Case study 1

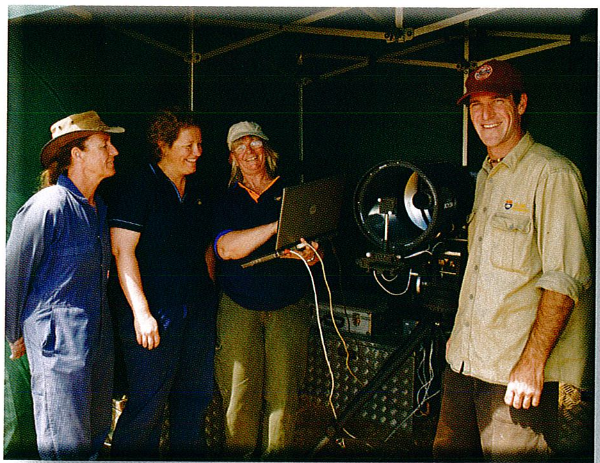
Agriculture

Seeking the ideal greenhouse cow

The livestock sector is a major contributor of greenhouse gases among agricultural industries. Methane and ammonia are natural by-products of ruminant digestion so lower output is desirable while maintaining efficient beef production.

Methane produced by ruminants can be 250 to 500 litres per head per day. Current knowledge shows that output can be influenced by feed intake and source, feed processing and the addition of rumen modifiers. Breeding cattle based on efficient feed conversion has been suggested as a possible way to reduce methane emissions.

Under the umbrella of the Beef Cooperative Research Centre, a project is under way at Vasse Research Centre in south-west Western Australia to investigate emissions from breeding cows.



A team from the Department of Agriculture and Food WA has been monitoring the maternal traits of cattle selected for both high and low net feed efficiency (NFI), the amount of feed required to gain a certain amount of weight. The cattle were selected over three generations at Trangie Research Centre in NSW, the only herd in Australia specifically chosen for these traits.

Under feedlot conditions, the more efficient converters (low NFI cattle) have shown a 25 per cent improvement but now the focus has been shifted to grazing conditions, the more general system of management. It is expected that cattle selected for low NFI should have lower outputs of methane, ammonia and other gases.

In January 2009, measurements were taken at Vasse using the Open Path Fourier Transform Infrared Spectro-photometry system developed at Wollongong University, to monitor two groups of 25 animals grazing low-quality pasture and selected on feed conversion efficiency.

Each cow wore a halter with a canister attached, which released a tracer gas (nitrous oxide) at a calibrated rate. The methane to nitrous oxide ratio was then measured continuously for five days 10 to 50 metres downwind of the herd to study the emissions.

Nitrous oxide is used as the tracer gas, as it can be released in sufficient quantities to dominate natural fluctuations, and measured simultaneously with methane and ammonia.

The trial will be repeated on higher quality pasture in spring and results are expected by the end of the year.

For more information contact Beef Research Officer Fiona Jones on 9780 6263 or 0409 117 132 or by email (fiona.jones@agric.wa.gov.au).

Case study 2

Agriculture

Wine industry prepares for changing climate

Climate change has the potential to fundamentally reshape the Australian wine industry.

It is expected that Western Australia's south-west, an important premium wine producing area, will become more important compared with other relatively warm wine growing regions, but climate change and seasonal variability will still present many challenges.

Rainfall in south-west WA has declined by 15 per cent since the 1970s and is projected to fall further by 2030. Less winter and spring rainfall is expected, combined with more summer showers, a later break to the season and fewer intense rainfall events reducing runoff. Ten per cent greater evaporation and higher overall temperatures, including many more days above 35°C are also likely. This will bring bud burst and harvest forward, shortening the season by 10 to 17 days and affecting varietal characters and wine styles. It is likely to favour later maturing varieties such as Cabernet Sauvignon, Shiraz, Nebbiolo and Grenache but work against cool-season types such as Pinot Noir, Pinot Gris and Riesling.

For individual vineyards, water use will rise due to the higher temperatures. More irrigation will be needed and more variable rainfall and lower runoff will offer challenges.

