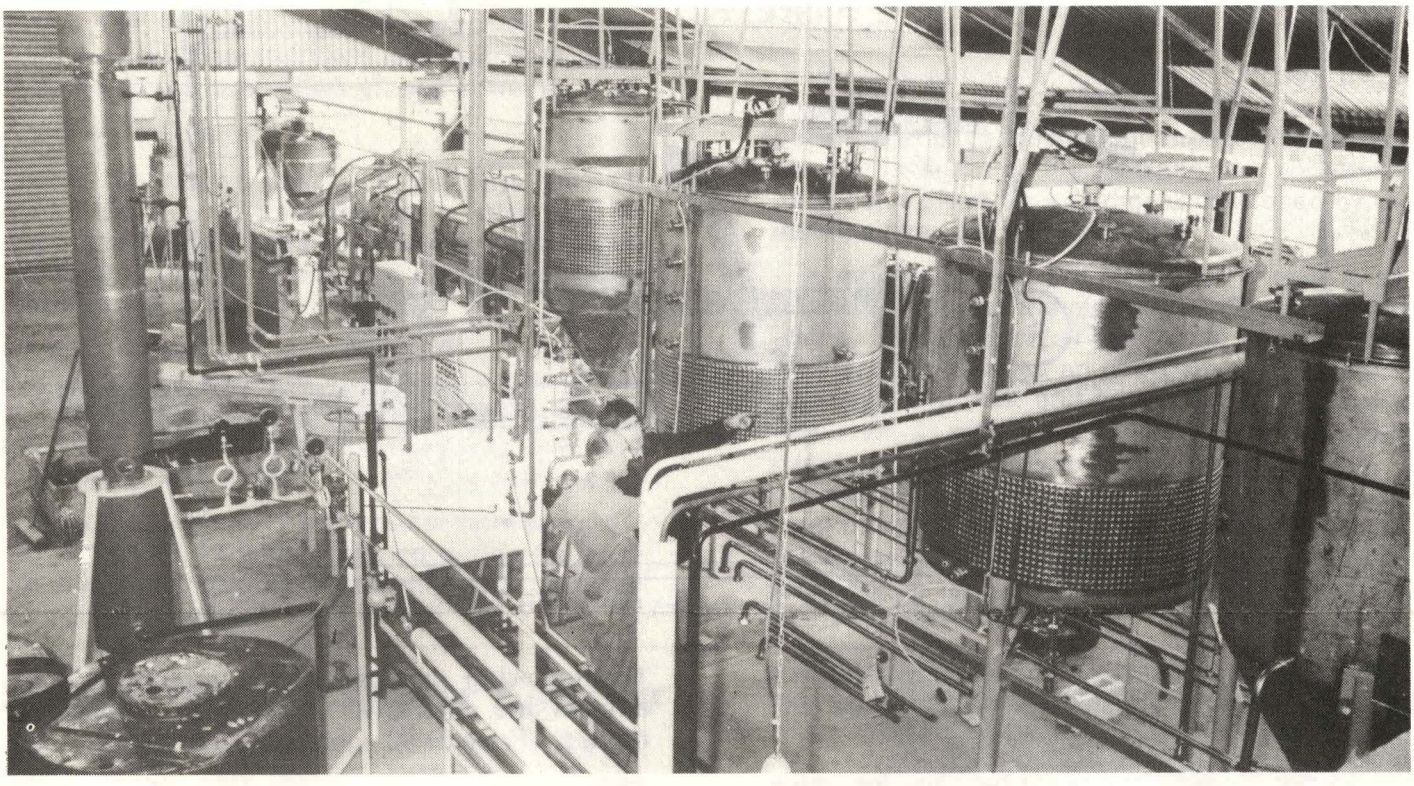
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Lincoln College, Canterbury, New Zealand

Beet-Ethanol Research Plant Ready



Dr Vince Bidwell in discussion with research plant operator Mr Simon Tump

The Beet-Ethanol Processing Plant shown in the photograph is now complete with only minor finishing work still required. It is an industry oriented research installation with a processing capacity of five tonnes of beet a day, producing 400-500 litres of ethanol. Diagram and processes are described on page 2.

The plant, which has been installed in a 375 square metre building at Lincoln College, has been built under a research contract with the Liquid Fuels Trust Board. It will be used to study the sugar extraction and waste treatment processes involved in the production of ethanol from beet at a factory scale.

