



South African Sugarcane Research Institute

MANAGING INFIELD TRAFFIC FOR SUSTAINED YIELDS: CONTROLLED TRAFFIC PRINCIPLES

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AGRONOMY ASSOCIATION DAY

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UNLOCKING THE POTENTIAL OF SUGARCANE

South African Sugarcane Research Institute is a division of the South African Sugar Association

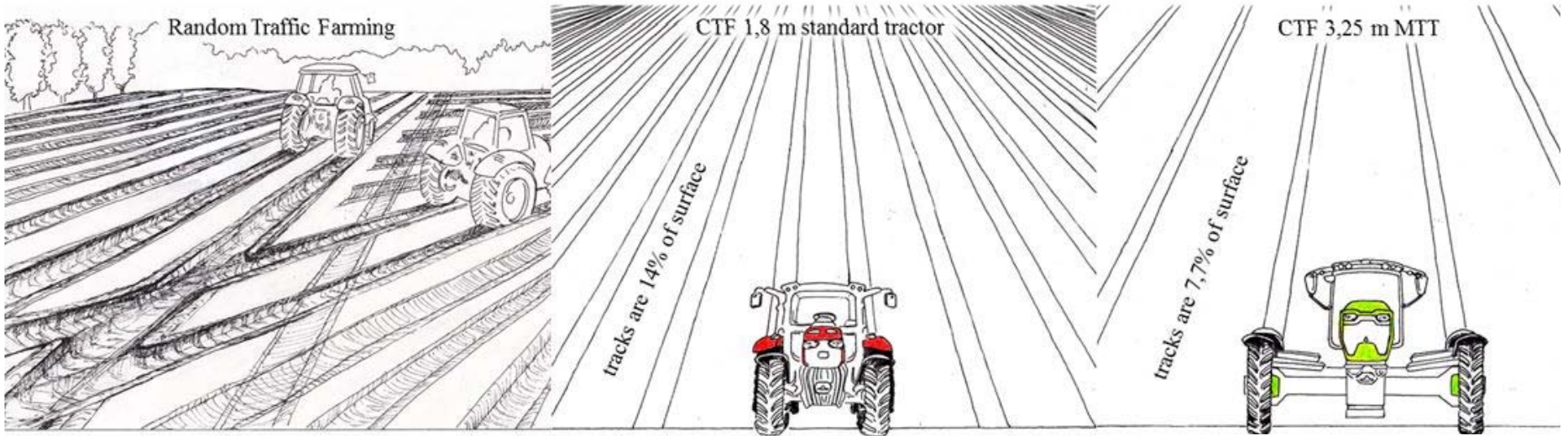


CONTENTS:

1. INFIELD TRAFFIC MANAGEMENT

- a. **Controlled traffic (CT) – what is it?**
- b. **The motivation for CT – To sustain yields**
- c. **Benefits thereof**
- d. **The range of options**
- e. **Case studies**

