

CTF Impacts: Environmental = Economic

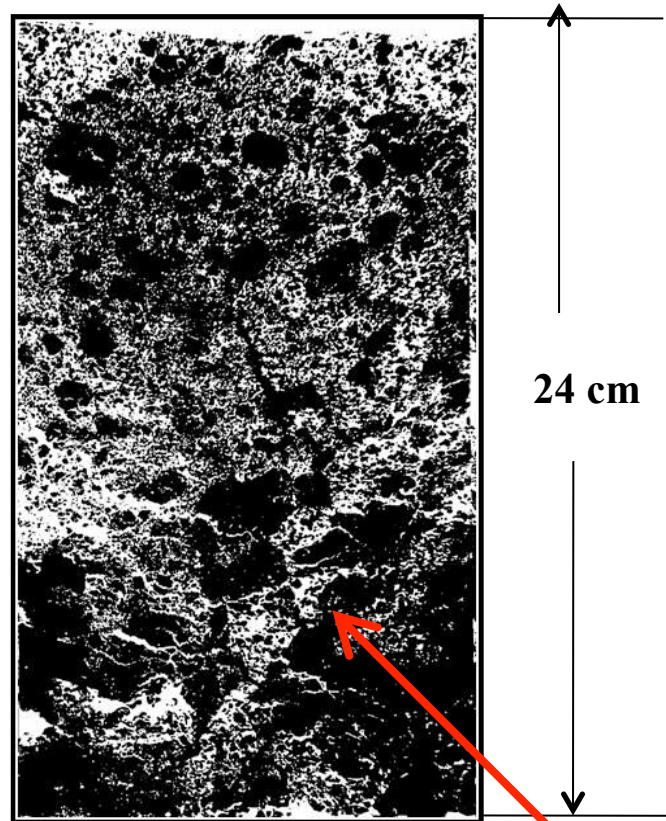
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Objective

Summarise evidence on the link between the economic and environmental effects of CTF.

No-till Soil Profile Images (by the late Des McGarry) from a heavy clay versosol



**Soil
profiles
should
look
look like
this.**

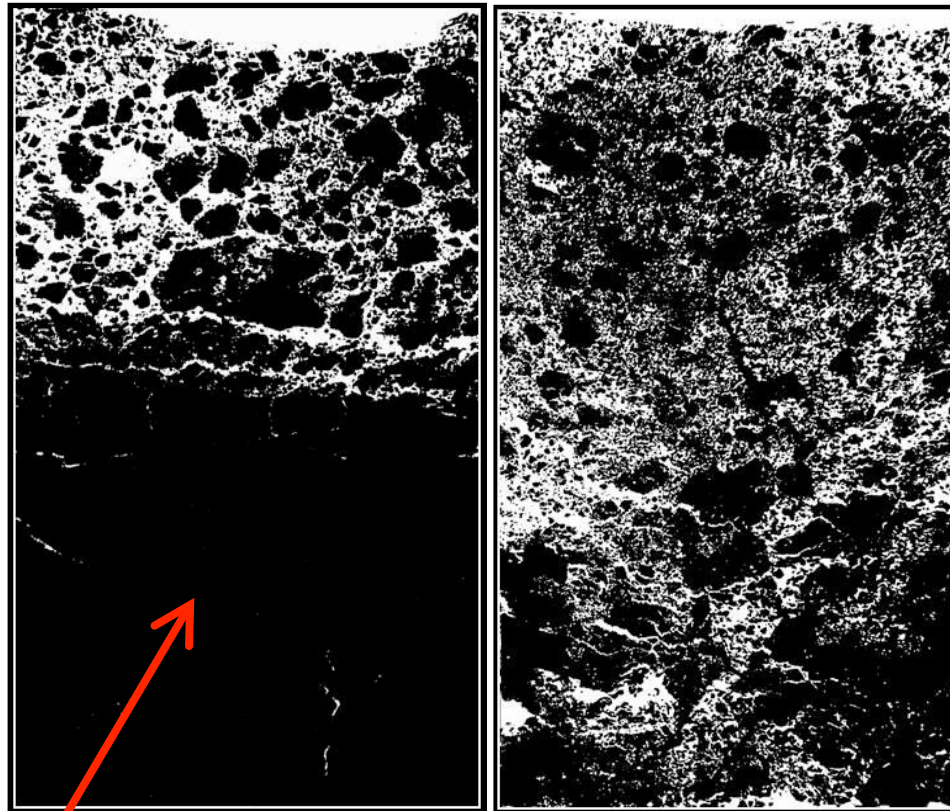
**Non-Wheeled Soil
(4- Years CTF)**

Porosity

White = Space (for Air or Water)

Into Subsoil

No-till Soil Profile Images (by the late Des McGarry) from a heavy clay versosol



Cumulative
effect of crop
roots and
soil biota.