Efficient extraction of the sugar and economic utilisation of the waste products will have an important effect upon the price of the ethanol. The ethanol produced by the plant will be denatured (made undrinkable) and then consigned to the Liquid Fuels Trust Board for use in their ethanol powered cars.

A second research contract with the Liquid Fuels Trust Board is now in its third year and this is concerned with the harvesting and storage of beet.

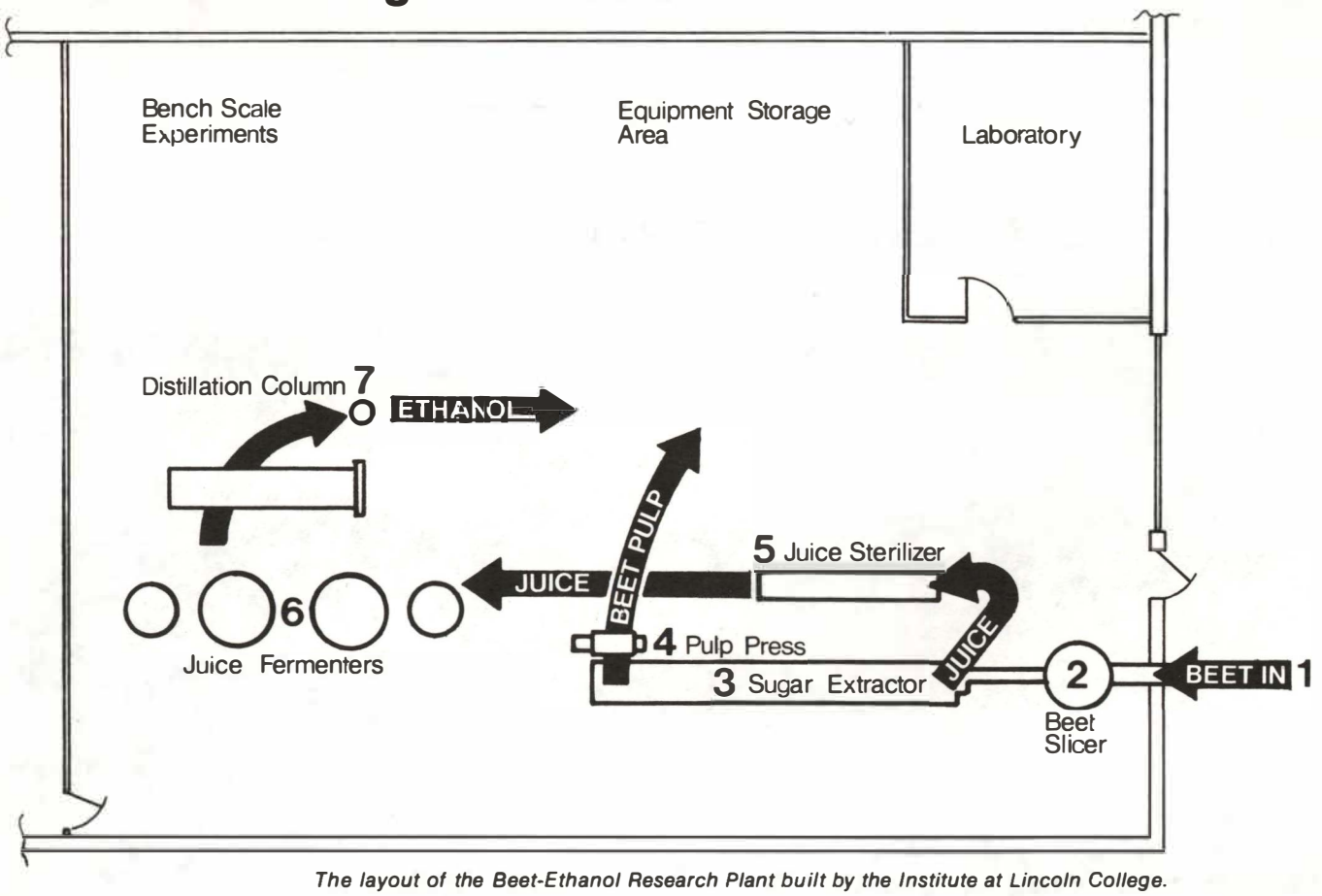
The Institute's beet harvesting team began the 1982 harvest in May on one of the New Zealand Sugar Company's trial paddocks at Eiffelton. Since then 60 hectares of commercially grown crop have been harvested, together with a further six grown at the College for storage trials.

Last season 370 tonnes of the beet harvested was used in storage trials. These were aimed at extending the ethanol factory season to obtain a more efficient utilisation of the processing equipment.

