Facing the water availability challenge workshop
Acknowledgements

• Aither would like to acknowledge the Meru peoples who were the traditional custodians of the lands on which we meet today.

• Aither would like to acknowledge CCW, Riverland Wine for making this session possible.

• Aither would also like to acknowledge the CSIRO and Andrew Weeks for being part of the session.
Irrigation management strategies

How much yield can I afford to lose?

How efficient is my irrigation right now?

What experience of deficit irrigation on my farm do I have?
Deficit irrigation management in viticulture

Everard Edwards | Research Team Leader
22-23rd May 2019
Irrigation management

Why do we irrigate?
Primarily to produce an economically viable crop.

How much should we irrigate?
The amount required to produce the economically viable crop (i.e. the desired yield/quality).
Replace soil water used by the vines.
Vineyard water use

Crop evapotranspiration

V I N E  T R A N S P I R A T I O N

Cover crop transpiration

Evaporation from soil

D E E P  D R A I N A G E
Estimating crop evapotranspiration

• Can be directly measured over a crop using an *eddy-covariance flux tower*.  
  • Impractical for grower.

• Reference evapotranspiration (*ET*$_o$) was defined by the FAO in 1990’s.
  • Specified surface equivalent to 12 cm tall sward of grass,
  • is mathematically modelled,
  • can be estimated from meteorological observations.

• Crop evapotranspiration (*ET*$_c$) can be estimated from *ET*$_o$ using a scaling factor (*K*$_c$).
  • *K*$_c$ is typically a ‘guesstimate’.
Irrigating to $ET_c$

- Can estimate Kc from satellite data.
- One example is IrriSat, developed by John Hornbuckle
- https://irrisat-cloud.appspot.com/
Deficit irrigation

• Simply:
  • *Irrigation at a rate that limits plant production*
  • e.g. irrigating to less than ET\(_c\).

• Can consider three basic strategies:
  • *Regulated deficit irrigation* (RDI), providing a fraction of ET\(_c\), typically at certain phenological periods;
  • *Sustained deficit irrigation* (SDI), providing reduced irrigation for all/most of the season;
  • Uncontrolled deficit – ran out of water!
Deficit irrigation for water use efficiency

• During periods of low allocations, aim of deficit irrigation is to minimise loss of crop value.

• In other words, aim to improve water use efficiency (WUE).

• Definitions:
  • yield / irrigation applied (vineyard area basis)
  • "irrigation WUE"
  • yield / water transpired (whole season, vine basis)
  • "crop water use index (CWUI)"
Vine transpiration: what drives *vine* water use?

Vine water use is a function of:

- *vapour pressure deficit (VPD)*,
- canopy size/structure,
- stomatal opening.

*modified by boundary layer/wind.

Cabernet Sauvignon, Sunraysia (Edwards *et al.*)
Stomata and transpiration

Movement of water from the vine to the air is termed *transpiration* and occurs through the *stomata*.

The underside of a vine leaf is covered in small pores: stomata.
Stomatal conductance

Stomatal opening is under tight control by the plant. The extent of stomatal opening is termed *conductance*. Movement of water from the vine to the air is termed *transpiration* and occurs through the *stomata*.
Vine transpiration: what drives *vine* water use?

Vine water use is a function of:

- *vapour pressure deficit (VPD)*,
- *canopy size/structure*,
- *stomatal opening (regulation by the vine)*.

*modified by boundary layer/wind.

Cabernet Sauvignon, Sunraysia (Edwards *et al.*)
Improving water use efficiency

• To reduce vine water use we can:
  • reduce VPD - vineyard design, overhead sprinklers(!);
  • reduce canopy size/alter structure;
  • reduce stomatal conductance.

• But, can simply reducing water use improve WUE?

• Or does reducing water use simply reduce yield?
Extending Regulated Deficit Irrigation

- Regulated deficit reduces canopy size.
- Greater deficit = greater canopy reduction.
- Effect not simply in-season limitation, but multi-season effect (images taken prior to RDI use in that season).

PD = extended RDI (longer, more severe).