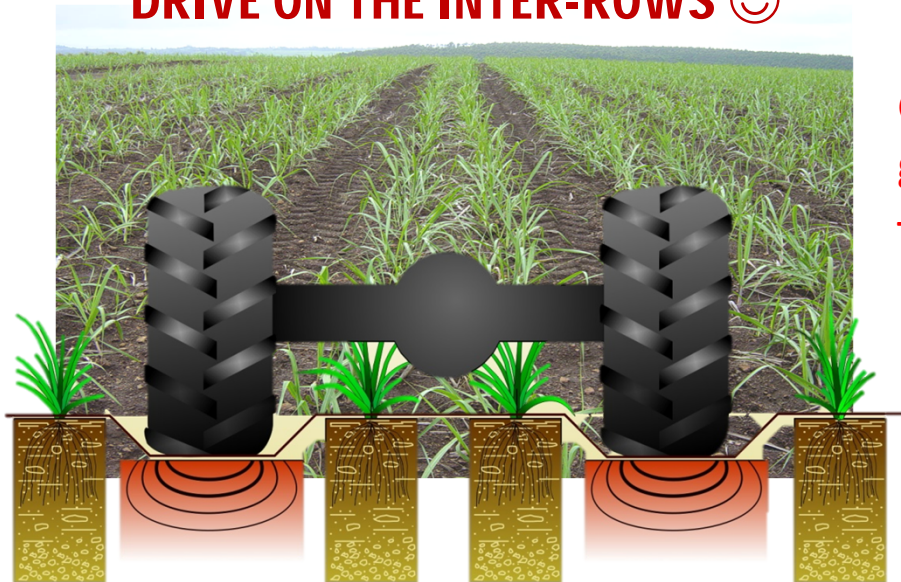
INFIELD TRAFFIC MANAGEMENT



Source: <http://www.multitooltrac.com/controlled-traffic-farming-ctf/>

REDUCE THE AMOUNT OF INFIELD TRAFFIC 😊

CONTROLLED TRAFFIC: DRIVE ON THE INTER-ROWS 😊

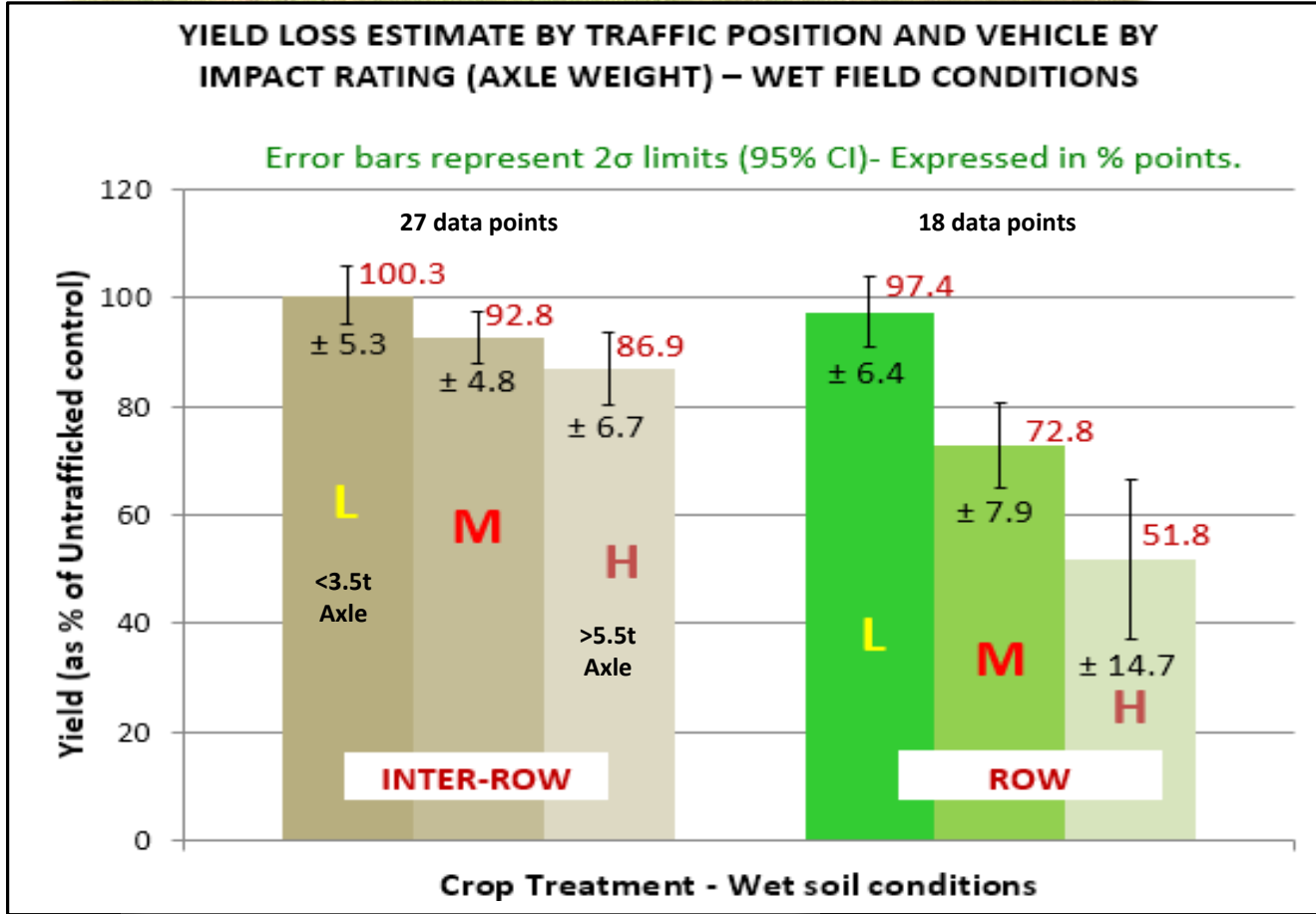


GPS Vehicle guidance / autosteer – ideal technology

CROP RESPONSE TO TRAFFIC (LITERATURE STUDY):



CROP RESPONSE DATABASE: (n=40 & 26)
Yield loss for Inter Row traffic 5%,
Yield loss for Row traffic 24%



