

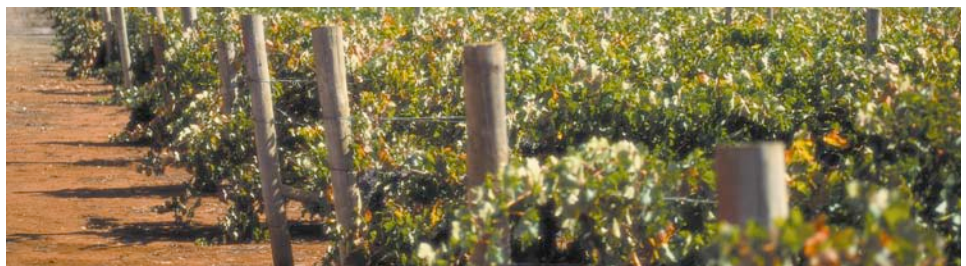
Managing Soil Salinity for Wine Quality Groundwater Irrigated Vineyards

CIF5121



NPSI Case study

April 2011



Situation

Subject: Hans Loder

Location: Coonawarra

Enterprise: Wine Grapes

Size: 200ha

Irrigation: Pressurised drip
irrigation and overhead
sprinklers for frost protection

Root zone and salinity monitoring and the potential impact of seasonal conditions on vineyard production

Link with NPSI

The aim of the project – **Managing soil salinity for wine quality in groundwater-irrigated vineyards** is to develop strategies to adapt wine grape production systems to the prevailing soil and climatic conditions, groundwater flow and quality regime and irrigation technology, to achieve premium wines that meet world food health standards and ensure export growth.

Project outcomes include investigation of new practices for managing root zone salinity and protecting soil structure as well as recommendations on salt excluding rootstocks for quality grape growing. The aim is to develop an integrated approach for sustainable, groundwater-based irrigation crop production systems that is tailored to the regional hydro-geology, soil types and crop production.

Hans Loder's involvement in this project resulted from contacts made and work undertaken during an earlier NRM Board funded Precision Viticulture (PV) EM38 mapping (soil depth to limestone) trial aimed at gauging irrigation efficiency. Given his goal of improving irrigation management and efficiency, Hans saw further involvement with the NPSI project as an *exciting opportunity to investigate an additional aspect (and potentially consequence) of irrigation management and improved efficiency*. Trial work has been carried out on Wingara Wine Group's Katnook Estate property, which he manages. It involved investigation of soil salinity management, irrigation efficiency and the consequences of accumulated salt in soil profiles.



Enviroscan Sensors 10cm

Although the location chosen for each Enviroscan probe in the vineyard had been good (capturing either an area of 'deep' or 'shallow' soil), poor placement of sensors along the length of the probe (in what could be described as a 'standard' setup), resulted in misrepresentative soil moisture information. This was mainly on account of sensors being placed in areas of limestone below the soil profile, with the limestone retaining significantly more moisture than the soil/root zone area.

By clustering sensors together (every 10cm) in the soil/root zone, detailed information is now provided about the movement of water through the soil, along with soil moisture status. A far better correlation has been observed between vine performance and soil moisture indicated by the Enviroscan probes. Being able to view the progress of wetting fronts through the soil, has also enabled improved sampling from the Solusamplers.

Changes made as a result of NPSI influence

As a result of involvement in this project, Hans has improved his knowledge and understanding of irrigation infrastructure. This has led to improvement in system maintenance and has resulted in more frequent monitoring of system performance.

Based on knowledge gained, he has also adjusted his soil moisture monitoring equipment to provide more meaningful data by clustering sensors in the soil and root zone. This is in contrast to what was provided by the previous 'standard' installation of these systems.

Wetting front detectors installed as part of the NPSI trial have also helped Hans gauge when (irrigation) water is being pushed past the vine root zone. This type of information has enabled him to reduce deep drainage by limiting irrigation shift run times.

