

## TWO WHEEL TRACTOR NEWSLETTER - AUGUST 2013

### The prototype 'Gongli- Africa' seed drill for 2WT. Progress report.

For the past three months, following the planning meeting in Arusha, Tanzania (see May 2013 newsletter) I have been working on a prototype CA seed drill for the FACASI project in East Africa.

The task has been to produce a seed drill of similar design to the ARC Gongli, but with the following special requirements for African crop agriculture, namely:

- Specifically set up for two row operation rather than four row.
- A more accurate, yet affordable seed metering system.
- Lower set seed boxes than the original ARC Gongli.
- The ability to fit soil engaging tools to suit high residue conditions (usually disc openers) instead of the tine openers that are at present fitted.

Several vertical spoon feed meters were imported from China. (They have been described in more detail in July 2013 newsletter). I already had some fertiliser metering units on hand. After several weeks of planning, and design, the first prototype of the 'Gongli- Africa' has been produced (although missing some parts such as the seed boxes.).

I have been fortunate in obtaining the part time expertise of Senior Technical Officer Paul Nash who is with the NSW Dept. of Primary Industries in Tamworth.



Paul (seen here posing with a vertical spoon feed meter and the new 'Gongli-Africa' seed box frame) is a University graduate (Science –UNE Armidale, Australia)

He is a long time employee with NSW DPI at the Tamworth Agricultural Institute. As well as being academically qualified, Paul is a first class innovator and metalworker. Since joining NSW DPI nearly 30 years ago, Paul has been involved in the design, construction and modification of many items of field and laboratory equipment, including plot seed drills, boom sprayers, plot harvesters, and soil sampling equipment.

Over a period of three weeks, working during slack periods, and using his skills with lathe, welder, and sheet metal fabrication, Paul constructed the 'Gongli-Africa' seed drill modifications. This has been at no cost to the project (apart from a few minor parts). A CAD drawing of the frame has also been produced.

I would also like to thank the Director of the Tamworth Institute, Dr. Guy McMullen who gave permission for Paul to work on the project.

A new support frame for the seed and fertiliser mechanisms has been built, complete with the drive system, to bolt to the existing 2WT tool bars. The Chinese vertical spoon seed meters have also been fitted as well as a two row fertiliser box. The 'Gongli-Africa' unit will drive from the ground wheel of the 2WT, as on the existing model.

The basic tool bar, as originally designed, together with the soil engaging tools and press wheels, has not been altered in any way.

On the next page, various pictures of the prototype 'Africa-Gongli' seed drill are presented.



The basic frame (left) with the fertiliser meters. An overall view of the unit (right) showing the vertical spoon feed metering system and the fertiliser boxes. No down tubes or drive chains have yet been fitted. Note the 'temporary' seed boxes on the top of the seed drill.



These views show more of the detail. The drive from the ground wheel goes to the original countershaft above the front tool bar. This further drives to a lay shaft immediately behind the front countershaft, and then to the vertical spoon feed meters. This set-up allows a variety of sprocket sizes to be used for maximum flexibility in choice of seed and fertiliser rates.



