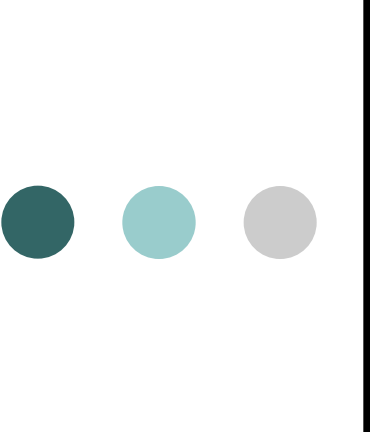


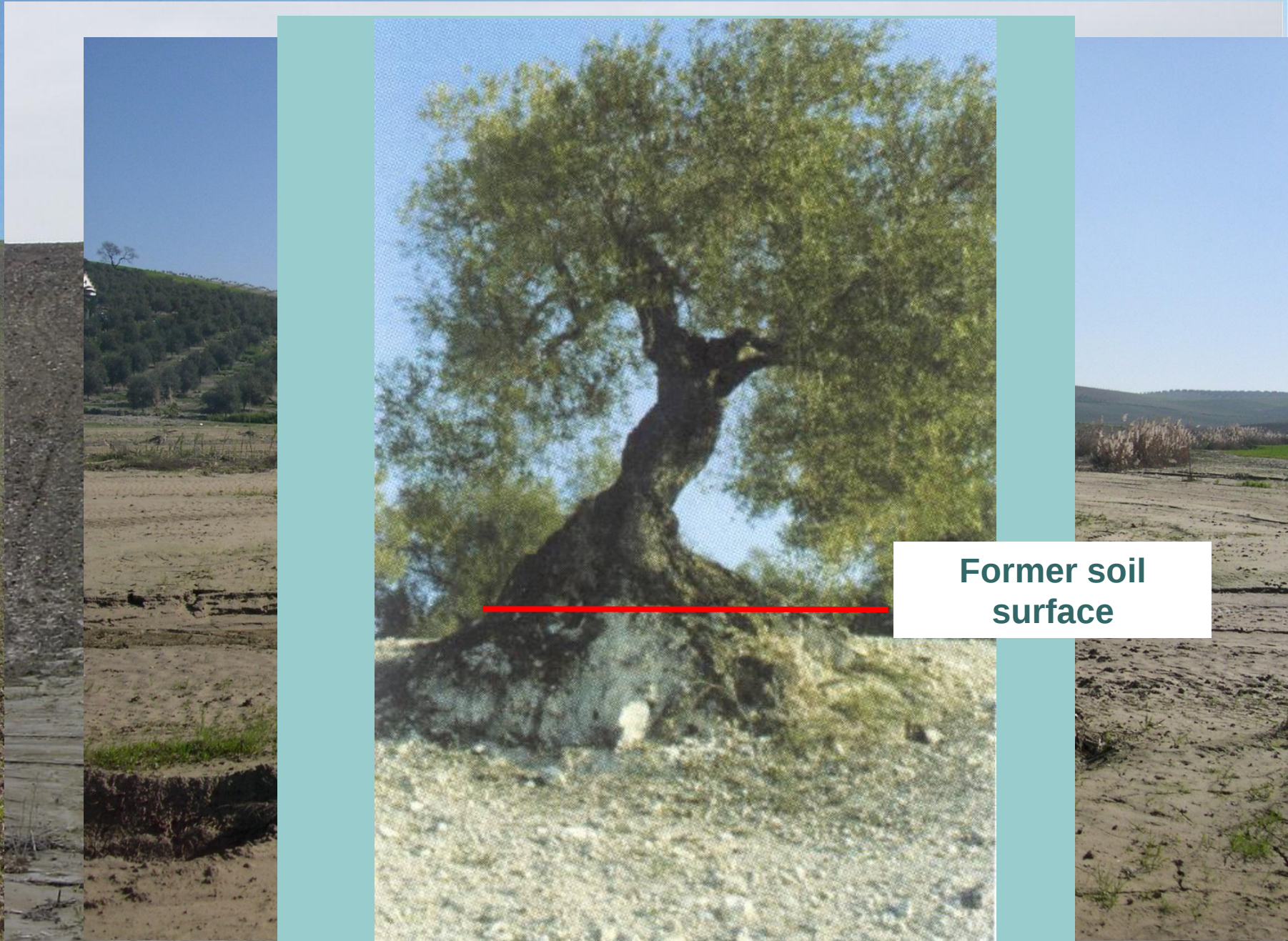


Conservation agriculture: an integrated approach for conserving soil, water & “farmers’ savings”

