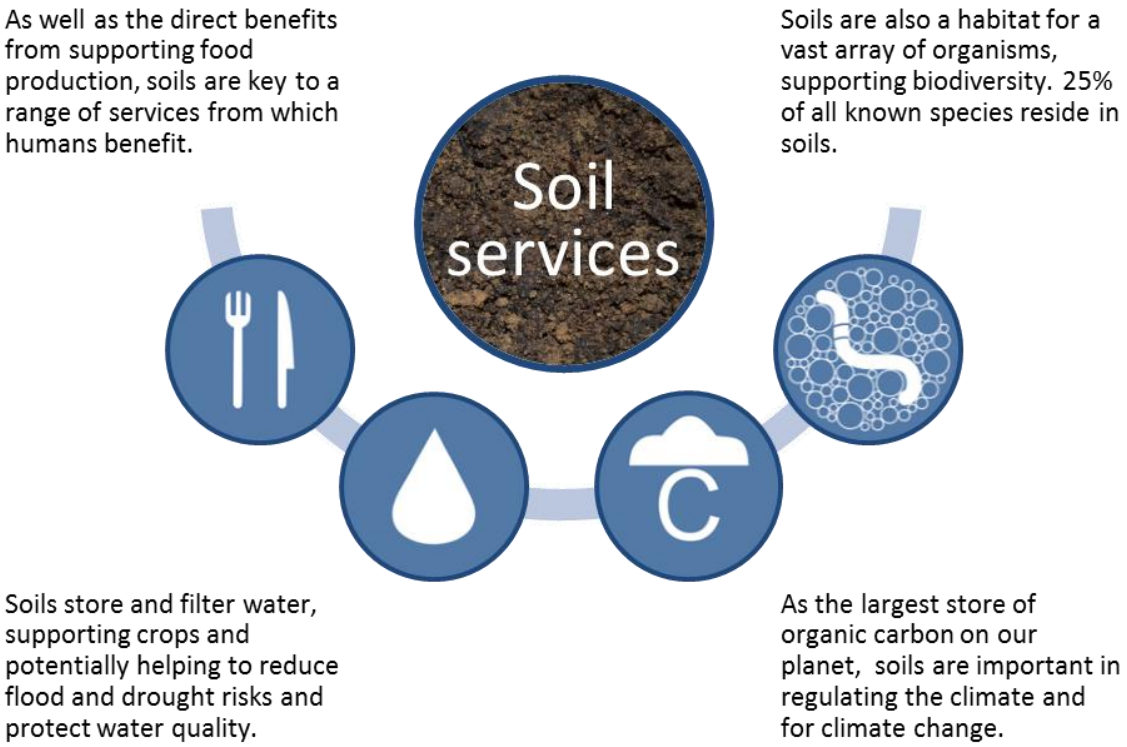
Soil natural capital valuation in agri-food business: An introduction

Dr Victoria Janes-Bassett & Dr Jess Davies
Pentland Centre for Sustainability in Business, Lancaster Environment Centre, Lancaster University, United Kingdom

Why take a natural capital approach to soil?

Soils are a key natural asset for food production. Soil provides nutrients, water and physical support for plants that are critical to agricultural productivity, and the sustainability of farming, agri-businesses and society. Agricultural soils also provide a range of other services with business and public benefits (as illustrated in the diagram below).

Yet soils are under threat. The UN's Food and Agriculture Organisation estimates that over 50% of agricultural soils are moderately or severely degraded.



To secure soils and their benefits we need to get to grips with the current state of this natural asset and the services it provides, and anticipate how these may be threatened, sustained or enhanced by land management choices.

A natural capital approach to soils offers a solution. Evaluating stocks of soil natural capital and flows of services (in financial terms or otherwise) helps highlight the value of soils, the risks of degradation and the benefits of investment and action, allowing soils to be integrated into sustainable decision-making.

Opportunities for sustainable business

Taking a natural capital approach to soils in agri-food businesses, and investing in improving soil natural assets offers five main opportunities:

1. **Business risk and resilience:** Soil underpins the supply chain. If soil natural capital is degrading, then business is at risk. Natural capital evaluation can help understand dependencies on soils, exposure to risk, and help find means for increasing resilience.

