



Focus vineyards: What is best practice and how to improve adoption of this best practice?

Irrigation Management: Optimising water usage while improving grape and wine quality

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EXECUTIVE SUMMARY

A large range of applied research has been conducted in the industry over this time, with varying degrees of uptake and implementation. This project seeks to bring together this vast quantity of information and integrate it into existing management systems with a focus on sustainable wine growing.

This report outlines the first seasons irrigation monitoring at the three focus vineyards and compares this with a SFF irrigation trial and industry practice within an established irrigation scheduling service.

Irrigation at the focus vineyard sites is generally within industry best practice. Soil moisture at Tyntesfield tracked similar to the Nautilus control where as Tyntesfield and Tohu Wines tracked at higher soil moisture levels. Most sites were showing some root water extraction at 120cm at some stage during the monitoring season. Irrigation system audits indicate that the Stenbridge system is operating within manufacturers guidelines, Tyntesfield is operating slightly higher than manufacturers guidelines and Tohu Wines had a significant issue with their irrigation systems at the end of last season.

Years two and three of this project will be used to implement and monitor best practice irrigation management and compare with deficit irrigation techniques.

INTRODUCTION

Nationally and internationally water is becoming a limiting resource to the production of quality wine grapes. In New Zealand rapid expansion in this industry has seen growth into previously considered water-short areas and exploitation of previously considered large aquifer reserves. Currently irrigation research is focused on water use in grape vines with the aim to reduce water inputs whilst maintaining or improving wine quality but not adversely affecting yield. As water becomes a more scarce resource then this approach may not give adequate water savings to enable sustainable production.

Our experience in both running/using an irrigation scheduling service and SFF projects looking at vine water use (00/294) tells us that vines are basically water hogs and will take almost anything that you can give them. This is not new, it has been known for some time, but gives us an important clue when it comes to the possibilities in this area of water management.

The aim of the irrigation component of this Focus Vineyard project is to disseminate results from previous irrigation trials and experience gained from operating an irrigation scheduling service in Marlborough since 1987. Specific attention will be paid to a current SFF research project titled “Maximising irrigation savings in grape vines and the effect on yield and wine quality” (SFF Project 03/100). This SFF project includes a replicated trial at Nautilus Estate, Renwick, and an annual report for this project is provided with this Focus Vineyard report.

The Focus Vineyard project includes intensive monitoring at three vineyard sites; Tyntesfield, Stenbridge and Tohu Wines (Awatere vineyard). This report will outline the monitoring conducted at these vineyard sites in 2004-05 and discuss dissemination plans for the next two years of the Focus Vineyard project.

METHODS

In 2004/05 two monitoring sites were set of on each Focus vineyard. The sites were located in two separate Sauvignon Blanc blocks capable of being irrigated separately. Each site included three aluminium tubes for monitoring soil moisture using a CPN 503DR Neutron Probe, a Nylex 1000 rain gauge and a 15mm water meter for monitoring irrigation application at the monitoring site.

These sites were installed in January 2005 and monitoring began on 24th January at Tyntesfield and Stembridge and on 18th February at Tohu Wines. Ideally sites are installed in the Winter but given a desire to start gathering some data these sites were installed in Summer and Full point (field capacity) readings taken in Winter 2005. Weekly monitoring of soil moisture, rainfall and irrigation application continued until one week after harvest. While measurements were taken weekly growers were not advised of these readings until the end of the season so as not to influence their standard irrigation application.

Immediately post harvest an irrigation system audit was conducted. This included measurement of flow rates and dripline pressure at various locations within each block. Emitter outputs were measured using the water meter and catch buckets and results compared with the rated output of the emitters.

At the end of the season, a meeting was held with each grower to discuss their irrigation strategies, the weekly monitoring results and the system audit results.

The results of the Nautilus trial and the first seasons monitoring at Stembridge were discussed at the general field day at Stembridge on May 25th 2005.

RESULTS AND DISCUSSION

The short monitoring season for the Focus Vineyard sites makes full analysis difficult but some interesting observations have been made.

A summary of irrigation application for the Focus Vineyard sites is presented in Table One and Table Two. This is compared with the Nautilus control site and the average of Sauvignon Blanc sites older than 3 yrs within Fruition Horticultures irrigation monitoring service.

Table One: Rainfall and Irrigation Application January 21st to Harvest.

Site Name	Average Full Point (mm/110cm)	Rainfall	Irrigation	
			mm	L/vine
Stembridge Spy Blk	331	94	67	403
Stembridge Graft Blk	287	94	98	531
Tyntesfield Sav C	249	89	66	356
Tyntesfield Sav A	266	93	26	140
Nautilus control	245	108	66	355
Fruition client ave	250	105	60	289

Table Two: Rainfall and Irrigation Application February 18th to Harvest.

