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Crop establishment systems at Knockbeg:

Past and future role for sustainable production.

National Tillage Conference 2025

Wednesday, 29th January | Lyrath Hotel, Kilkenny

www.teagasc.ie/tillagecon25

Why was the Knockbeg Long Term Experiment set up?

Interest in non-plough systems since 2000.

- Workrate / Labour / Costs
- Soil structure, Soil Carbon and GHGs

Uncertainty about

- Crop performance.
- Extent of claimed benefits

Need for long term trials

- Effects cumulative

♦Conventional Tillage: Deep Inversion Plough

♦Conventional : Secondary tillage and sow after the plough

- Minimum Tillage : Shallow non-inversion
- Stubble cultivation (stale seedbed)

♦Min-Till: Cultivator Drill

Strip Tillage: Cultivate strip (330mm) Alternative Min-Till System

Zero-till, Direct drill: Direct seed placement
Minimal disturbance

Phases, Treatments and Design

7 years: Plough vs Min-till and straw incorporation.

7 years: Plough vs Min-Till and applied N rates

9 years: Cultivations and Rotations.

Replicated trial

- Cultivation plots (30m x 30m) 4 reps
- Rotation sub-plots (5m x 30m)

What we found: Knockbeg and aligned work

Crop performance

- Often similar (WW) but not in wetter autumns

