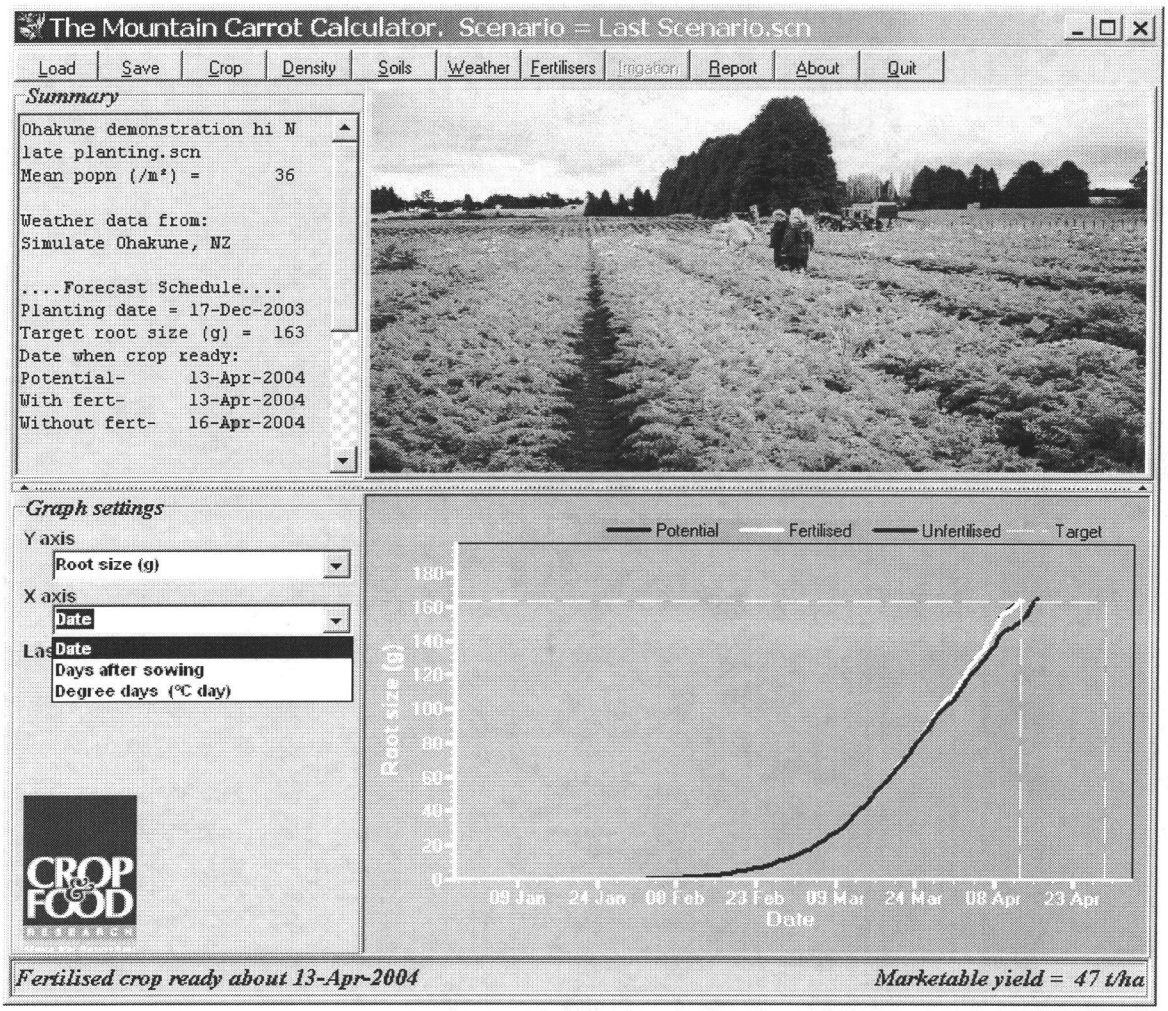

Figure 1. The Mountain Carrot Calculator home page.

Information about the crop is summarized in the top left window. The graph on the lower right depicts how yield changes over time. The graph axes can be changed by drop down menus on the lower left. The two vertical dashed lines on the right hand side of the graph indicate two dates. Firstly when the crop will reach the target yield or root size and the second is last acceptable date for reaching that target, a date set by the grower.