Site Name	Average Full Point (mm/110cm)	Rainfall	Irrigation	
			mm	L/vine
Tohu Waha Blk	313	110	65	283
Tohu Puketapu Blk	248	122	32	137
Nautilus control	245	107	53	285
Fruition client ave	250	104	44	212

Stembridge

Stembridge applied irrigation similar to the control treatment at the Nautilus trial (and Fruition client average) on the Spy block but applied greater irrigation on the graft block. This was due to the graft block being slightly younger and more variable and the grower intentionally applying slightly higher irrigation. The Stembridge sites have slightly higher Readily Available Water (RAW) compared to the Nautilus trial site.

Tyntesfield

Tyntesfield applied similar to the control treatment at the Nautilus trial (and Fruition client average) on C Block but applied less irrigation on A Block. The Tyntesfield sites have similar Readily Available Water (RAW) compared to the Nautilus trial site.

Tohu Wines

Tohu Wines applied slightly higher than the control treatment at the Nautilus trial (and Fruition client average) on Waha Block but applied less irrigation on Puketapu Block. Tohu Wines had the intention of irrigating both blocks at similar levels and it appears system performance led to less irrigation being applied at the Puketapu block. The Waha block has slightly higher Readily Available Water (RAW) compared to the Nautilus trial site, whereas the Puketapu block has a similar RAW.

Summary

Without soil moisture and irrigation readings prior to monitoring began firm conclusions are difficult however it appears, in general, irrigation management on these blocks is in line with reasonable industry practice. Without soil moisture and irrigation readings prior to January too much speculation would be involved to read too much more into growers' irrigation practice.

Soil Moisture Monitoring

Summary soil moisture reports were generated for each monitoring site. These reports showing soil moisture, rainfall, irrigation application are presented in Appendix One. Full Point has been estimated for each site based on one late winter reading. Further confirmation of Full Point will be conducted in Spring. These graphs indicate that Stembridge soil moisture followed a similar pattern to the soil moisture at the Nautilus control treatment, whereas both Tyntesfield and Tohu Wines sites tracked at slightly higher soil moisture than the Nautilus control treatment.

The neutron probe records soil moisture at 8 depths to a maximum depth of 120cm. As such it is possible to get an indication of soil moisture change, and hence root water extraction, at different depths in the soil profile. Analysis of this data showed that vines at most blocks extracted soil moisture from 120cm at some stage during the monitoring period. Only Stembridge Graft Block was different, showing minimal root activity below 70cm during this period.

Irrigation System Audits

Immediately after harvest each blocks irrigation system was audited for lateral pressure and emitter output. The results are shown in Table Three.

Table Three: Irrigation system audit results.

Block	Pressure (Psi)		Output (L/vine/hour)		
	Average	Variation	Specification	Measured average	Measured variation
Stembridge Spy Blk	20.0	+/-10%	6.4	6.0	+/-7%
Stembridge Graft Blk	21.5	+/-12%	4.8	4.0	+/-14%
Tyntesfield Sav C	22.5	+/-47%	4.8	5.6	+/-7%
Tyntesfield Sav A	29.2	+/-16%	3.2	4.5	+/-12%
Tohu Waha Blk	4.8	+/-47%	4.8	3.1	+/-78%
Tohu Puketapu Blk	0.8	+/-500%	4.8	0.5	+/-71%

This indicates that Stembridge blocks were operating within specification operating pressures and the emitters were applying slightly less water than their specification. However the variation between emitters was relatively low, ranging between 7 and 14% for the two blocks.

The Tyntesfield blocks were both operating at pressures slightly above specification ranges and the emitters were applying more water than their manufacturers specification. The variation between emitters on these two blocks was also relatively low, ranging between 7 and 12%.

The Tohu Wines blocks were both operating at pressures well below specification ranges and the emitters were applying less water than their manufacturers specification. The variation between emitter output on these two blocks was very high, ranging between 71 and 78%. This block has some significant problems with their irrigation system and this is being investigated by the irrigation designer and installer to identify the reason for the poor performance.

NEXT SEASON

Initial observations at the Focus Vineyard sites have been very interesting and have provided some useful base data with which to help make irrigation recommendations for the coming season. The intention is to meet with growers in October to discuss their irrigation strategies for the coming season. This will include selection of one of their monitor blocks for standard irrigation application and one block selected for a tailored deficit irrigation strategy similar to one of those that has been implemented at the Nautilus trial site in the past two seasons.