**CONTROLLED TRAFFIC:
 DRIVE ON THE INTER-ROWS 😊**

**REDUCE THE AXLE MASS OF
 EQUIPMENT FOR SUSTAINED YIELDS 😊**

BENEFITS: CASE STUDY EXAMPLES - AUSTRALIA

“Rising production costs, along with the current low world sugar price, are forcing Australian sugarcane growers to change to more efficient crop-production systems. Environmental pressures are an added impetus to move from entrenched farming practices to more sustainable systems.” Price et al. (2004)

Findings from the Australian Sugarcane Yield Decline Joint Venture (SYDJV) and from on farm research led to the development of an improved cropping system incorporating a) Controlled traffic; b) minimum tillage; c) crop rotation

1. Adopting a 1.8m tramline CT system (1996 to 2005): “The change is a profitable one in the short term and will be even more so in the long term” *Henry G et al. (2006). ASSCT.*
2. Changing from 1.5m to 2m (0,8m duals). “Increased workrates, operational flexibility, irrigation system benefits, better water infiltration, minimised stool damage, reduced labour costs. **Transition management, cost implications, harvester (reach of elevator) & equipment modification, weed issues**” *Price et al. (2004). ASSCT.*
3. Modelled: New farming system based on Precision Controlled Traffic Farming and minimum tillage: Gross margin improved by 11,8% and fuel use lowered by 58%. *Halpin NV et al. (2008). ASSCT.*

BENEFITS...

- Sugarcane yield increases >10% cited by Robotham (2003); Crop production increases **37%** & machinery cost reduction ±50% (Tullberg, 2010).
- Improvements in mechanical operations: Compacted traffic lanes - up to **20% fuel saving** (Trowse 1982), improved field access
- Soil health improvements in the plant/root zone (Lower density, greater infiltration rates, less soil erosion and runoff, up to **34%** increase in plant available moisture, soil biota improvements etc.)
- Environmental benefits Reduction in soil GHG emissions **30-50%**
- Improving and sustaining crop yields for longer
- Lower operation costs (reduced or zonal tillage)
- Improved profitability

Controlled Traffic Farming (CTF)

The need for CTF arises because farm profit is being reduced by the compaction caused by heavy machinery running over a large proportion of field areas every year.

What is Controlled Traffic Farming?

CONTROL TRAFFIC FARMING EUROPE: CTF Europe

CTF helps the environment

- reduced greenhouse gas emissions
- improved water infiltration, storage and drainage
- reduced water run-off, erosion and flash flood risk
- reduced chemical losses
- conserves organic matter and soil fauna

CTF reduces production costs

- lower and less intensive cultivation
- smaller and less frequent tillage
- less fuel consumption
- less wear and tear on machinery
- less maintenance
- less downtime

Controlled traffic "beds" yield about 15% more (averaged across 15 crops) than randomly trafficked soils and when these beds cover about 80% of a field, there is a great deal to gain in terms of yield. This comes from improved root growth that uses water and fertilizer more efficiently, so it is also good for the environment.

The other good news is that CTF can be achieved with existing machinery.

from be closer to the ground, which cost about 20% less than conventional tillage.

www.ctfeurope.eu

How is CTF adopted?

Economic and Practical:

- crop yields and N recovery increased by around 15%
- little or no tillage needed to produce well structured friable seed and root beds that retain moisture, are well drained and have around 35% more plant available water, as a result small seeded crops in particular are more reliably established and weed (stale) seedbeds more easily achieved
- big savings in fuel use
- more reliable spring sowing & direct drilling
- fuel use for crop establishment drops by at least 35%
- time and energy for crop establishment reduced by around 70%
- machinery costs reduced through lighter machinery
- power
- more reliable field access
- no under-tillage

With careful planning, CTF can be put in place incrementally, on any scale and at low cost. The process is:

- 1 Carry out a review of your cropping
- 2 Decide what machinery you need to grow these crops with CTF
- 3 Measure up these machines to see how they fit together
- 4 Plan an appropriate CTF system that minimises conversion costs. Consider:
 - guidance system to be used
 - what machines

AUSTRALIAN CONTROL TRAFFIC FARMING ASSOCIATION: ACTFA

centred but overlapping track widths. harvesters and a narrower one for all other equipment.

AdTrac^{CTF} - two standard track gauges, the narrower using one track of the wider, resulting in an additional track. Implements can be any common width or direct multiple (see illustration below).

TwinTrac^{CTF} - two track gauges, one straddling the other, with the width of implements being the addition of the two gauges or a direct multiple of them.