2. **Reducing costs:** Accounting for soil natural capital can help motivate changes to practice that has win-wins for soil sustainability and saving costs (e.g. irrigation and fertilisers).

3. **Increased value**: Increasing soil natural capital stocks increases the value of land and the value of agri-food produce in a market where sustainability is of growing importance.

4. **Co-benefits:** A focus on soils can lead to water, carbon, and biodiversity benefits (Fig. 1) that have value for both business and the wider community that business engages with.

5. **Stewardship**: Agri-food businesses directly or indirectly influence land management. Decision-making that maintains or enhances soils and land is key to responsible business and maintaining licence to operate.

How to evaluate soil natural capital?

To realise the opportunities of soil natural capital valuation, we need methodologies that:

1. Capture the whole pathway between drivers, supporting processes, soil natural capital stocks, services and benefits (see Box 1).

2. Consider the range of soil benefits not only crop productivity. The primary services relevant to the agri-business sector are: food production, soil carbon storage, and water regulation.

3. Recognise both private and public benefits, whilst acknowledging that public benefits also have private value.

4. Combine soil data and models to provide a full evaluation of the soil natural capital pathway. Soil measurements can provide an indication of current stock levels e.g. soil carbon storage. However, data needs to be combined with modelling to understand changes to soil stocks and ecosystem services in response to drivers over time, and the value of management options.

Box 1. Capturing the whole natural capital pathway

Accounting for the whole soil natural capital pathway gives insight into not only ecosystem services, but also how natural capital stocks are changing, the resilience of the soil system and the economic implications making the business case for change.

Soil stocks (the amount and quality of the soil) define the capacity of the soil to provide a service of direct human benefit. Soil properties can act as a stock metric.

Supporting processes underpin stocks and services. These can be thought of as supporting services with indirect benefits, and include processes such as nutrient cycling, water infiltration and biological activity.

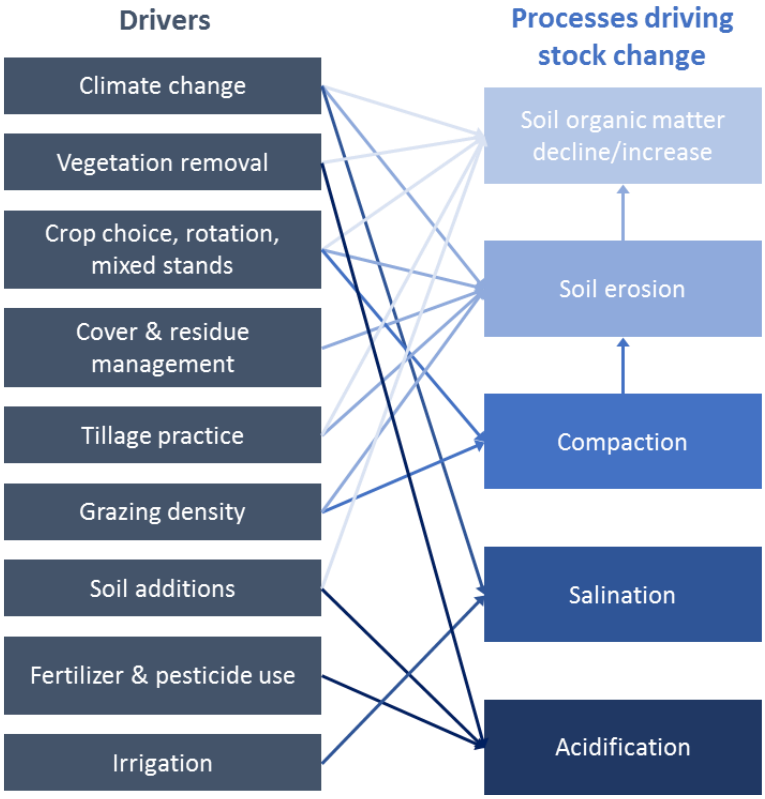
Drivers are human or natural factors that influence stocks and supporting services over time.