Cabernet Sauvignon, Sunraysia (Edwards et al.)
## Extending Regulated Deficit Irrigation

<table>
<thead>
<tr>
<th></th>
<th>Yield/Irrigation (t ML⁻¹)</th>
<th>Yield/Transpiration (t ML⁻¹)</th>
<th>Transpiration Eff. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>11.2*</td>
<td>2.9*</td>
<td>39</td>
</tr>
<tr>
<td>Regulated Deficit</td>
<td>5.6</td>
<td>5.2</td>
<td>38</td>
</tr>
<tr>
<td>Prolonged Deficit</td>
<td>4.5</td>
<td>5.6</td>
<td>54</td>
</tr>
</tbody>
</table>

- Extent of RDI may govern CWUI improvements.

*Control over-watered to ensure no limitation.
Sustained Deficit Irrigation

- Sustained deficit irrigation
- Each square contains multiple treatments;
- 10%, 20%, 30%, 50%, 100% irrigation from fruit set;
- Rainfall ≈20% control;
- Treatments maintained for up to four seasons.

Chardonnay, Riverland (Tyerman, McCarthy, Edwards et al.)
Sustained Deficit Irrigation

Effect of SDI on yield smaller than the reduction in irrigation applied.
Can’t separate effect of canopy size and effect on stomatal conductance though.

*Blue bars are a single (4th) season, red lines are average of four seasons.*
Sustained Deficit Irrigation - Recovery

- *Sustained deficit irrigation*
- Each square contains multiple treatments;
- 10%, 20%, 30%, 50%, 100% irrigation from fruit set;
- Rainfall ≈20% control;
- Experiment included recovery after 1-3 yrs of deficit.

Chardonnay, Riverland (Tyerman, McCarthy, Edwards *et al.*)
Sustained Deficit Irrigation - Recovery

- All treatments bar 10% (30% inc rainfall) had yield recovery in the first season after return to full irrigation.
# Irrigation: partial root zone drying (PRD)

<table>
<thead>
<tr>
<th></th>
<th>Yield (t ha(^{-1}))</th>
<th>PRD yield reduction (%)</th>
<th>WUE Control (t ML(^{-1}))</th>
<th>WUE PRD (t ML(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shiraz (McLaren Vale)</td>
<td>20.3</td>
<td>6</td>
<td>13.3</td>
<td>24.7</td>
</tr>
<tr>
<td>Shiraz (Sunraysia)</td>
<td>29.0</td>
<td>7</td>
<td>3.9</td>
<td>6.1</td>
</tr>
<tr>
<td>Shiraz (Padthaway)</td>
<td>13.3</td>
<td>28</td>
<td>3.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Shiraz (Langhorne Ck)</td>
<td>12.3</td>
<td>-</td>
<td>3.8</td>
<td>6.7</td>
</tr>
<tr>
<td>Riesling (Riverland)</td>
<td>37.7</td>
<td>2</td>
<td>6.9</td>
<td>13.1</td>
</tr>
</tbody>
</table>

Effect of PRD on yield typically small, but large increase in irrigation WUE.

PRD effect not reliant on canopy size, but impact of root signalling (ABA).

Dry et al. 2000 Australian Grapegrower and Winemaker
Deficit irrigation and heatwaves

Well-watered

Water-stressed

2009/10 season, 13 days >40°C, Murray Valley.

Summary

- Reducing irrigation typically increases yield per ML water applied, but will also reduce yield per ha.

- Vines are resilient, yield recovery can occur in the first season after full irrigation applied.

- If possible reserve water for irrigation during heat wave.

- Need to consider enterprise, e.g. may be better financially to fully irrigate one block and allow another to fail.
Acknowledgements
Past and current staff and students of grapevine physiology team at CSIRO.

Work described funded by Wine Australia & CSIRO.
Sustained Deficit Irrigation

![Graph showing yield (kg/vine) vs. irrigation plus effective rainfall (mm). The graph includes data for different years with distinct lines and error bars. The x-axis represents irrigation plus effective rainfall in millimeters, ranging from 0 to 1000 mm, and the y-axis represents yield (kg/vine) ranging from 0 to 25 kg/vine. Different years are indicated by various line styles and markers: 08-09, 09-10, 10-11, and 11-12.]
Plants need water

Water is required for:
- cell function,
- photosynthesis,
- transport of photosynthate & nutrients.

Water moves from root to shoot and is lost from the leaves.

The plant is part of the "soil-to-air continuum".

Water deficit interferes with these processes.
Movement of water from the vine to the air is termed *transpiration* and occurs through the *stomata*.