<http://www.controlledtrafficfarming.com/Home/Default.aspx>

<http://www.controlledtrafficfarming.org/>

<https://www.actfa.net/>

SOUTHERN AFRICA?

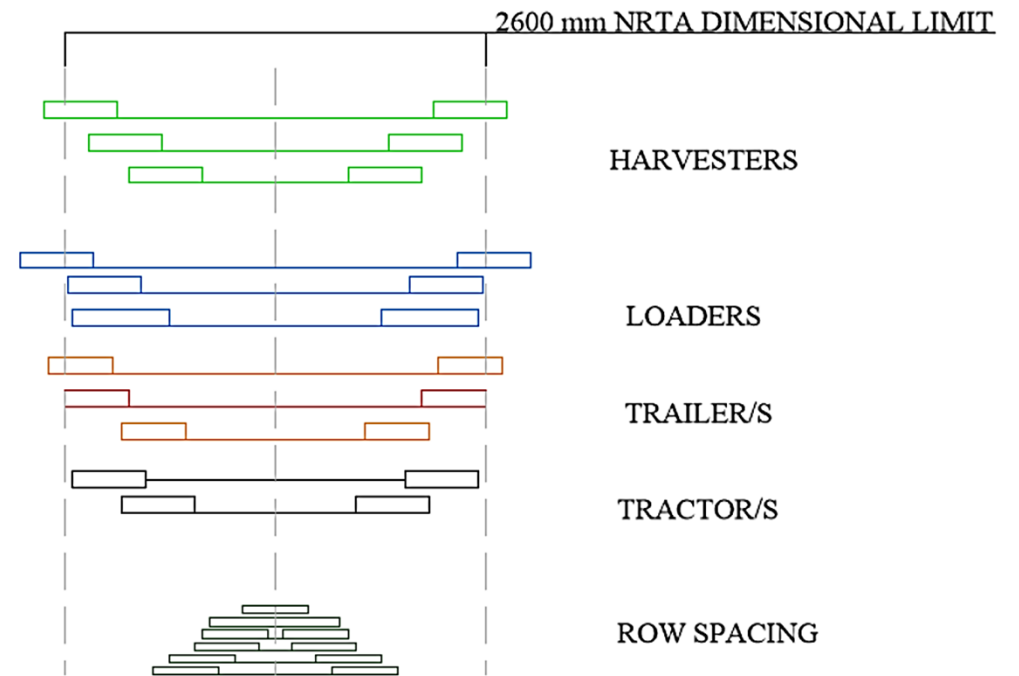
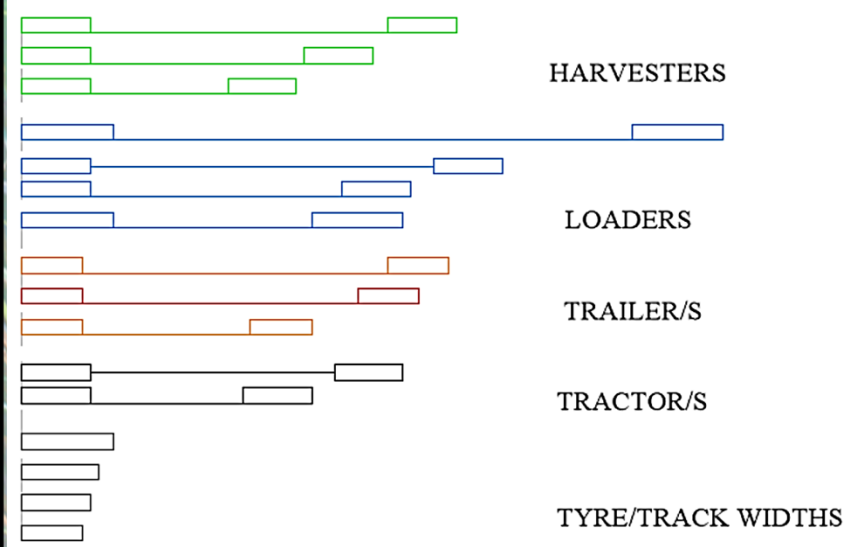
C.T. Adoption:

- Row spacing to match equipment? Or
 - Equipment spacing to match row spacing?
 - OR Combination of both...
- REVIEW EQUIPMENT & CURRENT & FUTURE PRACTICES ... **PLAN**