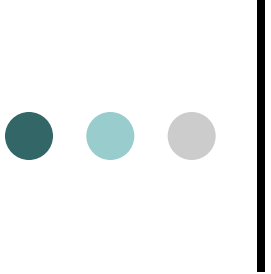


Helena Gómez Macpherson
Institute of Sustainable Agriculture
Córdoba, Spain

Soil water erosion



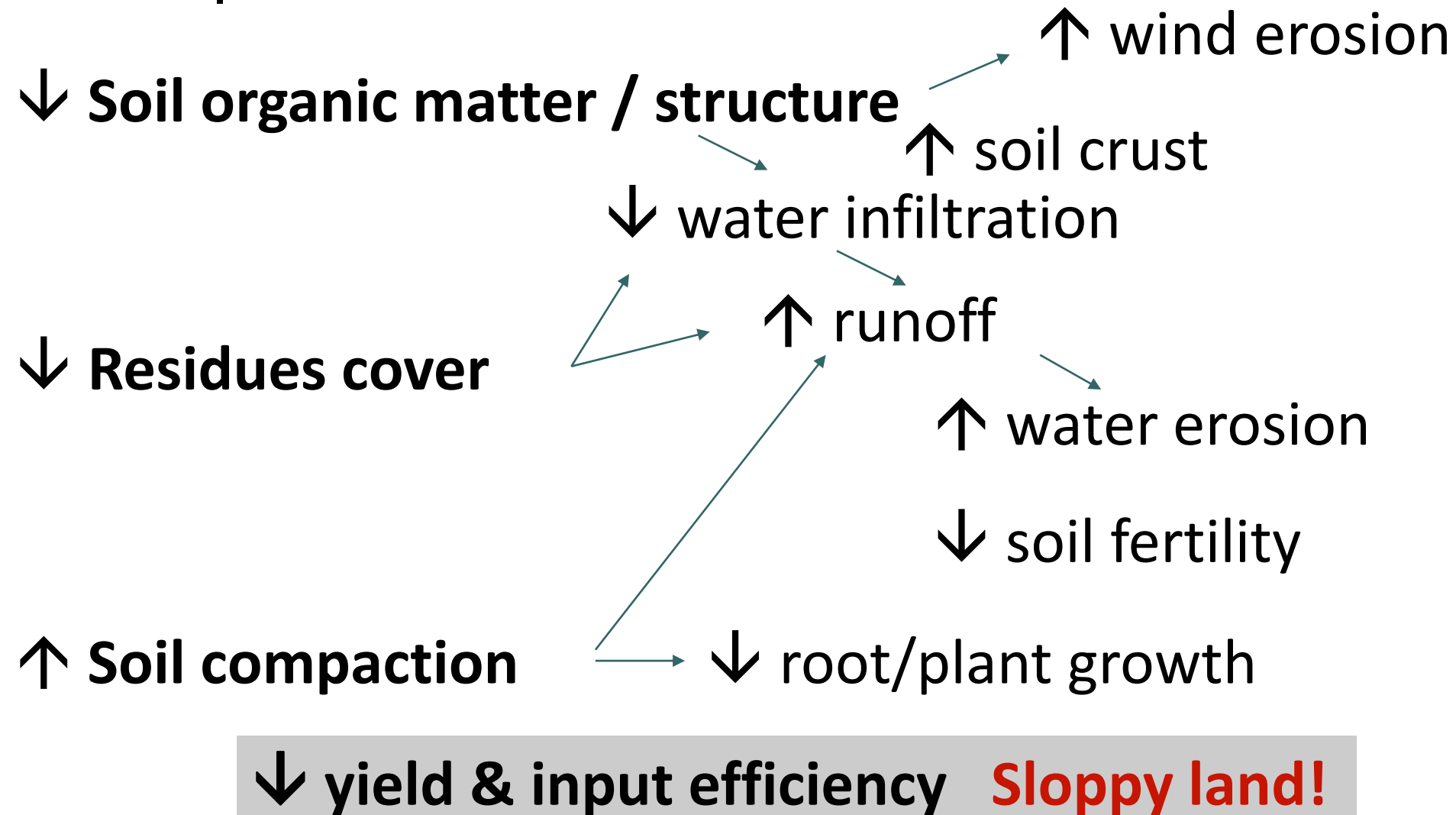
