Researchers cover the field

SOUTH Australia's $800-million-a-year sheep and wool industry can look forward to a future of improving productivity as a result of a series of co-ordinated research programs at the Turretfield Research Centre.

Researchers at this SA Department of Agriculture "centre of excellence" are working on everything from better crops and pastures to genetic engineering to find productivity aids for the industry.

The recent purchase of the historic Kingsford property, adjoining Turretfield, will allow research programs to be expanded.

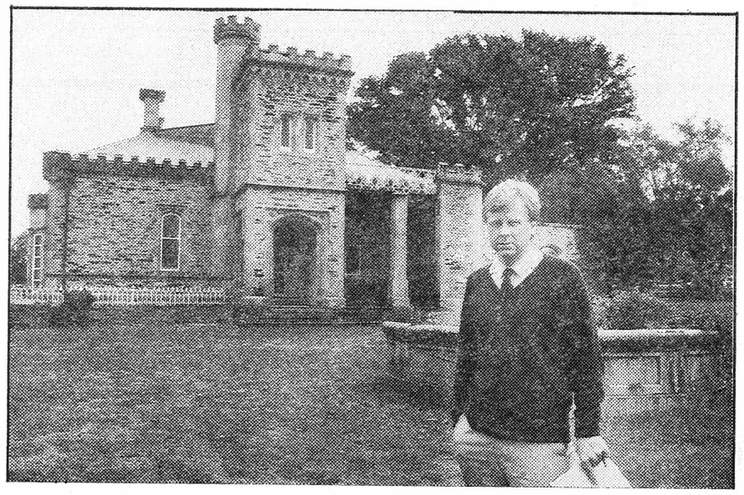
Some of funds for this work are coming from the industry, for example, through the Wool Research and Development Fund that growers contribute to through the wool levy.

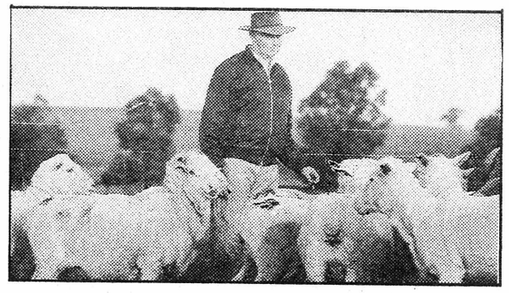
With the co-operation of local stud Merino breeders, the centre has established a high-quality SA-strain Merino flock to form the basis of many new programs designed to improve wool industry's productivity and profitability.

This research flock and some of the projects based on it are unique in Australia — indeed, in the world.

Turretfield is also heavily involved in cropping research; each year it helps evaluate new varieties of oats, barley, wheat, field peas and beans developed by scientists at Northfield, the Waite Institute and Roseworthy College.

It also produces and markets pure basic seed supplies of new crop varieties released from the plant breeding and evaluation programs including, last year, more than 40 tonnes of pure basic seed of the new CCN-resistant wheat Molineux, sold to certified seed wheat growers for multiplication, and more than 50 tonnes of Skiff, the new high-yielding malting barley.





ABOVE: Ian Rogan, principal research scientist, outside Turretfield's Holland House. Built in 1860, it will be restored for use as the administration centre. RIGHT: Technical officer Bob Lampe with rams and ewes in the Merino flocks. TOP RIGHT: Scientist Jo Crosby, researching more productive pasture legumes.

More feed, more wool

Several Turretfield research programs focus on improved pastures and better feeding of sheep.

Senior scientist Dr Bill Bellotti leads the pasture work aimed at selecting more productive cultivars, especially of legumes such as medics and sub clovers. As well as providing high-quality sheep feed the legumes are important contributors to soil fertility in pasture/cereal crop rotations.

Following the breeding evaluation and release of the improved sub clover, Rosedale, and the highly productive Paradana balansa clover, scientist Jo Crosby is now searching for more productive pasture legumes for the lower rainfall (less than 400mm) agricultural areas.

She will be evaluating several hundred possible new lines of clovers and medics at several mid-North farms over the next three years. The work, funded by the Wheat Research Committee of SA, will compare the growth, seed persistence and production of the experimental lines with the performance of existing sub clovers and medics.

Any promising new lines found will be evaluated fully under commercial grazing and cropping conditions before release to SA farmers.

No amount of pasture research will make rain fall and pastures grow in southern Australia's hot, dry summers and autumns, but scientist Mike Round is looking for ways to make better use of crop stubbles and dry pastures during this season.

His work at Turretfield and on farmers' properties across SA is designed to improve sheep and wool growth rates on stubbles and dry feed, devise more cost-effective ways of supplementary feeding and reduce the impact of drought on sheep on SA farms.

More lambs

A successful pilot trial in 10 commercial Merino flocks last season that indicated potential lambing rates of 132 per cent is being expanded with the help of Australian Wool Corporation funding in a quest for higher lambing percentages in SA Merino flocks.

The research, by senior scientist David Kleeman and his team, is placing most importance on reducing lamb deaths and other forms of "reproductive wastage" — the difference between a flock's potential lambing rate and the number of lambs actually marked. In SA flocks this wastage can be as high as 40 per cent.

