NEW ZEALAND

DIRECT DRILLING TECHNOLOGIES

John Stevens — Cass Bay, Lyttelton, New Zealand

Martin Mayer — Wintersteiger, Austria

John Baker — Centre for International No-Tillage Research and Engineering (CINTRE), Fielding, New Zealand

Xiao Yunlai — Director, Division of International Exchange and Cooperation, Department of Science and Education, Ministry of Agriculture, PR China

John Hampton — New Zealand Seed Technology Institute, Lincoln University, Canterbury, New Zealand

Poster to assist Farmer Training

ICETS2000, Beijing, PR China (11-13 October)

INTRODUCTION

- New Zealand direct drilling technologies suited to tractors 56kw and above have been successfully used internationally for 40 years (Figs. 1 and 2) for:

    - no-tillage
    - reduced tillage
    - full cultivation

- This success has encouraged the New Zealand design and manufacture of smaller (1 – 2m)* lightweight drills (Fig. 3) suited to small (7 – 56kw) all terrain vehicles (ATVs) and tractors used in:

    - flat, rolling and mountainous ecologies
    - developed and developing countries

- This poster introduces key drill components and associated technologies developed and manufactured in New Zealand as integrated systems

———————————————

* 1m drills also suited to animals

DRILL OPENERS

The inverted-T slot soil opener (Fig. 4) provides an improved environment for

- seed germination
- seedling emergence and survival
- early seedling growth

♦ These slots are formed using either the Baker Boot or Cross Slot openers

♦ Baker Boot (Fig. 5)

- mid-range industry standard
- designed for use with a leading disc
- at least seven commercial variants available
- some residue handling problems
- does not separate seed and fertiliser in slot

♦ Cross Slot (Fig. 6)

- upper-end of range for price and technologies
- central disc provides good performance in residues (up to 5 t/ha) and separate placement of seed and fertiliser
- low maintenance and minimal adjustment

♦ Factory kits are available to fit Baker Boots or Cross Slot assemblies to a range of seed drills and planters

SEED AND FERTILISER METERING DEVICES

- Using foam plastic as the primary metering device
  - combines the best attributes of forced feed
  - lowers product damage
  - eliminates periodicity
- A range of options exist (Fig. 7) including
  - radial seed flow (rubbing a foam disc against a stationary backing plate)
  - axial seed flow (rubbing a foam cylinder against the inside of a stationary backing cylinder)
  - tangential seed and fertiliser flow (two counter-rotating foam rollers) which allows singulation (metering of individual seeds) at reduced cost
- Sowing rates can vary from 0.5 to 350 kg/ha
- Systems driven
  - mechanically from a ground wheel
  - electrically from 12 volt DC supply
- Electrically driven systems can operate with ground speed radar and metering rates can be controlled by micro-processor

SEED QUALITY

- Failures using direct drilling commonly reflect the use of low vigour seed
- Seed lots sown must be of high quality (germination, purity, health and vigour)
- Germination data alone are not sufficient. Similarly high germinating seed lots can differ in vigour and hence their subsequent field establishment (Table 1)
- Request quality test data before purchasing seed lots and only sow high germinating and high vigour seed

Table 1. Effect of seed lot vigour on emergence and early seedling growth of four red clover (*Trifolium pratense L.)* seed lots sown at the same time at the same site.

	Seed Lot			
	1	2	3	4
Germination (%)	90	90	90	90
Field emergence (%)	69	56	78	80
Seedling dry wgt (mg)[1]	53.2	49.1	61.6	64.0

[1] Five weeks after sowing

Global Assistance

- Interactive global help available through SEMEC (www.semec.ws), the New Zealand - Australia Branch of the International Association on Mechanisation of Field Experiments (IAMFE) and the NZ Seed Technology Institute, Lincoln University

- Aims to help extend technologies through on-line global networking and co-operation

- Targets improved seed and food production and security for humanitarian relief, reconstruction / restructuring assistance, poverty alleviation, development, and regular production.

- Particular emphasis given to strengthening seed industry and research-farmer linkages and resources for improved seed maintenance, production and usage

- Includes the establishment, organisation, and development of integrated seed chains / systems (Fig. 8).

CONCLUSIONS

International usage of New Zealand's inverted T direct drilling and other associated technologies is already large (Fig. 2) and will continue to grow because they are:

- ✓ ecologically friendly, affordable and suitable for reduced tillage and conventional cultivation using the same equipment
- ✓ contribute significantly to improved seedling establishment and early growth for a wide range of crops and seed sizes
- ✓ avoids tucking residue into opener slots
- ✓ applicable to flat rolling and mountain ecologies in both developed and developing economies.
- ✓ suited to a wide range of tractor sizes from 7-11kw to over 100 kw
- ✓ can be used for research, specialist seed production; small-, medium- and large-scale farming; horticulture including orchards and vineyards; airports; parks and other recreational areas, and environmental rehabilitation and conservation
- ✓ are properly backed up by a highly skilled and well experienced multi-lingual global help group and on-line network which is pro-active.

Footnote

- This is an integrated activity of SEMEC on-line™ the NZ-Australian Branch of IAMFE and the NZ Seed Technology Institute developed in association with Lincoln University, Chinese colleagues, NZ manufacturers* of agricultural machinery, R&D organisations and agencies, and Wintersteiger and Hege

- The kind invitation of the Government of the People's Republic of China, the Chinese Academy of Agricultural Sciences, and the ICETS200 Organising Committee is gratefully acknowledged

- Prof Egil Oyjord and Mr Torbjorn Leuchovius were pivotal in forming the global drilling help group under IAMFE

- UNDP Beijing contributed to identifying the seed chain diagram

- Mr W.R. (Bill) Ritchie, Professor Murray Hill and Mrs Karen Hill very kindly provided data, photos, diagrams and other graphic material and helped to develop and edit this paper along with the cited manufacturers and colleagues from FAO, Messrs Francois Dauphine, Peter Griffee, Thomas Bachmann, Lawrence Clarke and Theodor Friedrich

———————————————————

* Aitchison Industries Ltd; Baker No-Tillage Ltd; W R Clough & Sons Ltd; Sandbrook MacRae Ltd; B S Taege Ltd.

Captions to Figures

Fig. 1. Examples of large-scale direct drills plus a soil opener test rig/plot drill (see insert) designed and manufactured in New Zealand, suited to 56kw tractors and above.

Fig. 2. Global spread of NZ direct drilling technologies.

Fig. 3. Small-scale NZ drills for 7 to 56kw tractors.

Fig. 4. Slot shapes formed by different kinds of soil openers, position of seeds planted, and associated micro-climates / vapour losses (Baker *et al*., 1996).

Fig. 5. Different versions of Baker Boot.

Fig. 6. Cross Slot assembly mounted on parallelogram drag arms with hydraulic damper (Baker *et al.,* 1996).

Fig. 7. Foam plastic metering systems.

Fig. 8. Establishment and organisation of Seed Systems