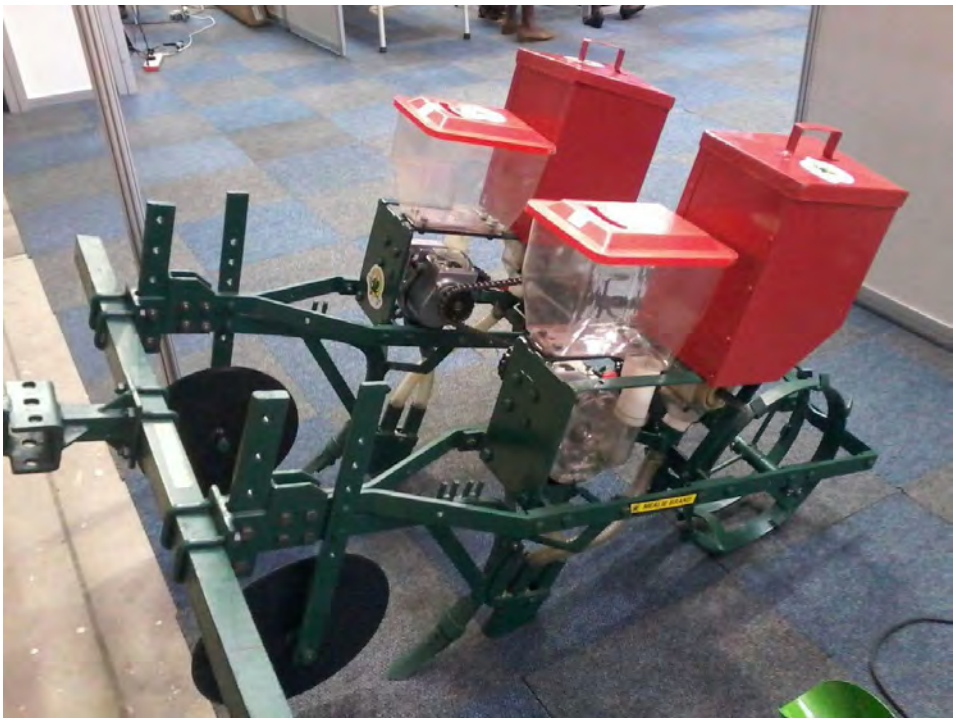
TWO WHEEL TRACTOR NEWSLETTER MAY 2016

Another Zimbabwe 2WT planter prototype to undergo evaluation.



Raymond Nazare of University of Zimbabwe has sent this pic. of another prototype 2WT two row planter, that was fabricated by Zimplow in Harare, as a cooperative venture with the University (Dr. Special Musoni).
"The design is modelled around a plain tool bar on which are mounted two independent planting units. The planting units incorporate the Chinese seed and fertiliser metering devices, compliments of Chinese manufacturer, and are mounted on what look like the standard Mealie Brand animal drawn planter frame, presumably to lower retooling costs. The drive for the metering plates is from two steel wheels at the back.
The unit as is meets most of the 'ideal specs' for the small Farm Shop type 4 wheel tractor. In fact our understanding is Zimplow (Mealie Brand) already have provisional orders for 10 units from Farm Shop for their small 4wts."
The small 4WT units in Zimbabwe were featured in the last 2WT newsletter.

Raymond has also sent a 'wish list' of ideal features for 2WT planters, which he has formulated based on his experience/

Ideal service providers planter specification (based on 2015/16 observations)

- At least two row, with variable row spacing (60-110cm)
- Independent mulch cutting coulter and planting device ground following capabilities,
- Accurate in row seed and fertiliser placement
- Variable seed and fertiliser placement depth (15-70mm)
- High fertiliser (>50kg)and seed (>20kg) hopper capacity,
- High dry and wet mulch handling capabilities,
- High transport speed,
- Multi crop handling capabilities (long and short season crop varieties)

- Incorporates a seat,
- Low set up time, low hitch time,
- low turning radius,
- One man operation,
- Transportable in a small pickup truck with the tractor,
- Durable
- Retail price less than USD 800 in East Africa.

Joseph Mutua (KENDAT Kenya) and I did the same exercise independently in 2014, and came up with exactly the same conclusions.

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Can we increase the tractive ability of a 2WT through various simple adjustments?

Mr. Jasbir Singh, an Indian national studying for a Master's degree at University of Southern Queensland is carrying out a small project using various treatments to attempt to increase the tractive ability of 2WT. Most of the treatments are commonly used on larger 4WT.

Jasbir & I took the 2WT to a farm at Pittsworth, near Toowoomba (where the University is located) and over several days did some extensive field testing. The 2WT used was a DF-15, fitted with a 2 row planter on a mounted tool bar. It was also fitted with steerable tail wheel and a seat.
A small portable dynamometer had previously been purchased from an instrument company in China (cost $US300) and this was used in the trial.

In the absence of sophisticated measuring techniques to carry out the experiments, we carried out the work by physically dragging trailing vehicles along a black soil road, gradually applying more resistance using the brakes until we reached the point where traction was lost and there was 100% wheel slip.

During the experiments, the soil engaging tools were not lowered. The 2WT physically pulled the towed vehicle along the test track

The treatments consisted of measurement of tractive ability in:

A. standard configuration with 6.00 x 12 tires at 15 p.s.i. tire pressure

B. Standard configuration tires with lower 10 p.s.i. tire pressure

C. Larger 6.00 x 16 tires at 15 p.s.i. tire pressure.

D. Dual 6.00 x 12 wheels/tires at 15 p.s.i. tire pressure

E. Weight addition of 50 Kg to the front of the tractor.

F. Weight addition of 50 Kg to the tool bar immediately behind the drive wheels of the tractor.

Some pictures of the various treatments

The rig in standard configuration ready to tow an ATV motor cycle with all up weight of 300 Kg (including operator)
Extra resistance is exerted by gradually applying the foot brake to the motor cycle.