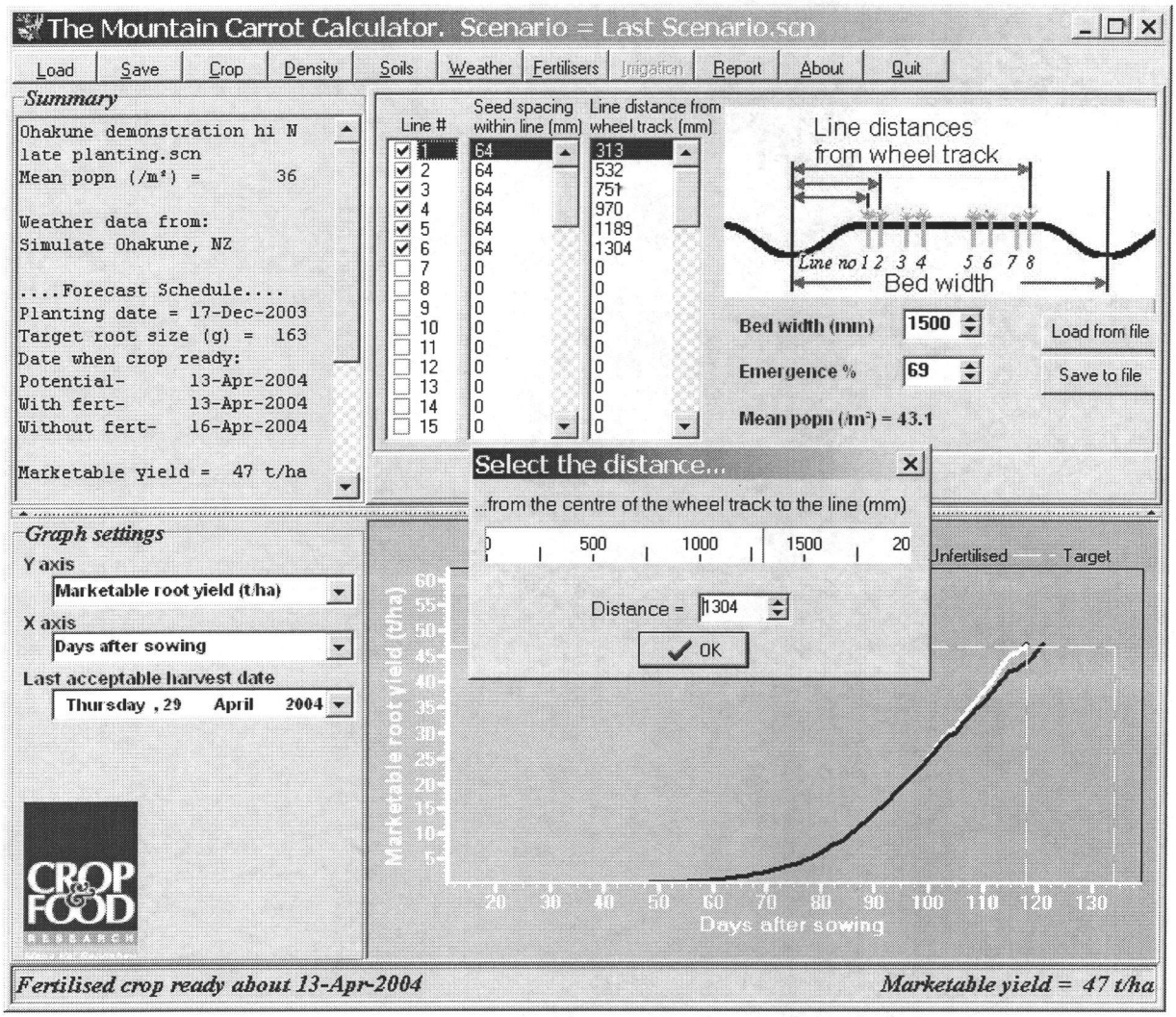

Figure 2. Planting density page

On this page we can alter the planting density to any configuration, both seed spacing within rows and distance between. Plant population has a strong effect on root size and yield. Note the graph is shown on every tabulated page. Here we have changed the axes.

