NZAEI NEWS

NO.11 *An informal account of current activities* DECEMBER 1978

EDITORIAL

If you would like to comment on any of the items appearing in the Newsletter, or on the work of the Institute, please write to:

The Information Officer
NZAEI
Lincoln College
Canterbury

The Information Officer will also handle address changes and requests for the Newsletter or other NZAEI publications.

HAY HANDLING

The bale storage and weathering trial at Hari Hari in Westland was ended in October after seven months of storage in the open. Local farmers were invited to attend our final assessment and to inspect the bales. A lively audience of about 25 were present and helped to cut the bales open to expose rainfall damage.

The uncovered round bale was estimated to be 80% damaged. Rain penetration was clearly marked by a band of rotten hay up to 300 mm in from the roof line. Beneath this layer was a band of musty hay - a hazard to stock and their handlers.

By contrast, the impervious plastic cover had given complete protection. The hay appeared to be in as good a condition as when it was placed in store. This bale had also retained a good cylindrical shape. The other two bales had slumped to form the familiar D-shape of wet and weathered bales.

The third bale, fitted with an open weave plastic cover, had shed only a proportion of the rain falling on it. Degradation was approximately half that of the uncovered bale.

Samples of hay were taken from all three bales for nutritional assessment by the Lincoln College Animal Science Department.

TUSSOCK OVERSOWING

The oversowing trials were continued with the Institute Howard Seedavator which has been converted to cut grooves 100mm wide at 250mm intervals. Two types of coulter were used in sowing. The first type was a simple tube through the back flap and the second was a double disc opener, rubber mounted to allow sideways movement when traversing slopes.

Grass establishment trials have been laid down to determine the better of the two coulters and the degree of tilth require-.

Another trial was laid down in November at Holbrook station to see whether turnips can be established in a dense turf in a one pass operation. This year, fuel consumption, blade wear and time per hectare were measured. Rocks have caused the greatest difficulties and more work will be directed at alleviating this problem.

HARVESTING

A simple mechanical impactor to remove canopy grown fruit is being designed after a detailed analysis of film taken of the hand operated impactor.

To reduce the overall cost of providing support for the canopy system it was suggested that the netting could be placed by crimped line wires. A request to Hurricane Wire Products Limited for a supply of suitable wire resulted in the resurrection of an old crimping machine and the supply of several hundred metres of 11 gauge high tensile wire.

Some work not directly connected with harvesting was recently carried out in the fruit tree section of the Horticultural Research Area at Lincoln College. Explosives were used to shatter the subsoil thus helping the trees to develop good root systems. Forty millimetre holes were drilled about 900mm deep and then charged with

gelignite. This method of shattering the hard clay pan proved to be far quicker than the alternative method of hand digging a large deep hole.

EMERGENCY LIME DUMPING

A full size hopper from a Piper Pawnee aircraft has been set up, complete with an Easton Hopper box outlet. This will be used for full scale dump tests.

Visits have been made to several limeworks,and to Brunner, Westport and Reefton to observe lime sowing operations. The way in which the lime releases from the hopper while the aircraft is in flight has been closely observed. Several air film sequences were obtained for later study. This record will be extended by attaching a movie camera to the aircraft itself, and filming the hopper outlet. Four lime samples have been obtained including at least one known to have poor jettison characteristics. These are now being tested for their flow properties, principally by means of a direct shear cell.

WATER RESOURCES

The Glenmark Irrigation Scheme has been accepted by a farmer vote and approved by the Cabinet for construction. The Institute is assisting the consulting engineers with survey information.

WASTE MANAGEMENT

The Institute has been asked by the Interdepartmental Working Party on Land Disposal of Treated Sewage Effluents to provide information on the properties of aerosols arising from spray irrigation and on the methods of reducing their production and drift. A report on an alternative irrigation method is in preparation and a literature survey on the subject is being assembled.