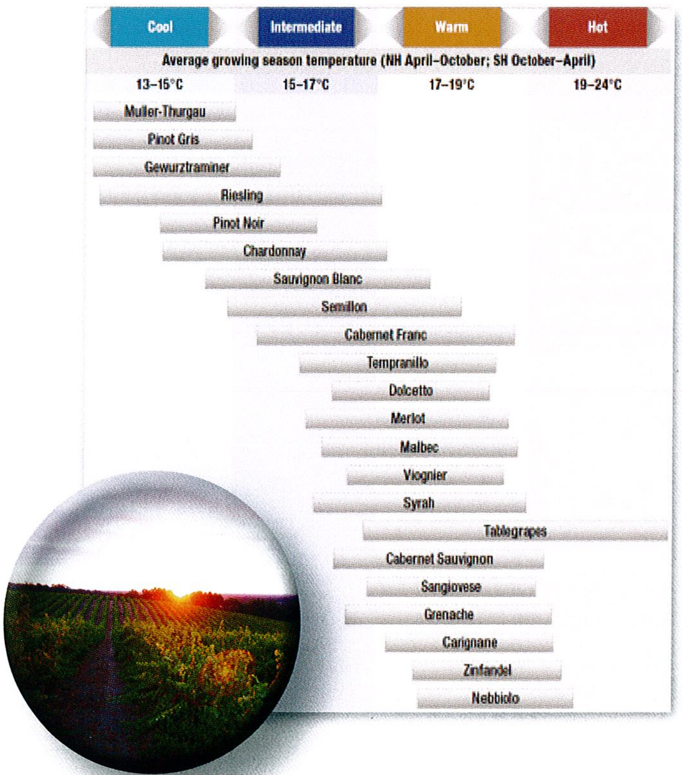
At workshops held in 2008, growers were advised to plan to secure their future water supply by increasing dam storage, maximising runoff and increasing water harvesting using methods such as efficient roaded catchments and plastic sheeting in vineyard rows. In a trial at Frankland run by the Department of Agriculture and Food WA, plastic between rows collected 0.74 megalitres in a year of 600 millimetres of rainfall — about three quarters of annual vine water requirements. Use of windbreaks, covering the water surface with polymer to reduce evaporation from dams and carefully checking irrigation efficiency are other options being recommended.

Temperatures in the vine 'bunch zone' are critical to wine quality. As temperatures rise, sugars in the grape berry are concentrated, acid depleted and colour lost. Red wines become more jammy and plummy with more intense tannins, while losing characters such as raspberry and pepper flavours.

Bunch zone temperature monitoring is being recommended by some experts to enable variety-specific, regionally and seasonally adapted canopy management even in the worst seasons. Removing leaves from the vines to increase sun reaching the grapes was traditional. In future, vignerons will be retaining leaf cover to increase shade in hot seasons.

These adaptations and others will help industry prepare for the challenges ahead.

For more information contact Department of Agriculture and Food WA Premium Wine Project Manager Glynn Ward on (08) 9368 3568 or by email (glynn.ward@agric.wa.gov.au) or visit www. agric.wa.gov.au.



Climate change and wine: observations, impact and future implications
Ripening date chart – Jones, G. (2006)

Case study 3

Wheatbelt areas likely to contract

In recent years, Western Australia has been the nation's largest grain producing state despite its legacy of poor soils and low rainfall.

Wheat is the most widely grown crop followed by barley, lupins, canola and oats (2006 figures). WA wheat is used in many foods and exported around the world.

Annual average rainfall in growing areas ranges from 300 to 600 millimetres, with most areas receiving less than 500mm. Crop yields are closely related to rainfall during the winter growing season and may be less than two tonnes per hectare in some shires. This seems low, but is viable due to large areas and very efficient operations.

Climate variability presents a significant challenge to grain production and records show that, since the 1970s, rainfall has declined significantly in agricultural areas while day and night-time temperatures, particularly in winter and autumn, have gradually increased.

With funding from the Commonwealth Department of Climate Change, the Department of Agriculture and Food WA modelled likely yield changes for wheat and four other crops to 2050 using CSIRO climate change predictions based on Ozclim 2.0.1 Beta.

These predictions showed reductions in the north, east and southern agricultural zones. Western areas increased but overall decreases outweighed the increases. Thirty-four per cent of the land, or 8.9 million hectares, showed reduced potential yield while 2.1 million hectares were predicted to increase. The remaining 15.6 million hectares did not change more than ±10 per cent.

Over large areas north of Northam, yield declines of 10 to 30 per cent were largely attributed to lower rainfall. But further north more dramatic yield losses above 30 per cent were predicted due to changing rainfall and higher temperatures. All crops showed similar trends.

Modelling is a tool that needs to be viewed with an open mind. Simple models are often useful as it is easy to follow their logic and they can account for much of the predicted result. For example, there may be opportunities to expand cropping in higher rainfall zones where current production is reduced by waterlogging, disease and frosts.

In some areas and seasons, rainfall decline is expected during winter when it may exceed crop requirements. Therefore, overall decline might be less than this simple model predicts. Conversely, greater seasonal variation, not considered here, will increase negative impacts.

These results highlight where management may be adjusted by different planting times, new fertiliser regimes, farming systems or alternative crops. They could also indicate traits that would be desirable in new cultivars, or simply help to focus where more climate change research is important.

For more information contact Research Officer Dennis van Gool on (08) 9368 3899 or by email (dennis.vangool@agric.wa.gov.au) or download Resource Management Technical Reports 295, 302, 303, 304 and 305 at www.agric.wa.gov.au/aboutus/Pubns/rmtechreport_index.htm.

processgreen
environmentally sustainable printing

This brochure is printed using vegetable-based ink, power that is derived from green sources and chlorine free paper stock that is sourced from plantation grown timber. Both paper manufacturer and printer are certified to ISO 14001, the international standard for environmental management.

2009100D-0309-500