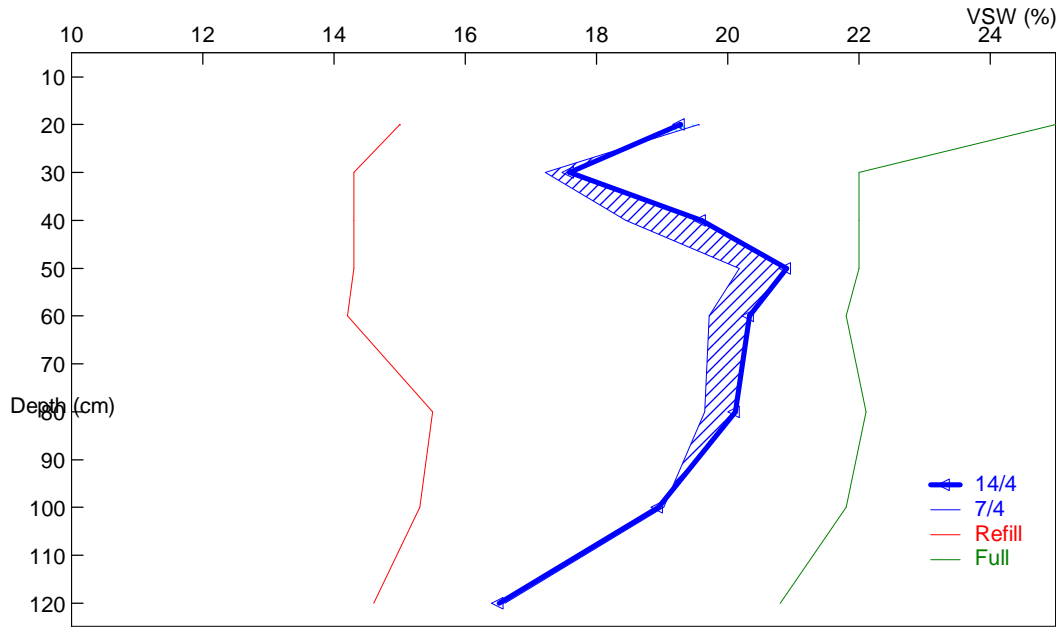
CONCLUSIONS

- Irrigation application on the Focus Vineyard blocks is similar to industry best practice.
- Stembridge applied slightly more irrigation than the Nautilus control and had greater readily available water.
- Tyntesfield and Tohu Wines applied similar or less irrigation than the Nautilus control.
- Soil moisture at Tyntesfield tracked similar to the Nautilus control where as Tyntesfield and Tohu Wines tracked at higher soil moisture levels.
- Most sites were showing some root water extraction at 120cm at some stage during the monitoring season.
- Irrigation system audits indicate that the Stembridge system is operating within manufacturers guidelines, Tyntesfield is operating slightly higher than manufacturers guidelines and Tohu Wines had a significant issue with their irrigation systems at the end of last season.

ACKNOWLEDGEMENT

Thanks to growers for cooperating with the trials and allowing access to their properties for irrigation monitoring.

