Learning together at Angas Bremer

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Many people are each contributing their specialist pieces to the jigsaw puzzle as they learn together and build a shared picture for the future of the Angas Bremer district. Every local grower, their community, people from government and other agencies, researchers, business people and consultants are all involved. Their achievements include

- 20 years of developing and implementing water management policies that have succeeded in saving the previously over-used aquifer,
- creating and using Irrigation Annual Reporting to highlight the wide variation in irrigation practices and to provide accurate district irrigation statistics and
- using the CSIRO FullStop device to monitor drainage and to improve irrigation efficiency.

The Angas Bremer district is located near Strathalbyn, beside Lake Alexandrina, about 30km from the Murray mouth and 60km south east of Adelaide. The 7,100ha irrigated includes 5,400ha of wine-grapes, 470ha of lucerne and 430ha of potatoes.

1. A remarkable achievement

In the Angas Bremer district, by 1981 the annual use of groundwater for irrigated agriculture had reached 27GigaLitres per year (27 thousand ML or 27 million cubic metres). This un-sustainable volume was four times the annual groundwater recharge. After 20 years of determined effort, by 2001 groundwater use had reduced by more than 90% to 2GL/yr as shown in Figure 1. Both the farm-gate dollar income and the area of land irrigated have increased while the volume of irrigation water used has decreased. This has been achieved by local development and implementation of innovative water management policies: In 1986, all groundwater allocations were cut by 30%, spread over 5 years, then cut by an additional 15% over the next 5 years. Policies encouraged the exchange of groundwater allocations for River Murray allocations. This required the local-funding and building of pipelines. Policies also assisted a change in the predominant crop type from lucerne hay (needing 10ML/ha) to wine-grapes (needing 2ML/ha).

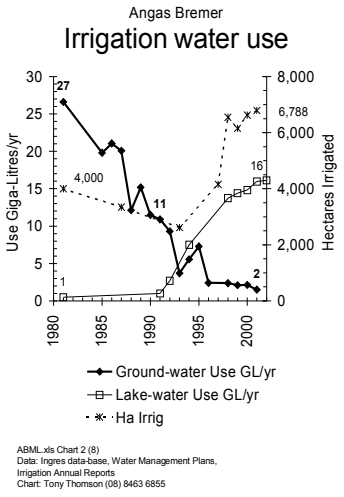


Figure 1 Ground-water use has fallen while lake-water use and the area irrigated have increased

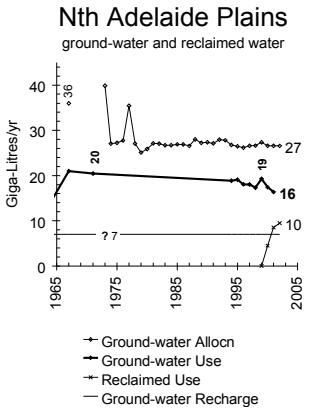


Figure 2 Groundwater use exceeds recharge. Allocations were not cut when reclaimed water became available

For comparison, Figure 2 shows that on the Northern Adelaide Plains, where groundwater use has been more than double recharge since before 1975, the reclaimed water from the Bolivar Sewage Treatment Works has been made available without any reduction in groundwater allocation or in groundwater use.

2. Irrigators' Code of Practice – a first in Australia

The locally-elected Angas Bremer Water Management Committee has developed an Irrigators' Code of Practice comprising four components which are: Irrigation Annual Reporting, Water-table height monitoring, Drainage monitoring to improve irrigation efficiency and Planting vegetation for water-table height management.

2.1 Irrigation Annual Reporting is an essential first step in learning.

If you don't know your (irrigation mm/yr), your (mm per irrigation) and whether water was wasted to drainage, how can you improve? In each year since 1997, all the one hundred and sixty Angas Bremer irrigators have been learning together using a simple, low cost process called Irrigation Annual Reporting. Each grower has collected and recorded data including their annual water meter readings and the area of each crop type under irrigation. The data has been collated into District Irrigation Annual Reports that have been distributed to each grower.