24 cm

micro &
macro

Annually Wheeled
(by 5t Tractor)

Non-Wheeled Soil
(4- Years CTF)

But they
often look
like this

And < 50%
Soil biota

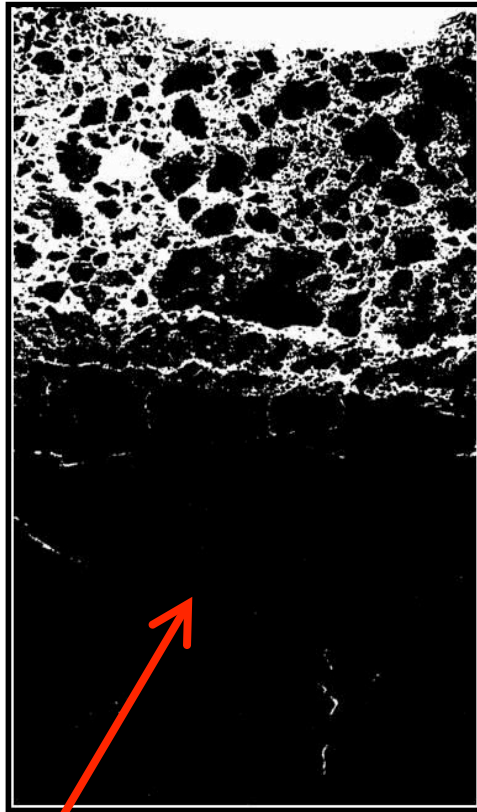
Almost Zero

Subsoil Porosity

White = Space (for Air or Water)

No-till Soil Profile Images (by the late Des McGarry) from a heavy clay versosol

*Cumulative
effect of
wasting
15-50%
tractive
power
and fuel*



Compaction:

**Not good for crops
But better to drive on.**

**Permanent traffic lanes =
Reduced fuel costs
Faster field access
(after rain)**

**Annually Wheeled
(by 5t Tractor)**

Almost Zero

Subsoil Porosity

White = Space (for Air or Water)



? Days Earlier ?

No-till Soil Profile Images (by the late Des McGarry) from a heavy clay versosol

Outcome?