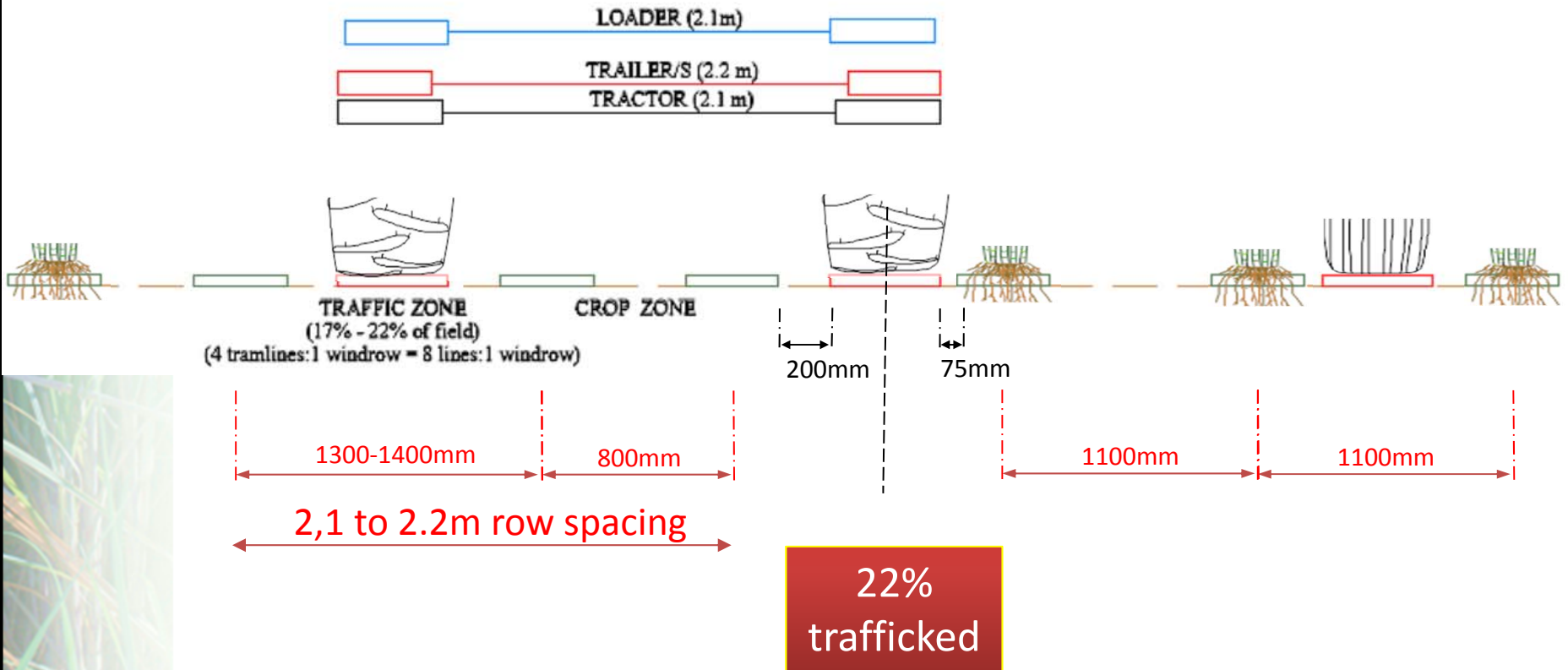
OPTIONS:

- Range of equipment wheel track gauges:
- 1.5m, 1,8m 1,9m...2,4m; 3m; 3,6m



C.T. Options for Cut & Windrow systems? Tramlines vs single rows

- Slew loader (Cut and windrow)
- Plus closely matched tractor-trailers for cane extraction (Max width of 2.6m)
- 800mm tramline + 1300-1400mm spacing compared against 1,1-1,2m rows



C.T. Options?

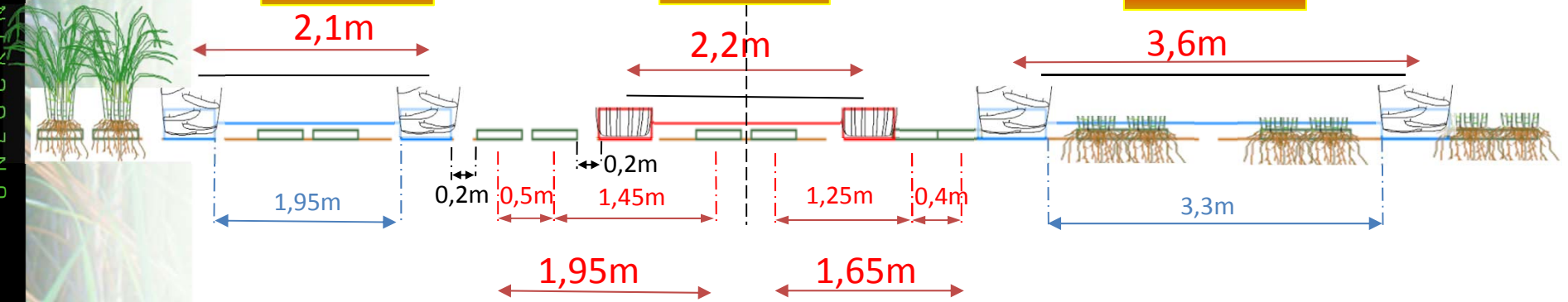
- Some examples of systems being used...on raised beds