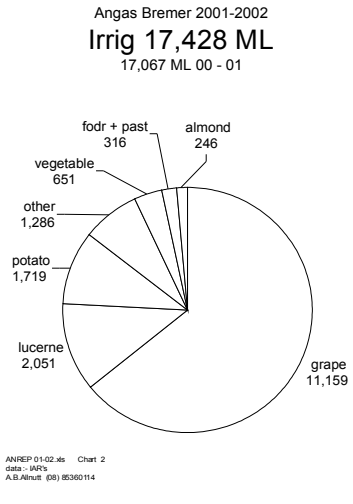


Figure 4. Most of the irrigation water was used on grapes

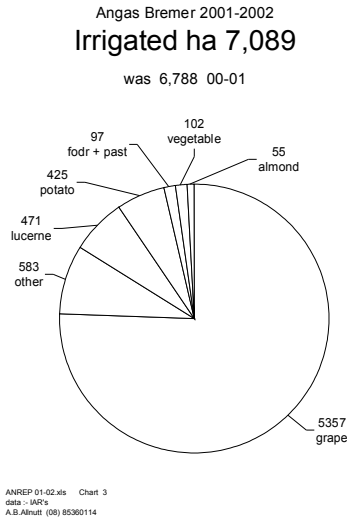


Figure 5. Most of the irrigated land grew grapes

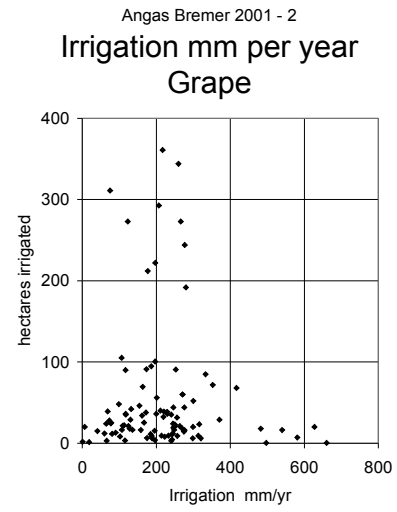


Figure 6. Most grape plantings received irrigation of between 50 and 350mm/yr. Some small areas received up to 650mm/yr.

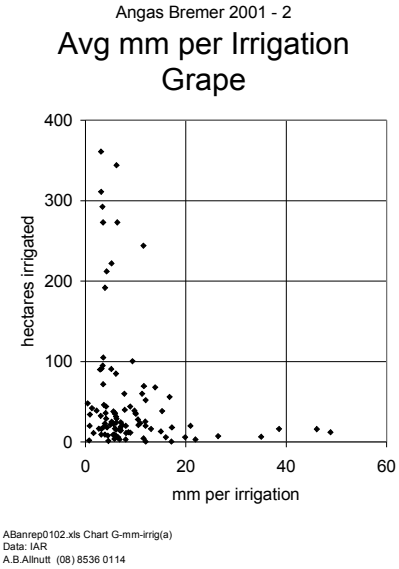


Figure 7. Most grapes received an average of between 2 and 15 mm per irrigation. One 10ha block received 50mm in a single winter irrigation.

Each year, public meetings and local irrigation training workshops have been held to present, to discuss and to learn together from this information. Figure 4 and Figure 5 show how the 17,428ML used and the 7,089ha irrigated were split between the different crop types. Figure 6 and Figure 7 show the wide variation in the Irrigation mm/yr and the wide variation in the (mm per irrigation) reported by every grape irrigator. Note that an application of one ML/ha is 100mm of irrigation.

2.2 Water-table height monitoring to avoid waterlogging and avoid salinity

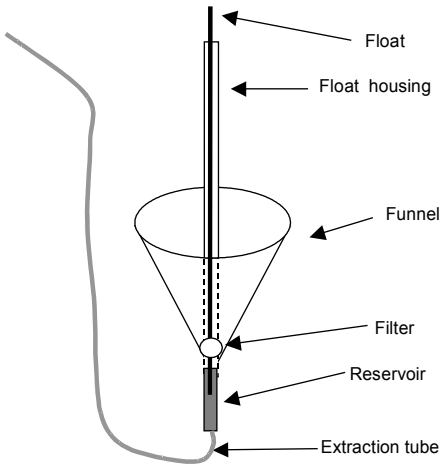
If growers were to apply too much River Murray water, water-tables would rise and cause waterlogging and salinity problems. Each grower has put in a 6 metre-deep monitoring-well and each grower measures the water level in the well four times a year (September, December, March, June). The four numbers are recorded as part of each grower's Irrigation Annual Report.

The Angas Bremer Water Management Committee decided that every grower would own and monitor a well, rather than putting in fewer wells in strategic locations and involving only some of the community. Every grower is involved so that if water tables do rise, the growers will themselves immediately drive the steps needed to manage the problem.