The underside of a vine leaf is covered in small pores: stomata.
The stomata are also the site where CO$_2$ enters the leaf (for photosynthesis).

Water loss and carbon uptake are directly linked!

Stomatal opening is under tight control by the plant. The extent of stomatal opening is termed *conductance*. 
Vine water use is determined by:

- *stomatal conductance*,
- *canopy size*,
- *vapour pressure deficit*.

Vapour pressure deficit (VPD):

- $\text{VPD} = \text{amount of water in saturated air (100 %RH)} - \text{actual amount of water in the air}$

The amount of water required to saturate air increases with temperature.

Therefore, VPD typically increases with temperature.
• Increasing VPD results in greater water loss from the leaf for a given value of conductance.

• Vine water use likely to increase at high temperatures even if vine responds by closing stomata.
Conductance responds to VPD: varietal differences

Soar et al. (2006) AJGWR

Water loss increases even with a 70% reduction in conductance

Soar et al. (2006) AJGWR
Drivers of vine water use – an example

Vine water use is a function of:

• *vapour pressure deficit (VPD)*,

• canopy size/structure,

• stomatal opening.

*modified by boundary layer/wind.

Cabernet Sauvignon, Sunraysia (Edwards et al.)
Effect of water deficit on conductance

- Sustained deficit irrigation (reduced from fruit-set to leaf fall).
- Impact of reduced soil water availability present throughout season.
- Low conductance reduces vine water use, but also reduces photosynthesis.

Reduced stomatal conductance and WUE

- Reducing stomatal conductance increases WUE of photosynthesis – up to a point....

Data are Edwards, unpublished.
Canopy structure and water use - models

• Model by the late Eric Lebon & co-workers at SupAgro Montpellier,
  • 3D vine structure model leaf to vineyard scale.
  • overlaid with leaf physiology model and solar radiation.

• Model suggests that open, less dense, canopy will be more water use efficient (photosynthesis).

• Greater proportion of leaf area illuminated.

Figure from Louarn et al. Annals of Botany, 2008.
Implementing canopy size/structure control

- Leaf removal (summer pruning, mechanical, hand);
- Deficit irrigation (RDI, SDI, PRD);
- Vigour controlling rootstocks (e.g. Merbein series).

Hilltops < 10 t ha\(^{-1}\)
Sunraysia ≈ 23 t ha\(^{-1}\)
Langhorne Ck ≈ 10 t ha\(^{-1}\)

Edwards, Walker, Smith, Holzapfel, Barril et al.
Rootstock conferred vigour

*Flowering*

*Canopy closure*

Ramsey  1103 Paulsen  Merbein 5512

Vines grafted with Shiraz, growing in the one block in Sunraysia, approx. 20 years old.
Rootstock conferred vigour

Canopy size estimated as leaf area index (LAI).

Rootstocks split into three groups, two-fold range.

Leaf Area Index (m²·m⁻²)

Mean LAI over four seasons.
Can rootstocks effect CWUI of the scion?

- Actual vine water use measured using sapflow sensors.
- As with deficit irrigation, rootstock effect on water use greater than on yield.
- Need to match irrigation to rootstock to achieve improved irrigation WUE.
Conclusions

Reducing vine transpiration can, and usually does, improve WUE;

All types of deficit irrigation can improve WUE;
  • but note that economics will depend on many factors;
  • be aware of oncoming heat events.

Low vigour rootstocks likely to improve WUE without additional management costs.

Potential to develop rootstocks that influence scion via response to soil environment, e.g. increased ABA.

Improved WUE ≠ improved drought tolerance;
  • Probably the reverse in the case of low vigour rootstocks.
The sessions will provide information and knowledge regarding:

- the status of water markets and outlook for 2019/20 and beyond
- understanding the drivers of water prices
- various water purchasing and portfolio management options
- insights to assist with short term and long-term business planning

**But, we will not tell you how to run your business**

- We are not providing certified financial advice
- We encourage you to get information from as many sources as possible
- Our aim is to help you plan and make good decisions
Who is Aither?