Machinery, Workrates, Costs

- Non-plough: Lower costs and higher work-rates related to depth

Fauna

- Earthworms, slugs carabids increase

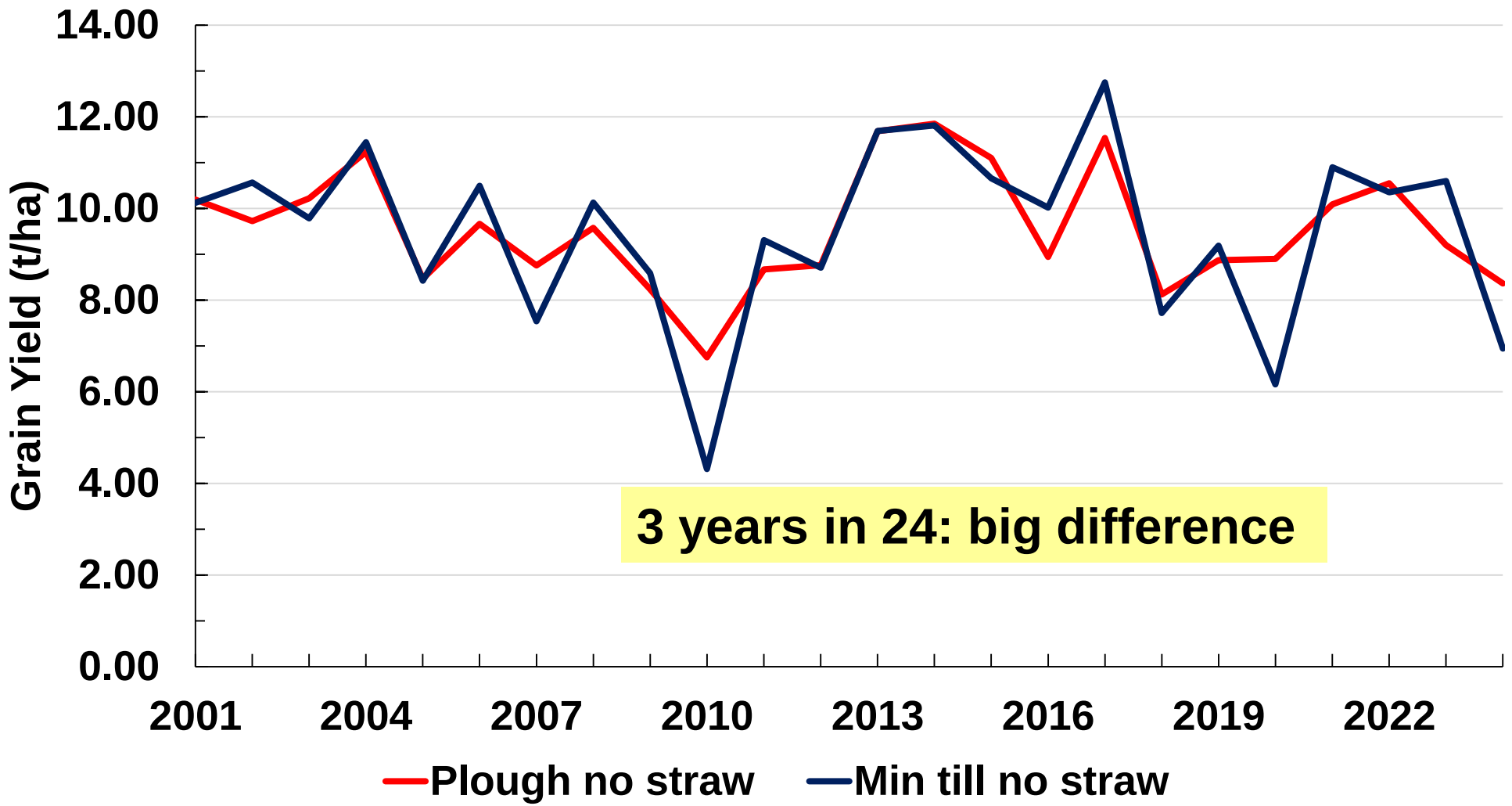
GHG emissions

- Small impact: Min-till: + for C – for NOX

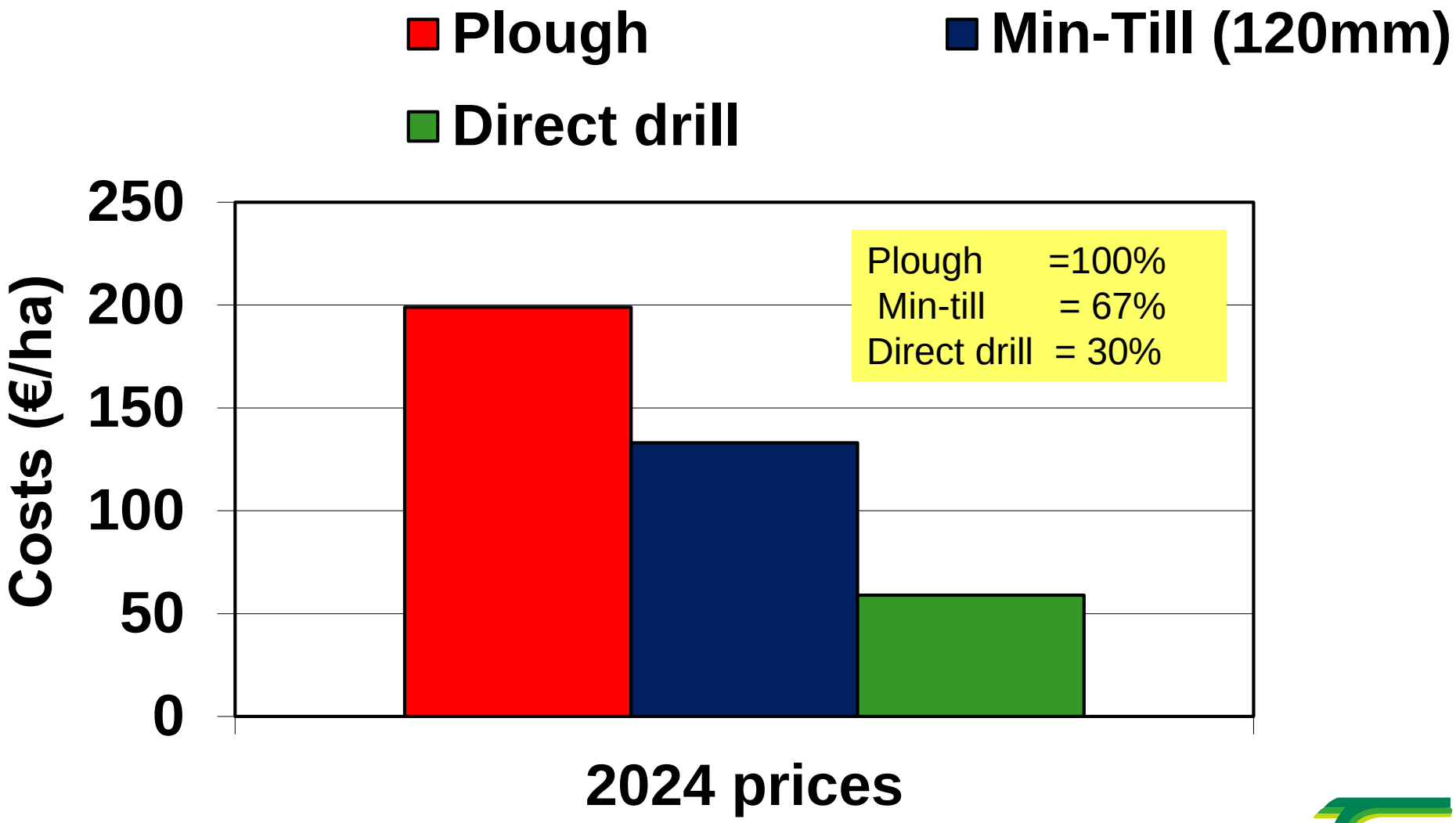
Soil microbiology

- Can influence bacterial and fungal populations but impact?

Yield similar but not every year! (cont. wheat)



Establishment costs lower with less tillage



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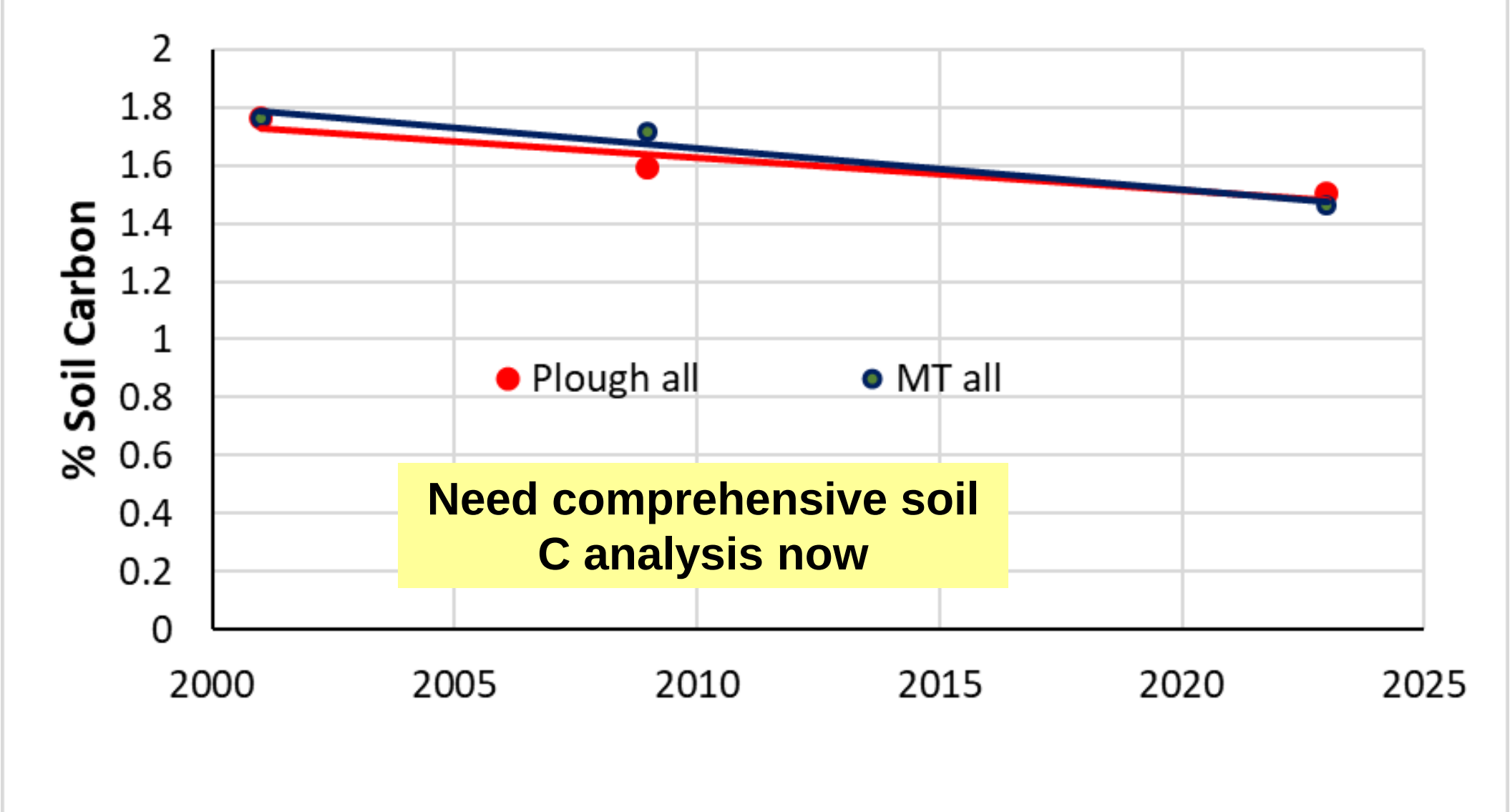
Cultivation system has little impact on Soil C