**Former soil
surface**

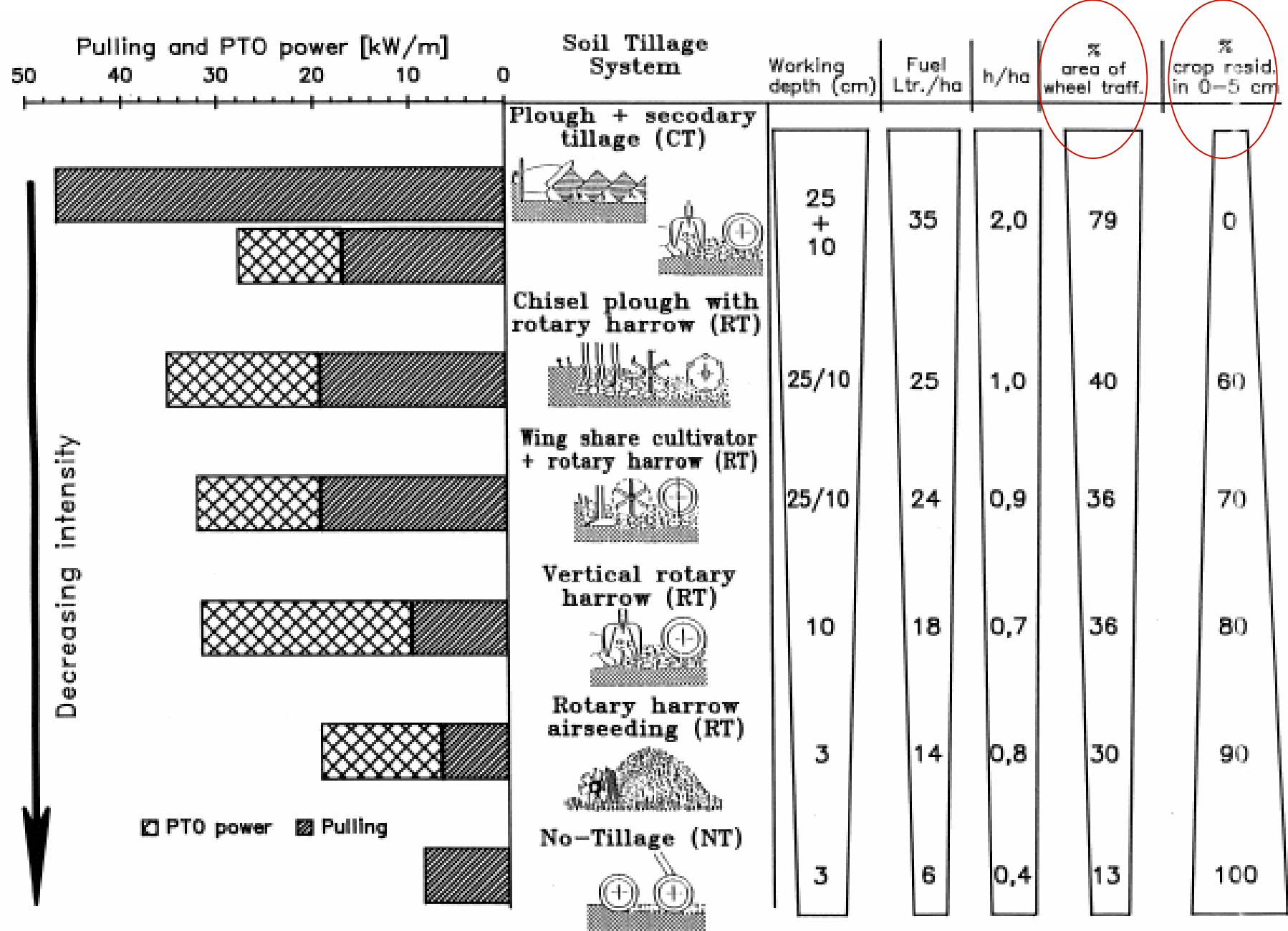


Tillage

- prepare seed bed
- weed control
- incorporate fertilizers
- compaction relieve
- ...

