FLEXISEEDER SEED AND FERTILIZER COULTER MODULE: AN OVERVIEW INCLUDING TECHNICAL SPECIFICATIONS

Flexi Technical Note - 004

Stevens, E.J. [1], T. Leuchovius[2], T. Gaardlos[3], I. Close[4], N.D. Collins[5], G. Gray[6]

SUMMARY (ABSTRACT)

The design and construction of multi-purpose seed coulters is pivotal to the overall success of multi-purpose plot seeders. Hoe, spring tyne and disc assemblies may be used, depending on the weight available to provide downwards pressure on the coulter assemblies to make them penetrate into hard ground. Single, double and triple disc assemblies have been used, with and without press wheels, requiring the greatest amount of down pressure compared with hoe and then spring-tyne coulters. Spring-tyne coulters, while requiring comparatively less weight to penetrate for zero tillage are more easily blocked with residue than discs and need better fine adjustment than hoe coulters to maintain even sowing depths in cultivated soil, particularly soft soil. Compound modules are available which combine the best features of each basic coulter system. Interchangeable Flexiseeder coulter modules introduced and described in this technical note (developed by S&N International Ltd in association with SLU[7] and BACD[8] under the Flexiseeder project[9]), allow the operator to mix and match individual coulter technologies according to their respective needs when used in conjunction with the Flexiseeder rotating tool bar and/or frame module. An integrated disc and tyne option is available. There are also standard bolt-on multi-purpose cast tips for hoe and spring tyne coulters, plus a range of knock-on shoes (cast and forged) to be fitted to a common cleat which is either welded or bolted permanently to the coulter. These technologies have been put into the public domain.

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[1] S&N International Ltd, Governors Bay Road, RD1 Lyttelton, New Zealand, 8971.

[2] Swedish University of Agricultural Sciences, (SLU) VPE/Fält Forsk, Uppsala, Sweden.

[3] Bioforsk Arable Crops Division, Apelsvoll, N-2849 Kapp, Norway.

[4] The Casting Shop Ltd, 5A Watts Road, Sockburn, Christchurch, New Zealand.

[5] Collins Patterns Ltd, 2/114 Conway Street, Barrington, Christchurch, New Zealand, 8244.

[6] Geoff Gray Engineering Ltd, 25 Klondyke Drive, Hornby, Christchurch, New Zealand.

[7]Swedish University of Agricultural Sciences (SLU), VPE/FÃ¤lt Forsk, Uppsala, Sweden.

[8] Bioforsk Arable Crops Division, (BACD), Apelsvoll, N-2849 Kapp, Norway.

[9]www.flexiseeder.com. A voluntary user-group project of the Seed and Seed Drilling Technology Help Group: International Association for the Mechanization of Field Experiments / Global Institute and Agricultural University Internet Hub (IAU Trust). Group was formed at IAMFE 2004, St Petersburg.

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INTRODUCTION

For the past 40 years, New Zealand and Australian arable farm drill coulters have also been used successfully on plot drills for light direct seeding and reduced tillage, particularly grass and other small seeds, more so than comparable equipment from Europe and North America, which tends to be lighter in design and construction. It has become common practice to up-grade European Oyjord plot seeder frames over time using these coulters and also to manufacture new frames using these coulters, to which a range of metering devices have been fitted (Plate 1). This equipment is not robust enough for today's requirements and it does not offer a wide enough range of coulter types. New modular options / approaches are needed for up-grading and/or replacing this equipment keeping in mind the considerable benefits of using farmer coulters on plot seeders to save money, facilitate maintenance and, encourage the rapid dissemination and adoption of research results into the farming community. This technical note is one of six (listed in the attachments) that support different components of the new Flexiseeder[10] modular approach for manufacturing / fabricating zero tillage plot drills also suited to reduced tillage and traditional cultivation, introduced and described by Leuchovius et.al. (2008) and Stevens et al. (2008).

One of the first Oyjord – Shou planters to reach New Zealand.

(NZ Crop and Food Research Inst.)

Locally manufactured Oyjord – Type plot seeder fitted with Duncan arable seed drill coulters to which forged interchangeable knock-on knife tips are fitted. (www.agpoint.com.au)

Plate 1. Historic use of arable coulter assemblies on New Zealand plot drills also used for light direct seeding and reduced tillage besides conventional arable seeding. This equipment is still in use after almost 40 years.

[10] www.flexiseeder.com. A voluntary user-group project of the Seed and Seed Drilling Technology Help Group: International Association for the Mechanization of Field Experiments / Global Institute and Agricultural University Internet Hub (IAU Trust) formed at IAMFE 2004 in St Petersburg.

BACKGROUND

The need to use and benefits of incorporating a range of “quick change” farmer drill coulters as modules for a common tool bar carrier are obvious, depending on crops to be sown, residue, soil type and moisture. At the same time while using lighter frames / tool bar carriers, the need to transfer tractor / operator weight onto the discs modules to cause them to penetrate must be kept in mind. Double and triple disc modules used for direct seeding and / or reduced tillage require proportionately more down pressure to penetrate than single discs which in turn require significantly more down pressure to penetrate than either spring tyne or trailing hoe coulters. Wear as well as overall maintenance requirements are greater on discs than on tyne and trailing hoe coulters. As a general rule, given the options, discs should only be used where either tyne or trailing hoe coulters are inadequate, which is mainly in high residue situations and some wet clay situations (which are also prone to glazing when discs are used). Rather than “locking” a plot seeder into one particular type of coulter assembly, a range of quick change options should be offered / used along the lines described pictorially below, variously identified, developed / improved and promoted under the Flexiseeder Project.

