TEAGASC RESEARCH INSIGHTS
LEADING RESEARCH FOR TOMORROW'S AGRI-FOOD SYSTEMS

Soil Physical Quality

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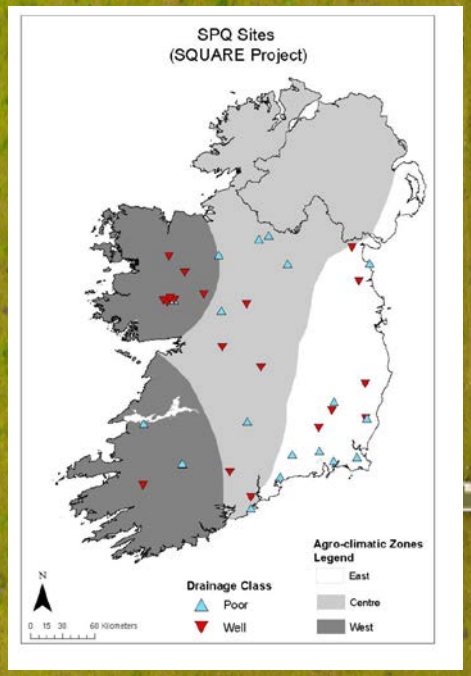
Grassland & Tillage Soils

OVERALL “very good” soil physical quality



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Management can cause compaction

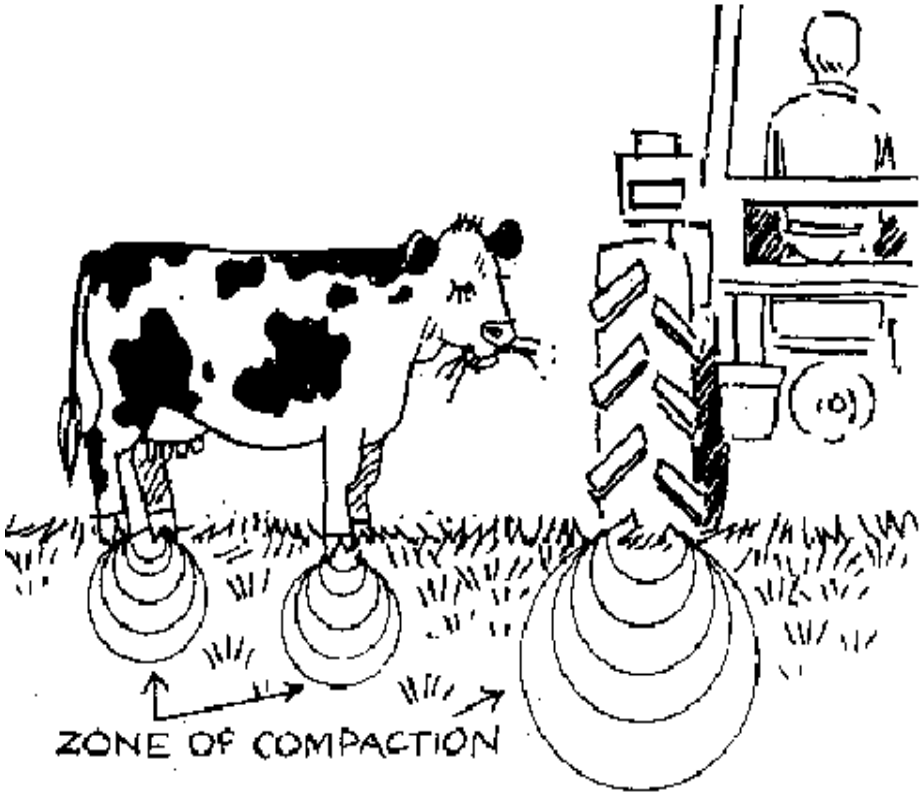
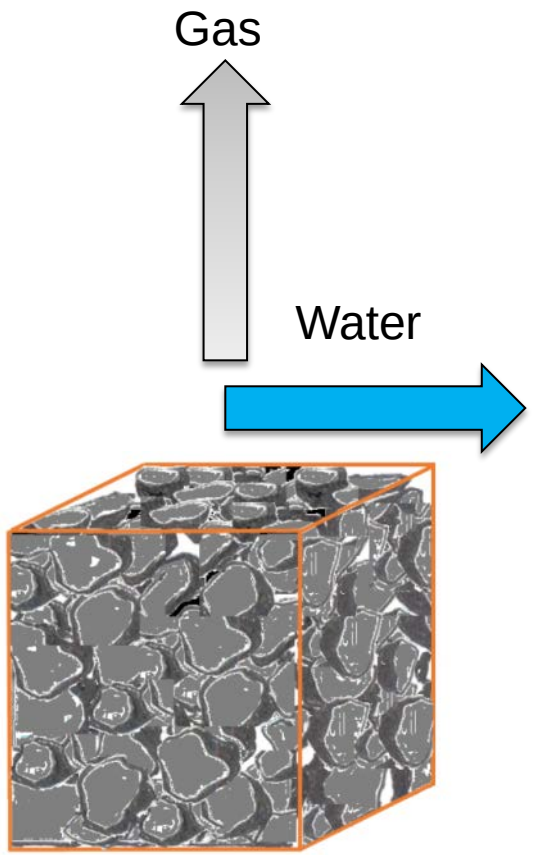


