

Recent advances in multi-sensor and data fusion for precision agriculture applications



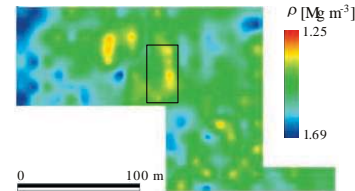
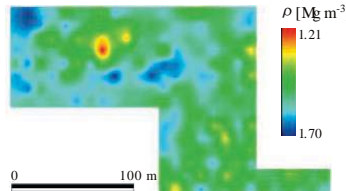
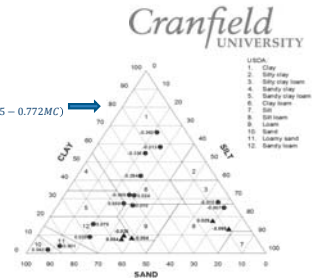
Abdul M Mouazen
Cranfield Soil and AgriFood Institute

www.cranfield.ac.uk

Soil Compaction

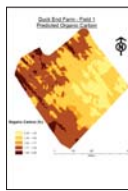


$$BD = \left(\frac{\rho + 21.36MC - 73.9313d^2}{1.6734} \right) \times (1.255 - 0.772MC)$$



After: Mouazen and Ramon (2006) & (2010)
- Soil & Tillage Res

Core competency & innovation

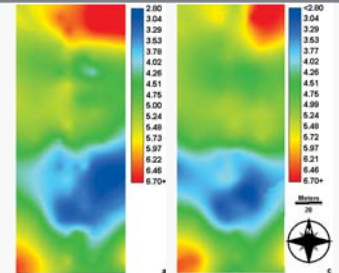


On-line multi-sensor platform (Mouazen, 2006)

Mouazen, A.M. (2006). Soil Survey Device. International publication under the patent cooperation treaty (PCT). World Intellectual Property Organization, International Bureau. International Publication Number: WO2006/015463; PCT/BE2005/000129; IPC: G01N21/00; G01N21/00.

- High resolution data (1500 – 2000 reading per ha).
- Readings can be taken from any depth between 5 – 50 cm.
- The sensor can also be fit on different soil equipment e.g. tillage, planters, and seeding machine.
- The system is particularly successful for the measurement of organic carbon moisture content, total nitrogen, clay and organic matter.
- Other properties can also be measured with less accuracy e.g. pH, phosphorous, calcium cation exchange capacity and Magnesium.

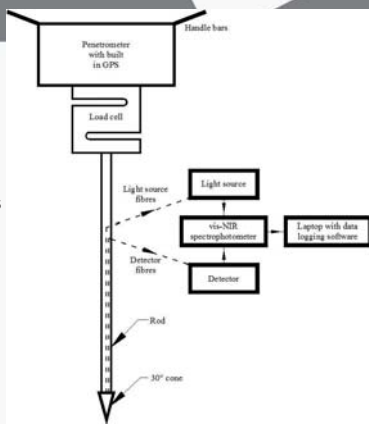
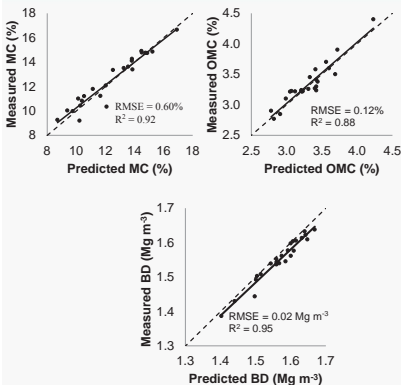
Sensor-based Site Specific P Fertilisation



Olson method On-line

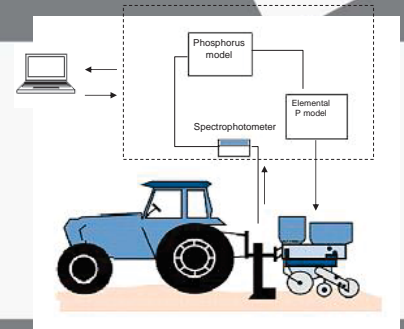
After: Mouazen et al. (2009) – Soil & Tillage Research

Portable multi-sensor probe



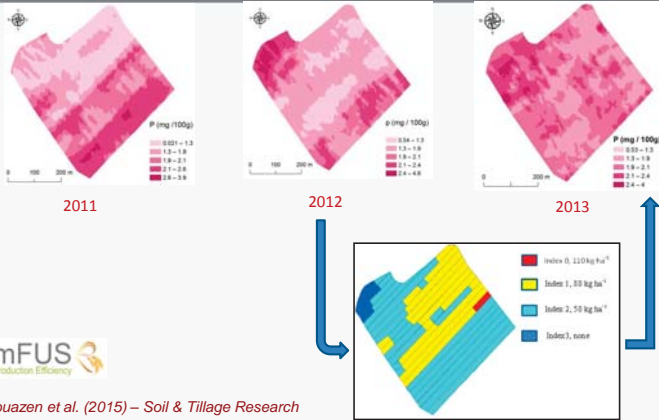
After: Quraishi and Mouazen (2013) – Soil & Tillage Res.

Sensor-based Site Specific P Fertilisation



After: Maleki et al. (2008) – Biosystems Engineering

Map-based Site Specific P Fertilisation



FarmFUS
Optimising Production Efficiency

After: Mouazen et al. (2015) – Soil & Tillage Research

Agri-EPI Centre – UK 2016-2020

Funding: 50% UK Government & 50% industry (Total £35 M)
Academic Partners: SRUC, Harper Adams and Cranfield University.
Industry partners: 75 national and international industry partners from different sectors



Site specific irrigation



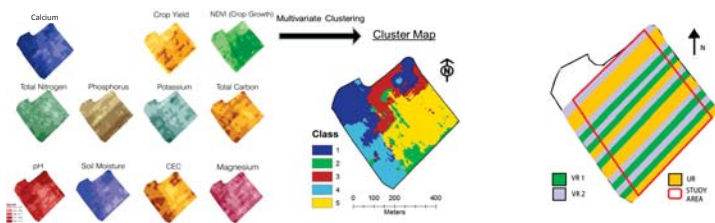
After: Mouazen et al. (2014) – Soil & Tillage Research

Sponsors



Delineation of management zone for VR N application

- Common Raster Grid Creation
- Data Fusion by Clustering
- Mapping



After: Halcro et al. (2013) – 3rd International Workshop on PSS

FarmFUS
Optimising Production Efficiency

Thank you

E-mail: a.mouazen@cranfield.ac.uk