Key drivers of soil natural capital change

Soils are influenced by a wide range of natural and human drivers. There are varying levels of scientific knowledge and uncertainty regarding how each driver influences stocks and processes, and the consequences for services and benefits.

It is important to capture the main drivers of change and the land use management options available in a soil natural capital approach to understand business risks and guide land management and investment decisions.

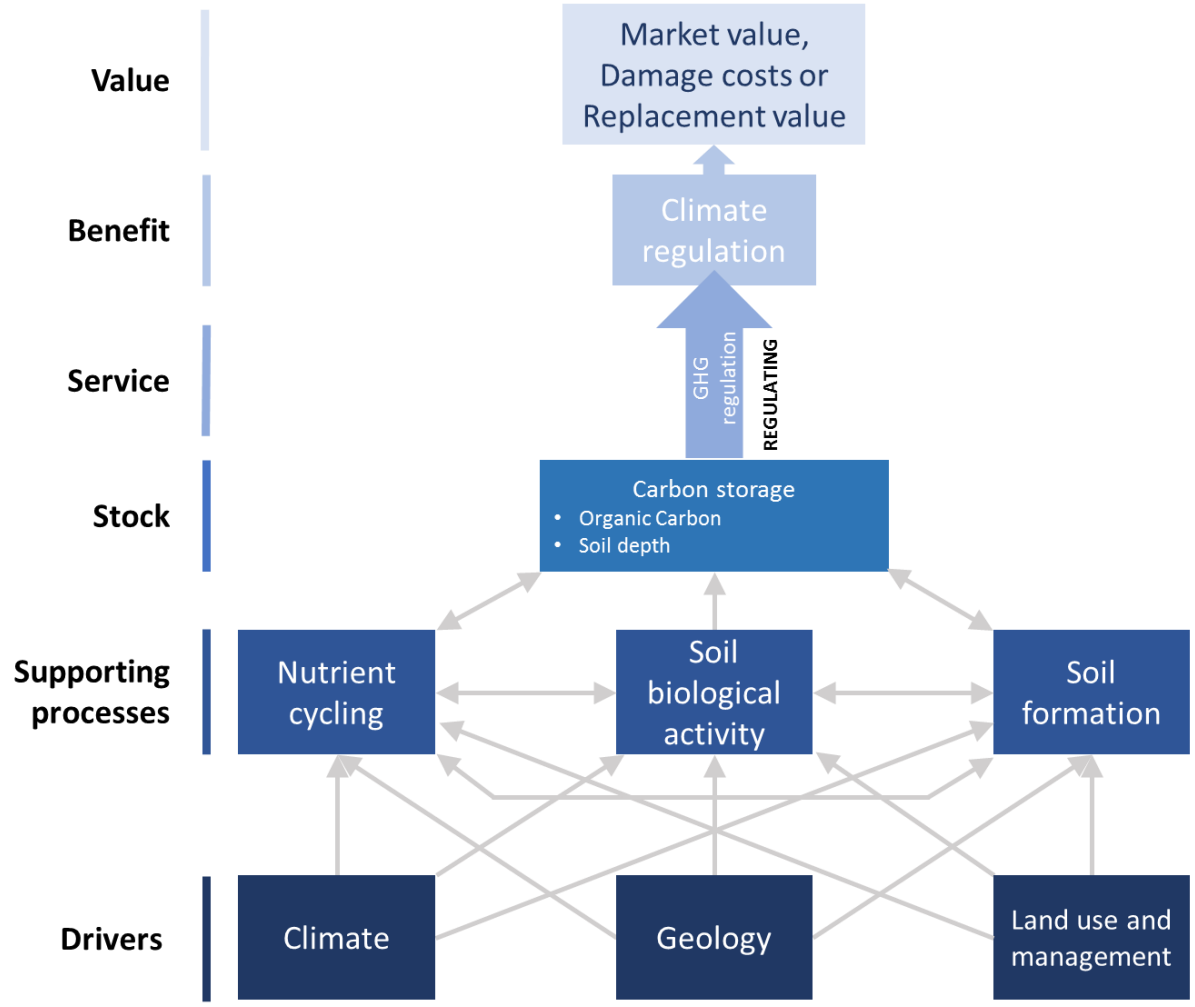
The key drivers will vary with what is being farmed, how and where. However, some common drivers that are relevant to many agri-food contexts are highlighted opposite.