Image Credit: https://www.dpi.nsw.gov.au/



Teagasc has produced useful in-field and laboratory tools to assess soil structure for all soils

Original Photos Used

In the field options:
A machine learning tool for Grassland

Predict soil horizon bulk density (dynamic property)

Phone APP

Geoderma 318 (2018) 137–147

Contents lists available at ScienceDirect

Geoderma

journal homepage: www.elsevier.com/locate/geoderma

Using machine learning to predict soil bulk density on the basis of visual parameters: Tools for in-field and post-field evaluation

Giulia Bondi[a,*], Rachel Creamer[b], Alessio Ferrari[c], Owen Fenton[a], David Wall[a]

[a] Teagasc Crops, Environment and Land-Use Research Centre, Wexford, Ireland
[b] Soil Biology and Biological Soil Quality, Wageningen University, Wageningen, The Netherlands
[c] Consiglio Nazionale delle Ricerche, Istituto di Scienza e Tecnologie dell'Informazione "A. Faedo" (CNR-ISTI), Pisa, Italy

7 visual indicators give an in-situ harmonized bulk density value

FULL DETAILS IN OUR PAPER:

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A Visual Field Scale Grassland Management Tool

Soil Use and Management

Soil Use and Management doi: 10.1111/sum.12396

GrassVESS: a modification of the visual evaluation of soil structure method for grasslands

J. P. Emmet-Booth[1], G. Bondi[2], O. Fenton[2], P. D. Forristal[3], E. Jeuken[4], R. E. Creamer[2,5] & N. M. Holden[1]

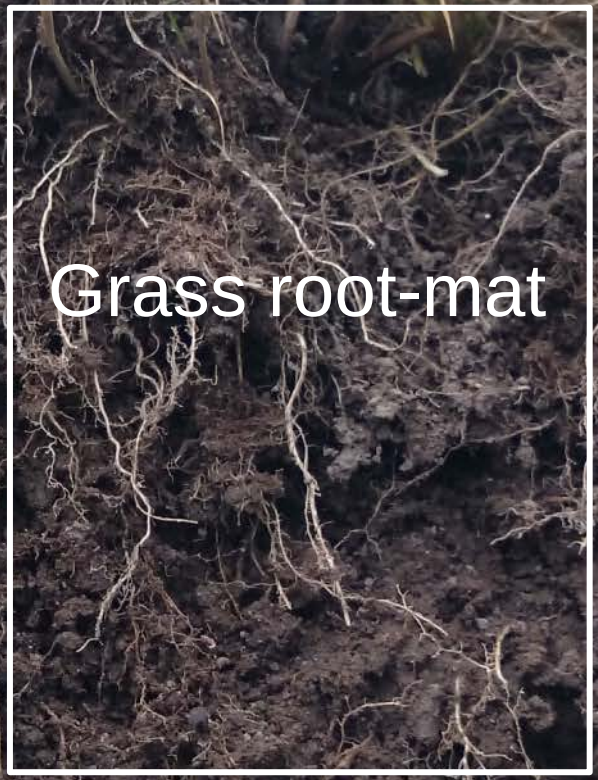
Soil Use and Management doi: 10.1111/sum.12300