Tyntesfield Site 1 Sav C R103/104



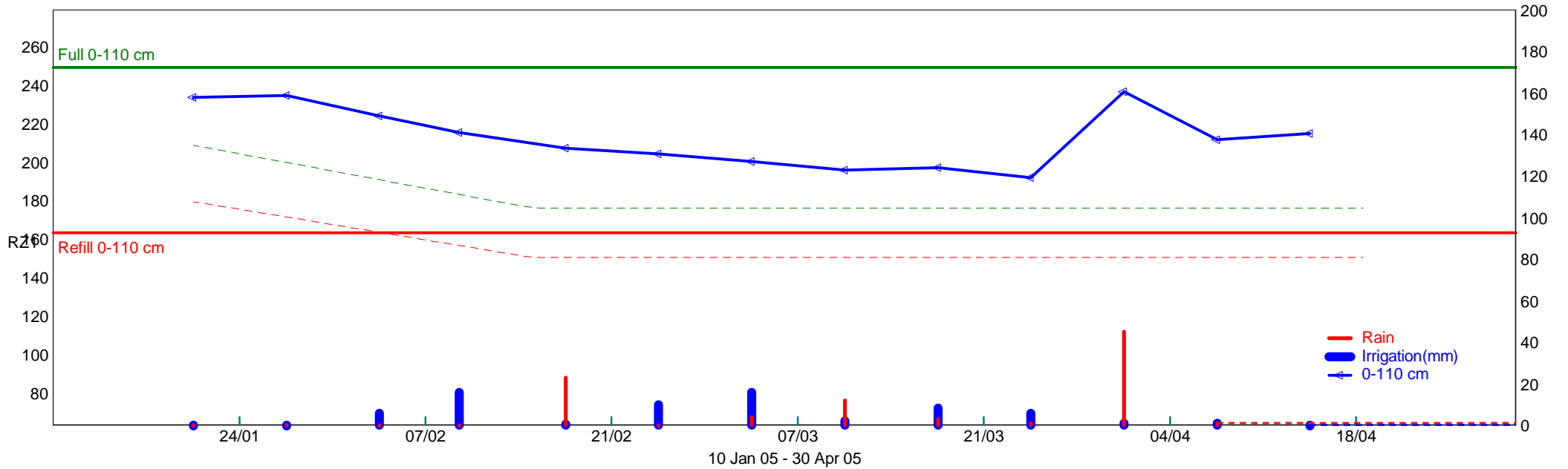
Season Summary

RootZone	0-110 cm
Full Point	249 mm
Refill Point	163 mm
FAW	86 mm

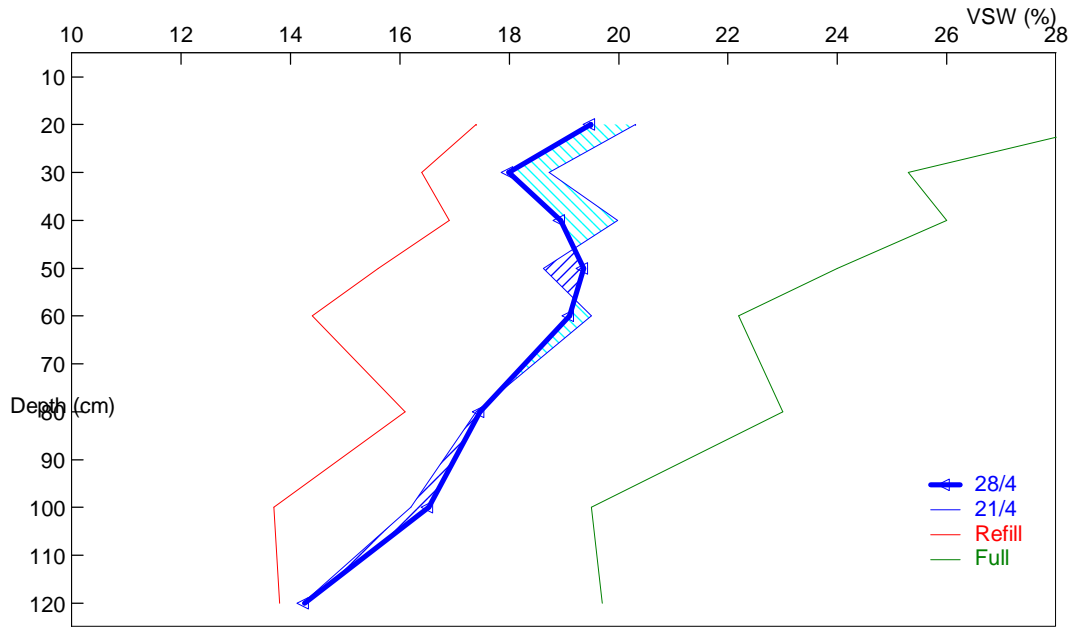
Irrigations	mm	L
Delivered:	66	356
Effective:	66	356
Efficiency:	100%	