TRACTOR SAFETY AND OCCUPATIONAL HEALTH

During the period twelve protective frames were tested and sixteen reports issued. Another twelve reports extended existing certificates or accepted OECD tested frames. Assistance was given to two manufacturers, one in the design of a frame for a crawler tractor, and the other with advice on the acoustic treatment of cabs.

IRRIGATION

The 'wheel' irrigator was exhibited at the Canterbury A & P show and the College Field Day. Considerable interest has been shown by farmers and manufacturers. It remains to be seen whether this will lead to commercial production.

ETHANOL PRODUCTION FROM CROPS

Analytical techniques to be used with the six litre tower fermentor have been developed. They include gas-liquid chromatographic measurement of ethanol and sugars. The equipment for preparing the beet and leaching out the sugar solution is being built. Fermentation studies will soon start on sugar beet from the Winchmore Irrigation Research Station and fodder beet from Lincoln College.

Associated work on distilling the beer produced by the tower fermentor and on anaerobic digestion of pressed pulp and still bottom wastes is being carried out by the Chemical Engineering Department at the University of Canterbury. An alternative digestion process producing hydrogen, acetone and butanol is being studied in the Agricultural Microbiology Department at Lincoln College.

Proposals are being prepared for a 250 litre workshop-scale plant to include all the necessary processes for an integrated plant.

ELECTRICAL PROJECTS

An Institute designed electronic sensor and proportional controller to maintain the temperature in poultry houses is under test. A request has been received from glasshouse owners to incorporate additional features so that the controller can be used in glasshouses.

ARTIFICIAL SHELTER

An artificial shelter fence, 5.5m high and 100mm long, of woven plastic material, has been erected on the Lincoln College Research Farm. One pole is now being guyed and instrumented to measure wind loading. This

should assist in determining the drag on various materials used for such fences which are often used to protect kiwifruit orchards. A number of poles have been broken by wind in Northland and the Bay of Plenty. The strength of the wood has been studied by M.A.F. staff but the drag properties of the plastic materials have not been known.

FROST PROTECTION

The New Zealand Meteorological Service has been asked to provide historical temperature data to be used in producing statistics of the occurrence of sub-zero temperatures. This information will be related to the critical low temperatures for various crops. The resulting frost risk data will be useful in assessing the development of horticulture in new areas.

STAFF

Colin Bedford has been appointed to the new position of storeman in the Institute.

We are pleased to report that Brian Earnshaw is now back part-time after being seriously injured in a motor accident.

HERE AND THERE

•We have had nine requests for drawings of the Vibarscreen so far: Five from farmers, two from research groups, one from an engineering firm and one from a cattle breeders' association in Israel.

•John Dunn attended the 20th International Horticultural Congress in Sydney in August and presented a keynote paper dealing with the Institute's work on apple and raspberry mechanisation in the Temperate Fruit Section.

•Visitors to the Institute discussed garlic harvesting, black-currants, raspberries, flax, glasshouse environment control, trickle irrigation, cultivation, overdrilling, fertilizer placement, herbicide incorporation, pneumatic pruning, plant propagation, seed calibration, safety frame design, and alcohol from crops.

RECENT PUBLICATIONS

NZAEI INTERNAL REPORTS

93. A review of cultivation studies undertaken by NZAEI P.E. Steele. 50c

94. Mechanisation and haymaking P.E. Steele. $1

95. Ethanol produced from fodder beet. J. Dunn, C. Henderson, D. Painter, P. Steele, R. Young. 50c

PAPERS BY NZAEI STAFF

Steele, P.E.
Fieldays in Review
N.Z. Journal of Agriculture, 136(9), September 1978.

Steele, P.E.
Two New Round Balers
N.Z. Journal of Agriculture, 136(10), October 1978.

Steele, P.E.
Cultivation Studies
N.Z. Farmer, 99(19), October 1978.

Steele, P.E.
Engineering a Way Out.
Straight Furrow, 38(23), November 1978.

