

## **TWO WHEEL TRACTOR NEWSLETTER JANUARY 2018**

First of all – I trust all of the 2WT enthusiasts had a festive Christmas and a prosperous New Year 2018. I trust you will all receive the funding you require to continue valuable R. & D. work with 2WT, with particular reference to Conservation farming.

### **A short review of a decade of development of 2WT planters and associated implements.**

I have been associated with small farm mechanisation for the developing world since 2005, and particularly with 2WT since 2007.

What has been achieved in the last decade? Where have we come from, and is the work progressing? From my recollection, the first significant step forward was in 2004, when Craig Meisner, Enamul Haque, Israil Hossain and Scott Justice with several others Bangladeshi colleagues presented a number of papers to an Agricultural conference in Beijing in 2004. They described the early work with rotary tillage seeding, and the initial work with strip tillage seeding, which was based on the 2BG-6A Chinese made rotary tillage seeder. A tined seeder designed on a two row tool bar was also discussed.

I observed these rigs when in Bangladesh in 2007, and with the assistance of ACIAR, was able to fabricate an improved model of the tined seeder, which was named the ACIAR-Rogro 2WT seeder. This was taken further by China Agricultural University in 2011, with the release of the ARC Gongli 2WT seeder. Since that time many variations on this basic design have been fabricated. Jack Desbiolles with the assistance of CARDI developed units for direct seeding of rice in Cambodia. Leigh Vial and John Schiller along with Thai and Lao national workers have fabricated simple versions on this principle for use in Laos and Thailand.

The rotary strip tillage design has been further developed by Enamul Haque, Richard Bell (Murdoch University) and Bangladeshi colleagues. The Versatile Multi Planter (VMP) is now available commercially. To my knowledge, over 100 units have been sold.

Bangladesh research groups (BARI) along with NGO's have produced many and varied tool bar seeders and planters over the years.

An excellent review of all of this work was done by Tim Krupnik of CIMMYT and others in 2013.

<http://repository.cimmyt.org/xmlui/handle/10883/3381?locale-attribute=en>

Various lightweight tool bar tined models have been produced in India, principally for hillside work. Also, experimental tool bar tined units have been fabricated in East Africa (Tanzania, Kenya, Zimbabwe, Ethiopia), principally financed by the FACASI aid program. CIMMYT also made up a tool bar tine model.

Two Brazilian manufacturers (Fitarelli, Knapik) have both single row and two row 2WT planters. Various Chinese manufacturers have single and two row planters which are basically row crop modules attached to a single tool bar.

There are now many single row 2WT planter units available. Some examples are the Morrison planter, (USA) Knapik, Fitarelli, (Brazil) Chinese units, and Eden Equipment (South Africa). Syngenta Foundation (Indonesia) has done preliminary R. & D. in Indonesia. Ndume (Kenya) has made experimental units.

However: When one looks back at the R. & D. effort emanating from many countries and programs over the last decade, , how far have we moved forward? What is the situation with local manufacture, involvement of the private sector, and overall uptake of the technology by farmers and others who own 2WT? In my opinion, although the efforts of many are commendable, not much has been achieved. Why?

Some peripheral challenges have been resolved, including the ready availability of affordable single seed grain metering units. The vertical plate single seed meters from China, and also inclined and vertical plate units from Bangladesh and India can be fitted to most 2WT planters and seeders. Where do we go from here? Comment on this topic would be appreciated.

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### **United States Dept. Agriculture (USDA) research with 2WT**

(referred to as ‘walk behind tractor’ in the presentations)  
USDA, working from the Research Station in Auburn Alabama, has developed various CA implements to suit 2WT. They can all be viewed in a series of Youtube videos at:

<https://www.youtube.com/user/usdansdl>

Units include a crimper, vegetable seeder and transplanter. The research workers have used North American or EU made 2WT traction units to power these implements. Unfortunately Asian made 2WT cannot be used, partly due to safety issues, and partly as the diesel motors do not conform to North American emission standards.



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### **Some further observations on the four wheel ‘Tool carrier’ tractor, and the suitability for the small area farmer of the developing world.**

In the October 2017 issue of 2WT newsletter, there was a report on the ‘Oggun’ tool carrier tractor of around 25HP. The unit is based on ‘Open Source’ principles, where the originator provides plans and advice (for a moderate charge). Potential fabricators make up or assemble tractors with parts supplied by the original company, or alternatively can source local components and parts. This allows for a range of motors to be used (petrol or diesel, single or multi cylinder), as well as other components (steering, transmission) from independent sources.

The Oggun tractor as shown operates completely by hydraulic power. The engine is matched to a large hydraulic pump, which is connected to an infinitely variable hydraulic transmission. The

steering set-up and the implement raise-lower also operate by hydraulics. All the hydraulic componentry can be purchased by assemblers from a variety of machinery outlets.



Two of these tool carrier units have been evaluated in Australia, and I understand there are further challenges to overcome in the design. With a constant oil supply from the hydraulic pump, there is considerable variation in forward speed, depending on the draft requirement of the soil engaging tools. An operator may set the rig up for a certain forward speed, consistent with the effort required to pull the soil engaging tools through the soil. In a high draft area of the field (heavy or tight soil) the unit slows down, whilst in a low draft area (sandy or loose soil) the unit speeds up, and I surmise accelerates excessively when the implement is raised from the ground. Maybe more development design is necessary.

