FLEXISEEDER FRAME MODULE: AN OVERVIEW INCLUDING TECHNICAL SPECIFICATIONS

Flexi Technical Note - 006

Stevens, E.J. [1], T. Leuchovius[2], T. Gaardlos[3], C.D. Roberts[4], G. M. Gray[5], L.P Thian[6]

SUMMARY (ABSTRACT)

Conceptualizing and designing frame modules within strict dimensional and weight limitations is the most challenging part of building multi-purpose plot seeders that are equally suited to zero tillage, reduced tillage and cultivated ground. Because this is a relatively new area of application, there is only limited history and accumulated experience to draw on, mainly from scaled down versions of farmer / horticulture / viticulture machines which seldom meet the immediate dictates of plot seeders and have to be modified / re-built to suit individual needs. This is time consuming and expensive. To save costs and increase efficiency a, two-way cross-over modular approach has been developed by the Flexiseeder Project[7] under the combined leadership of S&N International Ltd, SLU[8] and BACD[9], which (a) takes on board relevant technologies from large-scale commercial production lines and (b) systematically matches these with specialized research components / modules in ways that are interchangeable and reciprocal. It is upon this underlying philosophy that the applied Flexiseeder Project is built. Practical examples are introduced and described in this technical note. Resulting developments 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, (BACD), Apelsvoll, N-2849 Kapp, Norway.

[4] C&C Roberts Engineering, 54 Crossgates Rd, RD3 Leeston, New Zealand.

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

[6] Thian Agri, Manufacturing Ltd, Cryer Street, Southbridge, Canterbury New Zealand. www.thianagri.co.nz

[7] 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).

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

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

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INTRODUCTION

As a general guide, the un-laden weight of light – weight plot drills for 50 hp tractors should not exceed 350 Kg; intermediate-weight drills for 70 to 90 hp tractors, 550 kg; and heavy weight drills for 120 hp tractors, 1000 kg. Designing and constructing robust plot seeders that penetrate easily into hard ground and contour follow well within these parameters is difficult. This is a major challenge, especially to target zero tillage primarily yet still adequately serve the need for sowing reduced tillage and cultivated land. Meeting these needs is still a relatively new area of research and equipment design and manufacture. It relies heavily on the cross-over / import of technologies from farmer drills. This cross-over approach can save time and money, particularly where modular concepts are used to turn the construction of individual plot seeders into production runs, as has been achieved under the Flexiseeder programme[10].

This technical note which introduces and describes the evolution of a new modular approach to manufacturing / fabricating plot drill frames is one of six listed in the attachments providing additional technical background to Leuchovius et.al. (2008) and Stevens et al. (2008)[11].

BACKGROUND

The role of spring tynes in manufacturing light yet robust farm drills suited to zero tillage, reduced tillage and cultivated ground has been well established, including the use of 12mm S tynes rotated back from a vertical position and fitted with a range of tips (Stevens et. al. 2000, Stevens et.al. 2004). In 2004 a Taege Vineyard drill (Plate 1) with fixed tool bars was imported into Sweden as a plot seeder frame and used with good results. During the same year an older style (Finish) Tume tyne harrow with adjustable tool bars (Plate 2) was returned to New Zealand for the concept to be evaluated as a light plot seeder cum farmer drill.

Plate 1. Taege vineyard drill www.taege.com

Plate 2. Finnish Tume harrow with rotating tool bars.

[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).

[11] Covering the evolution and development of modular components of the Flexiseeder project, under the IAMFE / IAU Seed and Seed Drilling Help Group formed at IAMFE 2004 in St Petersburg.