Rain

Delivered:	89	481
Effective:	63	342
Efficiency:	71%	



Tyntesfield Site 2 Sav A R31/32



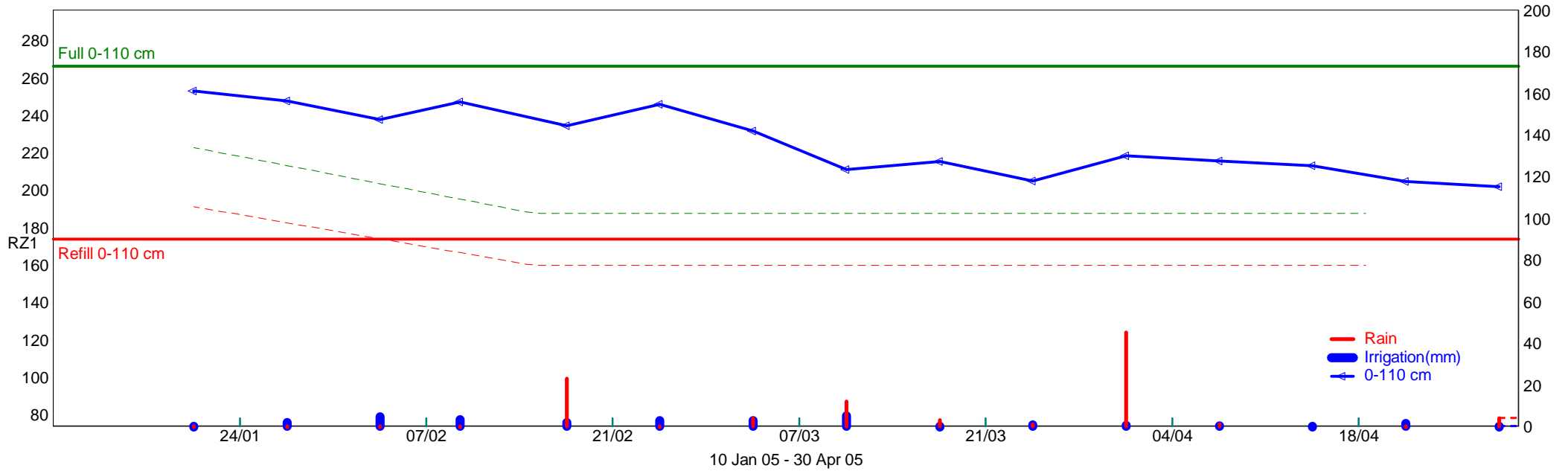
Season Summary

RootZone	0-110 cm
Full Point	266 mm
Refill Point	174 mm
FAW	93 mm

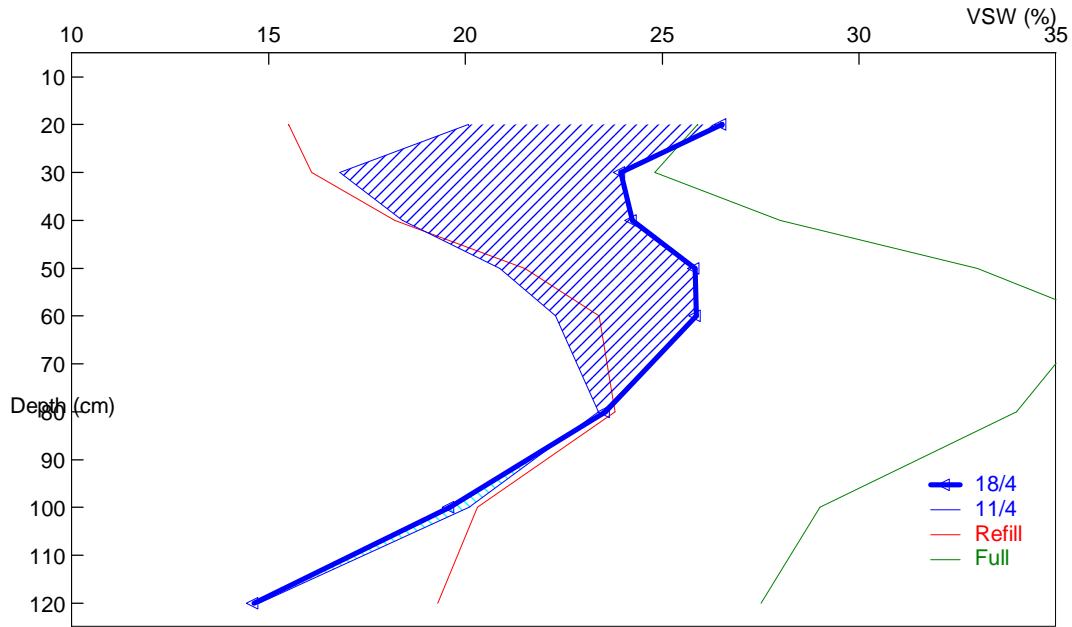
Irrigations	mm	L
Delivered:	26	140
Effective:	26	140
Efficiency:	100%	

