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Institute of Biological, Environmental and Rural Sciences

Cynllun PROSOIL+ Project

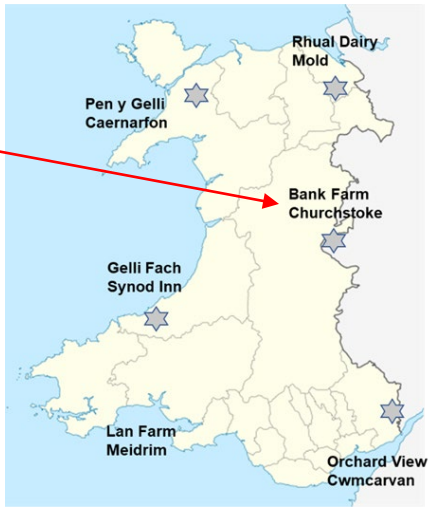
PRIFYSGOL ABERYSTWYTH UNIVERSITY

"Inspiring Farmers to Safeguard Soils"

BANK FARM: A Participatory Research Farm Case Study

Farm Facts

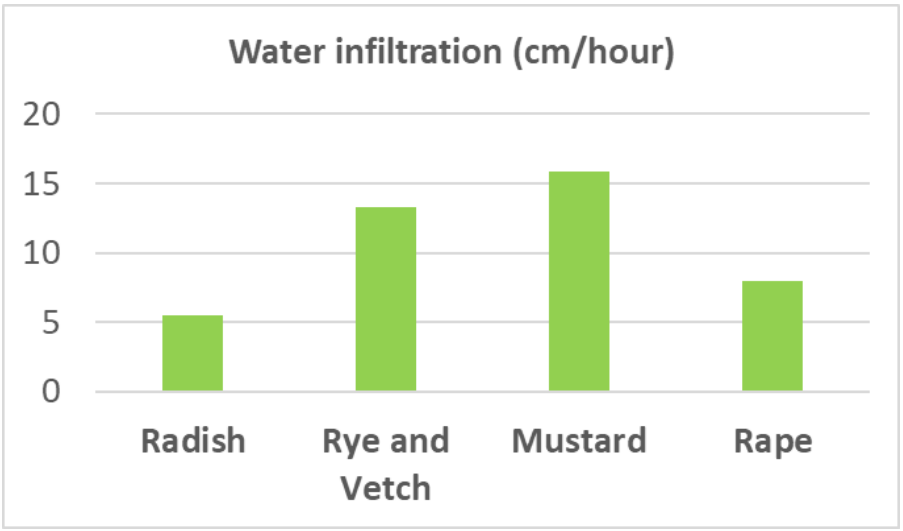
Bank Farm is a dairy farm with arable and sheep enterprises between 275m and 400m asl. The land extends to 131 ha with further grass keep during spring and summer months. Soils are mainly silty loams. The livestock include 120 Dairy Shorthorns, mainly summer calving with 400 ewes including pure Shropshires, Mules and some Lleyns. The Pugh's operate a bio-digester and buy in a small range of clean waste feedstocks to generate electricity and gas for on-farm use. Digestate is applied as part of the fertiliser policy and nutrient management plan to supply crop needs as required.



Clive Pugh

Cover Cropping

Good soil structure is key to the way that the arable, brassica, grass and cover crops are established at Bank Farm. Crops of winter wheat, spring barley and stubble turnips for winter grazing are successfully established by direct drilling. Clive was interested in evaluating cover crop options following barley on the project. The farm's new direct drill was used to establish **mustard, radish, rye & vetch and rape** in mixtures in early September. These were grazed as winter progressed with soil monitoring (surface water infiltration rates; see chart below) also being carried out as part of the project (*data for on-farm comparison only).



This project is funded through the Welsh Government Rural Communities - Rural Development Programme 2014-2020, which is funded by the Welsh Government and the European Union

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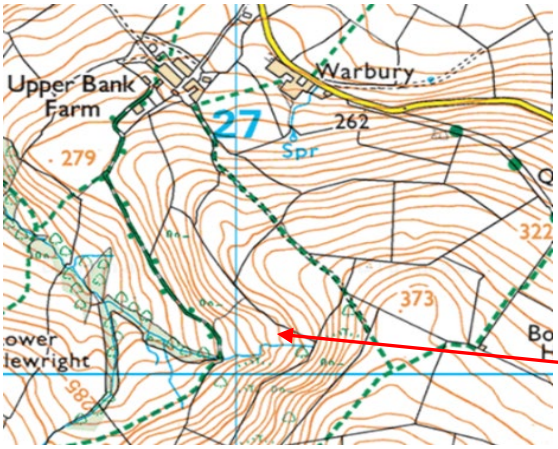
A pilot investigation into methods to monitor weather and land management that enable more effective soil protection on farm

To enable better protection of soils in areas of high livestock trafficking on sloping ground that is subject to potential water run-off, a series in-field "virtual gateways" were studied on areas of bare ground (2m x 1m) aligned down the slope of a selected field site.

The aim was to monitor water and soil movement through these gateways using aerial drone technology. There are five areas marked by the posts visible in the image below leading towards the field boundary. Once the site was prepared, drone flights over the site were planned to gather images. To date, one preliminary UAV flight has taken place to record baseline images.



Source: DigiMap Ordnance Survey

Drone images are processed through software which builds a digital elevation map of the land surface. The soil erosion is related to how much the elevation has lowered; we can also see where eroded soil has deposited - by looking for areas where elevation has increased and this is something that can be done accurately- to millimetre precision. In addition, soil moisture distribution, soil health indicators (such as earthworm numbers) and soil chemical status (pH, and nutrient changes) also provide useful information.

The benefits and limitations of this technology:

1. We can measure the amount of soil erosion and identify precisely where soil has been eroded.
2. We can fly over after each precipitation event, given us a much better idea about how soil responds to each weather event.
3. Changes occurring at the site captured by drone images can be analysed and interpreted with the objective of enabling the farmer to use the information to plan strategies on farm that better protect the soils on sloping ground and heavily trafficked areas.

As a consideration for future work, we found that the use of drones was highly weather dependent; suitable weather windows for operation are infrequent during a time of year when data capture is needed and this approach will require more than one season to capture effective data.

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IBERS PROSOIL Project Research Link

The Sward Establishment Plots of perennial ryegrass and red clover were established either a) by ploughing after glyphosate, b) by direct drilling after glyphosate or c) by direct drilling without glyphosate application. This was to test the hypothesis that direct drilling will produce similar forage yield to the ploughed treatment, but with less cost and less environmental impact.

In summary, we found -

a) Forage yields after re-seeding were significantly greater regardless of how the sward was established;

b) More weed grasses after direct drilling into an existing sward *without* weed control;

c) Yields were comparable from swards established by direct drilling after glyphosate and swards established by cultivation

Main Message:

The COST BENEFIT of direct drilling would make it *the most economic option* with which to establish a new sward containing these species.

Clive Pugh: "I've benefitted a lot from being involved in PROSOILplus; I've found it hugely interesting and informative. I've always been interested in the soil and how everything works in it, and in improving soil health. I've been able to avoid using compound fertiliser as we have digestate from our AD plant available to us which has improved soil N, P, K indices and we've not ploughed land for many years. Using a direct drill since the early 1990's has also improved our soils as the less the soil is disturbed the better".

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