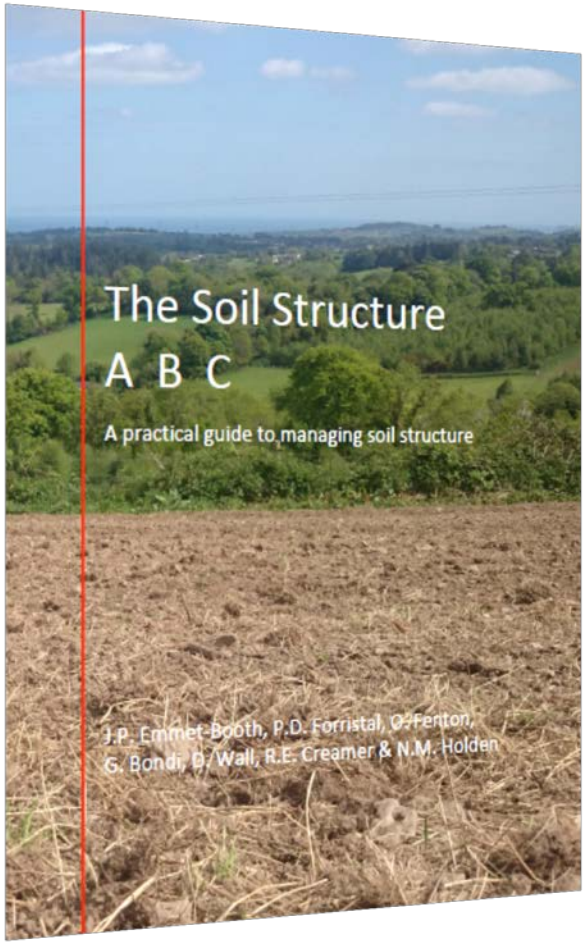
REVIEW ARTICLE

A review of visual soil evaluation techniques for soil structure

J. P. Emmet-Booth[1], P. D. Forristal[3], O. Fenton[3], B. C. Ball[4] & N. M. Holden[1]

CHECK OUT OUR PAPERS:





https://www.teagasc.ie/media/website/environment/soil/The-soil-structure-ABC.-A-practical-guide-to-managing-soil-structure.pdf

https://www.teagasc.ie/environment/soil/research/square/visual-soil-examination-and-evaluation/

