

Sustainable production in the uplands: The Brignant plots at Pwllpeiran

One of the unique research resources at the Pwllpeiran Upland Research Centre (IBERS, Aberystwyth University) is the Brignant plots. These plots have been established as long-term extensification plots for the past 22 years. The aim of these plots is to investigate different management practices on grassland productivity as well as the effects on the supporting ecosystem services. The long-term nature of this project provides an excellent resource to begin to establish best practices for the future that will aid sustainable production systems in the uplands.

The land surrounding these plots has had minimal management over recent years, with a withdrawal of fertilisers for at least the last 7 years. This provides an opportunity to begin to investigate how to renovate land. Through the establishment of Pwllpeiran as a Farming Connect Innovation Site, Farming Connect will be involved in the creation of three additional blocks to the already established Brignant plots, where three innovative renovation treatments will be tested.

Why is this work needed?

Research completed at the Bronydd Mawr Upland Research Centre (Institute of Grassland and Environmental Research, IGER) investigated some of [the long-term effects of reducing fertiliser inputs to upland permanent pasture](#). Experimental plots with 25-year-old perennial ryegrass/bent were established 370-390 meters above sea level in 1990 and four treatments investigated:

1. N, P and K plus lime
2. P and K plus lime
3. Lime only
4. No nutrient application.

Fertiliser was applied annually and lime in 1990 and 2007. Plots were grazed with Brecknock Hill Cheviot ewes and lambs from spring to late autumn each year. Sward measurements and chemical composition alongside animal measurements were taken in 2008.

The study found that the removal of all fertiliser and lime increased herbage biomass. However, when biomass composition percent was investigated it was found that the majority of this increased biomass was comprised of mosses and dead matter (28% and 40%, respectively, of total biomass in no nutrient plots). Similar effects can be viewed on an unmanaged plot within the Brignant plots at Pwllpeiran. Increases of mosses likely prevented germination of plants and therefore reduced the diversity of species in the plots. The reduction of live grasses negatively impacted the nutritive quality of the plots and subsequently reduced liveweight gain of ewes and lambs and the carrying capacity of the pasture.



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Although not as extreme as removal of all fertiliser, the removal of nitrogen alone caused significant changes to the pasture. As would be expected there was a decrease in sown grasses and an increase in white clover. Legumes provide a high source of crude protein in pasture as well as having greater voluntary intake rates compared to traditionally used ryegrass, due to a faster digestion rate in the rumen. Furthermore, legumes are an alternative to the use of nitrogen fertiliser through their nitrogen-fixing abilities and improved soil structure, highlighting their potential as sustainable fodder in the uplands.

Previous work within IGER showed that use of legumes, such as red clover and lotus, in a lowland system improves [liveweight gains](#) and reduces time to slaughter, whilst still maintaining [carcass and meat quality](#). However, in the study at Bronydd Mawr Upland Research Centre, increased clover growth in the nitrogen free fertiliser treatments, had no subsequent effect on liveweight gain of lambs grazing this pasture. It must be noted that the overall percentage of clover within the total biomass from plots was low in all treatments, and thus increasing the proportion of legume varieties in upland pastures would be expected to improve production efficiency.

What will be investigated?

Alongside the existing Brignant plots, Farming Connect will be working with IBERS at Pwllpeirian Upland Research Platform on the addition of 3 new sets of plots on land that needs renovation to improve the production potential. The following will be investigated to test the use of alternative renovation techniques:

1. Treatment with a regeneration harrow. Fertiliser application will also be reintroduced and optimum soil indices will aim to be restored through the use of these techniques.
2. Same treatments as above but also including slot-seeding of a mixture of clovers (red and white) and lotus plants. The depth of knowledge that comes from IBERS plant breeding research will be utilised to choose specific varieties and lines of clover and lotus to be utilised. Specific types that will be suited to an upland system, with the ability to establish in marginal soils and have high grazing tolerance, will be selected. Furthermore, a trial of a new red clover variety will be undertaken, which has exhibited similar growing characteristics to white clover and is therefore more persistent in the sward.

Within both of these plots, the productivity and nutritional value of the swards and soils will be evaluated and compared to controls within the original Brignant plots. Meteorological data and rainfall infiltration; sward biomass, composition and chemical composition; soil structure and carrying capacity of the plots will be recorded over the next three years. The data generated will enable the evaluation of the effectiveness of two upland regeneration practices, with a view of informing future best practice.

3. The final plot will be left unmanaged. There is presently an unmanaged area in the existing plots, which shows a good example of the effects of abandonment. The new plot will initially have the turf removed, before being left for the study period. Adjacent to Pwllpeirian is a woodland area, therefore by stripping the turf, the effects of natural seed sources and potential woodland reversion will be examined.



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How can I find out more?

The plots will be put in in June 2016 and the project will run until March 2019, with data collection occurring throughout the study period. At the end of the project, the findings will be disseminated to Welsh farmers to aid in the development of best practices for the future.