Cultivations and Rotations

Rotation – 5 crop

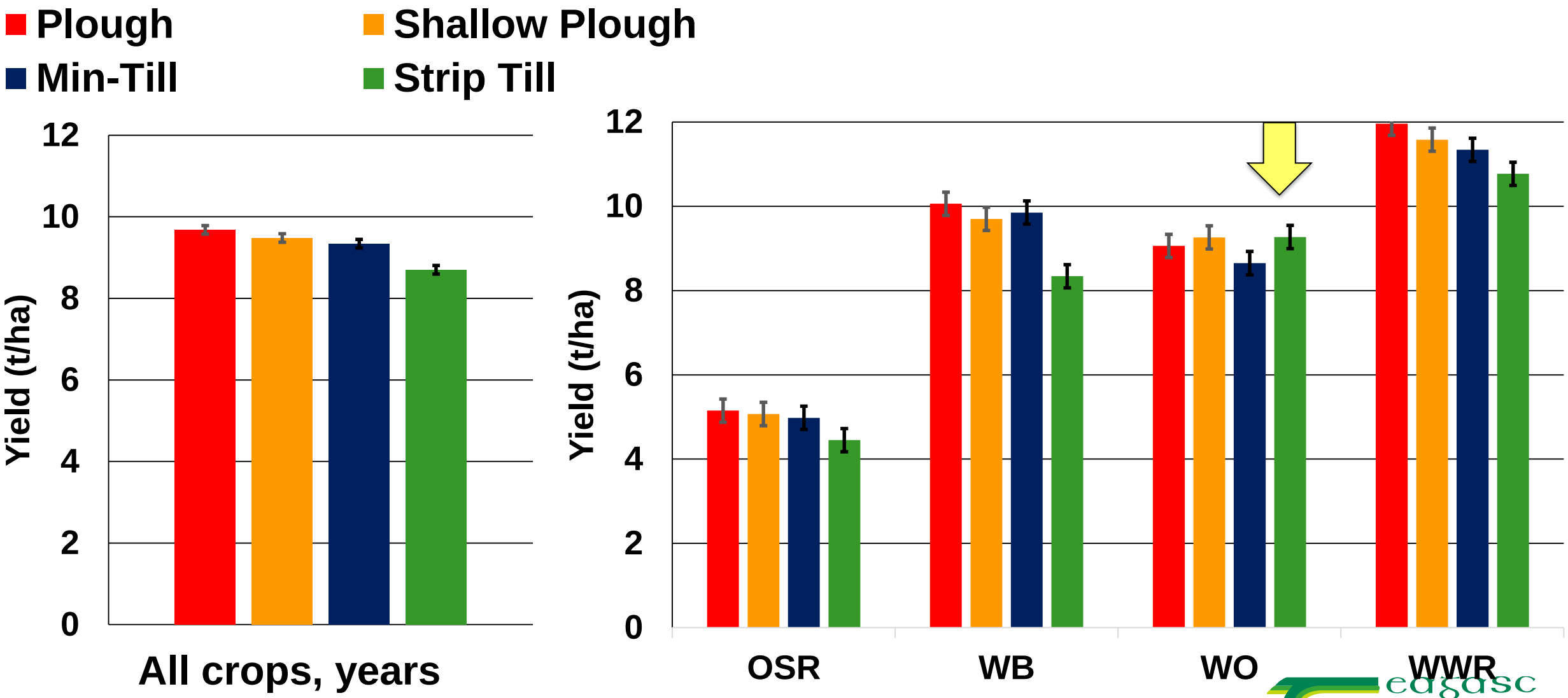
- W. Oilseed rape,
- W. Wheat (R),
- W. Oats,
- W. Wheat(O),
- W. Barley

Continuous W.Wheat (C)