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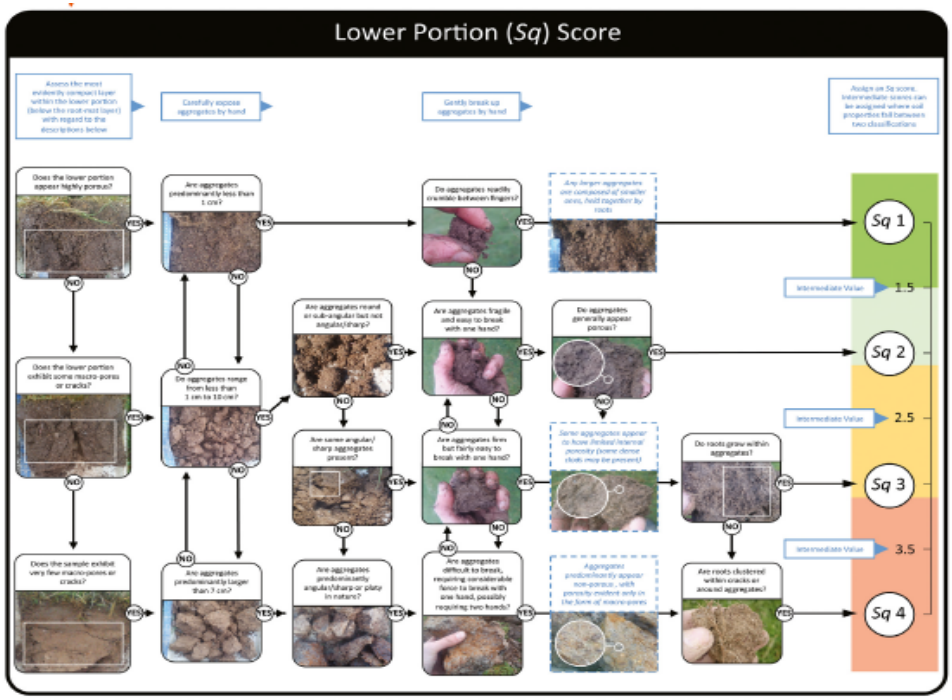
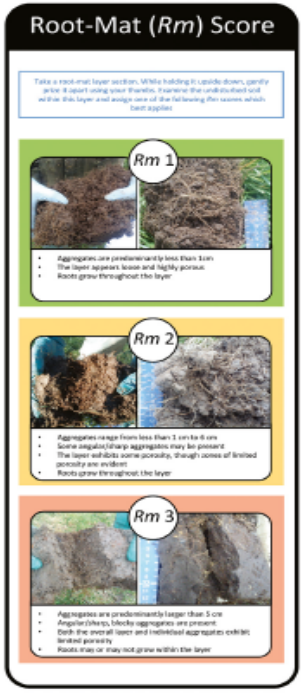