Rain

Delivered:	93	502
Effective:	56	305
Efficiency:	61%	



Gifford Site 1 Spy Sav Blanc R64/65



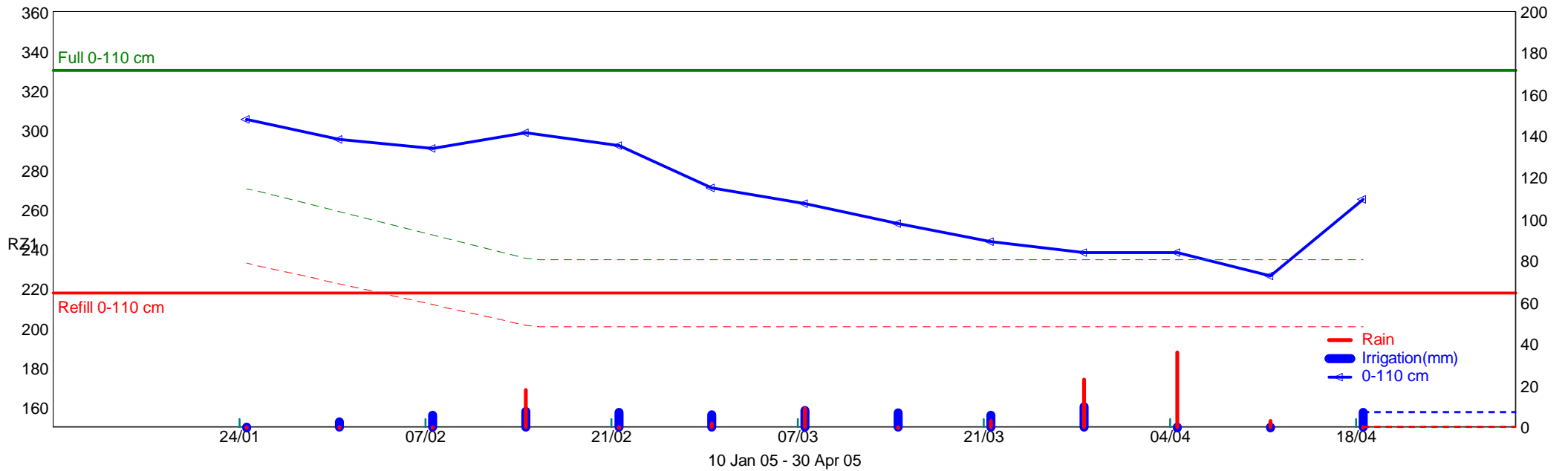
Season Summary

RootZone	0-110 cm
Full Point	331 mm
Refill Point	218 mm
FAW	113 mm

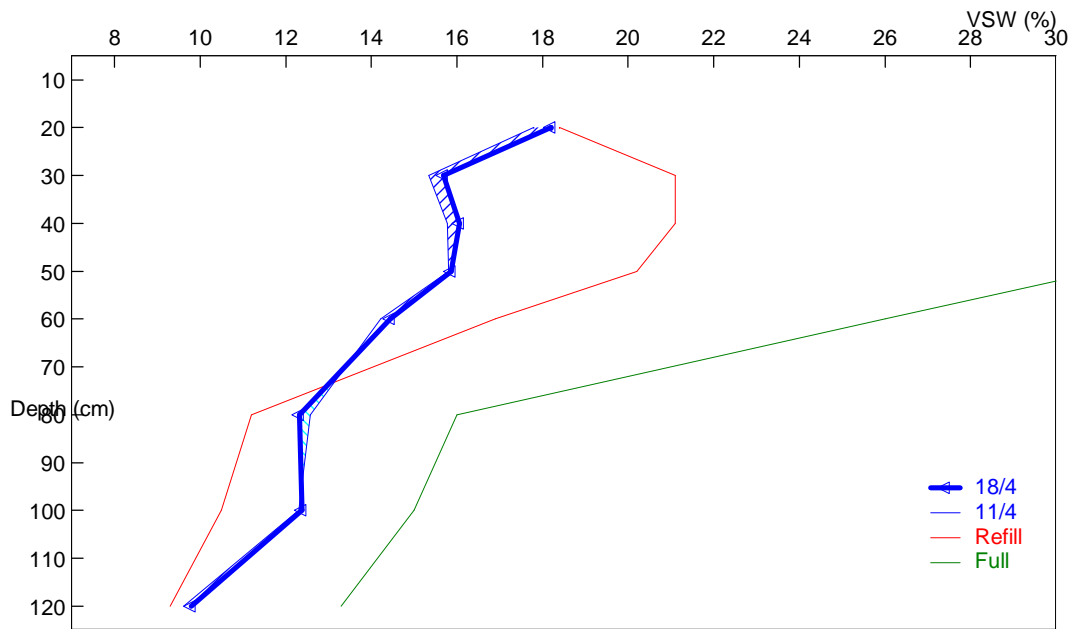
Irrigations	mm	L
Delivered:	67	403
Effective:	67	403
Efficiency:	100%	