When a government-owned-and-monitored network of wells produces un-palatable data, it is human nature to question the validity of that data and to demand the collection of more data. This can put off addressing the problem by many years. The problem then grows to be much larger and it becomes more difficult to solve.

2.3 Drainage-monitoring to improve irrigation efficiency

Irrigation water is used efficiently when most of the water is transpired by the plants. In the Angas Bremer district, the CSIRO FullStop is being used to detect drainage and increase irrigation efficiency. If a FullStop is buried at the bottom of the root-zone, its float flags a warning to STOP irrigating when the root-zone depth has become FULL of water. The FullStop is used as a feedback and learning tool. (Figure 8.1)



Figue 8.1 Parts of a FullStop

Each of the 160 Angas Bremer irrigators is using two FullStop devices. One is buried at 0.5m and one at 1.0m. At each irrigation, water should be detected by the 0.5m FullStop but not collected in the 1.0m FullStop. Shortening the irrigation time reduces the volume caught in the FullStop. Collection of zero milliLitres of water in the 1.0m deep FullStop indicates a zero (or very small) volume of water draining below 1.0m.

Figure 8.2 shows the responses of the FullStop flags to each irrigation and to each rainfall for one site during 2002-3. Irrigation of 229mm/yr was applied as 40 irrigations, an average of 6mm per irrigation. At the first irrigation (in September) only the 0.5m Fullstop responded. Thereafter, both 0.5m and 1.0m FullStops responded on 11 occasions.

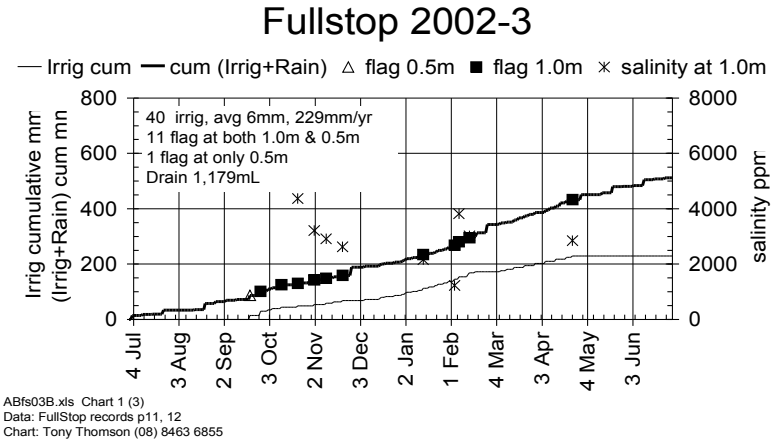


Figure 8.2 FullStop responses to Irrigation and Rainfall

The FullStop is also used to collect samples of soil-water that are tested in a laboratory to measure salt and fertiliser concentrations. The salt concentrations plotted in Figure 8.2 (asterisks) show that during October and November there was a decrease in the salinity of the water caught in the FullStop at 1.0m.

2.4 Planting vegetation for water-table height management and to increase biodiversity

Angas Bremer irrigators are enlarging the area of deep-rooted, winter-active vegetation as one tool to manage the water-table height. The root-zone of the vegetation will intercept winter floodwaters, will assist with removing any irrigation drainage and will extract water from the watertable.

This is a community-initiated vegetation-planting and management program that will protect existing red gum swamps and increase the area of vegetation. The program requires each irrigator to plant and maintain a minimum of two hectares of deep-rooted winter-active vegetation, for every 100 megalitres of allocated water.

3. Learning how the creek water-flows affect groundwater levels

The first grapes at Langhorne Creek were planted by Frank Potts in about 1860. They were planted on the deep, alluvial floodplain soils of the ephemeral Angas and Bremer Rivers. The floodplains were chosen because, after natural winter flood events, the grapes started their growing season with a deep soil profile, full of water. No irrigation water was needed.

In 1886 the first adjustable weir was built, temporarily to block flow in the Bremer River and cause the river to flood even when the winter flow was too low to cause a natural flood. The effects of these traditional practices are being investigated in the Floodplain study.

The Floodplain Study is

1. mapping the boundary of each flood event and
2. estimating the volume of water draining to the water-table below each flood.

