

Crop & Food Research Confidential Report No. 1522

Vineyard soil management survey

A Pearson

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A report prepared for
Hawke's Bay Focus Vineyard

Copy 5 of 5

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Contents

1	<i>Executive summary</i>	1
2	<i>Introduction</i>	2
3	<i>The survey</i>	3
4	<i>Results</i>	3
4.1	<i>Vineyard details</i>	3
4.2	<i>Soil sampling</i>	4
4.3	<i>Weed control methods</i>	4
4.4	<i>Soil moisture and irrigation</i>	5
4.5	<i>Soil management issues raised by respondents</i>	5
5	<i>Recommendations</i>	6
6	<i>Looking to the future – soil quality survey 2005-06</i>	7
	<i>Appendix I Focus Vineyard soil management survey</i>	8

1 *Executive summary*

- This report to the Hawke's Bay Focus Vineyard (HBFV) committee summarises results from a postal survey to Hawke's Bay grape growers on vineyard soil management.
- The aims of the survey were to:
 - benchmark current management practices
 - determine soil-related issues the HBFV could address
 - identify vineyards for a soil quality monitoring project.
- A survey was prepared and distributed via the Hawke's Bay Grape Growers Association (HBGGA) and HBFV field days. There were 39 respondents who managed over 1200 ha of grapes.
- The issues raised included:
 - ways to maintain or improve soil structure, organic matter and biological activity cost-effectively without increasing levels of soil nitrogen or vine vigour,
 - the effect of herbicides on soil structure, soil organic matter, soil biology and vine health,
 - the relationship between soil health (especially biological health) and plant health,
 - the effect of side-thrown mower clippings compared with compost application,
 - the nutrient requirements of vines and relationship with grape and wine quality,
 - the timing and benefits of solid versus foliar fertilisers,
 - optimal soil management practices to manage soil moisture and pests/diseases,
 - the management of soil compaction, especially in the mid-rows,
 - managing wind erosion,
 - managing high pH soils,
 - managing soil magnesium,
 - irrigation timing and use of mini-sprinklers versus drip irrigation,
 - soil issues that should be considered when developing a vineyard (pre-plant).
- Many of these issues have been extensively researched and we recommend that technical articles on these subjects are prepared for presentation at field days and seminars. Detailed recommendations on technology and information transfer are provided in Section 5.

- Current projects should help address most unresolved issues. However, the benefits of side-thrown mid-row clippings should be investigated.
- We identified two soil types that can be investigated in the soil quality survey. A proposal to undertake this work has been prepared by Crop & Food Research and accepted by the HBFV.

2 *Introduction*

As part of developing a soil research program for the Hawke's Bay Focus Vineyard (HBFV), Crop & Food Research was asked to prepare a survey for distribution to grape growers. The aims of the survey were to:

- benchmark current soil management practices in vineyards
- identify potential properties for future studies
- document the aspects of soil management growers are particularly concerned about or would like more information on.

This survey is the first part in a four-step investigation of soil quality within the focus vineyard project. The next three steps are outlined below:

- Soil quality survey of selected Hawke's Bay vineyards (2005-06)

This will be conducted using two or three soil types commonly used for grape growing. The quality of each soil type will be assessed on vineyards of different ages, using long-term pasture as a benchmark. The soil-quality indicators will be chosen with reference to similar studies for other land uses (e.g. cropping and pipfruit) and to overseas research on vineyard soil quality.

- Replicated small-plot trials on commercial vineyards (2005-06)

It is proposed that small, detailed trials are conducted on the Focus Vineyards. These trials will investigate the effect of specific management practices on vineyard soil quality. The management practices to be investigated are yet to be determined, but the present survey should provide some direction. Initial suggestions include side-throwing alleyway grass clippings into the herbicide strip under the vines, product testing soil biological activity enhancers, and identifying the benefits (or otherwise) of grazing stock over winter.

- Best management soil practices (2006-07)

Information gathered in the previous three steps will be collated into a booklet of best management practice for vineyard soils. During steps 2 and 3, soil descriptions and photographs will be collected to develop a grower-friendly soil score card. Where possible, relevant experiences of similar horticultural production systems (e.g. pipfruit and berryfruit production) will be incorporated.