Establishment

- Plough
- Shallow Plough
- Min-till
- Strip Till

Tillage system: impact but crop dependent



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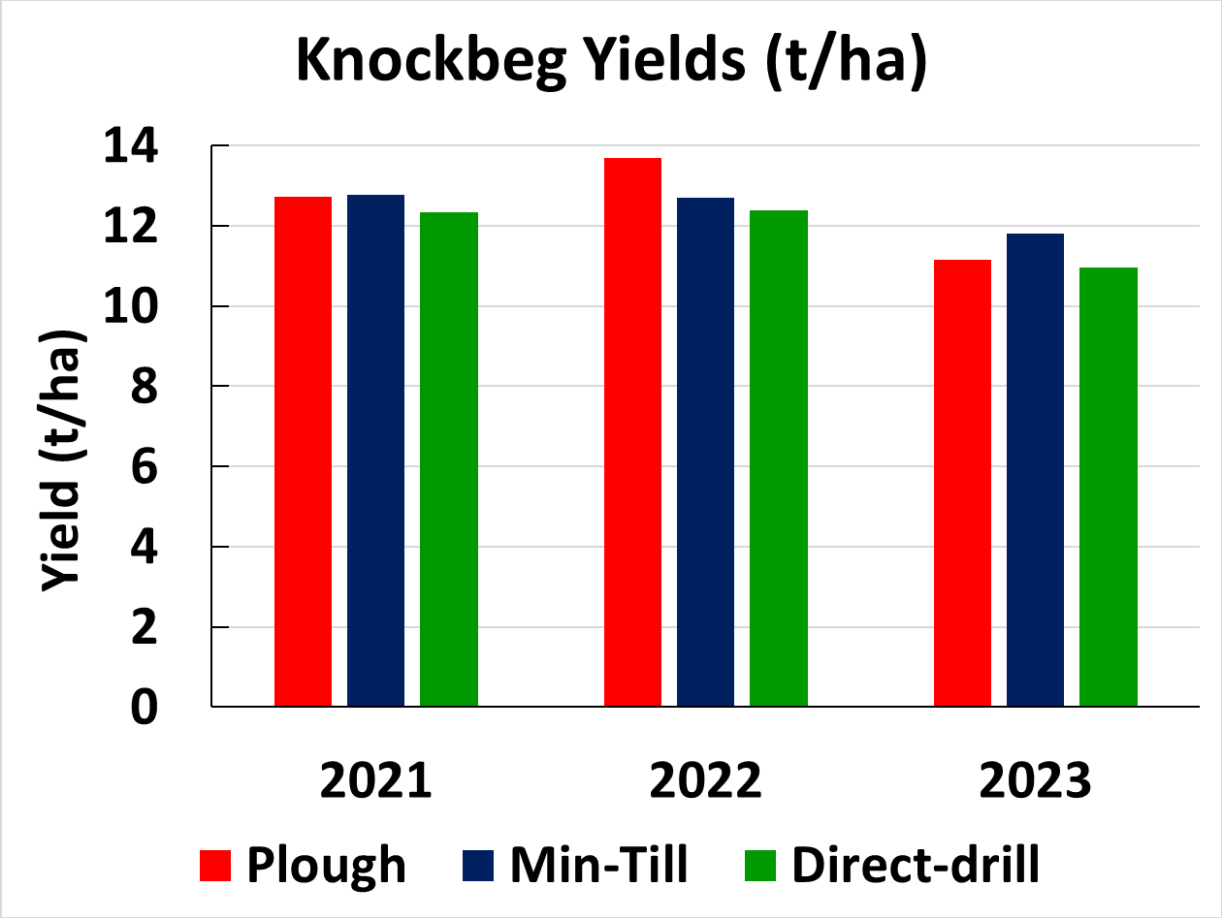
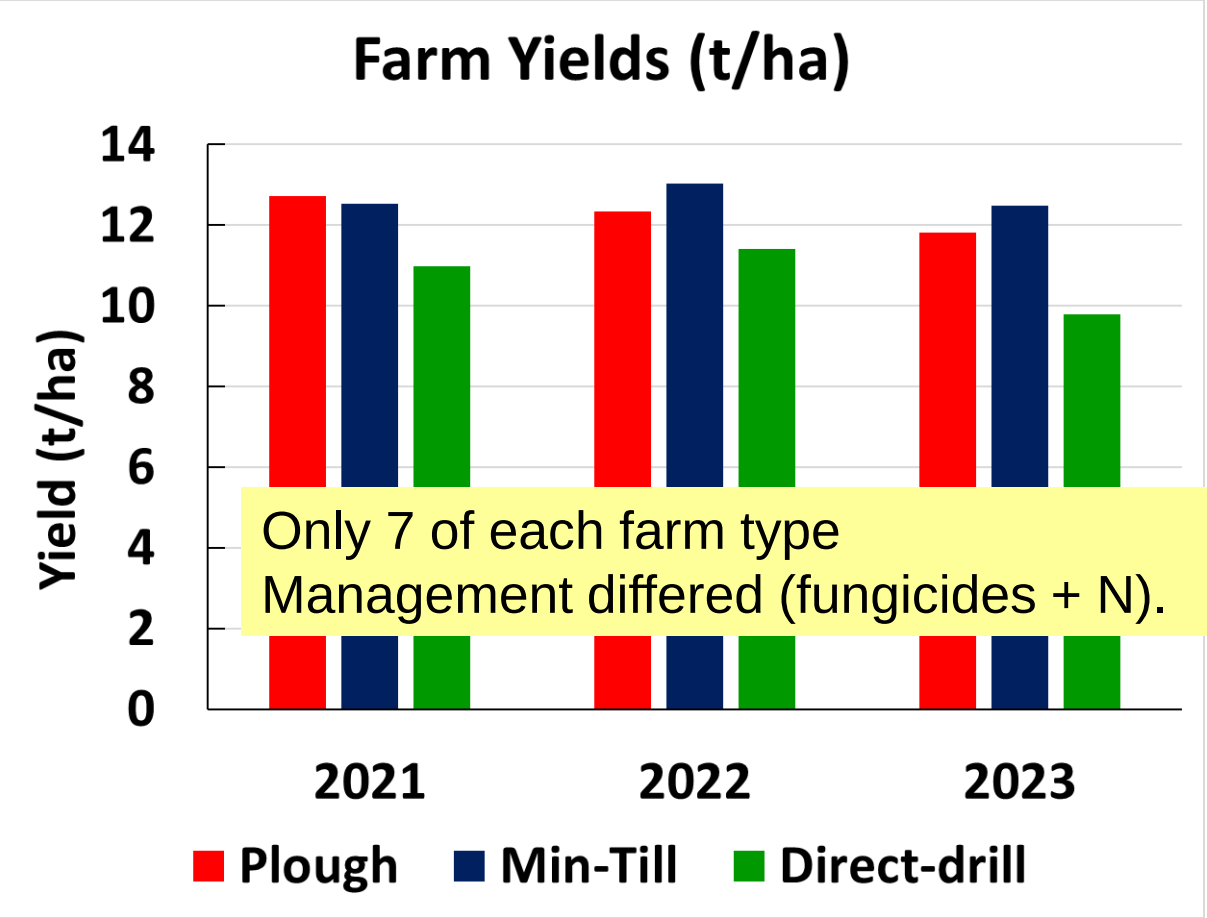
Current / Recent elements

