

# Where wheat is made

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**Plate 1. Ruth Dill-Mackay, pathologist, prepares a barley plant for cross-breeding**

Many people think of Toowoomba as a city of gardens, a cool comfortable haven for retirement after a hard life on the hot dry land. Such it is, but it is also a considerable centre for education and agricultural research.

Sitting atop the Great Dividing Range, 130 km west of Brisbane, it services both the Lockyer Valley and the rich agricultural Darling Downs to the west. Because of its location it is well suited to accommodate the Queensland Wheat Research Institute (QWRI).

QWRI is the centre for research about wheat and the problems about wheat growing in Queensland. It was started by and is still largely funded by the Wheat Research Committee for Queensland, representing the wheat growers themselves. Other sources of funding are the Australian Wheat Research Council, the Barley Research Committee for Queensland, the Australian Barley Research Council and the National Soil Conservation Program.

High on the list of priorities at QWRI is the development of new wheat varieties suited for the subtropical climates of Queensland and northern New South Wales. Variety names such as Oxley, Cook, Banks, Flinders, Hartog, Torres, Bass, King, Vasco and Diaz are familiar to anyone involved with agriculture; all of these, plus 1989 releases, Janz and Perouse, were developed by the wheat breeding team at QWRI.

The need for new varieties arises because diseases and other growth problems are constantly changing. Varieties are bred to resist these problems and maintain the value of the wheat industry. Farmers are always eager to have higher yielding varieties that will help in their battle against rising costs.

These and many other issues are studied by 22 scientists supported by skilled technical and field staff.

Besides variety improvement, areas of study include pathology, microbiology, soil fertility management, crop nutrition,

weeds, water and erosion control and grain quality assessment. These activities are well supported by an excellent analytical laboratory. Although still called the Wheat Research Institute, quite a lot of work concerns barley, the other major winter crop in Queensland. Barley quality and pathology are especially important areas of research, and this work is done in close collaboration with the barley breeders at Hermitage Research Station, Warwick. In addition, much of the work on weeds, soil fertility and erosion benefits other crops.

Because many problems in agriculture are complex, cooperation between scientists is the key to success in solving them. Producing a new wheat variety, for example, requires cooperation between breeders (geneticists), cereal chemists and plant pathologists.

Also, recommendations for solving one problem may conflict with those for dealing with another. For example, fungal infections on leaves can be controlled by burning off, but if the stubble cover is removed, its value in controlling soil erosion is lost. Conservation tillage procedures enhance water retention and erosion control, but create problems in weed control.

## *Soil fertility restoration*

The heavy black earths of the Darling Downs have been used continually by farmers for up to a century now. The rich soil once produced grain with 15% protein — now they can only give 11 to 12%. The nitrogen and other elements essential to produce top quality grain are no longer abundant in the overworked soil.

A soil fertility restoration program has been running at Warra, west of Dalby, for four years. Pasture leys, legume crop rotations and fertiliser trails are all giving results and recommendations that are relayed to farmers at popular field days.

## *Conservation tillage*

Water is the scarcest nutrient in Australian farming soils. Various conservation tillage practices have shown to have important effects in storing soil water and recycling nutrients in the soil.



### Soil microbiology

Root lesion nematodes (and fungi that can catch them), long fallow disorder and trace element nutrition occupy the attention of the soil microbiologists. So too, do the friendly VAM fungi which are important in the nutrition of many plant families, including cereals. It is surprising how many plants depend on special fungi that live in their roots and extend out into the soil, bringing scarce but essential chemicals into the plants.

### Foliar diseases

The ravages of foliar diseases can be spectacular. Since it is impossible to prevent the highly coloured but devastating effects of airborne fungal diseases, the team tries to keep ahead of new fungal types by breeding resistant wheat and barley varieties.

### Wheat-breeding

The wheat-breeding group prepares new crosses from selected parents. New lines are carefully nurtured from small grain samples, grown and tested in the large glasshouse complex and in nearby field trials. Eventually a few select lines are tested in trials across the wheat belt and one or two may be released as commercial varieties.

Everything can be lost in field trials if rain does not fall, or if too much rain

comes at the wrong time — or the local birds home in on a ripe crop early one morning. Some ingenious devices are used to overcome these threats.

Enormous bird-cages cover hectares of trial grounds at QWRI. Inside some of them are huge plastic 'rain-out' shelters, used to prevent unwanted rain damaging the crop. There is also a truck and trailer which can carry a large, portable 'rainulator' to provide controlled, simulated rainfall wherever it is needed.

Machinery and equipment are housed, cared-for and modified as needed by a support team of field workers.

Some extremely sophisticated and sensitive equipment is to be found in the Analytical Chemistry section. It is used by a team of expert technicians for testing soil and whole plant materials.

The Cereal Chemistry section is especially equipped to deal with grain quality. Flour from the breeders wheat lines is produced by a test mill and rigorously tested for its suitability for making bread and noodles, the end-product of much of Queensland's wheat crop.

Barley samples from Hermitage Research Station are also examined, in particular for malting quality. Sad to say, QWRI has not yet acquired a test brewery!



Plate 2. 'Bird-out' cage and the new 'rain-out' shelter Inside It at QWRI.

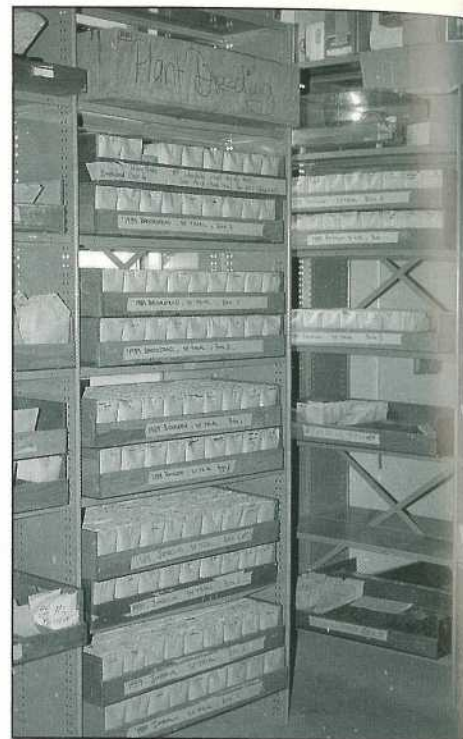


Plate 3. Part of the seed store for cross-breeding.

Developing new breeds of wheat to suit new market needs has led to interaction with Asian and Middle Eastern countries in recent years, with exchange visits by QWRI staff and Asian agricultural scientists.

Visiting scientists are always present — the common room is a miniature United Nations. Last year most visitors were Chinese, Canadian or American. This year Indian visitors predominate, due to the large international project on zinc deficiencies in vertisols, sponsored by the Australian Centre for International Agricultural Research.

QWRI not only has a good mixture of nationalities but also has a goodly proportion of females on the staff. Three are in the highly efficient front office, while three research scientists, several of the leading technicians, the librarian and information officer are women.

All up, the staff at QWRI are an harmonious and successful group led with care by director, Allan Clarke.