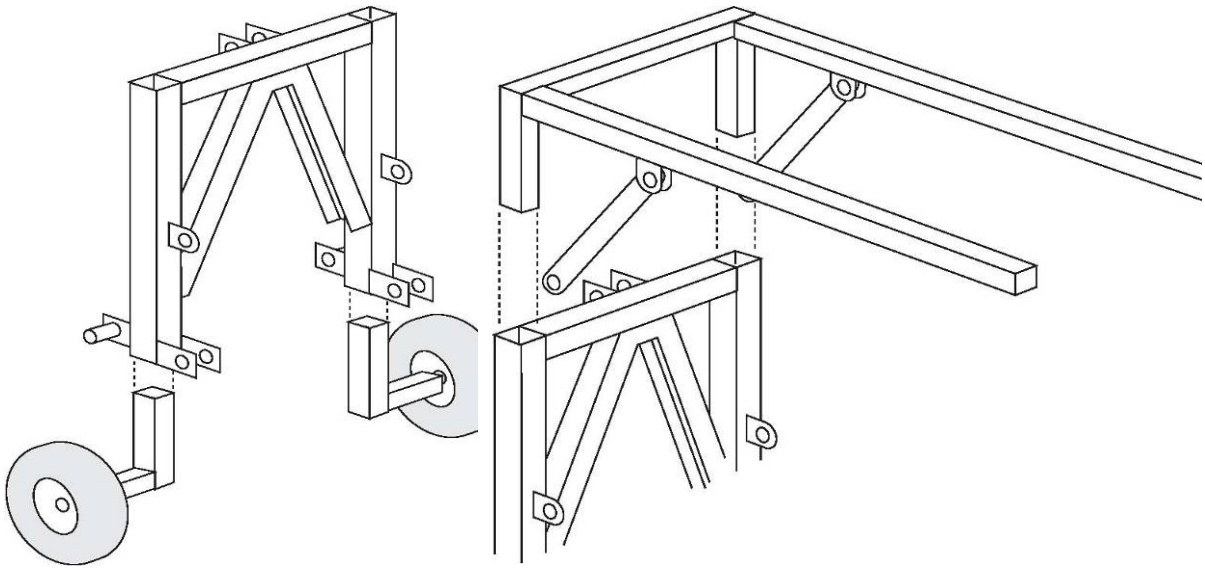
RESULTS

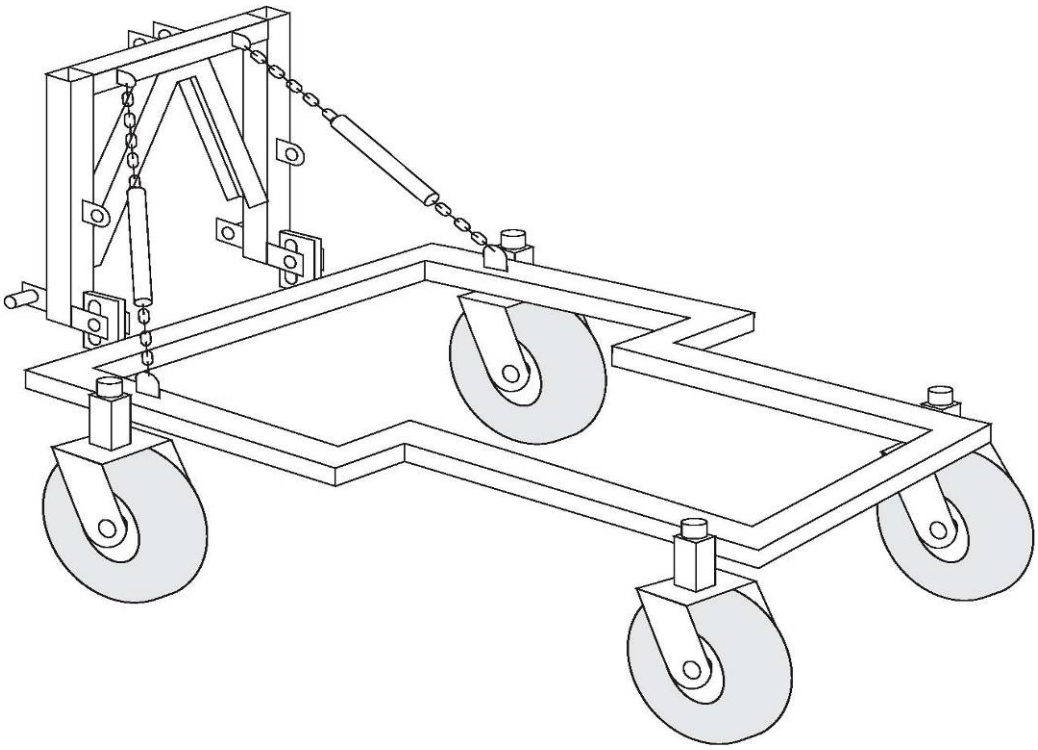
Rotating tool bars were found to have distinct advantages for depth control and the formation

Plate 3. Heavy-duty Flexi Plot frame.