Soil natural capital pathway example:

Soil carbon and climate regulation

The diagram below gives an example of a soil natural capital pathway focusing on soil carbon storage for climate regulation benefits*.



Climate regulation benefits

Soil carbon storage in soils has benefits for climate regulation. Enhancing or maintaining the amount of carbon stored in soils, particularly in agricultural lands where soil carbon has been lost due to past practices, is increasingly being highlighted as an important strategy for mitigating climate change.

* Pathways for soil carbon regulation, as well as crop productivity and water regulation are more fully described in the Valuing Nature Synthesis Report, Janes Bassett, V., & Davies, J.A.C., 2018, 'Soil natural capital valuation in agri-food businesses' available at www.valuing-nature.net from May 2018.

Whilst, soil delivers climate regulation benefits to a global public, there can also be private benefits to businesses as increased sustainability and responsible actions have marketable value.

Soil carbon storage has other public and private benefits beyond climate regulation. For example, increased soil carbon increases soil water storage capacity, helping support crops and mitigate against flood and drought risks. This is why it is **important to consider a range of soil benefits.** Considering the benefits of carbon for climate alone underestimates the value of protecting or increasing soil carbon stocks.

Valuing climate regulation benefits

The value of climate regulation benefits provided by soil can be estimated using; market prices (of carbon), replacement value (alternative carbon storage costs), and damage costs (costs associated with increased atmospheric carbon).

Estimating soil carbon stocks

Stocks of natural capital can be assessed using both data and models. Data provide a means of monitoring current stocks, whilst models provide an estimate of future changes. Soil carbon data is relatively abundant and simple to collect. Soil carbon storage with depth should be considered to give a fuller account of the value of this stock for climate regulation benefits. Models are needed to understand how soil carbon will change in response to future drivers of management options.

Supporting processes

Soil carbon storage is influenced by a range of supporting processes, including other nutrient cycles such as nitrogen and phosphorus, which are highly modified in agriculture. It is important to consider these processes to understand risks to soil natural capital, ecosystems services and the provision of benefits.

Key drivers

Drivers influence natural capital stocks directly or indirectly through their effects on supporting services.

- **Natural drivers** include climate and geology. Climate influences nutrient cycling. For example, warmer climates promote faster decomposition and recycling of nutrients.
- **Anthropogenic drivers** include land use and management practices. Changing tillage practice; crop choices or grazing density; cropping, residuals and cover management; and soil additions such as manure or biochar will influence soil carbon stocks or underlying supporting processes.

Putting soil natural capital into practice

Bridging the science-business gap

Whilst there are gaps in our current understanding of soils and capabilities to predict supporting process and stock changes[†], we know enough about soil processes to start making science-based natural capital assessments using existing data and models. But to achieve this we need to bridge the gap between science and business. This means:

1. **Closer partnerships between business and science** are needed to develop a clearer understanding of the needs, issues and options agri-food businesses have, and establish specific datasets and tools to address these issues. Stronger partnerships can guide the development of relevant science and future of soil monitoring and management practices.

2. **More funding mechanisms that allow science-business co-creation** would allow co-development of science-based soil natural capital valuation methods and road-testing in real business settings. This goes beyond consultancy: to tackle the urgent issue of soil degradation new scientific discoveries that achieve real practice change are needed. This requires funding structures that facilitate both goals.

3. **Developing a community of practice around soil natural capital,** including academia, business, and the wider set of stakeholders that benefit from soil ecosystem services, would accelerate progress. Sharing data, methodologies and applications is key to ensuring the sustainable management of soil natural capital, and the continued provision of vital soil ecosystem services.

[†] Gaps in current capabilities for soil natural capital valuation are summarised in a Valuing Nature Synthesis Report, Janes Bassett, V., & Davies, J.A.C., 2018, 'Soil natural capital valuation in agri-food businesses' available at www.valuing-nature.net from May 2018.

Contact

If you are interested in collaboration or for more information, please email Dr Jess Davies jess.davies@lancaster.ac.uk

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