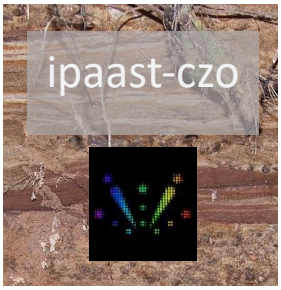
ipaast report: introductory workshop on connecting remote and near surface sensing across archaeology and precision agriculture

– 12 July 2021 – Report prepared by Rachel Opitz

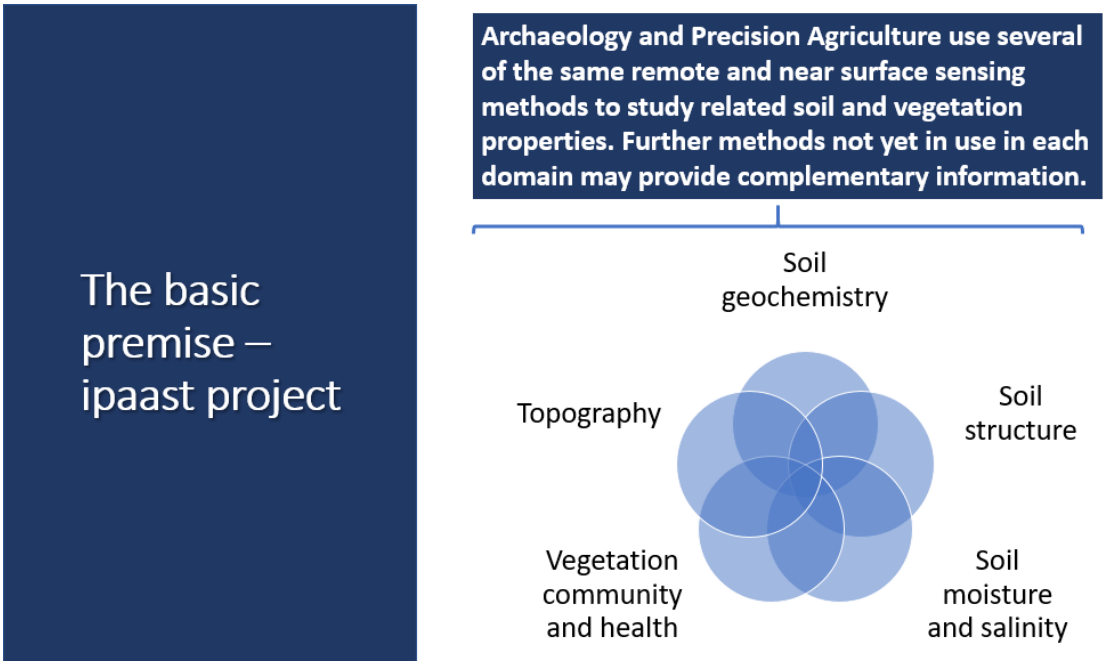


This workshop aimed to:

- introduce stakeholders from archaeology and precision agriculture to one another;
- gather information on the aims of different stakeholders in collecting and using remote and near-surface prospection data;
- gather information on what makes different data types useful and usable for applications in each domain.

Perspectives represented at the 12 July 2021 workshop, which brought together stakeholders from industry, academia and third-sector organisations in archaeology and agriculture.

Participants: Nick Wilson (York University); Jose Maria Terron (CICYTEX); Toby Waine (Cranfield University); Philippe de Smedt (Ghent University); James Willoughby (Birdsall Estate); Holly Wright (Archaeological Data Service); David Depraetere (ILVS); Dominic Powlesland (Landscape Research Centre); Clive Blacker (Precision Decisions); Craig Patrick (Precision Decisions); Iain Cameron (Envisys); Victorino Mayoral Herrera (CSIC); Keith Challis (National Trust); Rachel Opitz (Glasgow University)