Independent advisors on water markets, policy and infrastructure

Our team works closely with investors, agricultural corporations and governments

Offices in **Adelaide, Melbourne, Sydney, Canberra** and **Brisbane**

Aither provides its water market clients with:

- Monthly market updates
- Transaction and investment due diligence
- Water portfolio strategy
- Water valuation services
- Water price modelling
- Regulatory and policy advice

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Current status

Water availability and markets

- Where are water markets today?
- What is driving the market?
- What does this mean for allocation prices in the year ahead?
Current status

Storages levels have declined substantially but look to have bottomed out for this year

Southern Murray–Darling Basin major headwater storages, to 30 June 2019

Source: Aither, 2019.
Inflows have been very low but there is still time for decent winter and spring rains.

**Current status of inflows**

Inflows (GL/day)
Current status of the BOM outlook

The outlook isn’t great but is uncertain
Current status of allocation prices

Allocation prices have responded to reduced inflows and high demand

Source: Aither, 2019. Based on state water registers.

Major southern Murray–Darling Basin allocation market prices, July 2017 to June 2019
Current status

Entitlement prices continue to rise

Source: Aither, 2019. Based on state water registers.

Major southern Murray-Darling Basin entitlement market prices

Source: Aither, 2019. Based on state water registers.
South Australian 2019-20 allocation forecasts, announced 1 August 2019

<table>
<thead>
<tr>
<th>SA River Murray</th>
<th>Irrigation Allocation Scenarios</th>
<th>Minimum Allocation for 2019-20</th>
<th>Projected Allocation as a Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Purpose - Class 3</td>
<td>01 August 2019</td>
<td>1 Sep 2019</td>
</tr>
<tr>
<td>Exceptionally dry</td>
<td>50</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Extreme dry conditions</td>
<td>50</td>
<td>51</td>
<td>70</td>
</tr>
<tr>
<td>Very dry conditions</td>
<td>50</td>
<td>56</td>
<td>78</td>
</tr>
<tr>
<td>Dry conditions</td>
<td>50</td>
<td>61</td>
<td>89</td>
</tr>
<tr>
<td>Average conditions</td>
<td>50</td>
<td>68</td>
<td>100</td>
</tr>
<tr>
<td>Wet conditions</td>
<td>50</td>
<td>74</td>
<td>100</td>
</tr>
</tbody>
</table>

Based on forecast end July 2019 water availability.

DISCLAIMER: This data is provided for information only. Historical performance is not necessarily an indicator of future outcomes. Projections are based on historical climate variability across the last 30 years. The Government of South Australia accepts no liability for any loss resulting from the use of or reliance on any of this data or information.

Definitions: Based on modelling of water availability that simulates historical variability in rainfall and temperature, in combination with current policy and operational settings:

- Exceptionally dry: There is a 95% likelihood your allocation will exceed the allocation in this scenario.
- Extreme dry: There is a 95% likelihood your allocation will exceed the allocation in this scenario.
- Very dry: There is a 90% likelihood your allocation will exceed the allocation in this scenario.
- Dry: There is a 75% likelihood your allocation will exceed the allocation in this scenario.
- Average: There is a 50% likelihood your allocation will exceed the allocation in this scenario.
- Wet: There is a 25% likelihood your allocation will exceed the allocation in this scenario.
## Current status

**NSW and Victorian allocation forecast summary**

### NSW Murray General Security 2019-20 allocation forecast, announced 15 July 2019

<table>
<thead>
<tr>
<th>Historical Inflow Scenario</th>
<th>1 Sep 2019</th>
<th>1 Nov 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme 99 chances in 100 (99%)</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Very dry 9 chances in 10 (90%)</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Dry 3 chances in 4 (75%)</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>Median 1 chance in 2 (50%)</td>
<td>0%</td>
<td>30%</td>
</tr>
</tbody>
</table>

### NSW Murrumbidgee General Security 2019-20 allocation forecast, announced 15 July 2019

<table>
<thead>
<tr>
<th>Historical Inflow Scenario</th>
<th>1 Sep 2019</th>
<th>1 Nov 2019</th>
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<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Dry 3 chances in 4 (75%)</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>Median 1 chance in 2 (50%)</td>
<td>5%</td>
<td>25%</td>
</tr>
</tbody>
</table>