CTF = Increased

Increased

Root Exploration

Runoff and

Available Water

Waterlogging

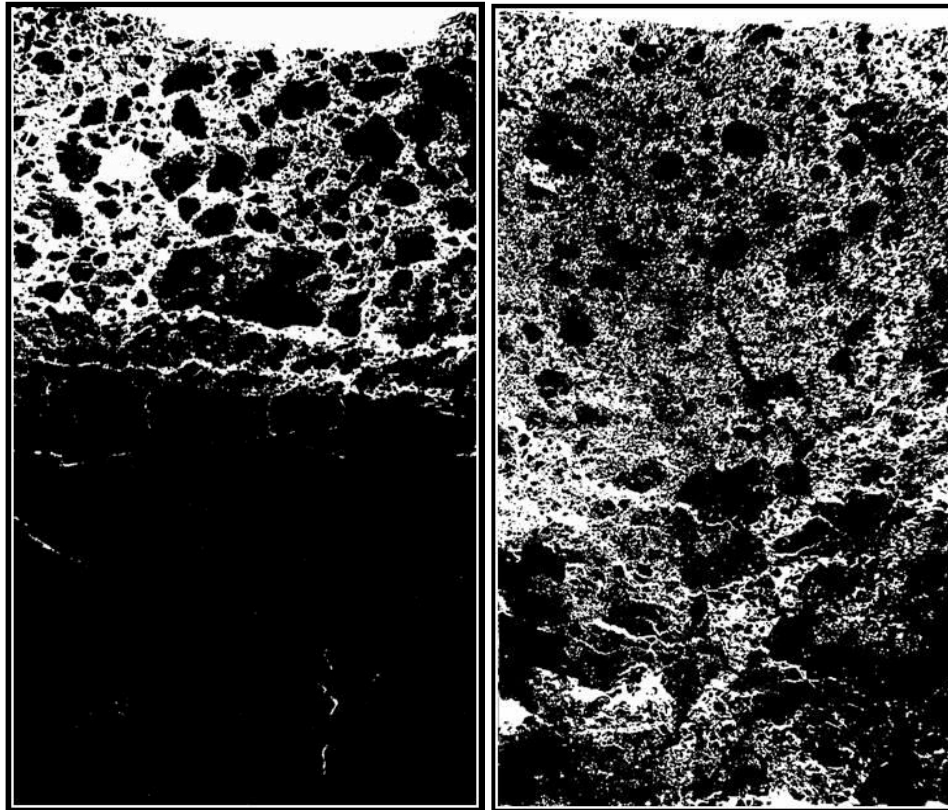
Soil Biota

Reduced

'Rootability'