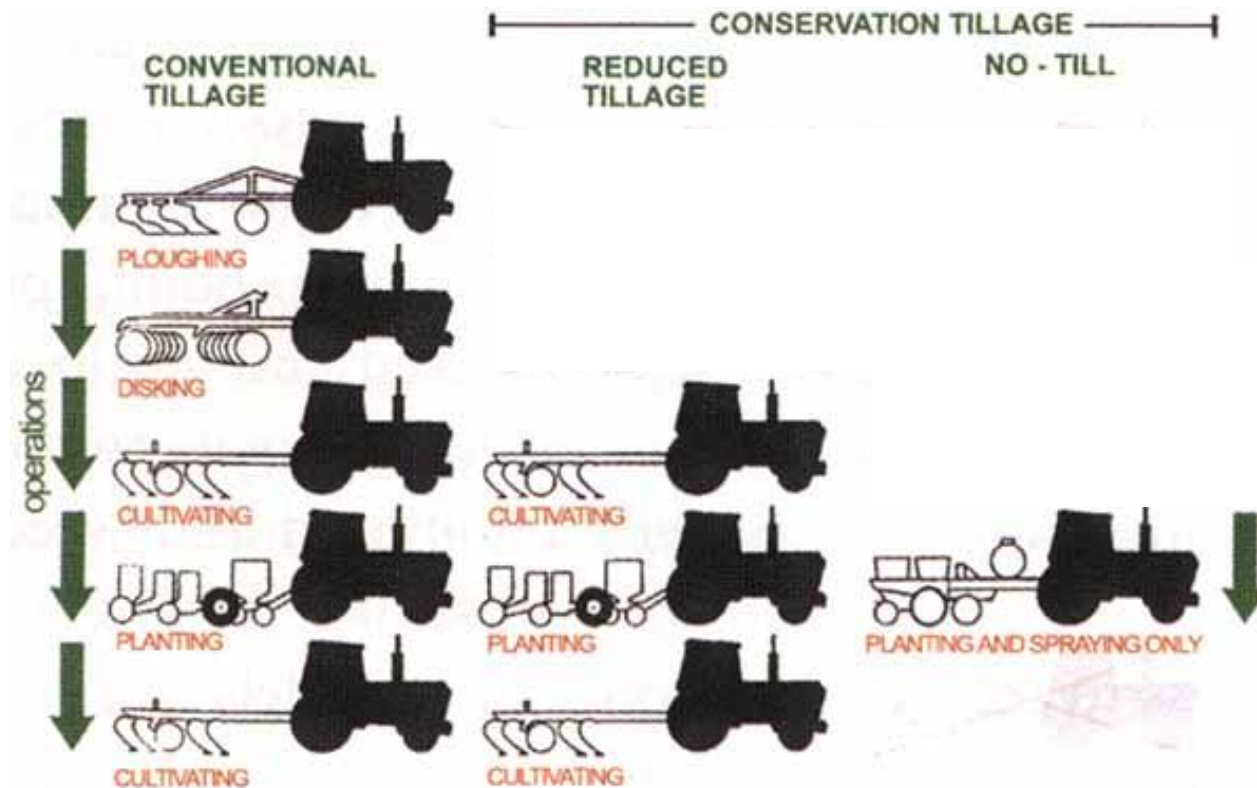
Tillage





Conventional Agriculture

Conservation Agriculture



Residues

Crops rotation

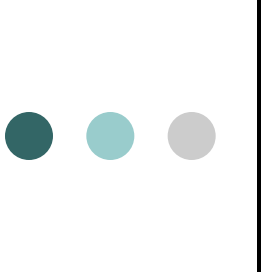
Minimum tillage



Soil Erosion in No-till Corn



No-till sown maize into soybean stubble.
Northeastern Indiana.



Conservation agriculture

- There is no single recipe
or 'one size does not fit all'
- Needs local adaptation
- Holistic approach
- Close collaboration of actors
- Evolving process

Conservation agriculture

Crop establishment

leading with residues
↑ soil temperature



Double disc seeder opener



**Tillage
point**

No-till points



Adapting local seeders

JJ.Pérez

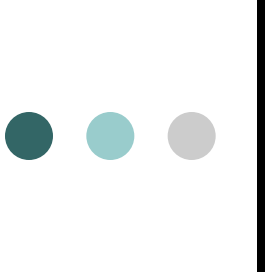


Adapting machinery



Bangladesh: 2-wheel zero till drill





Permanent bed system & controlled traffic

- Soil compaction

Controlled traffic

Deep ripping in trafficked furrows

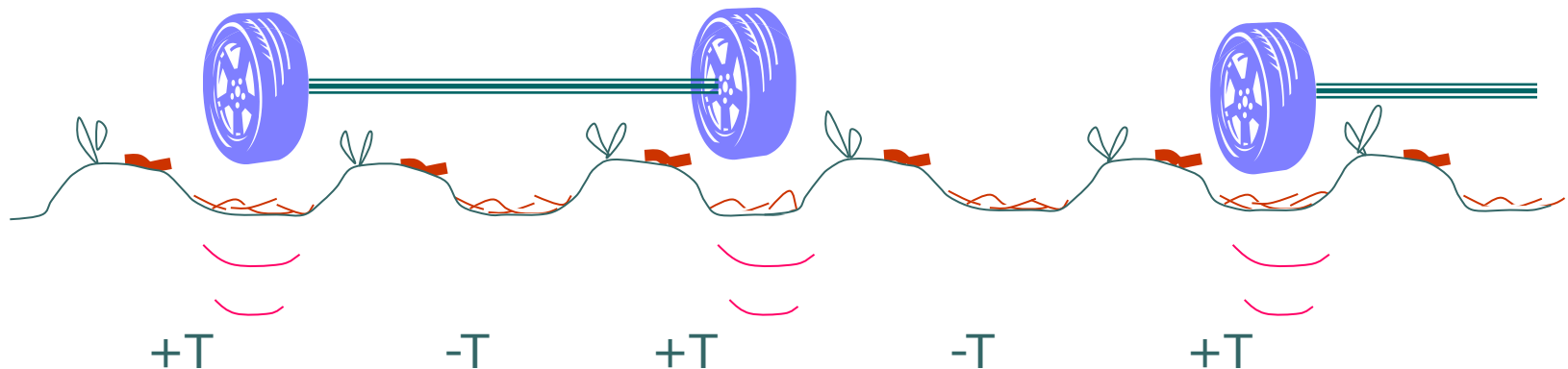
High flotation tires

- Low soil temperature – residues

maize-cotton rotation

Permanent bed system & controlled traffic

- Spatial variation
Bed
Furrows +/- wheel traffic
- Decompaction in trafficked furrows