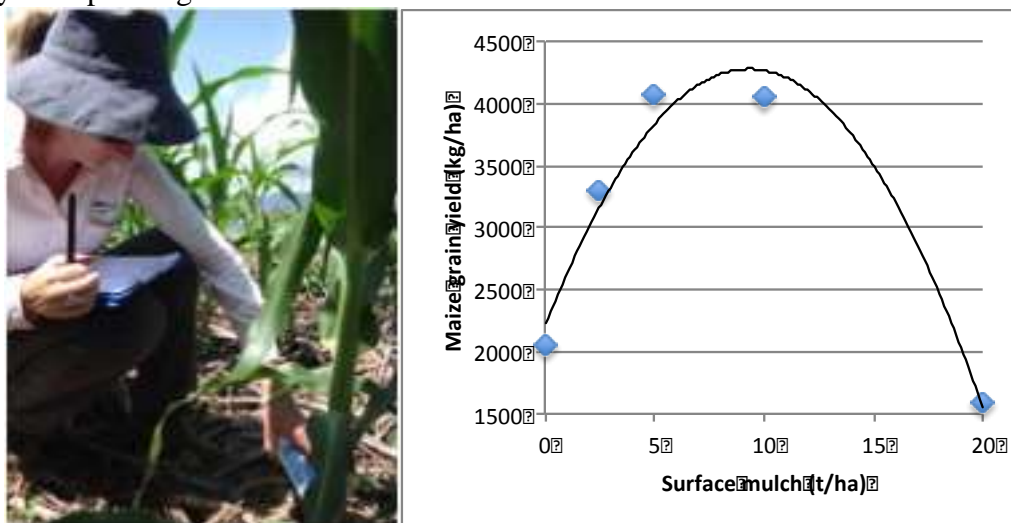
The seed delivery tube from the meter to the tine is shown on the left. If required, the tine can be removed, and a disc opener used as an alternate soil engaging tool. The picture on the right shows the frame 'flat packed' for transport to Africa.

Dr. Bob Martin, Team leader for ACIAR Project ASEM/2010/049 “Market-focused integrated crop and cattle enterprises for NW Cambodia” poses the question-

### **How much is crop residue ground cover worth?**

This is a good question and early results from a mulch experiment at Pailin Province, NW Cambodia indicate that the financial cost of removing crop residues is very high indeed. The mulch experiment commenced in March 2013 with surface mulch levels of Nil, 2.5, 5, 10 and 20 tonnes/ha of maize stover. The trial (rain fed) was then sown to maize, mungbean, peanut and sunflower. The maize results are in. The grain yield (adjusted to 14% moisture) for the nil (bare soil treatment) was 2,062 kg/ha which was about half that of the best treatment of 5 t/ha mulch (4,068 kg/ha). There did not appear to be an additional benefit from 10 t/ha and 20 t/ha appeared to be too much.

The value of the maize at \$US330/tonne was \$US681/ha on the nil and \$US1342 with 5 t/ha of mulch treatments respectively. So effectively the cost of removing the crop residue was \$US662/ha. This does not include the extra cost of ploughing to bury the residues in the first place. 5-6 t/ha of maize stover is roughly what is left behind after a 4 t/ha maize crop. So the clear take-home message for farmers is that they will make more money if they leave the crop residue on the soil surface and adopt no-tillage. To do this they will need to modify their planting machines to handle the residue and the firm soil conditions



**Figure 5. Australian agronomist Stephanie Belfield (left) taking soil temperature and moisture measurements in the mulch experiment and the effects of mulching on maize yields (right).**

Why such a big response to the mulch? Stephanie Belfield found big differences in soil temperature and moisture under the different mulch treatments – especially in the early wet season when there were prolonged periods without rain. The surface mulch treatments reduced soil temperature by up to 10°C at 5 cm depth and there were also big differences in soil moisture at the same level. Many Pailin maize crops failed due to drought in the early wet season. Preserving crop residues could have reduced the chance of crop failure.

Dr. Martin suggests this is a WIN:WIN:WIN - keeping crop residues on the soil surface increases farm income, reduces risk of crop failure and protects the soil resource. There is now good Cambodian evidence to try and convince the farmers. Commercially-based demonstrations with key farmers at farm-scale might help with this in the first instance.

*There is a message here for the various groups developing CA seed drills for 2WT in the developing world. This and other evidence shows that we should be actively continuing this implement development, as the ongoing benefits are obvious. Ed.*

The August newsletter has been produced at relatively short notice, due to deadlines in the construction and transport of the ‘Gongli-Africa’ seed drill from Australia to Tanzania as part of the FACASI project. Unfortunately there has been insufficient time for field evaluation of the new seed box system, and some of the pictures are not as good as I would like. Another newsletter will be produced after my return from Africa. *Note: This newsletter has been sent in a low resolution pdf. format for those on slow internet connections. If you require the newsletter or parts of it in higher resolution please let me know.*

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