Hans explains that although he is currently using the EM38 data to determine shallow areas and apply mulch, maps such as this form the basis for improved irrigation system design. He says this will enable him to reengineer irrigation systems if thought necessary and practical.

The NPSI trial has also made Hans more aware of technologies such as the Sentek Solusamplers, which he uses to monitor salinity in his soil. He notes that prior to this trial, he had limited understanding of salinity management in his vineyards and as a result of involvement in this project, salinity is now something that is monitored. He is *more aware that salinity will increase in an individual season if rainfall is limited and irrigation will then be required to flush salt from the soil.*

Costs of making changes

Hans believes the costs to implement change have not been excessive. He has invested in an instrument for measuring EC, which cost approximately \$200, as well as additional, minor monitoring requirements. However, Hans explains that the majority of monitoring has been incorporated into general operations and is viewed as a good opportunity to get out of the office and take a closer look at the vineyard.

Hans says he was fortunate enough to have been involved in previous trial work where Full Stop probes and Solusampler infrastructure were left in place. He continues to use these in his monitoring.

Overall, he thinks that the time and cost of involvement in this NPSI project has been *definitely worthwhile*, as it provides an opportunity to monitor salinity in the vine root zone.



“... we are aware of when salinity levels change and may create an issue.”

Katnook Estate Valve: Increased emphasis on maintenance and monitoring of irrigation infrastructure has improved system performance and reduced variability.

Benefits of making changes

Installation of monitoring equipment, along with a growing understanding of how soil salinity is affected by seasonal conditions, will ensure that we are aware of when salinity levels change and when they may create an issue.

This type of information will allow Hans to make informed decisions and take action to apply flushing irrigations when salinity levels are high and threaten to compromise vine function and wine quality.

He says that this is particularly vital during drier and hotter seasons when salinity monitoring is important to reduce the possibility of crop loss (or rejection) as a direct consequence of high salinity levels.

As well as the benefits of improved salinity monitoring, Hans notes that overall, his irrigation has improved as a result of improved application uniformity of the drip irrigation system and with this, the benefit of reduced vineyard variability.

The NPSI trial provided the opportunity to utilise IRES (Irrigation Recording and Evaluating System) software. This software has enabled Hans to make a detailed interrogation of irrigation and water use, incorporating data on irrigation applied, ETo and soil moisture.

Katnook Estate Soil Depth

As part of the “ground truthing” component of the EM38 survey, detailed soil assessment was undertaken by digging a soil pit. Along with the comprehensive analysis of soil samples taken from the pit, it was visually striking to see the shallow and limited soil depth overlying limestone as well as the density of (feeder and structural) roots in the shallow profile.

Such a limited soil profile has clear implications for soil water holding capacity and the frequency at which irrigation needs to be applied.





Katnook Vineyards 2003

“There is a salinity threshold at which production will either decline or quality will be detrimentally affected.”

Impacts of making changes

Hans explains that one of the most valuable pieces of information he has gathered as a result of his involvement in this NPSI project has been the understanding that salinity could reach problem levels in South East (Coonawarra) soils in exceptionally dry years. But he is now confident in the knowledge that only one month of typical rainfall over the winter months is potentially enough to flush salt from the soil profile, returning the system to normal levels.

He adds that as a manager, he is now better equipped to evaluate and consider *the fine line between efficient irrigation practices and the lurking menace of salinity, which is inherent in all irrigation systems.*

Relevance to others

Hans notes that the practical application of salinity monitoring is valuable to many operations, given that there is a salinity threshold at which production will either decline or quality will be detrimentally affected.

The buildup of salt could occur in any irrigated system and therefore an awareness of correct system design, relative to soil conditions will ensure irrigation efficiency. This understanding will also ensure the effective flushing of salt from the plant root zones.

Supporting Material

NPSI website www.npsi.gov.au
QPI Milestone 4 Report

Further information

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