3 *The survey*

The survey was developed from a similar survey used to determine orchard soil management practices and was refined for grape growers following input from the Hawke's Bay Focus Vineyard Committee. The topics covered by the survey included:

- property location and soil types,
- vine details, such as age, variety, yields, rooting depth and plant disease,
- soil sampling systems and fertiliser inputs,
- herbicide use and width of herbicide strip,
- use of mulches or composts,
- understorey management, including stock grazing and mowing frequency,
- soil moisture monitoring and irrigation practices,
- soil management issues and ways the focus vineyard project can help.

The survey was distributed at focus vineyard field days held in February and June 2005. It was also emailed and posted by the Hawke's Bay Grape Growers Association to its members and distributed at the end-of-season golf day organised by the Hawke's Bay Grape Growers Association in April 2005. Appendix I contains a full copy of the survey.

4 *Results*

4.1 *Vineyard details*

We had received 39 responses by the end of November 2005. The respondents represented 350 vineyard blocks covering over 1200 hectares. Most vineyards were located in the Hawke's Bay, with two respondents from Gisborne and one from Martinborough.

The most common grape varieties grown (by area) were:

- Merlot (25%)
- Chardonnay (21%)
- Sauvignon Blanc (19%)
- Pinot Gris (10%)
- Cabernet Sauvignon (9%)
- Syrah (3%)
- Pinot Noir (3%).

Other red grape varieties (a total of 4%) were Malbec, Cabernet Franc, Grenache, Petit Verdot and Zinfandel.

Other white grape varieties (a total of 6%) included Gewürztraminer, Reisling, Semillon, Chenin Blanc, Müller Thurgau and Viognier.

The age of vineyard blocks ranged from two years to over one hundred years. The average age of a vineyard block was 11 years (n = 230) but this was affected by one property with a large number of young blocks. When that property was removed from the data set, the average block age increased to 12 years (n = 193).

Only eight respondents did not know which soil types were present on their property, and around one-third (14 out of 39) of properties had been soil-mapped. Most properties (29 out of 39) had been developed into vineyards from pastoral grazing. The rest were converted from cropping or orcharding.

4.2 *Soil sampling*

Most properties (31 out of 39) were sampled for soil nutrient status every one or two years. Just over half the growers were collecting soil samples themselves, the others had a company representative (e.g. fertiliser or supply company) collecting and submitting soil samples on their behalf. Three-quarters of properties had a standardised soil sampling system in place.

Growers typically used the standard soil test (pH, Olsen P, exchangeable cations, cation exchange capacity) to analyse soil samples. Some growers also made additional measurements, including trace elements (especially boron), organic matter, sulfate sulfur and potentially mineralisable (available) nitrogen. One vineyard was using Soil Foodweb testing in addition to the standard soil test.

Most stated their growers' fertiliser inputs. Foliar and suspension fertilisers (approximately 20%), magnesium fertilisers (15%) and phosphate fertilisers (25%) were commonly used. Around 13% of vineyards used no fertiliser.

4.3 *Weed control methods*

Many weed control methods affect soil quality through cultivation or altering organic matter inputs. About half the growers were tolerant of weed growth in their vineyards, provided they could control it when necessary "usually by herbicides". The rest were aiming for totally bare soil (responses A and B in Appendix I). The most common weed on the vineyards was mallow, followed by nettle and fathen.

All growers were using glyphosate (on average 3-4 times per year) rather than mowing to control weeds in the vineyard. "Buster" was also commonly used to control broadleaf weeds such as clovers (average of one application per year). Only three growers were using residual herbicides. Three growers altered the width of their spray strip during the season while the remainder kept the same width all season. The width of the spray strip ranged from 40 cm to 200 cm (16-60% of the row width). Only one grower was spraying the entire vineyard floor, the remainder were mowing the mid-row. Only one grower was attempting to mow under the vines. Side-throwing mower

clippings from the mid-row increases organic matter inputs to the spray strip, and this practice was used on nine properties.

About half were grazing sheep for winter weed control. Mulches, such as composts, were used by three respondents. Five vineyards were being regularly cultivated for a variety of reasons, including weed control, frost risk and to smooth mid-rows for vehicle access.

