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## Sowing the seeds of water efficiency

In the hot, dry Moroccan landscape, along where the Draa River meanders from the High Atlas mountains to the Atlantic Ocean, Boggabri cotton farmer Andrew Watson has found new ideas on how to farm when water is scarce.

The Draa Valley is famous as the date basket of Morocco. Water from its river is used to irrigate palmeriaes and small horticulture, although most of the year much of the 1100-km-long river is dry. It was along its banks that Mr Watson, a Nuffield scholar, encountered subsistence farmers growing mixed species crops – annuals and perennial tree crops – as a means of surviving when water availability was unpredictable.

He visited Morocco after he was awarded Nuffield Australia's Lady Southey Scholarship supported by the Sidney Myer Fund. It was one of several countries he visited – others being Spain, Germany, Ireland, China, New Zealand, Canada, the UK and the US – to see how farmers in other countries were managing their natural resources.

"In Morocco, where farmers can grow irrigated crops, they will generally grow a mixed species crop – so a tree crop and an annual crop such as date palm and wheat," Mr Watson says. "When there is no water they can still harvest the dates and when they have water for irrigation they grow wheat around the base of the date palms." Other combinations he encountered were olives grown among lucerne and stone fruit interspersed with barley and vegetables.

Mr Watson also found something in common with the Moroccan farmers. "They are facing the same constraints we do – dry climate, dry soil – but a lot less information on water availability," he says.

"They have overcome extreme variability by having an annual crop that can be grown on one or two irrigations and also a tree crop that's very drought tolerant, such as dates or olives."

Mr Watson says his Moroccan experience got him thinking on how Australian farmers were going to deal with variability in water supply on a dry continent. "I wondered if we could do something similar but incorporate mechanisation to allow for Australia's high cost of labour," he says.

"I've done partial budgets on the combinations of olive trees and cotton, and jojoba and wheat, but the numbers essentially show that it's not going to work for us. The main differences are the assumed yield losses in the annuals due to the 'edge-effect' of tree crops taking water, and the lack of economies in tree cropping species in less than optimal water conditions. The budgets show, over the longer term, these alternatives do not have the same profitability or flexibility as growing a pure, optimised annual crop."

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But the farming practices of water-scarce Morocco aside, in his travels Mr Watson didn't find a country facing the same desperate water shortages as Australia. "Generally, most people were not aware that water was running short," he says. "Some senior politicians were aware but not the farmers. Water policy in Australia is streets ahead of any other country I visited"

Mr Watson was named the NSW Farmers' Association Young Farmer of the Year in 2004 – recognition of his commitment to sustainable use of water and other resources on the family farm at Boggabri. A major focus of his Nuffield research was to see whether other countries had made advances in the areas where Australian water use efficiency research was heading – technical measurements and control of current irrigation models to achieve the greatest product yield with the least volume of water.

In his search, Mr Watson came to one overwhelming conclusion: the best practice, certainly for cotton farming, is found in Australia.

This matches with a 2003 study by the Cotton Cooperative Research Centre and CSIRO that found of the world's major cotton-producing countries, Australia uses its water most efficiently.

In 2005/06, 84 per cent of Australia's cotton crop was grown under irrigation. The 2005 Australian Bureau of Statistics report *Water Use on Australian Farms* found that cotton's average irrigation requirement is 6.5 megalitres/hectare (6.5 ML/ha) compared to rice (14.1 ML/ha), sugar cane (5.4 ML/has) and pasture for grazing (4.0 ML/ha).

The CEO of the Irrigation Association of Australia, Mr Jolyon Burnett, says many of Australia's irrigators have been quick to adopt new technologies and techniques to improve water use efficiency but that others have been slow to change.

"The best irrigators in Australia are some of the best in the world," he says. "Our rice growers produce more rice per megalitre of water than anyone else, our cotton growers produce more bales of cotton per megalitre of water and some of our dairy farmers and vegetable producers are at the cutting edge.

"Irrigation is becoming more sophisticated. There's more computer control of when to turn water on and off and more focus on trying to match water supply to plant requirements."

Mr Watson's property by the Namoi River in north-west NSW has 5500 hectares of farming area on which about 1000 hectares of cotton is grown alongside 1500 hectares of wheat and barley and a 350 second-cross vealer breeding enterprise.

The property encapsulates many of the water-saving measures being adopted by Australian irrigators. These include the use of microcapacitors – soil probes that measure soil moisture at six different levels so farmers can see when a plant is running out of water.

"We're also working on the timing of irrigation – how much water we push down the row and for how long we run it down the row," he says."

Mr Watson is also working with CSIRO and the Cotton CRC on two projects – a model that estimates when a plant will need moisture and tells farmers when to irrigate, and another computer program that tells where water losses are occurring, whether from seepage or evaporation from dams or fields.

He has also been conducting electromagnetic surveys of the soils in dams and fields to see if water is draining further than the roots can access it. "They also tell us if dams will leak if we put

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water in them,” he says. “As well, we use GPS technology in our tractors to graph the changes in slope up and down our fields in order to see when they will need re-leveling.”

Adopting these practices has seen Mr Watson’s production improve year-on-year. “In the last drought year, in 2002, we used about 10.5 megalitres of water per hectare of cotton and grew 1.1 bales per megalitre,” he says.

“This year I’ve used 8.5 megalitres to grow my crop and at the moment I’m harvesting between 11 and 12 bales per hectare and that’s with very little rain assistance, so it will again be about 1.5 bales/megalitre,” he says.

Mr Burnett says there’s no doubt Australians are world leaders when it comes to using technology to achieve efficiency of water use.

“Perhaps the biggest challenge for us is we need to see greater uptake of that technology across the irrigation community,” he says.

“We need for people like Andrew to be seen as advocates and champions of what’s possible.”

## 2007 NUFFIELD SCHOLARSHIP APPLICATIONS OPEN

Cotton farmers from across Australia have the opportunity to extend their knowledge overseas as 2007 recipients of Australia’s most prestigious agricultural award – the Nuffield Australia Scholarship.

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Applications close on June 30, 2007. Application forms are available from the Nuffield Australia office on 02 6964 6600, [enquiries@nuffield.com.au](mailto:enquiries@nuffield.com.au) or on the website: [www.nuffield.com.au](http://www.nuffield.com.au)

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