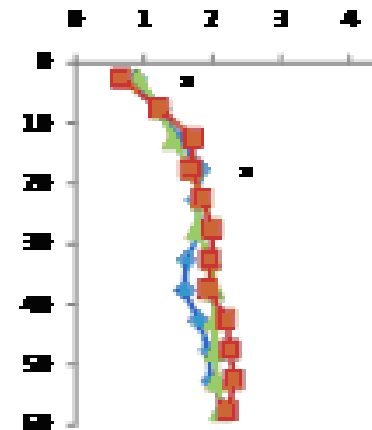
Permanent bed system & controlled traffic

- Soil organic matter (%)
already differences in year 3
Year 5

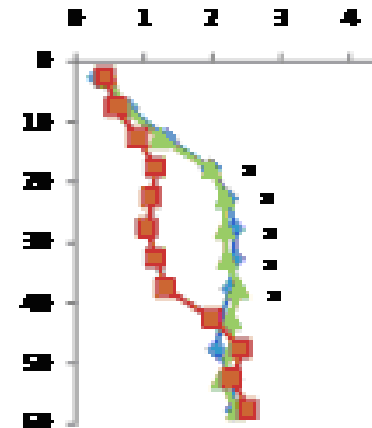
Depth		CB			PB	
(cm)	F-T	Bed	F+T	F-T	Bed	F+T
0-5	1.80	1.86	1.83	2.70	1.87	3.05
5-10	1.33	1.65	1.47	1.80	1.45	1.52