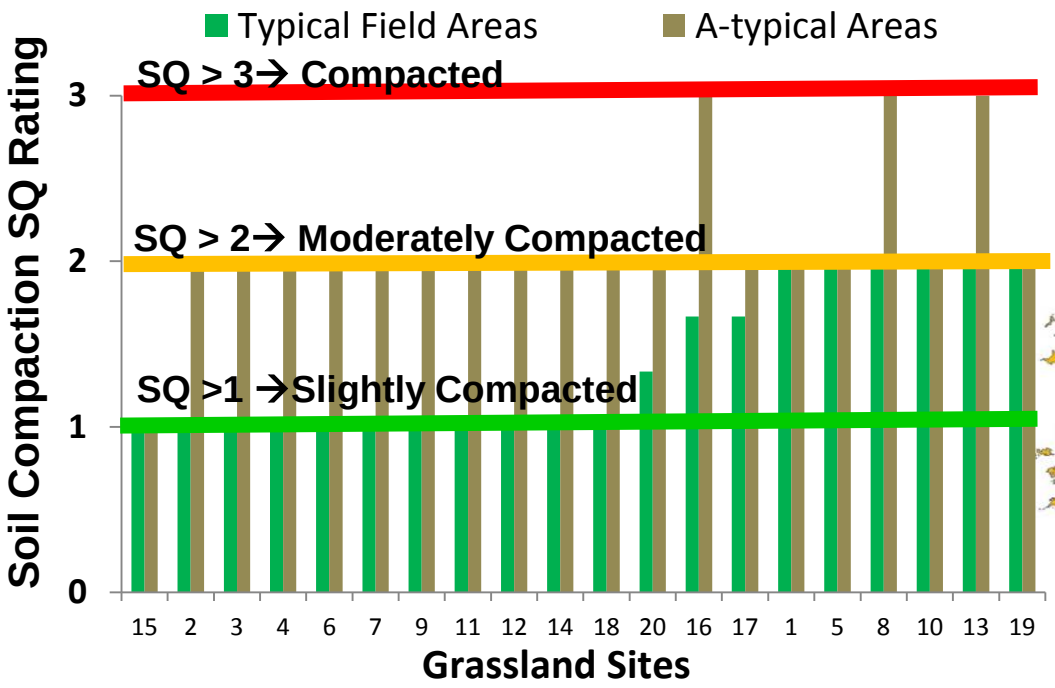


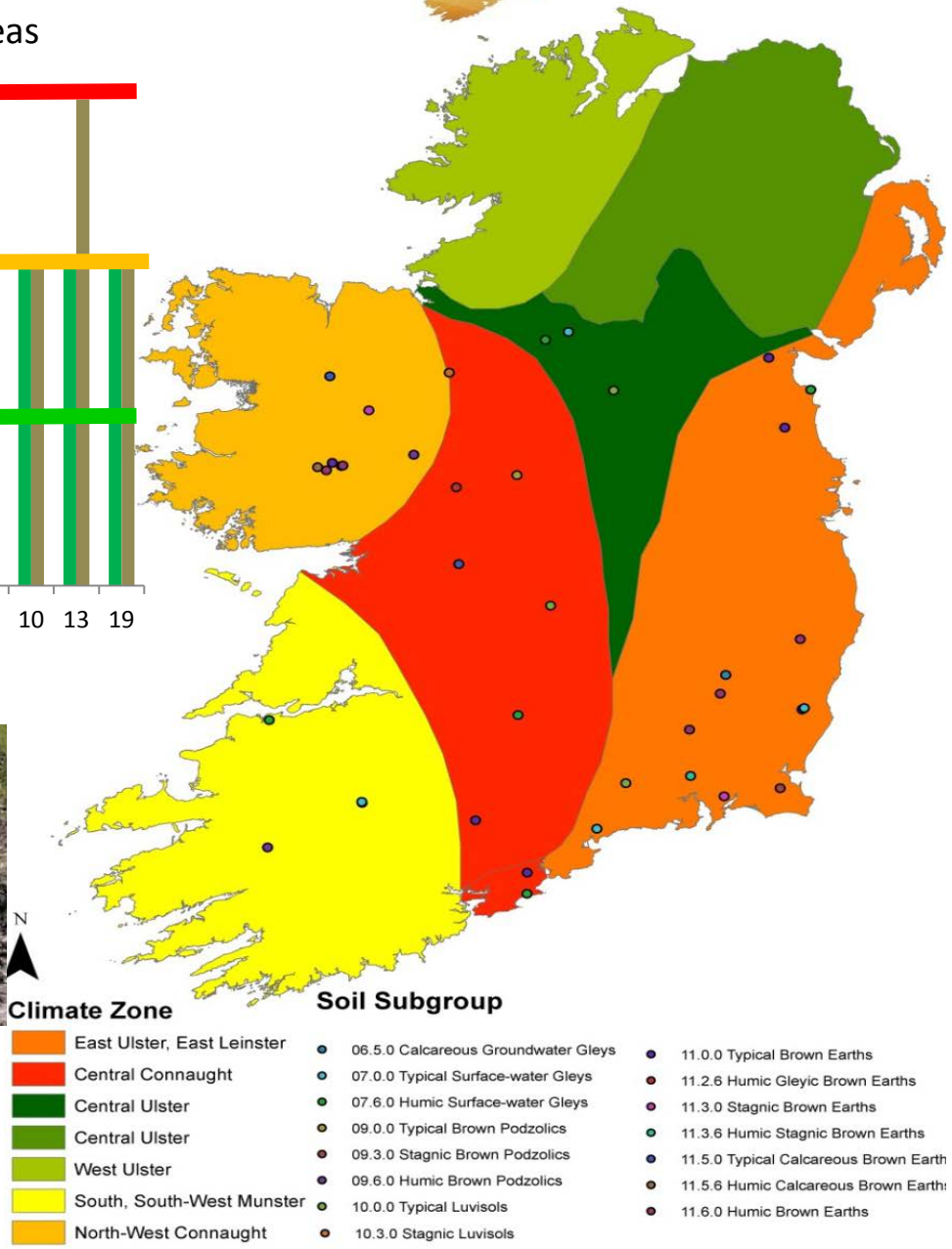
https://www.teagasc.ie/media/website/environment/soil/The-soil-structure-ABC.-A-practical-guide-to-managing-soil-structure.pdf

https://www.teagasc.ie/environment/soil/research/square/visual-soil-examination-and-evaluation/

Follow links above to get the method and videos that show you how it works.