It was demonstrated that beet could be stored in heaps for periods up to four months, depending on temperature and seasonal conditions. Deterioration was greater where higher dirt and trash content restricted ventilation. There was no significant difference in sugar loss between fodder and sugar beet, or between the scalped and the unscalped beet.

The trials are being repeated this year.

The Lincoln College Beet Ethanol Research Plant



The layout of the Beet-Ethanol Research Plant built by the Institute at Lincoln College.

The plant has a capacity of five tonnes of beet a day working continuously, which will produce 400-500 litres of ethanol.

This is a convenient size for handling feedstock and waste disposal. It is also large enough for a realistic scale-up of parameters to a full-scale industry.

Production processes shown on the diagram are;
(1) Washed beet is brought in by elevator.
(2) The beet is sliced into chips.
(3) These are fed into the sugar extractor in which hot water and the sliced beet pass each other in opposite directions. The sugar diffuses from the beet into the water to make sugar juice. This is the technique used in the beet sugar industry.
(4) Press de-waters the beet pulp which can be used for animal feed.
(5) Sugar juice is sterilized to kill micro-organisms which contaminate the fermenters.
(6) The juice is fermented to convert the sugar into ethanol.
(7) Distillation column where the ethanol is separated from the water.

Producing ethanol is not the real purpose of this research project which is concerned with the extraction of sugar and the utilization of waste products. The Liquid Fuels Trust Board considered that fermentation and distillation were already receiving enough attention.

The following publications by Institute staff on ethanol and alternative fuels can be supplied on request. Price $1.00 each post paid.

"The Lincoln College Beet Ethanol Research Plant." V.J. Bidwell. M.A.F. Agricultural Engineering Conference, Lincoln College 1982.

"Sugar loss from and degradation of stored beet and their influence on ethanol fermentation." C. Henderson/P. Steele/J. Smith/L. Young. N.Z. Journal of Science. 25:1982.

"Tower and stirred tank fermentation of sugar beet and fodder beet." C. Henderson/J. Smith. 5th Int. Alcohol Fuel Technology Symposium 1982.

"Evaluation of beet production for ethanol in New Zealand." R. Martin/V. Bidwell/J. Dent. 5th Int. Alcohol Fuel Technology Symposium 1982.

"Continuous fermentation of ethanol from sugar and fodder beet using a tower fermenter." C.F. Henderson. Proc. CHEMECA 81.

"The production of ethanol from sugar and fodder beet." C.F. Henderson. Future Fuels Seminar 1980.

"Engine fuels for agriculture from agriculture." G.R. Davies. NZAEI Report IR 99. 1979.

Agricultural Week and The Institute

By John Maber,
NZAEI Research Station, Rukuhia, Hamilton

Another National Fielday has come and gone – the first time the whole Agricultural Week has been free of rain.

It seems only yesterday that the first National Field Days concluded at Te Rapa, in Hamilton, back in '69. I remember two incidents which occurred then. The first was during the doubles fencing competition. These two likely lads were doing well. They had the two strainers in, and a line wire up.

The crowd cheered.

Next, the internal posts. "Right" says one, "I'll mark them out, you start digging the holes". Off he goes, pacing out the distance between posts while his mate, digging furiously at the marked spots followed along behind.

He must have got most of the holes dug when, suddenly, back over the brow of the hill comes his mate, running, and looking a bit worried. Well, panicking actually. It seems that he had more holes than posts and they would have to start again.

The other memory I have is rather more serious – the Airtruk PL-12 which crashed during the agricultural aerial display. Thankfully, no one was seriously injured.

At the Fieldays the Institute display is now a regular feature. This year entitled 'Tractor Factors', it dealt with the efficient operation of the farm tractor. A comprehensive display, with plenty of "handout" material. No one now underestimates the work involved before, during,and after the fieldays in staging such displays. A lot of effort, and a lot of time.

There are the many entries for the various awards each year - ingenious methods awards, invention awards, prototype awards, equipment awards, and some very worthwhile products have emerged.

Where does the Institute fit in to all this? It may not have new products to exhibit each year. It is not a maker of gadgets or equipment which can be entered in some of the sections, but six awards have been given for equipment developed by the Institute over the years.

In moving around the Fieldays it is easy to become confused by the plethora of new equipment, claims and counterclaims. Maybe the Institute's role is to be there as an observer, to be aware of new developments, and be in position to discuss them. Or, as with the last three displays, to take a particular topic, and deal with it in some depth. It does seem inconceivable that the largest agricultural equipment display in the Southern Hemisphere should proceed without the NZAEI – the national centre for agricultural engineering research in the country, being there.