Over the coming three years David Kleeman will study in detail the potential and actual lambing rates in 50 commercial ewe flocks over a wide area of SA.

The Turretfield team will visit all the properties at mating time, weigh and condition-score the ewes and record their ovulation rates. The ovulation rate indicates the potential lambing rate of each ewe — dry, single lamb or twin lambs.

The team will return to each property in the middle of the ewes' pregnancy terms and use ultrasound scanning to determine which ewes are dry and which are carrying single or twin lambs.

Finally they will return at marking time to count the number of lambs present and the death rates of single and twin lambs.

By studying a wide range of flocks mated and lambing at different times of the year under many feeding and management conditions, the researchers hope to identify what combination of practices ensures low reproductive wastage and high lambing percentages.

Farmers involved will get a detailed picture of what is happening in their flocks. Conducting the research in commercial flocks without any interference to the farms' normal feeding and management practices should make the results widely applicable to other flocks where low lambing percentages are a problem, and gives a high chance of making it possible to lift the State average lambing rate from 75 per cent.

De-bugging sheep

Worms cost every Australian sheep farm an average of $4700 a year in drenching costs, production losses and deaths of wormy sheep; and blowflies, lice, itchmite and ked cost another $2500 a year, according to Bureau of Agricultural Economics figures.

Turretfield scientists Alan Pullman and Peter James are researching several ways to reduce these costs and the production losses caused by sheep parasites.

Alan Pullman and his colleagues are working to develop reliable and cost-effective drenching programs for sheep in all parts of the State.

Already they have shown that worms in sheep can be kept under control with a considerably reduced number of drenches if they are given at the right time.

Peter James, investigating whether it is feasible to breed sheep less susceptible to flystrike, has proved it is worthwhile culling sheep with flystrike or with fleece rot after long wet spells — fleece rot is a major predisposing factor to body strike.

He also evaluated a large number of sheep characteristics as useful indicators of susceptibility to these problems. For example, sheep with yellower wool are most susceptible to fleece rot and flystrike under high-risk conditions.

But breeding more resistant sheep is a slow process, and even then the control of flies and lice will depend almost totally on chemical insecticides, which have a maximum control period of only about 12 weeks.

Mr James is studying new application systems based on controlled-release technology, for example, ear tags that continously release required amounts of insecticide, and a system that would release insecticide into the fleece only when climatic conditions dictate a high-risk situation.

Initial results from his work suggest blowflies and lice control for up to 38 weeks may be possible with insecticide-impregnated ear tags.

Super sheep

Recent joint research between Turretfield and the University of Adelaide has produced the world's first Merino lambs genetically engineered for better wool growth.

They carry extra genes, injected at the embryo stage, which are responsible for producing the amino acid cysteine, which is essential for wool growth. The lambs with the extra genes are expected to be able to grow more wool than their parents.

This work has enormous significance to the wool industry, with the possibility of using proven transgenic sheep in the stud industry to produce transgenic offspring for commercial use.

Production of transgenic sheep has had many technical problems, but the SA team has gained international prominence by overcoming many of them.

For example, damage to the embryo after the genes have been injected has stopped many embryos developing after transfer to surrogate ewes.

The SA team eliminated this difficulty by developing an artificial culture system that allows the embryo to grow for several days outside the ewe, so viability can be determined before transfer.

This research, partially funded by the Australian Meat and Livestock Research and Development Corporation and the Australia Wool Corporation, has resulted in about 40 per cent of transferred injected embryos developing into lambs; groups doing similar work in other countries generally achieve figures of five to 20 per cent.

About 170 transgenic lambs are due to be born at Turretfield before Christmas.

The research team, including Simon Walker at Turretfield, is elated at the number of lambs born so far that have been successfully "engineered". These lambs will be extensively evaluated for production and tested to find out how the extra genes are inherited.

Research funds are being sought from the AWC to centralise reproductive and breeding research on Turretfield.

New technology

Artificial insemination (AI) and embryo transfer (ET) are costly procedures that are becoming an integral part of livestock production in Australia. They involve valuable genetically-superior animals, so it is important to maximise the number of lambs they can produce.

Research at Turretfield by scientist Simon Walker, with financial support from the AWC, has identified factors that may be causing variation in the success of sheep AI and ET programs.

Both techniques involve using hormone treatment to synchronise the cycling pattern of ewes. But even with hormones the ewes' time of ovulation is often spread over 24 hours.

This variation makes it likely some of the artificially inseminated ewes will fail to conceive, especially with frozen semen as used for about 70 per cent of the 350,000 stud ewes inseminated in Australia each year.

Frozen thawed spermatozoa can begin to lose its fertility six to 12 hours after insemination.

In spring the problem is even worse — hormone-treated ewes can differ by several days in their ovulation time, seriously reducing chances of successful AI or ET programs.

The Turretfield research aims to develop treatment protocols to overcome these problems and improve the success rate of the techniques so genetically superior breeding stock can be more widely utilised through AI and ET.