### Victorian 2019-20 mid-February allocation forecasts, announced 15 July 2019

<table>
<thead>
<tr>
<th>Entitlement</th>
<th>Wet</th>
<th>Average</th>
<th>Dry</th>
<th>Extreme Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victorian Murray HRWS</td>
<td>100%</td>
<td>100%</td>
<td>55%</td>
<td>29%</td>
</tr>
<tr>
<td>Goulburn HRWS</td>
<td>100%</td>
<td>100%</td>
<td>43%</td>
<td>20%</td>
</tr>
<tr>
<td>Campaspe HRWS</td>
<td>100%</td>
<td>100%</td>
<td>44%</td>
<td>31%</td>
</tr>
<tr>
<td>Loddon HRWS</td>
<td>100%</td>
<td>100%</td>
<td>43%</td>
<td>20%</td>
</tr>
<tr>
<td>Broken HRWS</td>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Bullarook HRWS</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
### Current status of consumptive water in storage

Estimate of consumptive water in storage, 2019-20 (based on 15 July 2019)

<table>
<thead>
<tr>
<th>Entitlement</th>
<th>Current allocation percentages (as of 15 July)</th>
<th>Consumptive allocation (as of 15 July 2019) (GL)</th>
<th>Estimated consumptive carryover (GL)</th>
<th>Estimated allocation to environment (Commonwealth) (GL) *</th>
<th>Estimated environmental carryover (GL) **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vic Murray HRWS</td>
<td>16%</td>
<td>165</td>
<td>190</td>
<td>58</td>
<td>350</td>
</tr>
<tr>
<td>Goulburn HRWS</td>
<td>25%</td>
<td>198</td>
<td>173</td>
<td>79</td>
<td>194</td>
</tr>
<tr>
<td>NSW Murray HS</td>
<td>97%</td>
<td>174</td>
<td>-</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>NSW Murray GS</td>
<td>0%</td>
<td>0</td>
<td>256 (estimated)</td>
<td>0</td>
<td>35***</td>
</tr>
<tr>
<td>Murrumbidgee HS</td>
<td>95%</td>
<td>338</td>
<td>-</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Murrumbidgee GS</td>
<td>0%</td>
<td>0</td>
<td>114</td>
<td>0</td>
<td>40***</td>
</tr>
<tr>
<td>SA Murray</td>
<td>50%</td>
<td>226</td>
<td>102</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1101</strong></td>
<td><strong>835</strong></td>
<td><strong>245</strong></td>
<td><strong>619</strong></td>
<td><strong>619</strong></td>
</tr>
</tbody>
</table>

**Note:**
- * Based on entitlements owned by the Commonwealth in each system multiplied by current allocation percentages for each entitlement class.
- ** Based on carryover volumes reported by state entities.
- *** NSW reports environmental water held by NSW Office of Environment and Heritage (OEH), The Living Murray (TLM) and Commonwealth Environmental Water Holder (CEWH).
Drivers of water markets
Drivers of water markets

Water markets in the southern MDB are changing rapidly with profound implications for irrigators and policy makers.

- Reduced supply
- Increased demand
Supply side – how has it played out?

Example of the impacts of water entitlement purchases and impacts on dairy and rice growers

- Drought years increased debt and then commodity prices collapsed
- Many irrigators sold entitlement but kept irrigating due to cheap allocation
- Warning signs evident in 15/16 but rain granted a short-term reprieve
- Significant adjustment (exit) now occurring

Volume of water allocated (GL)

Volume allocated for consumptive use

Volume allocated to Cwlth water purchases

Allocation price ($/ML)
Demand side

Large shifts in irrigated agricultural demand have occurred

**Tree crops**
Large increases in the planted area of almonds (and citrus) in the lower Murray and the Murrumbidgee

**Cotton**
Large scale introduction of cotton into the sMDB with ~70k ha and 800k bales in Murrumbidgee and Murray for 2017-18 season

**Grapes**
Strong export conditions have driven recent investments in new table and dried grape developments
Recent Aither report

Water supply and demand in the southern Murray-Darling Basin

An assessment of future water availability and permanent horticulture irrigation water demand

A Final Report prepared for the Victorian Department of Environment, Land, Water and Planning (DELWP)

Friday 7 June 2019

Demand

Water demand from permanent horticulture in the Lower Murray has increased.

Source: Aither 2018 based on ABS 2018 and other industry sources.

Comparison of water demand from permanent horticulture, connected Murray, 2015-16 ABS estimate and Aither 2018-19 baseline estimates.
Balancing supply and demand

Water allocated in extremely dry years may exceed horticultural demand (excluding carryover)

Source: Aither 2018
Water availability scenarios and projected permanent horticulture water demand (at full maturity), connected Murray region
Outlook for 2019/20 and beyond

Allocation price is strongly related to total water availability.