Rain

Delivered:	94	564
Effective:	66	396
Efficiency:	70%	



Gifford Site 2 Graft Sav Blanc R189/190



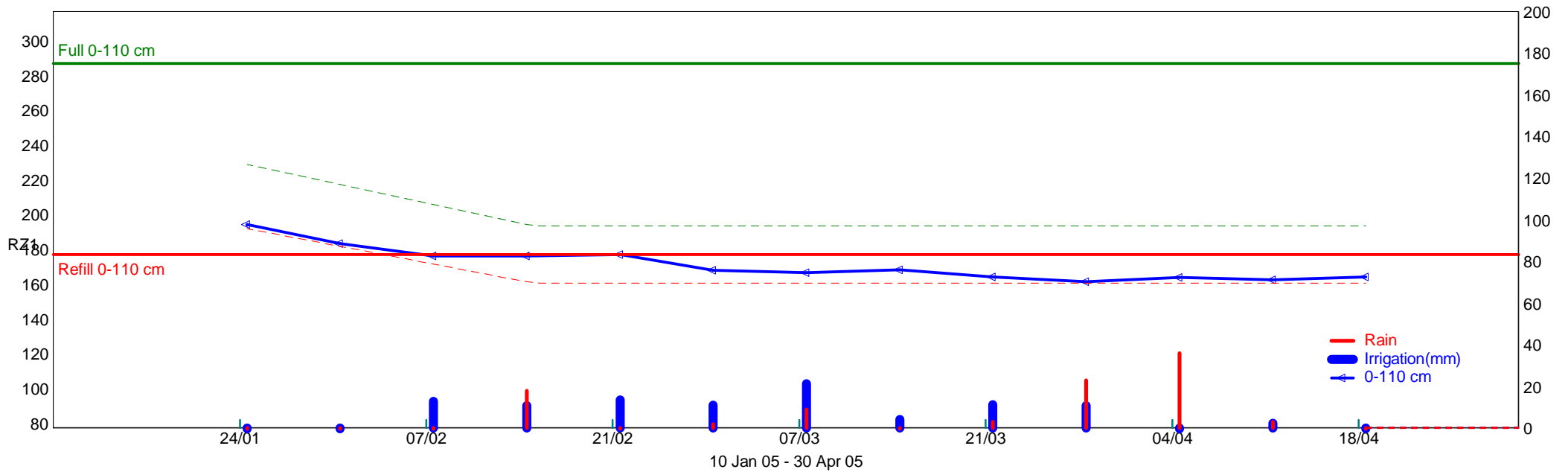
Season Summary

RootZone	0-110 cm
Full Point	287 mm
Refill Point	177 mm
FAW	110 mm

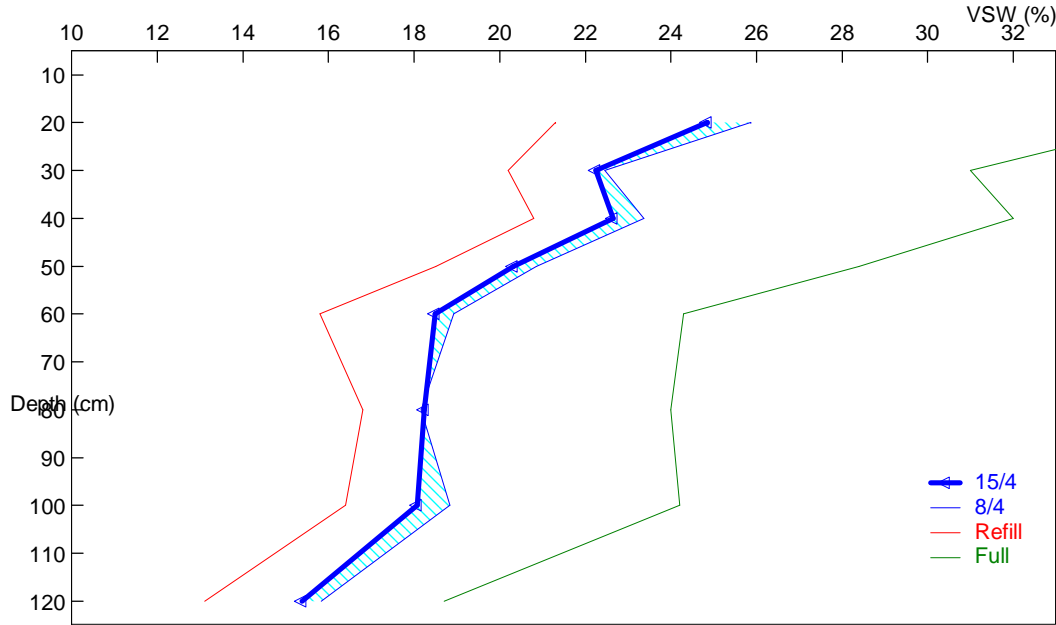
Irrigations	mm	L
Delivered:	98	531
Effective:	98	531
Efficiency:	100%	