4.4 *Soil moisture and irrigation*

Four properties were not irrigated – two in Gisborne and two at Meeanee. Interestingly, soil moisture was still monitored at one of the unirrigated Gisborne vineyards. Soil moisture monitoring is performed predominantly by the growers, with only nine employing consultants using a neutron probe, TDR or capacitance probe. Four of these nine growers supplemented the activities of the consultant with their own soil moisture monitoring.

Growers monitored soil moisture using tensiometers, gypsum blocks or capacitance probes generally on a weekly basis. Four monitored less frequently. Three growers relied on assessing soil moisture by feel. The soil moisture monitoring was the basis for irrigation scheduling, often backed up with observations of plant vigour.

Of those who irrigated, only six did not keep irrigation or rainfall records. Drip irrigation was the most common form of irrigation system, and was used on all properties except two. Four growers used travelling overhead irrigation, either solely or in conjunction with drip irrigation. Three growers used mini-sprinklers, either solely or with drip irrigation.

4.5 *Soil management issues raised by respondents*

Respondents were asked if they had any soil-related issues either in general or specific to their vineyard, and ways the Focus Vineyard project could help in relation to soil management. The issues raised included:

- ways to maintain or improve soil structure, organic matter and biological activity cost-effectively, and without increasing levels of soil nitrogen or vine vigour,
- the effect of herbicides on soil structure, soil organic matter, soil biology and vine health,
- the relationship between soil health (especially biological health) and plant health,
- the effect of side-thrown mower clippings compared with compost application,
- the nutrient requirements of vines and relationship with grape and wine quality,
- the timing and benefits of solid versus foliar fertilisers,
- optimal soil management practices to manage soil moisture and pests/diseases,
- the management of soil compaction, especially in the mid-rows,

- managing wind erosion,
- managing high pH soils,
- managing soil magnesium,
- irrigation timing and use of mini-sprinklers versus drip irrigation,
- soil issues that should be considered when developing a vineyard (pre-plant).

5 *Recommendations*

A key focus of this project is technology and information transfer. Many of the management issues raised by growers are well researched, and the information could easily be rewritten into a form suitable for growers such as the technical articles published on the website (www.nzwine.com/focus/) and presented at field days.

Issues raised and ways to address them are noted below.

- Interest in the use of **soil biological amendments** and their benefits for plant health will be addressed in part by the new project starting this season on composts and compost teas. In the meantime, existing information could be presented to growers at a field day and/or in technical articles. Two useful information sources include the mulching trial run by HortResearch in Marlborough, which investigated the use of various composts and mulches on many soil and vine parameters, and the cover crops literature review conducted by HortResearch, Crop & Food Research and Lincoln University, which also summarises the effect of management practices on soil biological activity.
- Many growers questioned the effect of **herbicide use** on soil quality parameters. Much of this information is well-known and could be summarised in a technical article.
- A **checklist** of soil issues that should be considered when developing a vineyard could be produced.
- The Hawke's Bay Regional Council has run a seminar for grape growers on **wind erosion** of vulnerable soils. This could be presented again at a field day and a technical article prepared.
- Stephen Trolove at Crop & Food Research has an AgMardt post-doctoral project underway investigating strategies to alleviate magnesium deficiencies in perennial crops such as citrus and grapes. He could present his first year results (end of the season) at a field day and/or write a technical article on soil magnesium.
- An experiment investigating the benefits of side-throwing mower clippings could be initiated on one of the Focus Vineyards. Such a project should run for at least 2 years, and investigate organic matter inputs, changes in soil nutrients, biological activity and moisture status.

6 *Looking to the future – soil quality survey 2005-06*

This survey identified two soil types that can be investigated in the soil quality survey this coming season. The two soils are:

1. Ngatarawa Rd/SH 50 area. Ngatarawa/Poporangi soils
2. Kereru/Mangatahi area. Takapau soils.

For both of these soil types, we will measure four vineyard blocks of various ages, and compare them with long-term pasture paddocks of the same soil type (Table 1). As management of soil in the vine line is quite different to soil in the mid-row, each of these areas will need to be sampled separately so that the overall impact of grape growing on soil quality can be determined on each block. Crop & Food Research has conducted extensive soil quality surveys of other land uses in Hawke's Bay including cropping, orchards and pastoral farms. We will use similar soil quality indicators in this survey so that comparisons with other land uses can be made. This project is due to begin in autumn 2006.