Available

Water

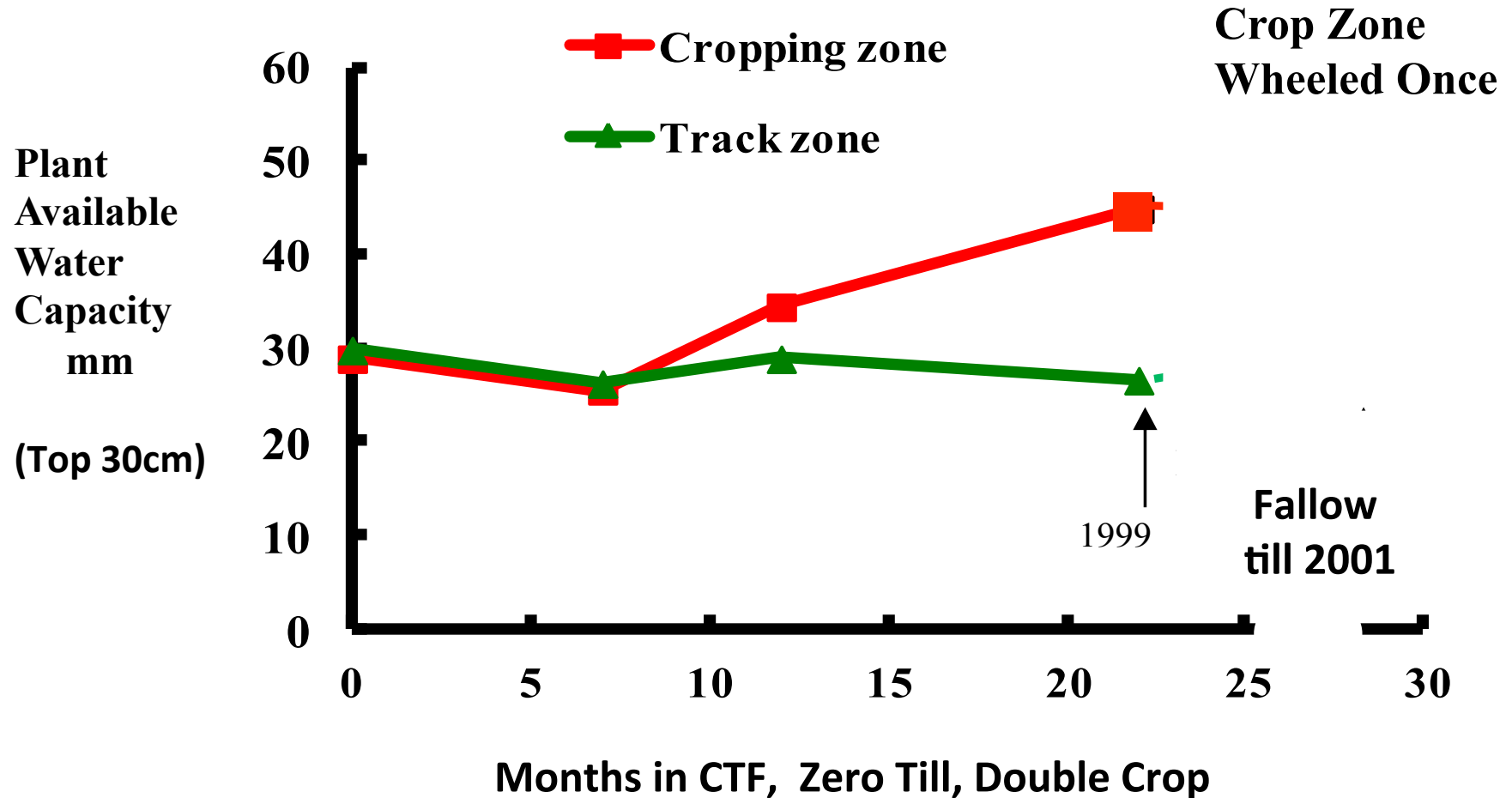


**Annually Wheeled
(by 5t Tractor)**

**Non-Wheeled Soil
(4- Years CTF)**

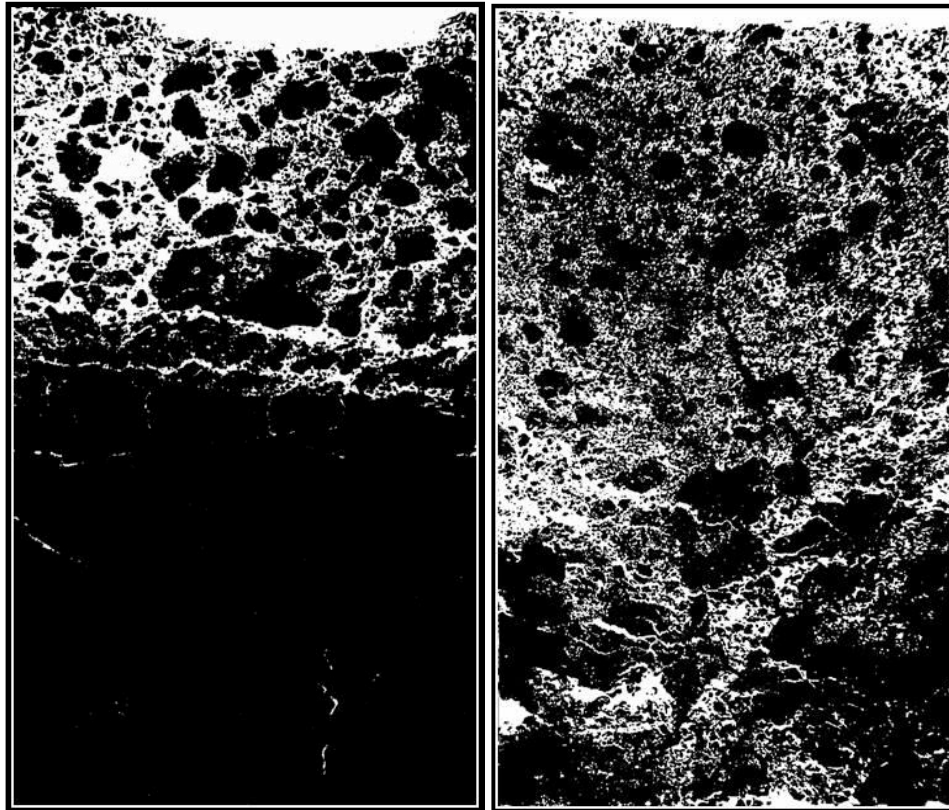
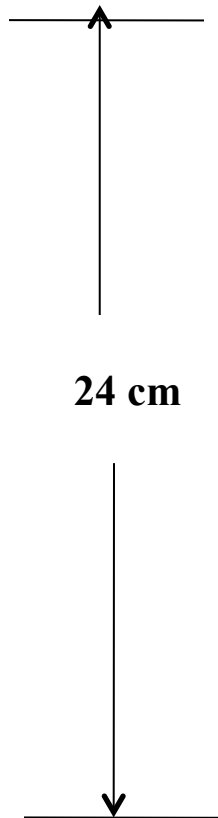
White = Space (for Air or Water)