- **Crop establishment:**
  - Controlled trials, on-farm studies and surveys: Jack Jameson:
- **EVOLVE:** Carbon modelling task (with UCD)
- **Climate Cropping**: EJP soil project: providing data and samples for modelling the effect of soil management practices.

Knockbeg and farm studies differ: First wheats





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Non – inversion systems generally

- High-output, lower cost and some soil benefits
- **Benefits** sometimes overestimated:
  - Soils; Soil C; GHG: Differences small in our climate.
  - Straw incorp. and Cover cropping may contribute more?
- **Challenged by** wet autumns and later springs

Grass weeds are a threat

- Favoured by: non-inversion; early sowing; mild climates.
- Herbicide reliance: Product loss and resistance issues
- Need cultural tools: Stale seedbeds, Ploughing, Rotation
- Need flexibility: not rigid systems

Future challenges – Lots to be done!

Sustainable production systems against a background of:

- Reduced pesticides / fertilisers
- Increased environmental requirements (GHG and water)

Rotations and Establishment: ***robust, climate-specific data needed***

- Impact on: nutrient cycling; C loss/sequest; soil structure; weeds etc.
- Interaction with agronomy, weed; pest, disease and economics.

Long term sites with history essential:

- Knockbeg site unique, but larger rotation base needed
- Multi-disciplinary approach essential: Crops /Soils /Environment
- Create and use long term sites carefully.

Thanks to:

Frank Ryan
Martin Walsh
Jack Jameson

Kevin Murphy
James Brennan
Tony Fortune

And many more!

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