The volume is being estimated by

a. measuring and recording the soil-moisture every 15 minutes at each 0.5m depth interval down to the 6m

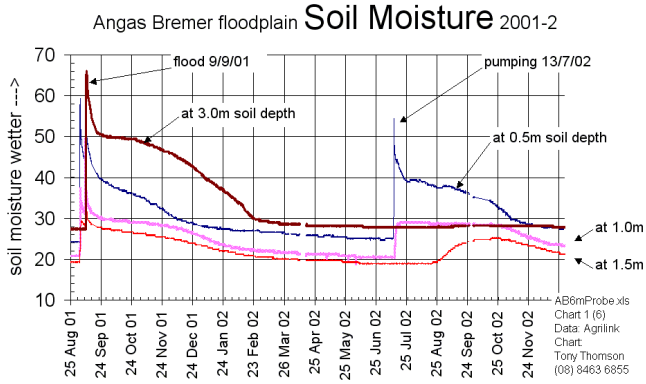


Figure 9 The flood on 8/9/01 wet soil down to 3m. Pumping on 13/7/02 wet down to only 1m

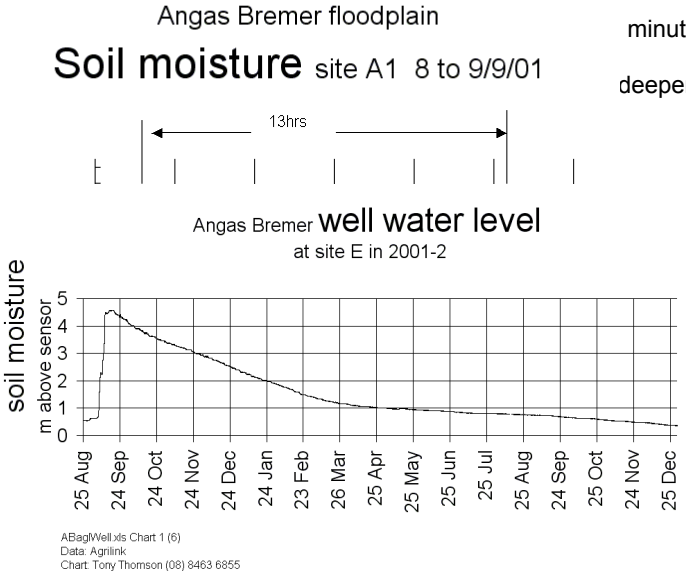


Figure 10 The water-table rose by 4 metres after the flood on 8/9/01. Without a flood in 2002 the watertable fell continuously.

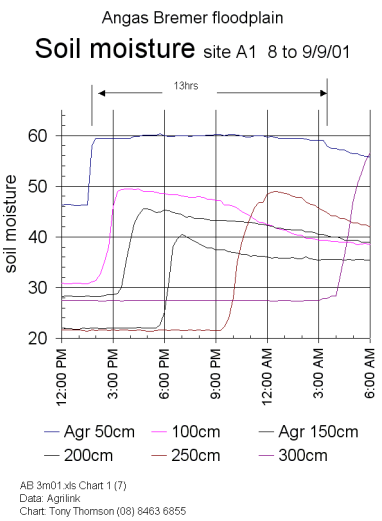


Figure 11 After the 13hr flood on 8/9/01, it took 8hrs for the water to reach down to 2.5m and 14hrs to reach to 3m

Figure 9 shows an example of the soil moisture changes and Figure 10 shows an example of the watertable height changes. Figure 11 shows, in detail, the time taken for the water to penetrate down to each soil depth after the flood event on 8 September 2001.

4. Reasons for success

- Success has been achieved by the strong local leadership of the Angas Bremer Water Management Committee, with its 20 year, single-issue focus on water.
- The committee has sought, and received, strong technical and administrative support from specialists in government agencies. It has worked with the local growers to develop practical strategies and policies designed for the benefit of the growers and based on commonsense.
- The leaders have been tenacious, with several being continuously involved for more than 20 years. They have been determined and they have shown great courage and diplomacy in confronting officials, including government Ministers, to insist that commonsense prevailed each time that bureaucratic and legal confusion appeared.
- The community has been truly involved and it has been very supportive of its committee.
- The district is a manageable size totalling 160 growers, many with families who have lived in the district for several generations. Many growers and their families have been actively involved together as members of their strong, local, football club.
- Angas Bremer growers do not have the future option to profit and retire after selling their land to grow houses because the district is too far away from Adelaide. Growers are keenly aware that their livelihoods and the livelihoods of future generations depend on the sustainable management of their resources so that agriculture continues to be viable in the long term.