SQUARE GrassVESS





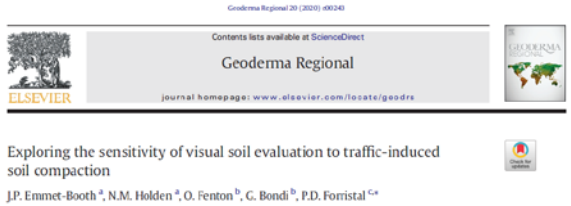
Source: GB & DW

Irish tillage soils: The Challenges

Visual assessment for tillage soils

Developed Double Spade method

- Assesses key transition layer to 40cm.
- More sensitive than quantitative methods.
- More information



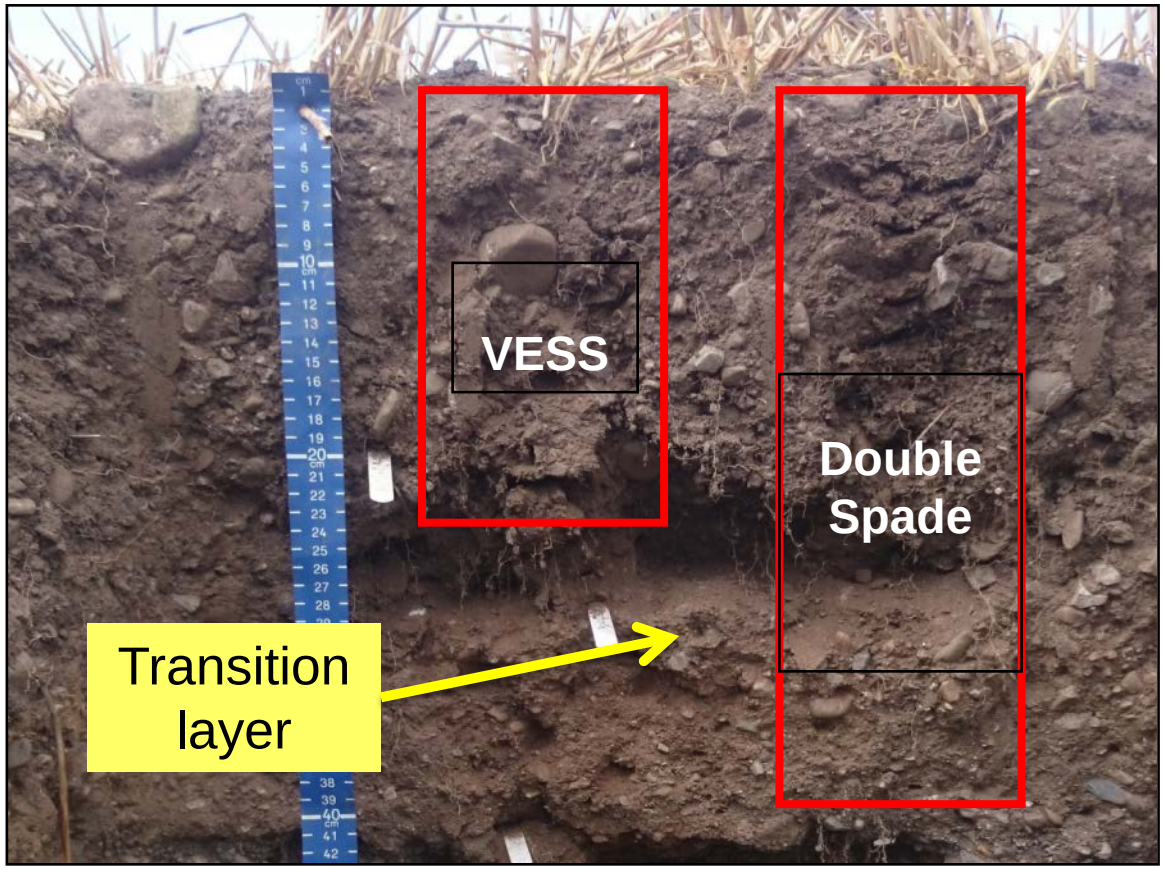
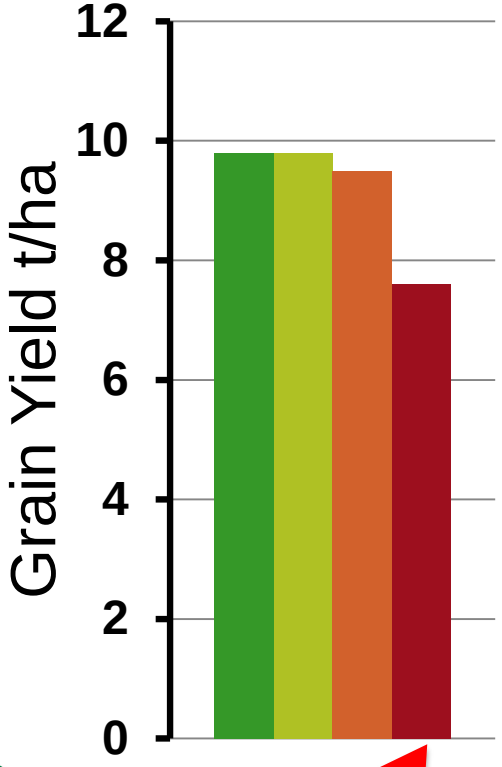


