

# an experiment from another age

by Ana María Cetto

**2006** marked the 150th anniversary of the world-famous Park Grass Experiment (PGE) in the UK. This experiment is a valuable resource used for a wide variety of scientific observations, leading to a continuous flow of research papers. It constitutes the longest standing ecological experiment of its kind, exemplifying the value of long-term studies to investigate the effects of external factors on population dynamics.

PGE started in 1856, on a hay field that had been in pasture for at least a century. It was the typical meadow that one could find in Southern England at that time — but that has almost disappeared. The experiment, initiated by John Lawes and Henry Gilbert, intended to examine the effects of inorganic fertilisers and organic manures on the yield of grass for making hay. A field of uniform vegetation composition and soil type was originally divided into 20 plots roughly 20 metres wide and 60 metres long, some of which were further subdivided at the beginning of the 20th century. A variety of fertilizer treatments were established and continue to be applied on a regular schedule to the present day. There are also three control plots that are not fertilized at all. The plots are cut

each year for hay, usually in June, and a second cut is taken in the autumn.

Within a couple of years, Lawes and Gilbert confirmed their hypothesis by observing increases in the yield as a result of the application of certain fertilizers. However, they also recorded a dramatic reduction in plant species growing on the fertilized plots.

The comparison among the plots today is much more striking. As a result of the treatments they have been subject to over 150 years, the Park Grass communities now represent a wide variety of grassland types. These differ in species richness, net primary production, and soil status. Some are scattered with colourful flowers, others are plush and green, while a few have a felt-like carpet of vegetation. Of particular interest is the dramatic difference in diversity: there are as many as 50-60 species on the unfertilised plots but only two or three species on some of the fertilised plots! Broadly stated, the more nutrients you add, the fewer species you get.

Most people who come across this result for the first time react with surprise: we tend to focus on

*The Park Grass experiment is a scientific lesson on how to boost productivity and destroy diversity — or how to look for long-term impact and sustainability.*

the positive short-term effect of fertilizers on crop yield, but much less so on the longer-term negative effect these same fertilizers have on species diversity.

According to Keith Goulding, a PGE specialist, the wealth of material accumulated over 150 years has allowed research into some unexpected areas. Some scientists have analysed radioactive elements on the grass samples.

They were able to identify plutonium coming from nuclear tests, and, because of the sensitive equipment used, they could tell exactly which nuclear tests it came from. Further research has included testing for other atmospheric pollutants and examining the impact of climate change on ecology.

In recent years, scientists have noted that plant species on adjacent plots have been evolving, responding to the constraints of a particular soil type. They are looking at evidence of 'genetic bottlenecks' and the impact these have had on diversity.

Scientists agree that the long-term nature of the project makes it impossible to assess where the next discoveries will be. Says Jonathan Silvertown,



**An aerial view of the Park Grass Experiment.**

Photo: Rothamsted Research

PGE specialist: "One thing that long-term experiments teach us... is that the longer you study something, the more surprises there are."

These long timescales are essential for understanding future ecological problems. Dr. Goulding agrees: "Short-term experiments are very good for answering specific questions, but if we want to develop truly sustainable systems we need to look at them in the long term."

*park grass experiment*