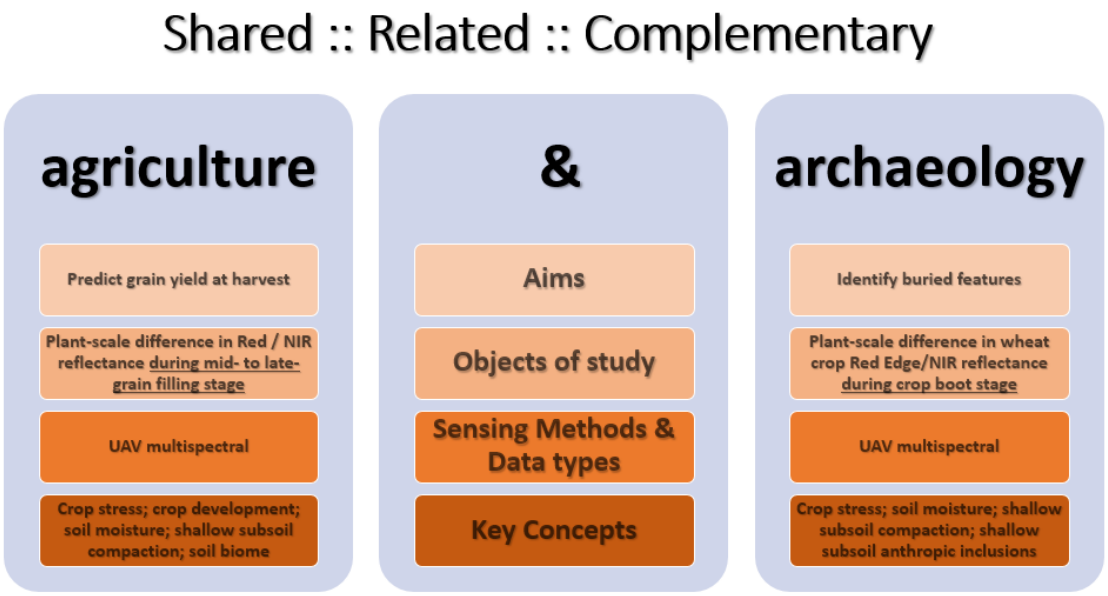
Workshop activities included an introductory presentation exploring connections between archaeology and precision agriculture, small group discussions about participants' current working practices, and a full group discussion of a data collection case study.

We asked - What are key motivations for collecting Remote and Near-Surface sensing data in PA and Archaeology?

Participant responses:

- Data is collected to provide inputs into ecosystem services platforms.
- Data is collected to provide easy to implement practical solutions for farmers - data products and outputs that can be straightforwardly implemented into existing operational systems for farm management.
- Data is collected to identify locations of previously unknown archaeological remains and establish the type, extend and value of the buried materials.
- Data is collected to provide easy to understand insights to heritage, environmental and other land managers.
- Data is collected to establish a holistic view of landscape potential, which includes an evaluation of what is commonplace and what is unique about each area.

I collect data to:
"- discover and maximise the knowledge and understanding of the archaeological cultural assets.
- Manage the productive potential of the land.
*- **Find a socio economic and cultural sustainable balance in land usage; therefore understanding one's** natural **capital to appropriately use the land**."– David De Praetere.*



Examples of parallel working practices, shared technologies and platforms, and related key concepts were discussed in the workshop.

We asked - What are your high-level expectations when collecting Remote and Near-Surface sensing data?

Participant responses:

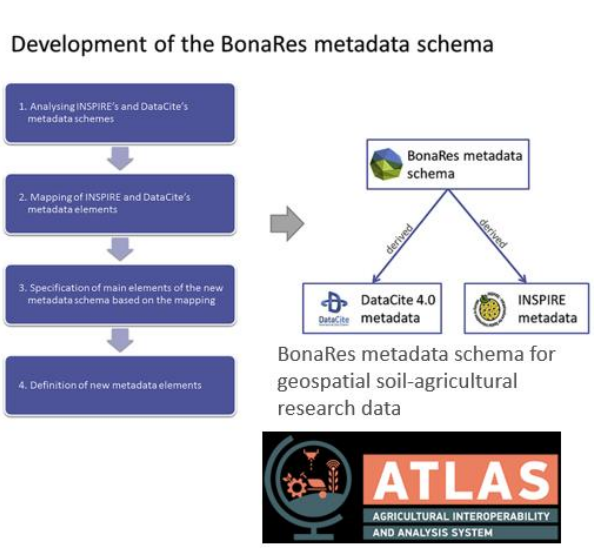
- When I collect data, I want to connect the data to insights or actionable information.
  "We should focus on delivering insight vs. delivering data. Taking data and turning this into actionable insight. A lot of the time the issue is around the meaning that is being created based on the data, and the implications this has for (land) management. – Keith Challis
- Data should allow me to produce maps which are used for visual interpretation and communication of insights.
- Data should allow me to communicate at every level, from "primary to academic, industry to population".
- Data should be shareable and reusable. The most shareable data is points with location, a set of attributes, and chronology where applicable.
- Data should be clearly structured so that how it was produced can be easily understood.