Storm Tests Shelter Fences

During Easter 1982 the prolific orchard lands of the Bay of Plenty were lashed with gale-force winds that flattened or damaged many shelter trees and fences.

After the storm Geoff Lawn of the Institute's Rukuhia Station set off to see how the shelter fences had fared.

He found around Opotiki, a variation of the more usual cantilevered roundwood poles. These poles were made from four or five laminations of 100 mm by 25 mm timber nailed together, and guyed with single strands of 2.5 mm H.T. wire.

The failures with this system resulted mainly from insufficient strength in the guy wires which snapped at the knots. The laminated poles themselves performed surprisingly well with only a few failures due to bad knots in the timber or to the laminations being parallel to the line of the fence instead of across it.

Geoff considered that most failures could have been prevented with proper design, but he noted that before his visit, growers had been rebuilding their fences with the same faults as before.

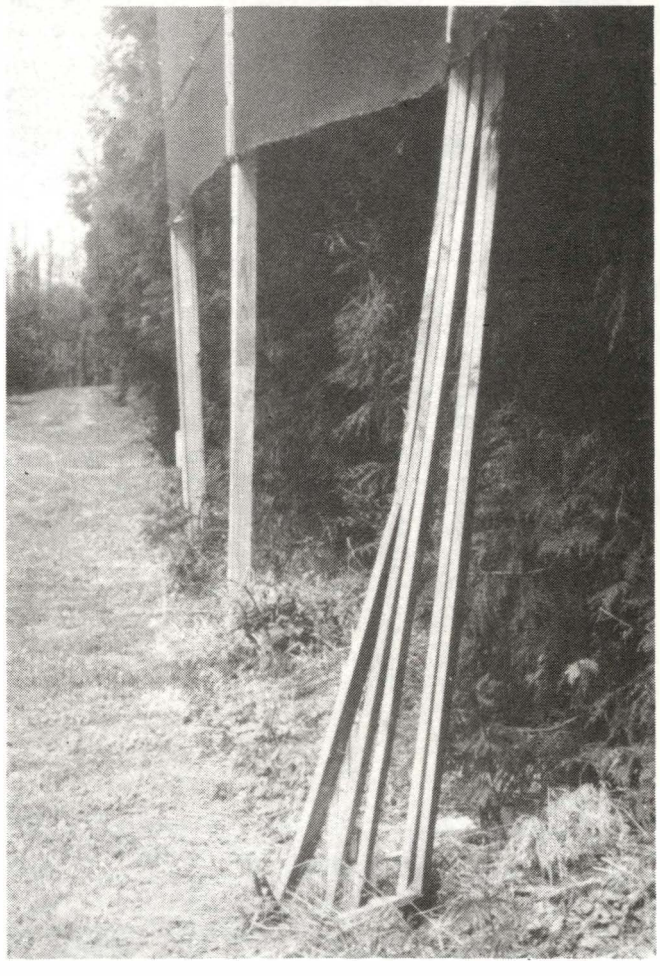
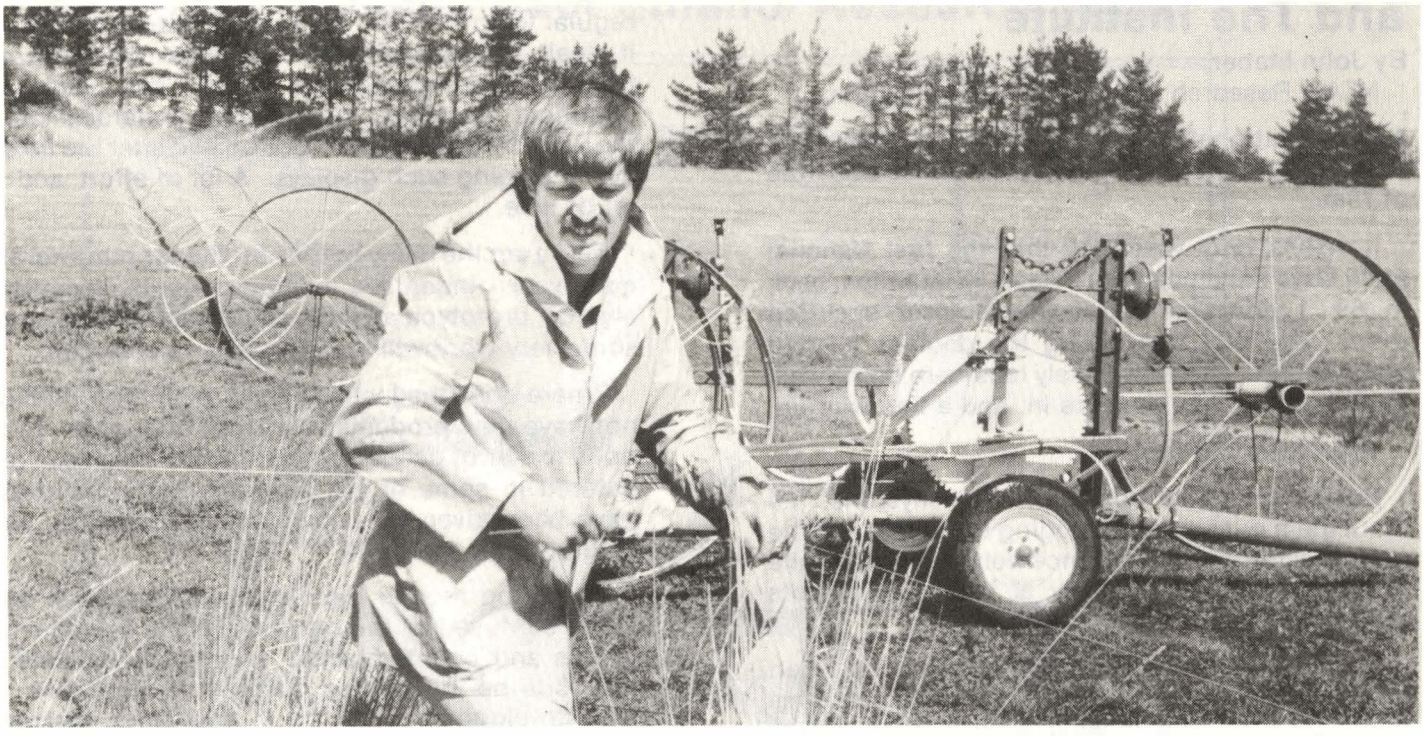