PHOTO CREDIT: Dermot Forristal

Structure assessment and crop yield

Visual assessment detects damage even before yields are impacted



TPHOTO CREDIT: Dermot Forristal

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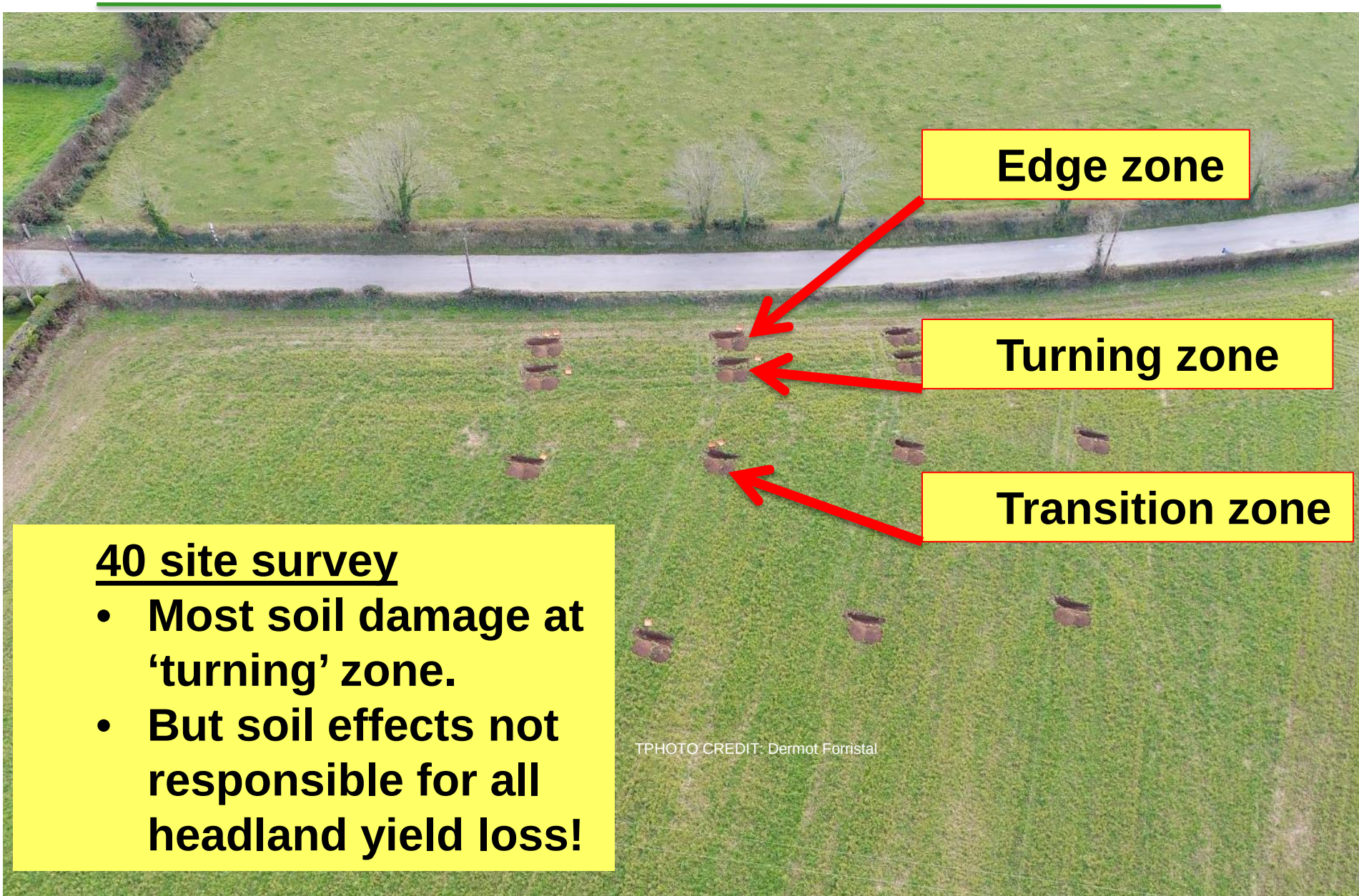
Headlands: machine traffic impacts