Loader

Trailer

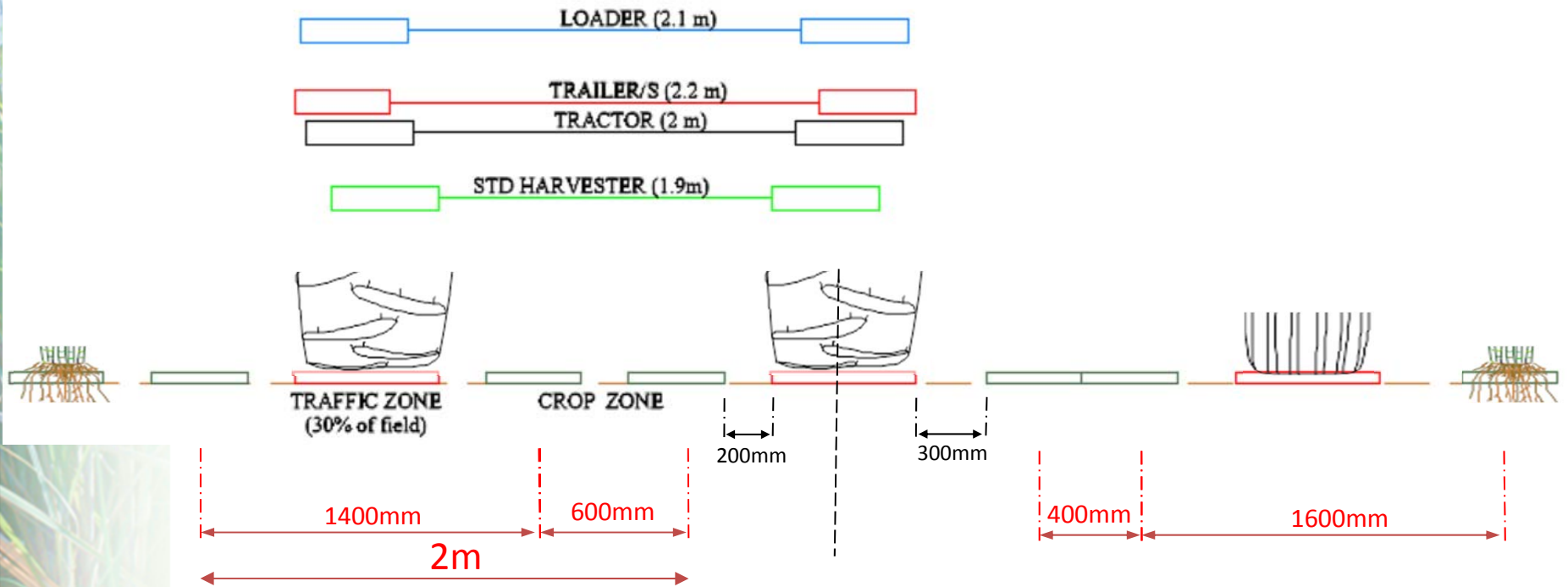
Loader



22-23% trafficked

C.T. 'one size fits all' – narrow tramline option?

- To suit: standard harvester: 1,9m wheel track* OR Slew loader (Cut and windrow)
- Plus closely matched tractor-trailers for cane extraction