Rain

Delivered:	94	508
Effective:	66	356
Efficiency:	70%	



Tohu Wines Site 1 Waha R52/53



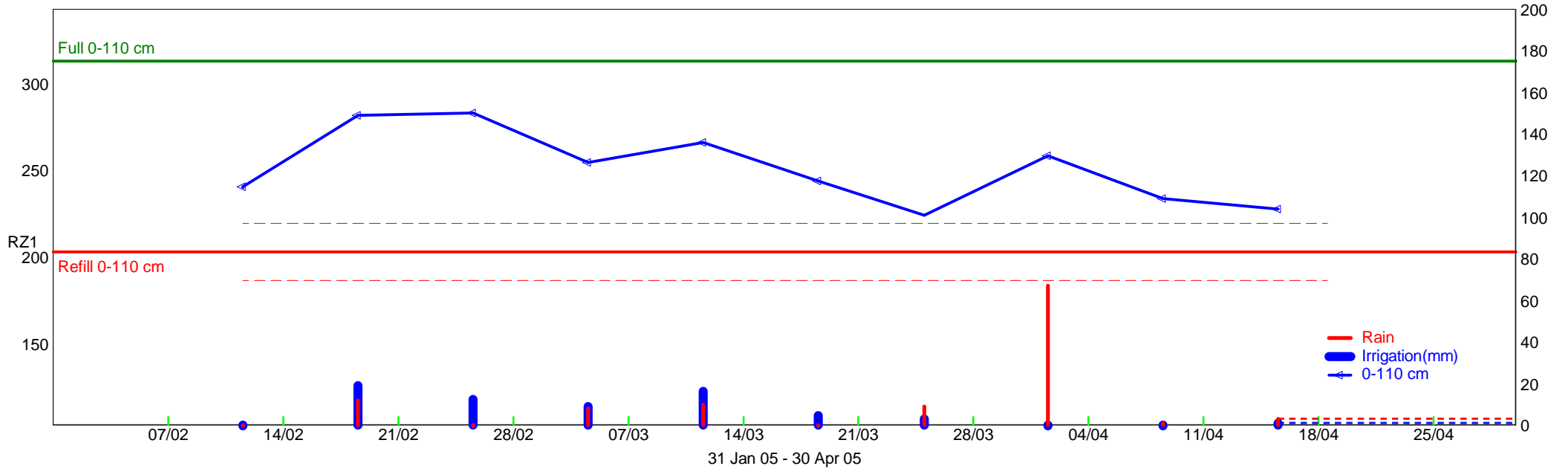
Season Summary

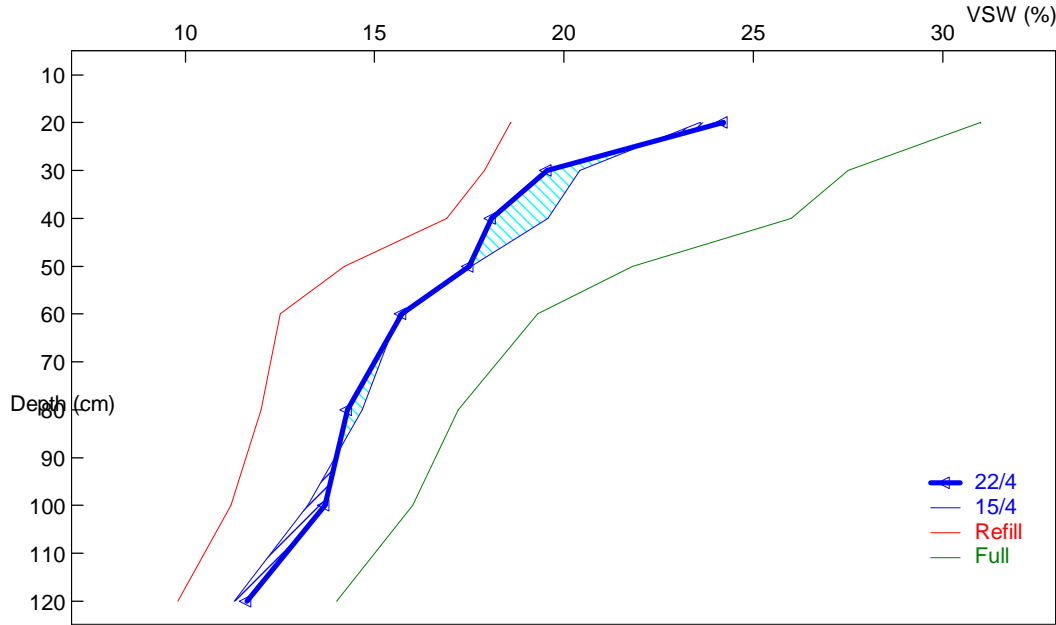
RootZone	0-110 cm
Full Point	313 mm
Refill Point	203 mm
FAW	110 mm

Irrigations	mm	L
Delivered:	65	283
Effective:	65	283
Efficiency:	100%	

Rain

Delivered:	110	475
Effective:	81	350
Efficiency:	74%	





Season Summary

RootZone	0-110 cm
Full Point	248 mm
Refill Point	161 mm
FAW	88 mm

Irrigations	mm	L
	Delivered:	32
Effective:	32	137
Efficiency:	100%	

Rain

Delivered:	122	527
Effective:	79	340
Efficiency:	65%	