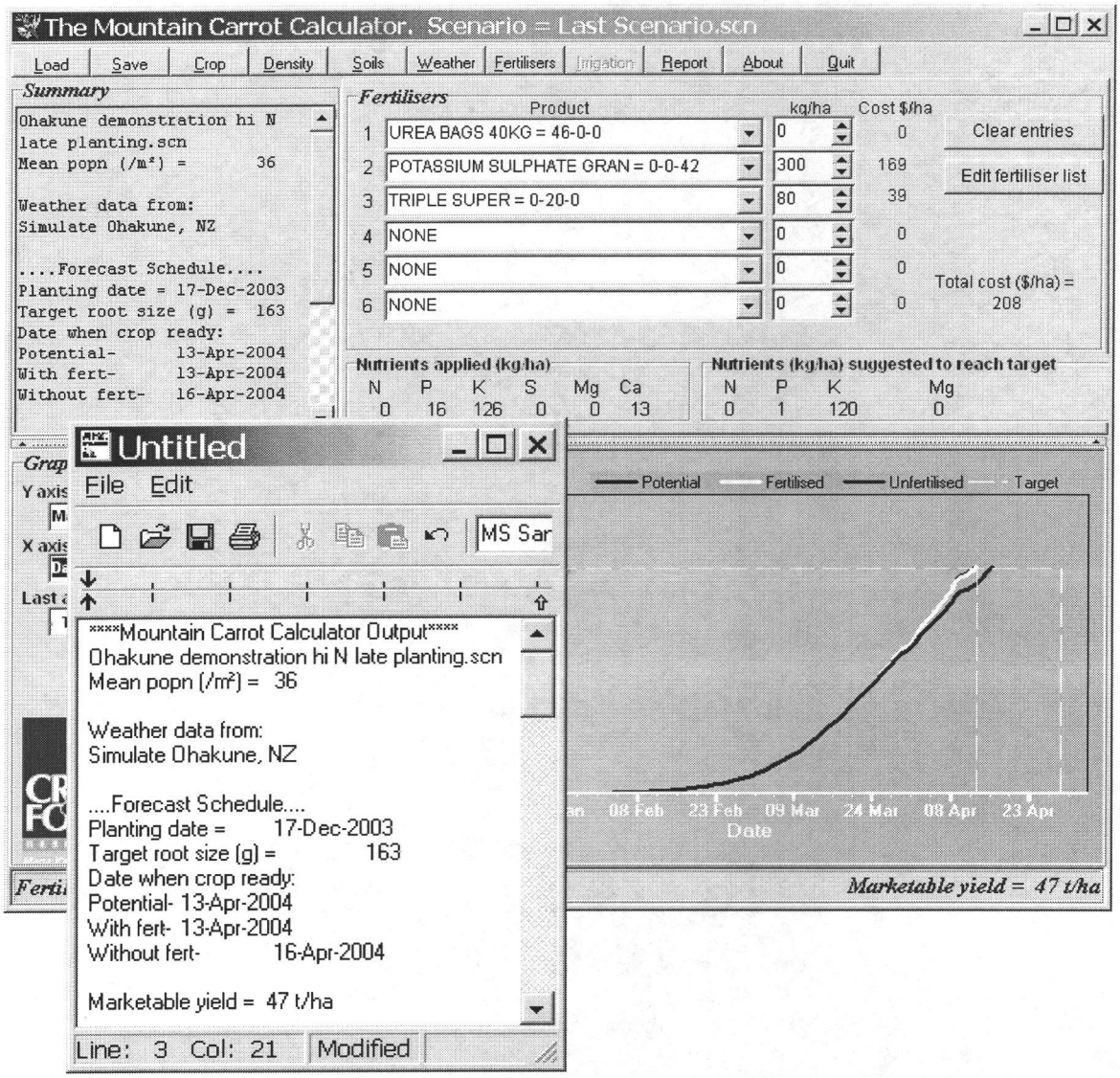

Figure 3. The fertiliser recommendation page

When all the variables have been added, the Mountain Carrot Calculator then recommends fertiliser inputs. The calculator has a fertiliser data base which can be modified, which contains fertiliser formulations and price. Rather than recommend fertilisers for maximum yield, the Mountain Carrot Calculator recommends fertilisers for maximum profit using fertiliser prices and carrot returns ($/tonne). This information can then be copied to a report in the form of a simple text file, with formatting suitable for copying and pasting directly into spreadsheets.

CROP & FOOD RESEARCH
Mana Kai Rangahau

Accounts Receivable Invoice Request

Version 03.04

Debtor Code	Name & Address of Customer to be Invoiced
D1461	MCL Koyo Carrot Export Growers
	c/- Mountain Carrots
	PO Box 91
	OHAKUNE
	To clear a debtor - delete the debtor code above.

Customers Reference	Attention:
	David Greenwood

DECFIN Report Description:

Mth service or goods supplied: January

Update Debtor & Job

Debtor Lookup: MCL Koyo Carrot Export Growers~c/- Mountain Carrots~PO Box 91 ~OHAKUNE ~

Use the drop down arrow above to find a debtor. If the debtor is not found, please enter details in the Name/ Address section above.

Notes: (Use this box for any general notes to finance staff)

Description of Goods & Services (40 chars per line)	Job Code	Cost Type	Qty	Rate Excl GST	Value Excl GST
Optimising Fertiliser for Profitable	8005317	020	1.00	$4,844.44	$4,844.44
Carrot Production' project.					
Final Payment					

	Total Ex GST	$4,844.44
GST / No GST	GST	$605.56
	Total Due NZ$	$5,450.00

Prepared By: Andrea Pearson — ☑ Check to sign

Approver: ☐ Check to sign

Accounts Receivable: ☐ Check to sign

Finance Manager: ☐ Check to sign

Report Information:
- ○ Not required
- ◉ Already posted
- ○ Completed; post with invoice
- ○ Completed; to follow invoice

Posting Instructions
- ○ Invoice to be posted by Finance
- ◉ Invoice to be returned to: Andrea Pearson

Clear Form

Print Form

Mail & Exit

Exit w ithout saving

Add detail lines