Wheel Effect on Plant Available Water



Adds Yield When Crop is Water Stressed

No-till Soil Profile Images (by the late Des McGarry) from a heavy clay versosol



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(by 5t Tractor)**

**Non-Wheeled Soil
(4- Years CTF)**

CTF = Increased

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Available Water

Soil Biota

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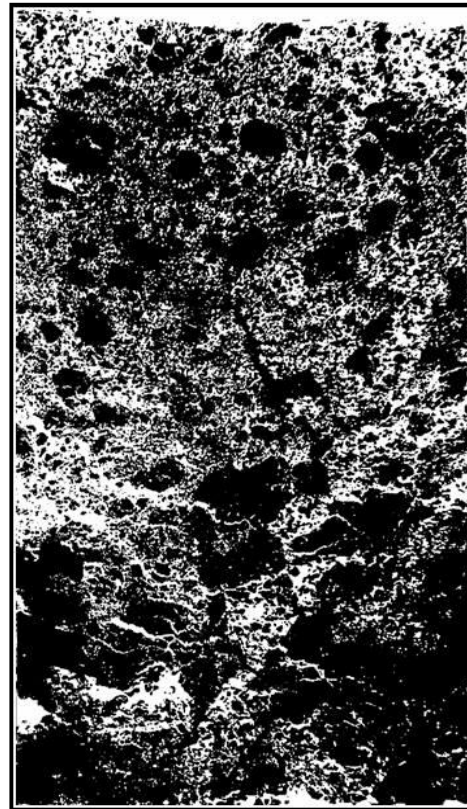
CTF = Increased

**Largely responsible for CTF
yield gains (7-15%) found
in side-by-side research**

**CTF runoff reduction.
15- 100% in single events.
30- 45% (annual, dryland).**

**& corresponding less loss of
soil, N & P, and pollution**

Other Soils, Environments?



Root Exploration

Available Water

Soil Biota

Reduced

Runoff and

Waterlogging

**Non-Wheeled Soil
(4- Years CTF)**

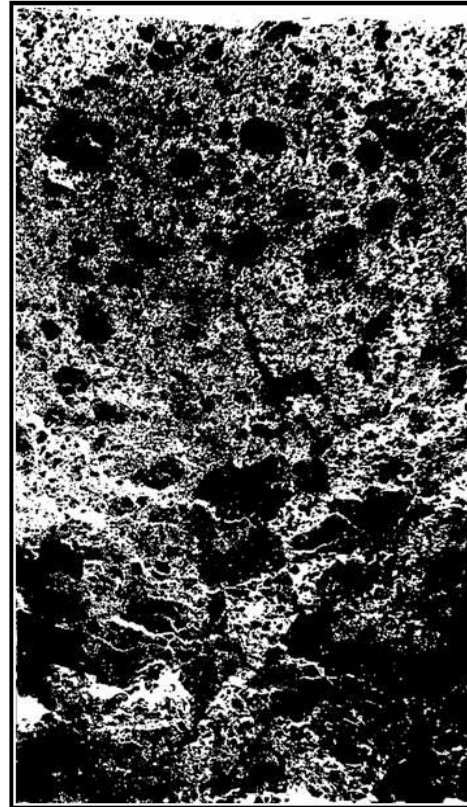
White = Space (for Air or Water)

No-till Soil Profile Images (by the late Des McGarry) from a heavy clay versosol

And
Increased soil biota =
Greater disease suppression

Less waterlogging =
Less denitrification.
Less N loss and
Nitrous oxide emission(50%)

Greater N efficiency
Reduced costs
Less Pollution



Non-Wheeled Soil
(4- Years CTF)

CTF = Increased
Root Exploration
Available Water
Soil Biota

Reduced
Runoff and
Waterlogging

Summarising:

**CTF gives plenty of specific benefits,
each producing 5- 25% effects,**

**But its the whole- system effect
that provides the big benefit.**



CTF's Major Impact is as a System Effect

Property	CTF Effect (v. Random Traffic)	Environmental Impact	Economic Impact
Soil Structure	Better porosity, more plant-available water	Less run-off, soil erosion, pollution	Better aeration , system rain & nutrient efficiency
	Better infiltration Less waterlogging	Less nitrous oxide	Reduced crop loss & N loss
	Soil biota numbers roughly doubled	Soil ecology, the basis of all ecology	Disease supression & nutrient retention
Permanent Traffic lanes	Reduced energy for all field operations	Less carbon dioxide	Less fuel, smaller power requirement
	Faster, more precise field access after rain	No-till synergy with less herbicide	Improved timeliness for all field operations

But some of it happens only if we exploit

Extra soil water and timeliness to produce more crop(s).

Better access to better match N input with crop demand

Precision to reduce herbicide inputs, improve planting

Concluding

- **CTF provides several specific 5- 25% benefits.**
- **CTF is a prerequisite of other major system improvements.**
- **Every productivity /economic benefit is an outcome of improved environmental performance.**
- **The farm machinery industry could make CTF adoption much easier.**
- **We have little understanding of the overall magnitude of CTF system effects on productivity or the environment.**

Thank You