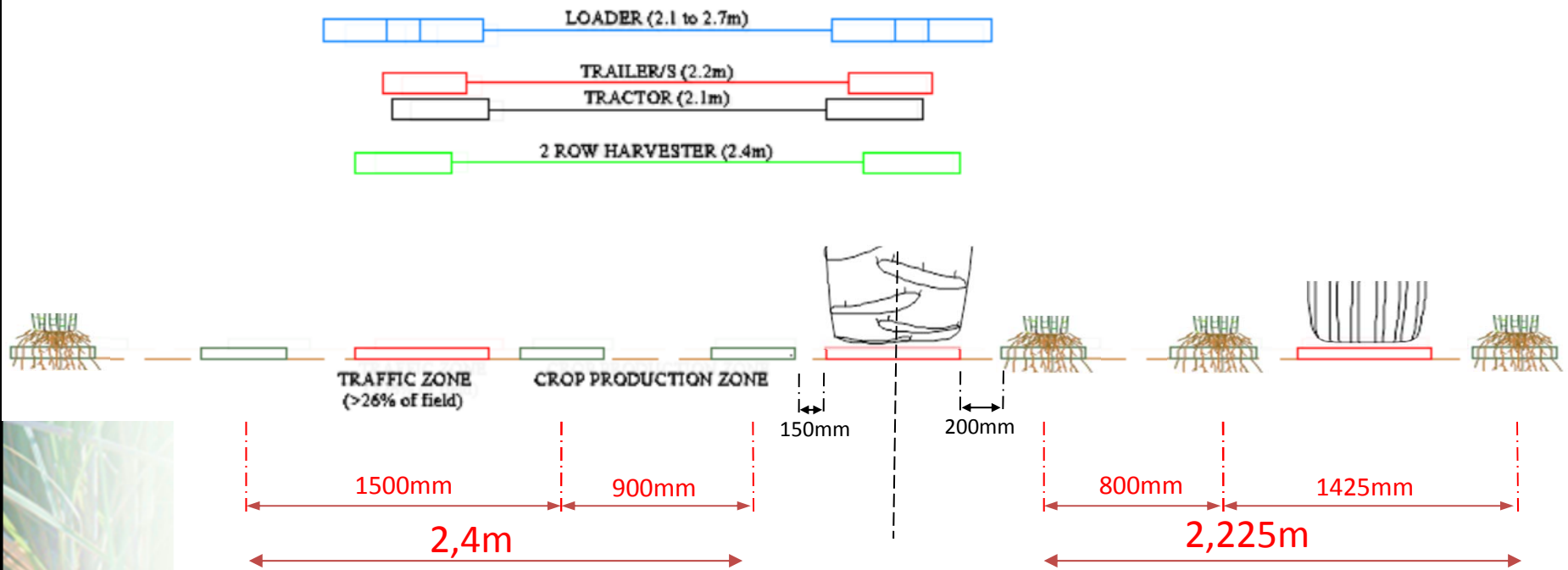
- 600mm tramline + 1300-1500mm spacing appears well suited to this system... but confirm with the specific loader grab/harvester elevator reach.

22-30%
trafficked

* Specifications vary between harvester models

C.T. 'one size fits all' – wider tramline option?

- Wide harvester: 2,4m wheel track OR Slew loader (Cut and windrow)
- Plus closely matched tractor-trailers for cane extraction

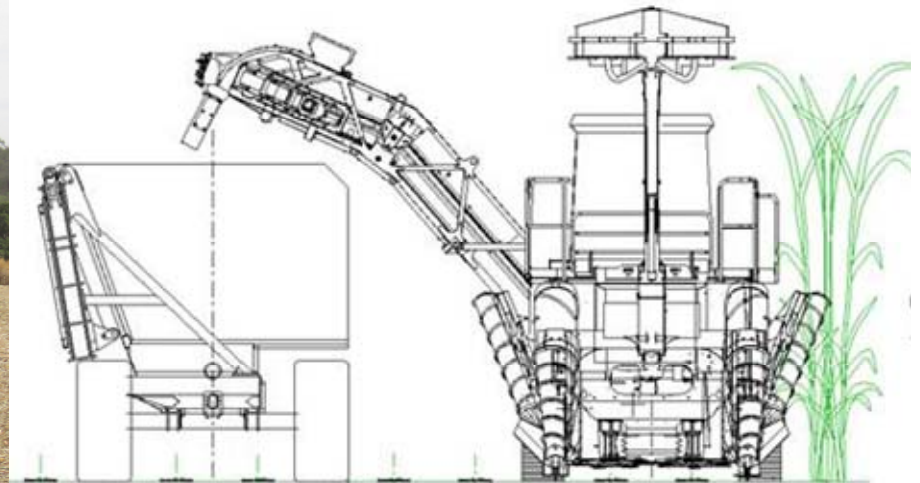


- 900mm tramline + 1500mm spacing appears well suited to this system... but confirm with the specific loader grab/harvester elevator reach.