Table 1: Soil types identified during the soil quality survey 2005-06.

	Age (years)	Ngatarawa	Takapau
Long-term vineyard	> 12	4	
Medium-term vineyard	6-12	4	4
Short-term vineyard	< 6	4	4
Long-term pasture	> 12	4	4*
Total no. blocks or paddocks		16	16
Total no. samples per soil type		28	16

* Conducted as part of another project.

Appendix I Focus Vineyard soil management survey

Dear grower,

We have identified soil management as a key research area in the focus vineyard project. We need your help to understand what current practices so we can target our efforts to the greatest benefit. We also intend to conduct soil quality assessments next season at some of the properties identified in this survey. Please indicate your interest at the end of this survey.

All information you supply will be confidential. Thank you for your time

Hawke's Bay Focus Vineyard committee

PLEASE RETURN SURVEY TO

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FAX: 06 870 0750

PROPERTY INFORMATION

Your name					
Your contact details (phone)					
Vineyard location					
Total vineyard area	(state ha or acres)				
No of blocks	(A block is a set of vine rows with the same variety, history and management)				
Block details					
<u>Block ID</u>	<u>Variety</u>	<u>Vine Age</u>	<u>Row width</u>	<u>Approx Area</u> (ha)	<u>Years in</u> <u>vineyard</u>
<i>(Continue block information on back of page if necessary)</i>					
Soil types on your property (if known)					
Have you had your soils mapped?					
Land use prior to viticulture					

VEGETATION CONTROL METHODS

Which best describes your vegetation control objectives (under vine)?

- A Total vegetation control
- B Try to achieve bare soil but tolerate some weeds if hard to control
- C Don't mind occasional small weeds
- D Not too worried about weedy patches
- E Weeds are acceptable
- F Other (describe) _____

How to you control your unwanted vegetation under vine?

Herbicides

<u>Product</u>	<u>Rate</u>	<u>When</u>	<u>How</u> (spot spray or full coverage)
No. of post-emergence herbicides applied per year →			
Residual herbicide frequency (e.g. once every 3 years) →			
Width of your herbicide strip →			
Do you change width during season. Describe →			

Mowing

<u>Location</u>	<u>Approx No times/year</u>	<u>When</u>
Mid Row →		
Under vine →		
Do you transfer mower clippings from mid row to under vine Circle →	YES	NO

Mulches

<u>Type</u>	<u>Rate</u>	<u>When</u>

Animal Grazing

<u>Type</u>	<u>When</u>

Cultivation

<u>Where (mid row/under vine)</u>	<u>Which blocks</u>	<u>When / how often</u>

What sort of cultivation equipment do you use	
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Other vegetation control practices, please describe

Worst weeds on property, please rank

1		4	
2		5	
3		6	

SOIL MOISTURE AND IRRIGATION

How is soil moisture measured on your vineyard? (circle)

It isn't	Diviner, gopher or similar capacitance probe
By kicking the dirt (by feel)	Gypsum blocks
Soil water balance using rainfall and ET	Watermark sensors
Tensiometers	TDR
Neutron probe	Growth stage
Other. Describe	

How many soil moisture stations are there on your vineyard?	
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Monitoring

Who monitors? →	Yourself or staff	Consultant contractor	or	No one
How Often? →	Weekly	Fortnight		Monthly
Other, please describe				
How do you decide when to irrigate? →	Consultants advice	Soil moisture status	Vine vigor	Vine and fruit condition
Other, please describe				

Irrigation

Do you irrigate? →	YES	NO
Do you keep irrigation records? →	YES	NO
Do you keep rainfall records? →	YES	NO
Are blocks irrigated differently? →	YES	NO
When did you last calibrate your irrigation system? →		

Irrigation system

Drip irrigation	Fixed mini-sprinklers	Travelling overhead irrigator
Overhead sprinklers	Moveable pipes	
Other, please describe		

Have you any other comments or queries about vineyard soil management

How can this project help your business? What would you like more information about?

Would you like to be involved in our soil study?

YES, count me in	NO, thanks
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