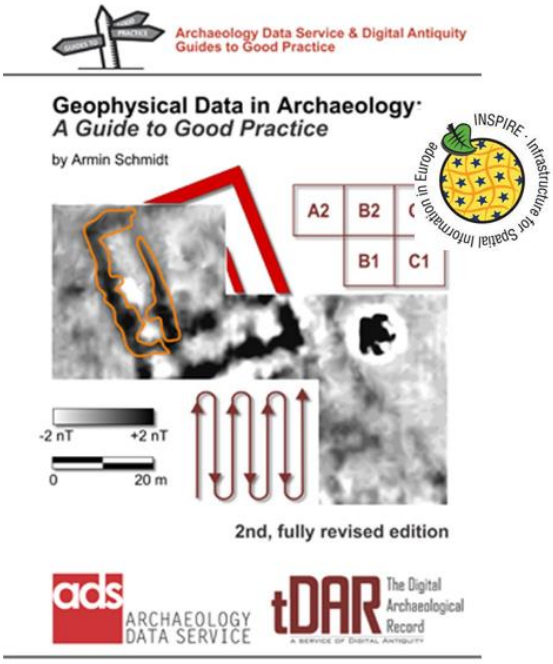
Requirements for data quality and character, practicalities of survey protocols, and expected outputs which would need translation across domains were discussed.

We asked - What might the underlying requirements for PA – Archaeology interoperable practices be?

Participant responses:

- Consensus is needed around what the PA-Archaeology community is trying to accomplish and around the general principles which underpin reuse and archiving of data. **Defining a common purpose for reusing and archiving the data** will make specifying what should be done technically and practically much easier.
- It is important to be able to discover data and **assess whether it will be usable** for your application. To this end, the most useful metadata will be **discovery metadata** and metadata which explains what questions the data creators were trying to answer in collecting the data, what techniques were used, and whether or not it worked. A **shared vocabulary** is needed across PA and Archaeology to allow for discovery of potentially relevant data through searching discovery metadata.
- **Information on analytical approaches** is needed, in parallel with data availability. It is essential to know about how other domains analyse and interpret 'raw' data in order to understand how it might be useful.
- **Algorithms** should be developed or **retuned for the spatial scale** of the data at which they're being applied.
- **APIs** that work against both archaeology and PA data archives would facilitate cross-domain applications. These APIs often assume shared basic discovery metadata.





Data and metadata standards in archaeology and precision agriculture already have some connected elements. For example, INSPIRE geospatial metadata are already part of the standards used in both domains in UK and European contexts to support data sharing. The roles of standards and metadata were highlighted.

We asked - How can we incentivise interoperable PA - Archaeology practices?

Participant responses:

- Incentives are needed: Social, economic and policy. These must support and encourage:
    - Open data
    - Improved awareness of archaeological questions and applications within the PA community
    - Communication with landowners
    - Awareness of buried archaeology as part of 'taking care of the land' and as contributing to the land's value.
- Heritage management needs to be linked into environmental management, where the positive momentum and incentives are currently situated. The [public] benefits of this approach need to be established.
- If public benefit of less processed, detailed data for archaeology and heritage applications can be advocated for within DEFRA policy e.g. in the context of ELM schemes, then commercial providers will be incentivised to provide it. Algorithms and processed data could be kept proprietary and commercially viable while the less processed data is made available on an open basis.

We asked - What specific problems in your domain could benefit from an interoperable approach?

Participant responses:

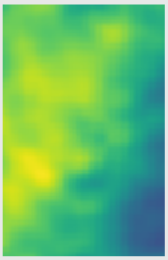
- Measurement, reporting and verification of Soil Carbon at different depths is a priority, as is better understanding of the impacts of different management strategies used on these soils.
- The creation of standardised derived indicator 'data' on PA and archaeology relevant soil properties with the detail about how it was derived from the raw data would be beneficial. This would provide a reference dataset usable in PA and archaeology which is uniform which can be linked back to less processed data to assess its reliability as needed.
- Benchmark datasets for calibration and validation are needed against which different analytical approaches can be tested. → Archaeological fieldwork may potentially provide calibration/validation sampling data for users of remote sensing data.
- PA needs more calibration data, e.g. physical samples of soils which are analysed, for the modelling and analytical approaches they apply. RS data scales well, it can be collected over increasingly large areas, but calibrations tend to only be valid locally. This doesn't scale well and there aren't good cost-effective mechanisms within PA to collect more calibration data or make it widely available. This problem is less well recognized in archaeology, because as long as local contrast in the RS signal reveals the appearance of buried remains, that satisfies the current basic needs of many data consumers. → Archaeological fieldwork may potentially provide calibration sampling data for users of remote sensing data.
- UAV survey isn't scaling well in PA. Treatments are applied at a coarser scale than UAV data, and the raw data delivered is too difficult to work with (large and detailed) to fit the purpose. Either incentives need to change, e.g. cost of crop treatments increases, to encourage more targeted applications which would require detailed data or other uses for the spatial detail need to be identified. Archaeological assessment would be a justification for this spatial detail.

could you easily ingest this into your platform / archive?

can you think of an application for it that would be relevant?

- why or why not?

Could you / your organisation use the data from this project?



Exchanges focused on barriers and incentives. Sharing data has to be both worth doing (valuable) and implementable (possible and practical).