40 site survey

- **Most soil damage at ‘turning’ zone.**
- **But soil effects not responsible for all headland yield loss!**

TPHOTO CREDIT: Dermot Forristal

Headlands: machine factors

Survey: turning practice on 35 farms

- 30% to 65% of headland had compaction
- Weight, tyres and pressures impacts on soil stress:
  - 65 kPa up to 125kPa (Soil flex model)
- **Scope to reduce damage by altering machine specification and by controlling traffic**

TPHOTO CREDIT: Dermot Forristal

In laboratory option for all soils: Soil Water Retention Curve Modeling

HYPROP IMAGE TAKEN FROM: https://www.metergroup.com/environment/products/hyprop-2/
Other photos from Matthias Bacher and SQUARE archive.

CHECK OUT THESE PAPERS:

CSIRO PUBLISHING
Soil Research
https://doi.org/10.1071/SR19319

Influence of dung pats on soil physical quality mediated by earthworms: from dung deposition to decay and beyond

M. G. Bacher[A,B], *O. Schmidt*[B,C], *G. Bondi*[A], *and O. Fenton*[A,D]

Soil Physics & Hydrology

Comparison of Soil Physical Quality Indicators Using Direct and Indirect Data Inputs Derived from a Combination of In-Situ and Ex-Situ Methods

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Environment Soils and Land Use

Bacher *et al. BMC Ecol* (2018) 18:59
https://doi.org/10.1186/s12898-018-0216-6

BMC Ecology

RESEARCH ARTICLE Open Access

The impact of cattle dung pats on earthworm distribution in grazed pastures

M. G. Bacher[1,2*], O. Fenton[1], G. Bondi[1], R. E. Creamer[3], M. Karmarkar[1] and O. Schmidt[2,4]

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In Summary

- The state of Irelands soil physical quality is very good, but problem areas exist
- There are in field quick tools to inform management in real time
- Different tools for grassland and tillage sites
- Laboratory methods which are the most sensitive. Could be used for national monitoring programmes