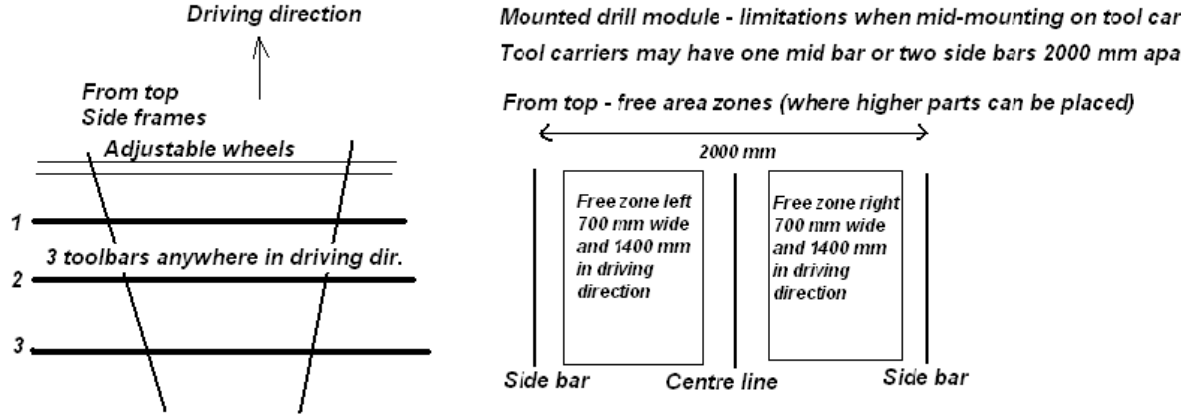
of tilth in the seed bed, over locked tool bars. However, where the drill frame had to be lifted together with its load, using three-point linkage, a proportionately heavier drill frame (Plate 3) was required to compensate for the loss of structural chassis function gained from welded tool bars that formed an integral part of the frame. To overcome this, a carrier frame approach was developed (Figure 1) that was more versatile, allowing tool bar positioning and row spacing to be easily changed. This allowed lighter frames to be used and a more open frame plan adopted for all classes of frames. This included the light, intermediate and heavy frames, with and without the Flexiseeder four-way spring mounted tool bar assembly (Plate 4) which to relieves stress on the frame and improves contour following of the tynes. Developing this spring system constituted a substantial break through in the design and manufacture of light open-plan drill frames.

All drill frames can be used as trailing, semi-mounted or fully mounted, requiring only a few minutes to change between the various options. Tool bar bearings assemblies can either be bolted or welded on to the tool bar. Remaining components are bolted to ensure maximum flexibility for shipping and servicing / maintenance, which is minimal. Tool bars may be rotated manually or using hydraulic rams. There are a range of drive modules including jack stand, jockey and land wheel and direct drive options.





Tractor tower with plot modules fork added from the top. Optionally a pair of support and/or drive-line wheels can be inserted from below.



Tooth lock device for positioning tool bars

Figure 1. Concept drawings for multi-purpose frame design which is open plan.

From this basis, a range of new open-plan Flexiseeder frame modules (Plate 4) have been developed suitable for plot and farmer / vineyard / horticultural drills. They were developed and evaluated across a range of ecologies in New Zealand, targeting those ecologies in particular considered to have international agro-ecological analogues. Subsequently, these frames have been sold and delivered to Sweden, Norway and Switzerland for field testing, demonstration and further improvement.

Flexi light frame – test bed trailing and 3 point linkage

Adjustable wheel module Sweden

Mid mounted (www.plantresearchnz.co.nz)

Hydraulic lift with manual depth set

Flexi light plot seeder Sweden

Mid mounted on Swedish tool carrier

Flexi intermediate plot / farmer carrier frame with spring mounted tool bar assembly

Flexi farmer drill fitted with Thian seed box (www.thianagri.co.nz)

Integrated trailing, semi-mounted and fully mounted options standard

Plate 4. Progression and types of Flexiseeder open plan plot and farmer drill frames

DISCUSSION AND CONCLUSIONS

A series of new direct seeder plot and farmer drill frame modules were identified and developed collaboratively within the Flexiseeder project using cross over between farmer drills and plot seeders involving people from four different countries spread around the world with overlapping agro-ecologies and seed drilling needs. These same frames also serve equally for seeding reduced tillage and cultivated ground. Besides developing and extending useful new technologies, this activity demonstrated the applied worth of networking under IAMFE and the IAU for a common goal, made possible by the internet. Solid foundations have been laid in economically sound, sustainable and timely ways as a catalyst for further progress both in the developing and developed world. This has been facilitated by releasing these technologies in the public domain at a time when economic food and fuel shortages, as well as the impact of climate change are uppermost in people's minds.

Where Next?

We are open to your suggestions.

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