Also several respondents to the October newsletter indicated that a full hydraulic system is maybe a 'bridge too far' in complexity and maintenance for the small area farmer of the developing world.



Above are two other examples of small tool carrier type tractors – The 'Tuff bilt' from Central USA (left) and the 'TerraTrekk Cultitrack' from France (right). Possibly there are others.

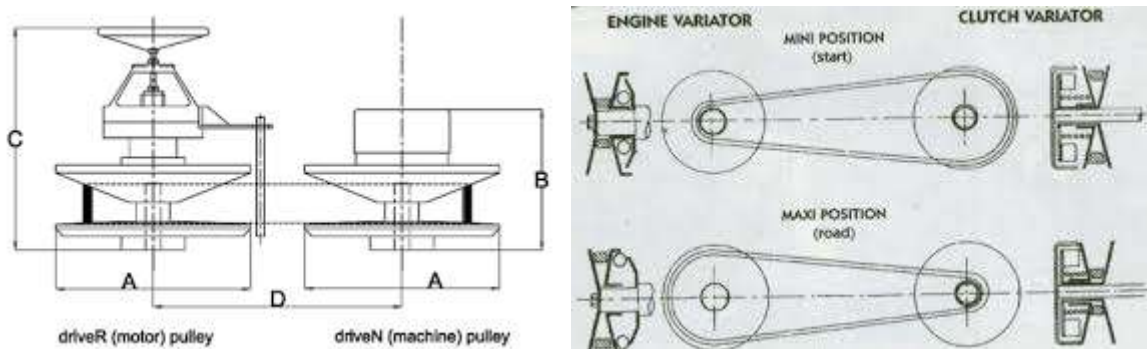
Perhaps the 'Tool Carrier' principle is one that could be further developed for a simple four wheel tractor for the developing world, using open source technology. I believe the whole rig could be greatly simplified. A few suggestions are set out below..

First – use a single cylinder Asian made diesel motor. These units are simple, with no 'bells and whistles' on them. The most basic ones do not have an electric start and are started using a crank handle.

Second – a mechanical lift system for the implement based on the 1930's lift arrangement (where the lift is driven by a chain from a ground wheel) could be used.



Third – use a variable speed vee belt drive to transmit the power from the motor. This effectively negates the need for a gearbox.



Some of the more basic ride on mowers have this system for a variable speed drive. Some also use an adjustable tensioner pulley to tighten the belt(s) as a simple clutch. I am sure there are many ideas from these sources.

Fourth- why not use a used differential/rear axle assembly from a world-wide commonly used vehicle (Toyota Hi-Lux?) for the rear drive wheels? The brakes and wheels could also be used with a simple hydraulic braking system.

With the system I am proposing, an arrangement for reverse gear and possibly a robust system of Vee belts would need to be incorporated, as well as a dog clutch (as used on marine craft).

In my opinion, Vee belt drives are an acceptable alternative transmission rather than gear drives or hydraulic drives. Belts are the first item to fail if the system is overloaded, and are simple to replace when worn or unserviceable. They serve us well on most 2WT drives!



Finally I consider that an ‘open source’ tractor (either conventional design or tool carrier) could be the way to move forward with a small four wheel tractor for the developing world. It would be a good project for a group of Ag. Engineering students from a reputable University, who are interested in this sort of thing, and could also gain a higher degree.

The only drawback is that there may not be any backing or assistance from the multi-national farm machinery and tractor industry. They may even actively oppose any proposal, as it potentially can divert sales from the traditional tractor market.

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I received recently the email quoted below from Kerry Clark of University of Missouri regarding a proposed forum for small farm mechanisation in Africa. I have reprinted it verbatim for general information. Please reply direct if you are interested.

*My communications director has set up an online forum called Mech for Africa that can be found here: <http://mechforafrica.proboards.com/>*

*I would like to invite you and your group to be the first users of the forum. The goal is to be a central source of information and discussion on mechanization work in Africa. You can set up and run your own threads. I thought this might be a simpler way to exchange information than through group*

*emails. This is similar to many other web based forums. You can post your newsletters here and they will be easily archived and found by people outside of your current mailing list. Then people can comment and discuss.*

*Your users can also post photos, designs, etc. so that information is more publically available  
I plan to post my designs for small threshers on the forum.*

*We are going to have a soft and a hard kick-off. I hope that your group will be the soft kick-off by getting on the forum, posting things, and creating threads.*

*After we get feedback from you guys, we can go public in a hard kick-off that will include advertising the forum in USAID publications and a webinar that will help people get acquainted with its functionality.*

*I would love it if you could get on and create an account, then maybe post your old newsletters.*

Kerry Clark  
University of Missouri  
Feed the Future  
Soybean Innovation Lab  
Cell [660-351-4696](tel:660-351-4696)  
<http://soybeaninnovationlab.illinois.edu/>

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If you have any comment on this newsletter, please let me know.

Back issues of the 2WT Newsletter can be found at

:<http://conservationagriculture.mannlib.cornell.edu/pages/resources/twowheel.html>

Facebook 2WT discussions: (Mike Cottam UK)

<https://www.facebook.com/groups/1609120186059164/>

*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.*

R. J. Esdaile,  
Agricultural Consultant,

3 Somerset Place,

SCONE NSW 2337 Australia. Email: [rjesdaile@bigpond.com](mailto:rjesdaile@bigpond.com) [rjesdaile@gmail.com](mailto:rjesdaile@gmail.com) (alternate)

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