Photo at right shows laminated poles after the storm. Failures occurred where laminations were parallel to the line of the fence.

Institute Irrigator Now In Production



Engineer Graeme Martin and the first production model of the travelling sideroll irrigator

The continuous move sideroll irrigator is now being manufactured by the two Christchurch firms of Harvin Ltd and Hylton Engineering Ltd.

The first farmer to buy one was Mr Frank McArthur of Harewood who converted his standard sideroller to a continuous mover with two of the waterpowered drive units designed by the Institute.

The Ministry of Works and Development in Dunedin requires another unit for a problem area of the Maniototo Scheme.

Present work on the irrigator project relates to the selection and improvement of sprinklers suitable for low pressure use. Tests on the "Wobbler" distributors are still in progress. Solutions to the excessive wear problem are now evident.

Weighing Livestock in the Electronic Age

During a survey made in 1973 only one livestock weighing machine out of the 16 tested approached an acceptable standard of accuracy.

There were many defects in design and manufacture which caused inconsistent performance even with a new machine. Examples observed included pivot points consisting of a mild steel rod inside a piece of pipe, and ball bearings set so that they could not be turned by hand.

Another common fault was the lack of an effective damping device to prevent animal movements causing fluctuations in the indicated weight. In fact the well designed machines with freely moving pivots tended to be worse in this respect. By 1979 the Institute felt that technological developments in electronics and especially microprocessors had reached the stage where an electronically damped measuring system had become practicable. In addition to compensating for animal movement, the system could provide a digital display, a printed weight reading and an automatic zero and tare.

A local manufacturer designed and built a weighing platform incorporating electronic load cells to sense the weight while the Institute designed and built the indicator unit. The measuring routine controlled by the microprocessor makes 200 readings within a two second period. This information is processed to give an accurate and immediate indication of the weight of the animal regardless of its movement on the platform.

The prototype unit, with platform, was first displayed at the National Fieldays in Hamilton in 1980 where it gained a Prototype Award. The manufacturer has now completed the development of the complete system and the machine is now being manufactured and sold.

Since the display of the unit in 1980 other manufacturers have entered the field and farmers will soon have an increasingly wide range of equipment from which to choose.

Requests for further information should be made to:

The Extension Officer
N.Z.A.E.I.
Lincoln College
Canterbury.