This treatment has the larger 16 inch wheels fitted, along with 50 Kg of suitcase weights sitting on the front of the tractor
This time a Toyota Land Cruiser pick-up is being towed, with an all up weight of 1800 Kg.
Extra resistance is supplied by gradually increasing pedal pressure on the foot brake.

Left: The Dual wheel treatment.

The two pictures below show the dynamometer instrument fitted to the tractor for easy reading on the left, and the in-line strain gauge fitted to the tow line (right)

Preliminary results.
The results are still being analysed. However a preliminary look at the data shows that the most effective treatment to increase traction was the addition of 50 Kg to the front of the 2WT. This increased traction by around 10%.
Other treatments such as lower tyre pressure and dual wheels had little effect. Similarly larger 16 inch wheels and adding weight to the tool bar had little effect. In my estimation the tyre and wheel treatments, although giving a bigger 'footprint' on the ground, probably lowered the overall ground pressure of the rig. This is an advantage for soil compaction, but in this experiment did not assist in overall tractive ability.
The addition of weight to the centre of the rig, in the configuration of a tail wheel with seated operator also was not effective in increasing traction either. My guess is that with the arrangement that was used, there is weight transfer from the drive wheels to the tail wheel with decreased tractive ability as the outcome. Adding weight to the front transfers weight to the drive wheels, increasing traction.
This is an area which needs further work and experimentation. It also partly explains why some other 2WT rigs with an operator stand apparently lose some traction once the operator stands on the rear platform. What do you think?

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Progress with mechanical lift systems.

As some of you may be aware, one of the long term objectives of various R. & D. workers who are involved with two wheel tractors, is the provision of a simple and effective mechanical lift system, for either the rear of the unit (for mounted implements and tool bars), or soil engaging tools (on both mounted tool bars as well as trailing implements).

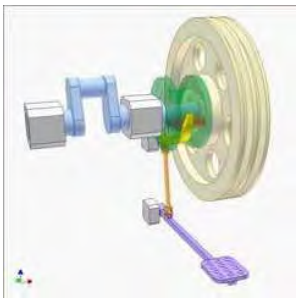
Hydraulic lift systems, although very convenient, have largely been ruled out, as they are too complex and expensive, and cannot be quickly repaired in the event of a breakdown, in areas where only the local blacksmith is available to do the job. Electrically powered systems are also not favoured, as most two wheel tractors do not have any suitable electrical circuits which can be used.

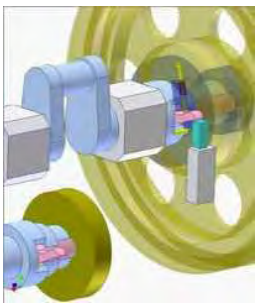
Manual lift systems (operated by a lever or rotating wheel) are an alternative. They are fitted on some Brazilian made 2WT planters.

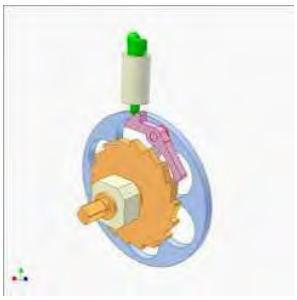
A Fitarelli two row trailed planter for 2WT is shown on the left. The raise/lower handle is circled. There is a similar raise/lower lever on the other side of the planter.
However they are awkward and can be very tiresome to use in small fields, where the planter tools must be raised and lowered every few minutes.

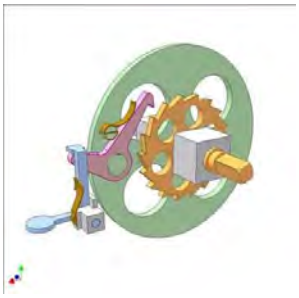
Older farm machinery (1930's and 1940's) in Western agriculture had mechanical lift systems which were driven by a ground wheel

. They were popularly known as ‘rope trip lift’ systems. Pull the rope once to trip the mechanism, and the implement lifts.
Pull it again, and the implement lowers to the operating position. The picture on the left shows an old US made ‘Van Brunt’ grain drill which is fitted with a rope trip lift’ Can we utilise this principle to fabricate a similar mechanical lift for 2WT implements?
To do this, one needs a simple half revolution, or single revolution clutch, such as is fitted to a power press. The mechanism is normally in neutral mode, until activated by the operator. It then goes through one cycle (lifting or lowering) and then returns to neutral.
Here are four examples of single revolution clutches. The Youtube link to a short video is listed below the pictures.


Pin clutch


Rotary key clutch


Ratchet clutch


Ratchet 360 degrees

Pin clutch https://www.youtube.com/watch?v=wcYKttiovDA
Rotary key clutch https://www.youtube.com/watch?v=f6q34XHP5Aw
Ratchet clutch https://www.youtube.com/watch?v=4tz_Q8LhK90
Ratchet mechanism – 360 degrees. https://www.youtube.com/watch?v=nPXjauQj3AQ
Further details available on request.
My thanks to Mr. Thang Nguyen Duc, a CAD guru, of Vietnam, who provided these links.

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Enamul Haque, Richard Bell, Amir Kassam and Nobi Mia have published the latest results with the 2WT rotary strip tillage drill being developed in Bangladesh. It is entitled:
“Versatile Strip Seed Drill: A 2-Wheel Tractor-Based Option for Smallholders to Implement Conservation Agriculture in Asia and Africa” It can be found at:
http://www.mdpi.com/2076-3298/3/1/1

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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

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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