- Wet
- Average
- Dry
- Extreme dry
- Allocation price

Water allocated (GL)

Total water allocated for consumptive use
Water allocated to Commonwealth environmental water
Extreme Dry
Dry
Average
Wet
Your water market options

• What options do I have to secure any shortfall in FY20?

• What costs and risks are involved?
There are more water market options available

Consider these for this year and beyond

Main options

- Allocation market

Other options

- Buy Vic entitlements
- Buy interstate entitlements
- Forwards
- Multi-year forwards
- Entitlement leases
- Parking/carryover
- (Call options)
Consider the costs, benefits and risks involved

- Cost risk
- Counterparty risk
- Diversification
- Trade restrictions
- Product availability
- Up-front capital costs
- Time frames
- Predictability
- Administration costs
- Liquidity / lock in

There’s no universal best option – it’s all about what’s right for your business at this point in time.
Buying more entitlement

Entitlements are expensive but provide long term rights to water

Additional local entitlement

Other High Security / Reliability products

- NSW, SA and Victoria – potential diversification benefits versus risk of trade constraints
- Major capital expenditure in a sellers markets at the moment

NSW General Security and Victorian LRWS

- Lower cost
- Carryover potential
- But GS mainly yields water in average/wet seasons
Southern Murray–Darling Basin
Trade restrictions
Leasing entitlement

Typical cost
- 5-6% of entitlement cost (was $320 - $380/ML for Vic 7 High and SA Murray at the end of last year)
- Lease cost has increased significantly in the last 12 months

Consider as a financing product
- Opex not capex

But you still bear the allocation risk

Other features to consider
- Term / extension options, revaluation clauses, access to carryover rights, payment terms
- Mainly sourced from major water investors
- Availability
Forwards for allocation

More of an option to consider at the end of this year for 2020-21

Typical cost
• Premium on current allocation price (reflecting cost to carryover water)

The only product which guarantees delivery of volume of water on a set date
• Counterparty risk is more the issue here

Other features to consider
• Term – hard to get more than 2 year forwards
• Payment terms and delivery dates
• Mainly sourced from major water investors
• Locking in at a high price – regret is your biggest concern

Could look for within season forwards
Purchasing carryover space

• Draws on carryover rights of others who are not using them
  • Mainly in NSW and Victoria

• Move your allocation at end of year, then move it back again in new year

• Prices vary based on demand for carryover and the system
  • Generally fairly cheap this year (circa $20-$35/ML of space but this varies and check conditions)

• An alternative to purchasing Vic LRWS and NSW GS entitlement to get access to carryover

• Think about for future years
Spectrum of water portfolio options to balance risk and return

- Allocation exposed (OPEX intensive)
  - Allocation spot market
  - Carryover or forwards
  - Leases

- Light hedge
  - Allocation spot market
  - Carryover or forwards
  - Leases
  - Owned entitlements

- More hedge
  - Allocation spot market
  - Carryover or forwards
  - Leases
  - Owned entitlements

- Conservative (CAPEX intensive)
  - Owned entitlements

Source: Aither 2019
Other resources available

- Aither Water Markets Report
- Twitter: @aithernews
- H2OX / Ruralco weekly newsletters (and other broker information)
- Victorian Water Register
- Goulburn Murray Water
- Lower Murray Water
- Northern Victorian Resource Manager
- MDBA
- Victorian Farmers Federation
- Rural Financial Counselling Service
- Other irrigators
Session 6
Andrew Weeks

Farm planning for the short term

What is my breakeven cost of water for FY20?

How much profit / loss will I incur in FY20 if additional water purchases are required?
Where is the new normal?