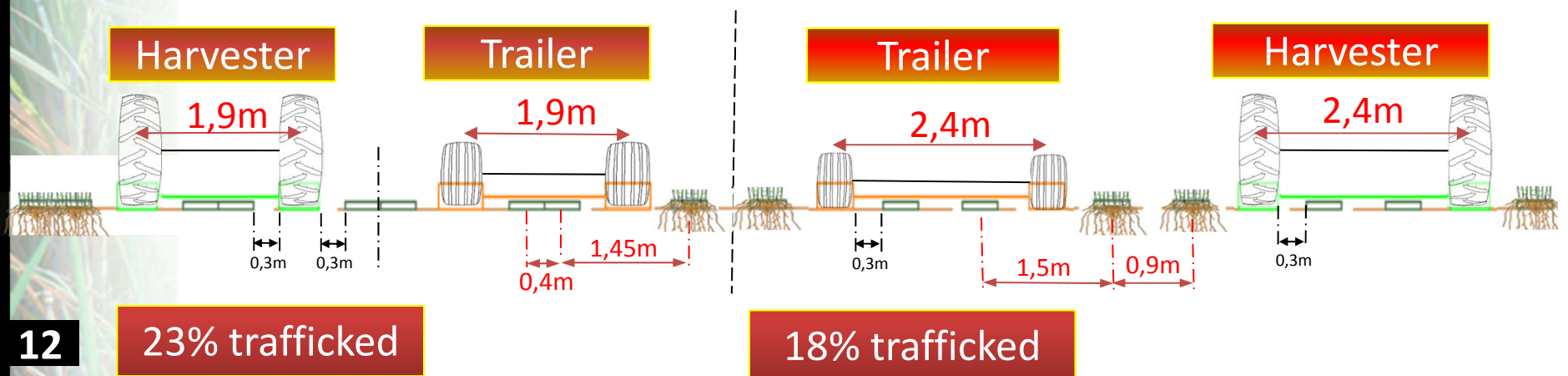
18-22%
trafficked

C.T. Options?

- Some examples of systems being used...



Courtesy of Mascor (John Deere)



SUMMARY TABLE:

KEY: **RED** = Not suitable
ORANGE = Marginal
GREEN = Suitable
BLACK = Range

ASSUMPTION: TYRE WIDTHS:

Trailer tyres = 400mm
 Harvesters = 450mm
 Loaders = 450mm
 Loader reach of 4,1m
 Harvester reach of 4.4m

Suits std harvester

May suit some irrigation systems

Suits agronomics

Suits wide harvester

ROW SPACING:	TRACK WIDTH (ALLOWING FOR SUITABLE BUFFER):
900mm	1,8m (span 2 rows) – 50mm buffer
1m	2m (span 2 rows) – 100mm buffer
1,1m	2,2m (span 2 rows) – 150mm buffer
1,2m	1,3-1,35m (span 1 row) – 100mm buffer OR 2,2m (span 2 rows) - 100mm buffer or 2,4m track (span 2 rows_ - 200mm buffer
1,5m	All equipment <2m (span 1 row) – 150mm buffer 3m gauge loader - 200mm buffer
400+1200 tram	Wheel tracks of 1,4-1,8m ok (span 1 tramline)
400+1500 tram	1,4-2.2m
400+ (>1500) 1,8	To match reach of loader or harvester (±4,4m)
600+1200 tram	1.6-2m
600+1400 tram	1,6-2,2m
600+ (>1400) 1,6	To match reach of loader or harvester (±4.4m)
800+1000 tram	1,8m
800+1300 tram	1,8–2,2m
800+ (>1300) 1,4	To match reach of loader or harvester (±4.4m)
900+1100 tram	1,8–2m
900+1250 tram	1,8-2,2m
900+ (>1250) 1,3	To match reach of loader or harvester (±4.4m)
900+1500	To match reach of loader or harvester (±4.8m)
1m+1,2m	2-2,2m

SUMMARY: FOR SUSTAINED YIELDS...

- 1. EQUIPMENT CHOICE – SIZE, PRODUCTIVITY**
- 2. MINIMIZE AXLE MASS OF EQUIPMENT FOR SUSTAINED YIELDS**
- 3. DRIVE ON INTER-ROWS AWAY FROM THE ROW**
REDUCE THE AMOUNT OF TRAFFIC IN THE FIELD – WIDER SWATHS
- 4. REVIEW EQUIPMENT & PRACTICES**
PLAN TO MATCH/ADJUST WHEEL-TRACKS
(CHECK REACH OF LOADERS/HARVESTER & IMPLEMENT SWATHS)
(CHECK TYRE WIDTHS)
- 5. TEST OPERATIONS IN THE FIELD**