Steele, P.E. and Pratt, T.H.
Double Up with a Bridge Link
Power Farming Magazine, 87(10), October 1978.

Steele, P.E. and Pratt, T.H.
Power Harrows
N.Z. Farmer, 99(20), October 1978.

Hirsch, S.J.J.
On-Farm Energy Production - Hydro Sources
N.Z. Farmer, 99(15), August 1978.

FENCING

Fence Durability Trials

Hari Hari and Wither Hills sites have been visited and a range of underground wire samples collected for analysis. A visual examination of one of the galvanised samples taken from the Hari Hari site shows that large

areas of zinc have been removed and rusting of the base steel has commenced.

An examination of aluminium clad and aluminium magnesium alloy wire samples after they had been held in contact with multi-salt treated timber showed that residues of the chemicals are very corrosive to these metals in the accelerated trial environment. Nevertheless, this corrosive action appears to be somewhat less severe than with zinc. In two cases wire samples showed a loss of over 50% of the zinc coating.

So far the preservative Pentachlorolphenol (PCP) has had little effect on any of these types of wire.

Electric Fencing

Many polymers from which electric fence insulators are at present manufactured have limitations when used in permanent electric fences. Six other polymers, which may possess better long term characteristics, have been selected by the Institute for investigation. Each polymer has been moulded into the shape of an insulator and its mechanical and weather resisting properties will be investigated. Sets of these insulators will be installed at each of the Institute durability trial sites.

Laboratory Accelerated Corrosion Trials

The pinewood blocks treated by the F.R.I. with alkyl ammonium compounds (three types) have been fitted with galvanised and aluminium clad wire specimens and installed in the laboratory accelerated corrosion trial. It is hoped to install fence posts treated with these compounds at the eight major durability trial sites when these are inspected in February of next year.

WHY FODDER BEET FOR ETHANOL?

We have recently been advocating the use of fodder beet rather than sugar beet as a source of ethanol which may be obtained by fermenting the sugars stored in the plants.

With some reason we have been asked why fodder beet has not been grown for sugar production. Well - the sugar profiles of sugar beet and fodder beet are different. Fodder beet has a higher proportion of monosaccharides which, while suitable for fermentation, are unsuitable for sugar refining.

Weight for weight, in fact, fodder beet only contains about 10% sugar compared with the 17% or thereabouts of sugar beet. The factor which disposes us towards fodder beet is the fresh weight yield. Despite a lower sugar concentration fodder beet should provide more sugar per hectare. For instance a hectare of fodder beet could yield 100 to 200 tonnes fresh weight, containing 10 to 20 tonnes of sugar. Sugar beet with a yield of 50 tonnes a hectare would give only 8.5 tonnes.

However, the prediction of fodder beet yield is based on two dryland trials which included high yielding monogerm varieties. The sugar beet yield is based on an average of several year's trials grown under irrigation. The fodder beet trials need repeating before we can be sure of the average sustainable yield.

Sugar refineries are large complexes dependent on a high input of raw material. One sugar refinery serves a considerable area and transport becomes a factor in the cost of production. The cost of transporting the greater bulk of fodder beet together with the proportion of unsuitable monosaccharides would make it unattractive as a raw material. The capital cost of the refinery would also be higher.

Ethanol factories can be relatively small with a relatively lower capital cost, and operate on a short collection radius. As they would be close to the source of supply there would be little difference in transport costs; the greater bulk of fodder beet would be offset by the proximity of the crop to the factory.

Our research programme includes fodder beet trials, at present under way, to verify the yield. Fermentation studies of both fodder beet and sugar beet are also planned.

As can be seen the proportion of unsuitable monosaccharides present in fodder beet rules it out for sugar production while the higher yield, in tonnes per hectare, dominates the economics of ethanol production.

New Zealand Agricultural Engineering Institute, Lincoln College, Canterbury, New Zealand.