Year 5, one year after decompaction

Furrow without traffic

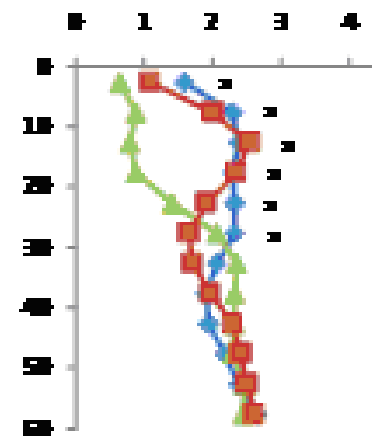


Bed



PB
DPB
CB

Furrow with traffic



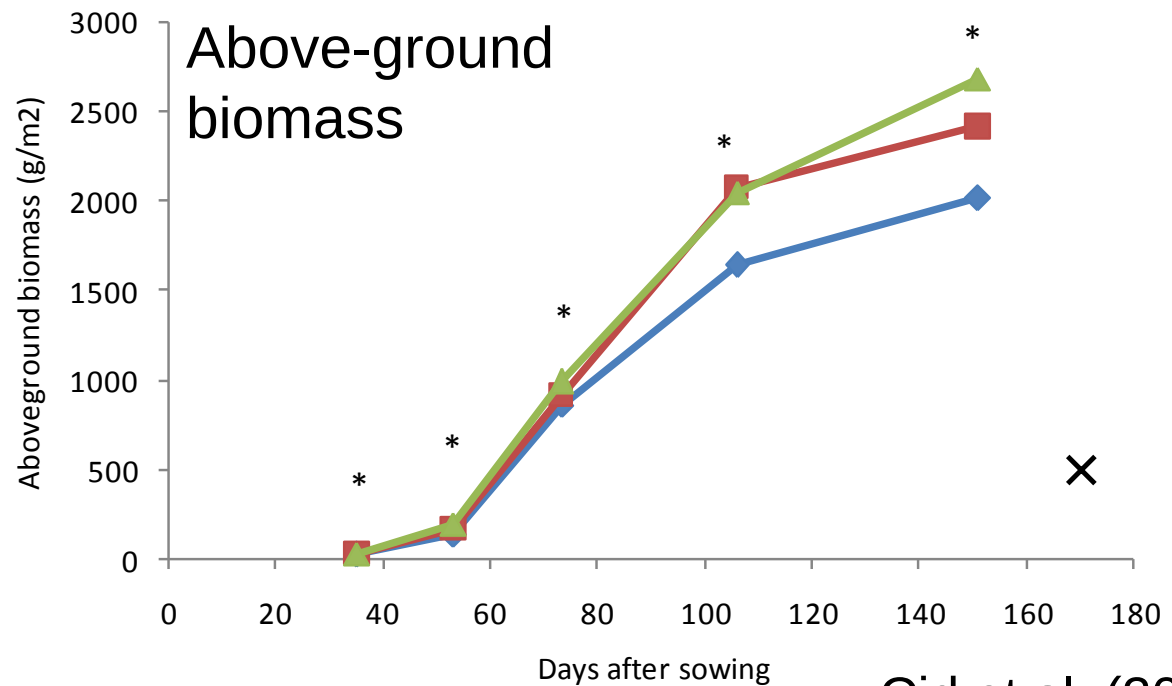
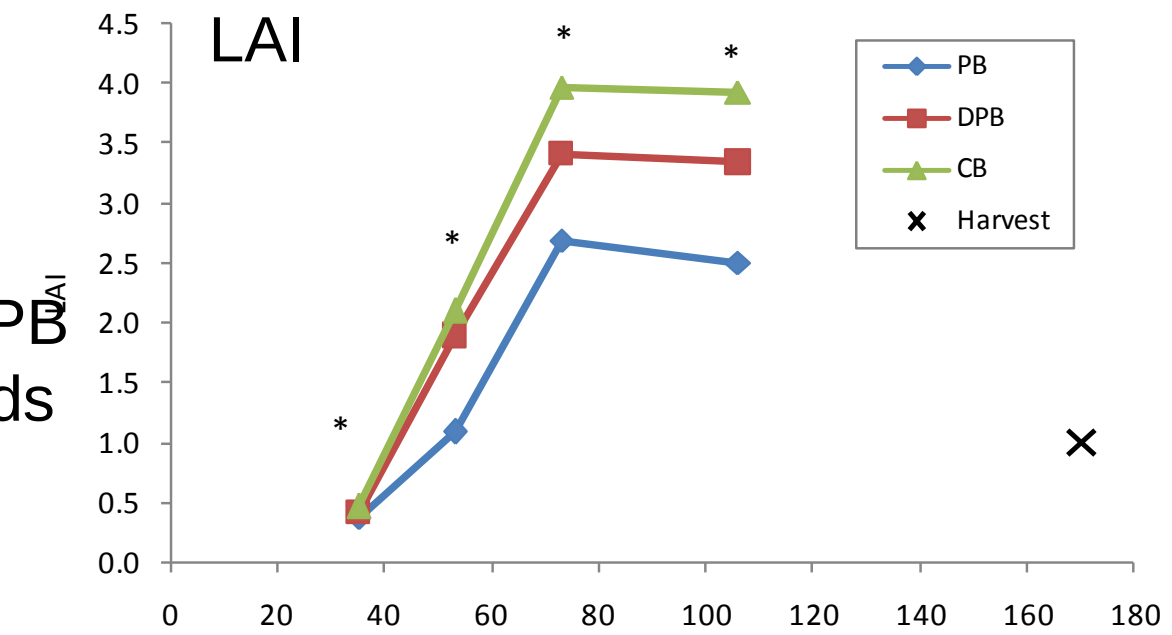
Cid et al. (2012)