MODULE COMPONENTS

Plate 2. Available range and use of bolt-on and knock- on tips fitted to trailing hoe and 12mm S tynes, plus matching seed tube options. Suffolk shoe option is shown – for which a double seed hose is also available. All knock on tips are interchangeable using the same cleat.

In the centre top picture, please note from right to left:

- ✓ Four knock-on tips developed in Australia during the 1970s, still available commercially (www.agpoint.com.au) and in use;
- ✓ First two tips on the right are heavy-duty Flexiseeder bolt-on tips, then a heavy-duty knock on Flexiseeder knife tip, both are cast either in Nihard or SG iron with hard surfacing, plus;
- ✓ Two models of cast Flexiseeder universal attachment cleats which either bolt onto spring tynes or, can be welded to other tube and hoe coulters;
- ✓ All points are interchangeable using the Flexiseeder bolt- / weld-on cleat.
- ✓ Cast and forged tips also fit and may be used conventional cultivators and tyne harrows, with or without seeder tubes / attachments.

Amazone RoTeC single discs;

Kongskilde double disc assembly

Conner Shea arable disc assemblies are heavier than those used historically on European plot seeders and have been up-dated and brought forward to the Flexiseeder for direct seeding, reduced tillage and cultivated ground.

Plate 3. Disc options currently available … others being developed / accessed / evaluated including single straight and triple disc (with and without ripple leading disc)

DISCUSSION AND CONCLUSIONS

A useful range of existing and new tip technologies have been identified / developed and evaluated as attachments to rotating tool bars on the modular Flexiseeder plot and farmer seed drills. Those shown are ready for commercial integration into the project. This constitutes a major step forward in the development of modular plot seeders for zero tillage which are also equally suited to reduced tillage and conventional arable cultivation. At the same time, these new technologies were also shown to have direct application on farmer drills, harrows and cultivators both in New Zealand and globally. These technologies are simple, robust and affordable.

Flexiseeder cast tips and Conner Shea disc modifications were commissioned for the project by S&N International. These technologies have been released to the public as standard items and are being manufactured in New Zealand and sold globally. They are available commercially under the Flexiseeder Project through S&N International Ltd to original equipment manufacturers as well as all other end-users, both as spare parts and as components for new machines.

Trading surpluses will initially be used to recover research and development costs, which have been considerable, funded by S&N International Ltd. After that, a portion will be given to help maintain IAMFE and to further develop and improve the initiative.

Where next?

We are open to your suggestions and advice.

REFERENCES

Fraser, D.S., E.J. Stevens, T. Leuchovius, L.P. Brooks, T. Gaardlos, M. Bakkegard. 2008. Flexiseeder drive modules: An overview including technical specifications. *Flexi Technical Note - 001.* Proceedings of IAMFE Denmark 2008. AgroTech, Ãrhus, Denmark.

Leuchovius, T., E.J. Stevens, D.S. Fraser, C.D. Roberts, T. Gaardlos, M. Bakkegard. 2008. Plot machine modules: More flexibility and lower costs. The Flexiseeder Approach. Proceedings of IAMFE Congress 2008, AgroTech, Ãrhus, Denmark.

Small, G.T., N.B. (Jock) Baker, E.J. Stevens, T. Leuchovius, T. Gaardlos, M. Bakkegard. 2008. Flexiseeder air assisted delivery and distribution module: An overview including technical specifications. *Flexi Technical Note - 003*. Proceedings of IAMFE Denmark 2008. AgroTech, Ãrhus, Denmark.

Stevens, E.J., T. Leuchovius, T. Gaardlos, A. Russell, R. Zuerrer, M. Bakkegard. 2008. Flexiseeder: A new modular approach to help improve correlation / cross-over of results between plot and field research and commercial agriculture, horticulture and viticulture. Proceedings of IAMFE Denmark 2008. AgroTech, Ãrhus, Denmark.

Stevens, E.J., T. Leuchovius, T. Gaardlos, N.D. Collins, I. J. Close, G.M. Gray. 2008. Flexiseeder cell wheel and distributor module: An overview including technical specifications.

Flexi Technical Note - 005. Proceedings of IAMFE Denmark 2008. AgroTech, Ãrhus, Denmark.

Stevens, E.J., T. Leuchovius, T. Gaardlos, C.D. Roberts, G. M. Gray, L.P Thian. 2008a. Flexiseeder frame module: An overview including technical specifications. *Flexi Technical Note - 006*. Proceedings of IAMFE Denmark 2008. AgroTech, Ãrhus, Denmark.

Stevens, E. J., P. K. Jarman, P. J. Clarke, J. G. Hampton. 2004. One drill for all establishment systems – is it possible? Proceedings of the 12th international conference on mechanization of field experiments (IAMFE Russia 2004). IAMFE, St. Petersburg, Russia.

Stevens E. J., C. J. Baker, M. Mayer, M. J. Hill. 2000. International potential of NZ direct drilling technologies for grassland experimentation. Aspects of Applied Biology 61, 2000. IAMFE/AAB UK 2000. The 11th International Conference and Exhibition on Mechanization of Field Experiments. pp. 269-278.

Thian, L.P., E.J. Stevens, T. Leuchovius, T. Gaardlos, K.I. Thian, M. Bakkegard. 2008. Flexiseeder ”continuous-run” seed and fertilizer modules for small-scale users: An overview including technical specifications. *Flexi Technical Note - 002.* Proceedings of IAMFE Denmark 2008. AgroTech, Ãrhus, Denmark.