Where might long-term prices sit?
Planning for the longer-term is essential for planning the shorter-term

• Your short-term plan for next year should fit into your long-term plan. Your long-term plan is not rolling out your short-term plan many times.
• The price of allocation and entitlement has moved up
• If we don’t get good rain this year, then next year will be worse
• What is your long-term break even cost of water? What is your long-term response to higher priced water? Do you need to change the way you source water?
• Do you need to change your farming system?
• Do you have a pragmatic long-term plan?
Be proactive


“If you are not across the water market, then you might as well be playing golf”

Sunraysia wine grape grower – 2010
The planning process

• Plan ahead
• Set a direction — be aware and flexible
• Identify critical times for crucial decisions
• Be realistic not hopeful
• Consider the alternatives:
  • Run your worst-case scenario
  • Run your expected scenario
  • Run your best case scenario
Viticulture decisions

• Think about the effects of different levels of water use:
• Too low at the wrong time:
  • May restrict crop level;
  • may reduce canopy and lead to sunburn, crop loss, and quality degradation.
• Forcing crop level to gain a return:
  • May lead to excessive disease pressure;
  • late ripening- fruit harvested late;
  • exposed to more weather events;
  • cash flow implications;
  • increased water use;
  • impacts on successive crops.
• Balanced water application – Why force excessive canopy growth early, only to cut it off several times during the growing season?
The planning process

• Planning water needs in three steps:
  • Part 1: Likely returns for crop
  • Part 2: Costs of water
  • Part 3: Dealing with complexity
Planning Part 1: Likely returns for crop

• Start with last year’s price
  • How does last year compare with this year?
  • Was there more or less supply?
  • What else has changed?
  • What was the price last time conditions were similar to now?

• Quality matters

• Be pragmatic, ultimately the price is outside your control

• Your base return is:
  dollars per tonne \( \times \) tonnes per hectare = base return
Planning Part 1: Likely returns for crop — reflection exercise

• How are prices trending?

• What were prices like last time conditions turned dry?

• What else could affect prices this next season?
Planning Part 2: Cost of water

• How much water is needed to irrigate that area?
• Be realistic
• Factor in unexpected hot conditions and unexpected demands
• Consider when you will need to be applying water
• Do scenario planning.
  • How much will you need if conditions are average, dry, or extreme dry?
Planning Part 2: Cost of water

Source: Aither, 2019.
Planning Part 2: Cost of water

Important to note:

• If the cost of watering is too high and the expected returns are too low, you may be below your break even point.

• If you are below your break even point, speak to your accountant, financial advisor or other expert advice early.
Planning Part 2: Cost of water — reflection exercise

• What can cause unexpected water demand or shortfalls?

• How do you manage in things do not proceed to plan?

• What other water sources have I considered?

• At what price of water is irrigating no longer profitable? What will I do in this case?
Planning Part 3: Dealing with complexity

- Overall farm enterprise
  - Other crop types
  - Varieties – reds, whites, neutrals

- Planning water use by patch

- Think about the water use for each under different scenarios one by one

- Record your thinking/planning as you go

- Make your decisions based on returns to investment and the risk involved
Planning Part 3: Dealing with complexity — reflection exercise

• What methods do you use to manage a mix of crops and varieties?

• Do you have other risk management techniques you use around water availability?
Farm budget planning – an example
Questions or comments

Any brief questions on this item?

Does this make sense?
Planning for the longer term

What market conditions do I expect over the next 5 years?

What is my long-term plan?

How will I plan around one, three, five or more years of dry conditions?
Large shifts in irrigated agricultural demand have occurred

**Tree crops**
Large increases in the planted area of almonds (and citrus) in the lower Murray and the Murrumbidgee

**Cotton**
Large scale introduction of cotton into the sMDB with ~70k ha and 800k bales in Murrumbidgee and Murray for 2017-18 season

**Grapes**
Strong export conditions have driven recent investments in new table and dried grape developments

Source: Aither, 2019.
Water availability and wine grapes

Horticulture demand and consumptive water availability - downstream of Barmah Choke in Victoria, NSW and South Australia

The yellow and red lines include an allowance of 200 GL for water traded in from the Goulburn and Murrumbidgee valleys. Trade assumptions are approximate and will vary year on year depending on seasonal conditions, crop prices and other drivers.
Winegrape prices are improving

Winegrape prices are improving – but not as fast as the price of water

Source: Aither, 2019. Based on SA water register
Consider alternative end uses

Bulk wine:
• Increased costs
• New territory, unfamiliar – potential for mistakes?
• Processing costs
• Market risk
• Possible additional costs?
• Other considerations?
• Comes back to the initial comments – make decisions with eyes open.
Threat or opportunity

• Is it an opportune time to convert low-value patches to higher value, higher quality clones, on water-efficient rootstock?
• If you have been considering it – is now a good time?
• In light of high water and property prices – is it a good time to sell or lease the vineyard?
• A possible time to work in with others in a collaborative sense?