Year 4
Maize crop

PB = permanent beds
DPB = decompacted PB
CB = conventional beds

PB 11 t/ha
DPB 14 t/ha
CB 15 t/ha

ETc ~ 700 mm



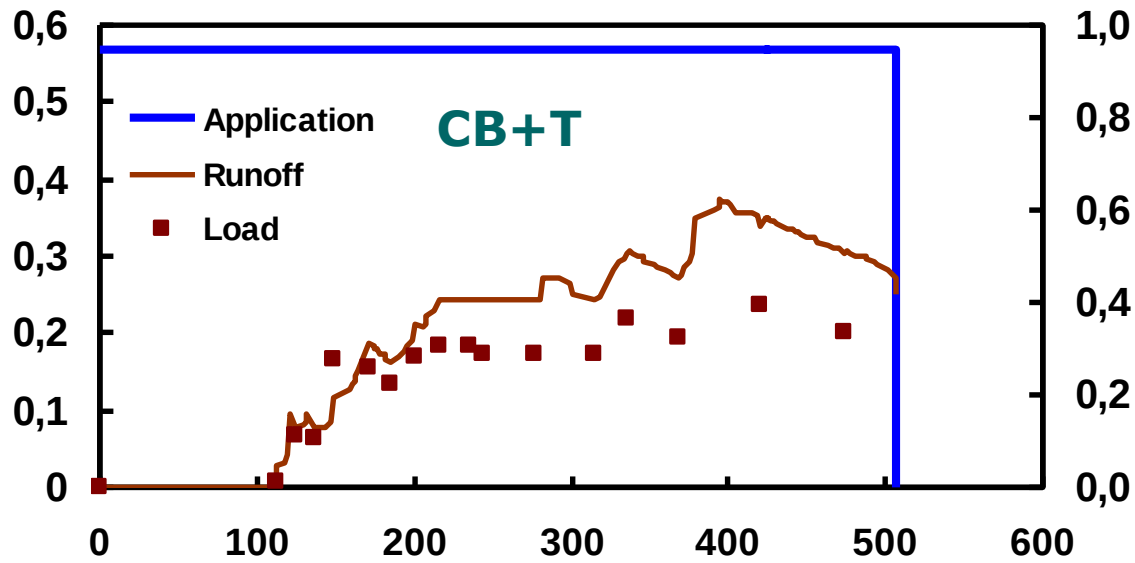
CB



PB

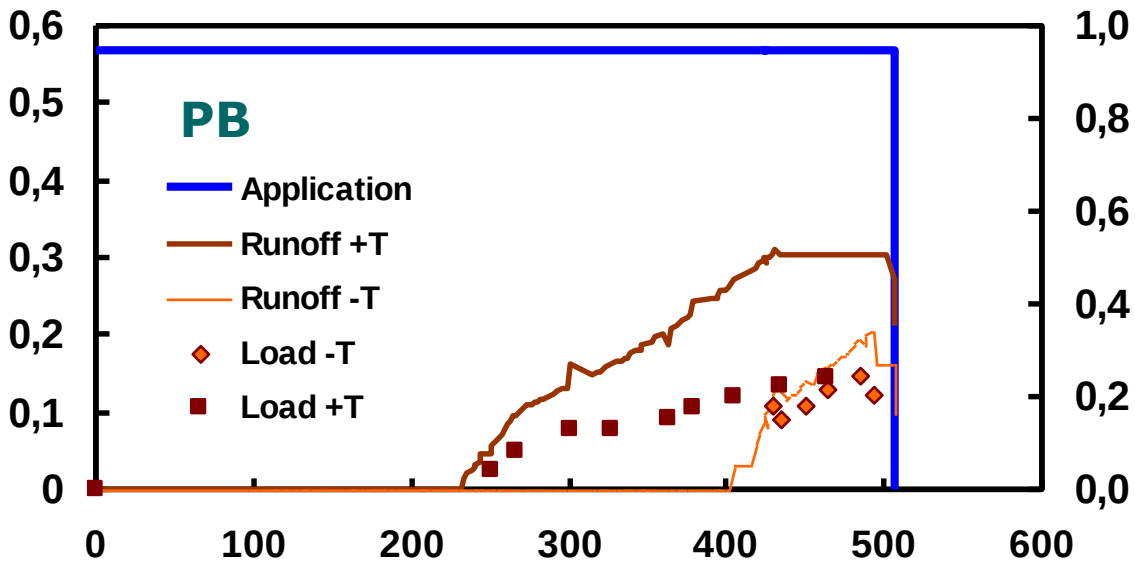


Application or runoff
rate (l/s)



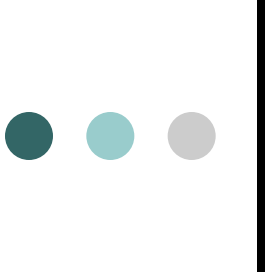
Sediment load
(g/s)

Application or runoff
rate (l/s)



Sediment load
(g/s)

Irrigation time (min)



Permanent bed system & controlled traffic

- Spatial variation

Bed

Furrows +/- wheel traffic

- Irrigation management practices identified for homogeneous soil management need to be revised

precision irrigation?

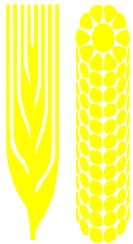
Conventional

Permanent beds

Residues



PERMANENT BEDS – Ken Sayre



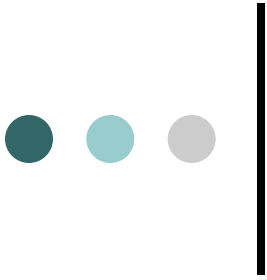
CIMMYT®



International Maize and Wheat Improvement Center

Permanent beds: sowing soybean on wheat residues





soybean on wheat stubble



Permanent beds

2-3 rows of wheat per bed



fertilization application in permanent beds



Residues

- Remove part
How much
to leave?
- $\leftrightarrow$ Livestock
- Rotation

Spain: maize-cotton

Australia: cotton-wheat



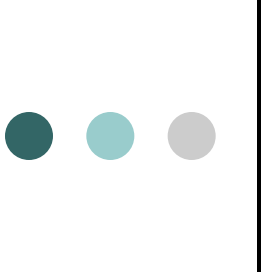
K. Sayre

Limited irrigation water

- Farmer, Córdoba (Spain)
maize-cotton-wheat rotation
pivot, permanent beds



applied irrigation reduced by 20% but equal yield



Limited irrigation water

- Nebraska (USA)
 - 123 field-year sites
 - pivot, NT, soybean-maize
 - highest IWUE 35 kg/ha/mm
 - highest yield 13.5 t/ha
 - 20% lower applied irrigation
- Grassini et al 2011

Limited irrigation water

- Chapada diamantina (Brazil)
commercial farm

1000 ha potato or tomato or maize
3000 ha quandu-brachiaria



Limited irrigation water

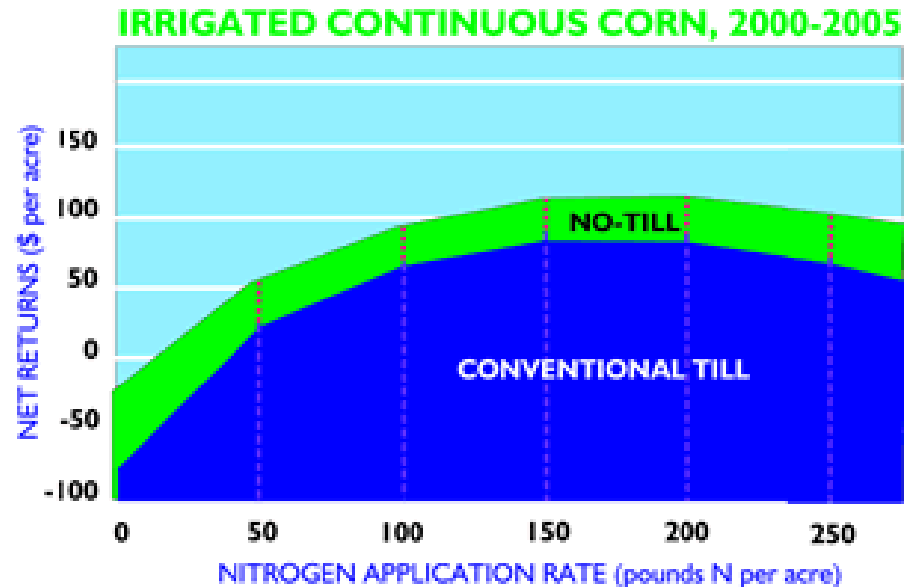
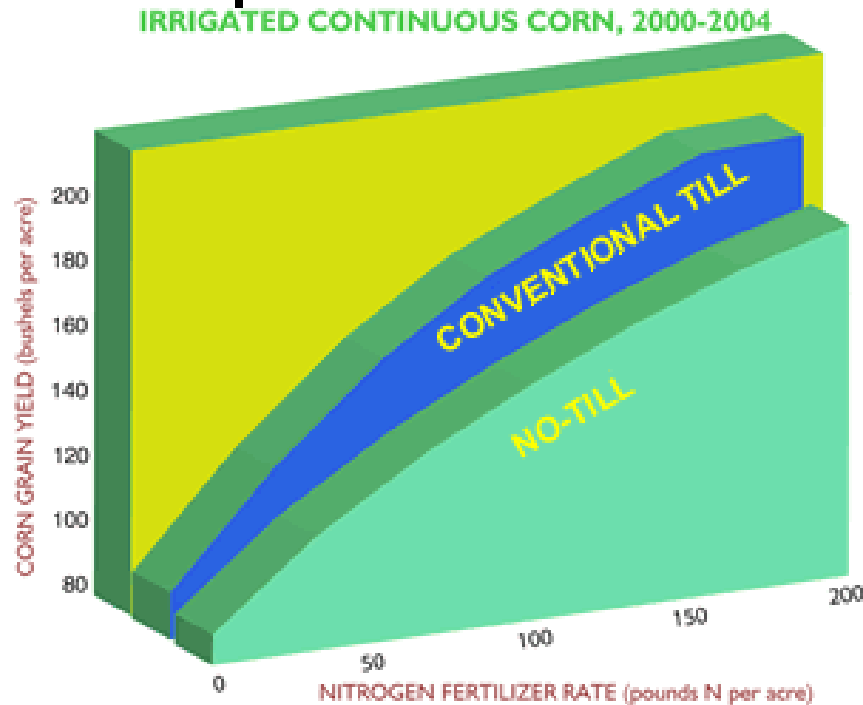
- Conserving rainfall (Mexico)
residues
↓ runoff



Limited irrigation water

- Deficit irrigation

Profitability



No-till maize - (Morris, Minn.)

↓ machinery & labor costs; ↓ fuel consumption

↑ increased net profits (\$83 per acre)

(Archer et al., 2007)

On the way

- GPS tractor guidance
- remote sensing:
 - application of herbicides, pesticides & fertilizers
- Inter-row weed management: low/no-chemical options



J. Desbiolles



J. Desbiolles

Obrigada!

