Working towards **sustainability**

Andy Boland
Teagasc Crops, Environment and Land Use Programme

Increasingly, international buyers will only pay a premium price for products which can be demonstrated to be verifiably sustainable. This report from the recent Teagasc environment conference shows that researchers are finding new techniques to verify that our farm output is environmentally sustainably.

Habitats

According to researcher Dr John Finn of Teagasc Johnstown Castle, many sustainability assessments struggle to include and implement assessments of farmland biodiversity. This is despite farmland habitats (e.g. hedgerows, ponds, woodlands and species-rich grasslands) being quite common on Irish farmland and biodiversity being an important pillar of environmental sustainability.

In addition, many Irish agri-food companies are seeking environmental accreditation by benchmarking against internationally recognized standards, e.g. the Sustainability Assessment Initiative (SAI) platform.

A common requirement of environmental accreditation standards that include biodiversity is the provision of a farm habitat map. Traditionally, habitat surveys involve visits to individual farms, which is expensive and time-consuming. Teagasc has been working closely with Bord Bia on a pilot project to develop cost-effective and scalable methods to efficiently map farm habitats.

Farmers were invited to participate in the project, with a total of 187 dairy, beef and arable farms agreeing to an ecological survey of their farmland. Three separate methods of habitat identification were conducted and compared: orthophotography, orthophotography coupled with farm-level photos and an on-the-ground habitat survey.

Aerial photography is an excellent starting point for identifying semi-natural wildlife habitats (Figure 1). A habitat map was produced that is the starting point for a farm wildlife plan, e.g. as required by SAI platform (Figure 2).

"Once a habitat map is generated, we can develop a short customised farm habitat plan that can satisfy the requirements of sustainability assessment criteria, e.g. the SAI platform," says John Finn. "The farm habitat plan contains a habitat map for a farm, the area of each habitat type on the farm, general information on the wildlife benefits and important management practices of the habitats that occur on an individual farm as well as photos of the habitats that occur on the farm."

Water

Dr Jenny Deakin, a catchment scientist with the Catchments Unit in the Environment Protection Agency, told the conference that national water quality monitoring data shows that 45% of rivers, 54% of lakes, 68% of estuaries, 24% of coastal waters and 8% of groundwaters that were monitored had unsatisfactory water quality in the most recent period from 2013 to 2015 (DHPCLG, 2017).

When all water bodies, including those that are not monitored, are included, the data show that approximately one third of water bodies are at risk of not achieving their Water Framework Directive objectives. This equates to 1,360 river and lake water bodies.

"The key issue in freshwaters is excess phosphorus leading to eutrophication of our waterways, although there are also excess sediment issues arising in places.

"An intensive assessment process conducted by the EPA with support from RPS consultants, local authorities and Inland Fisheries Ireland, has shown that agriculture is a significant pressure in approximately 60% of impacted rivers and lakes," said Jenny Deakin.

> "The farm habitat plan contains information on wildlife benefits and important management practices of the habitats

"The next greatest impact is caused by urban discharge, hydromorphology (pressures causing impacts on the physical integrity of the aquatic habitat), forestry, peat-cutting and domestic wastewater.

"The next step is to conduct a series of investigative assessments or stream walks, to narrow down precisely where and what the problems are in the catchment areas of each water body that is at risk, with the specific aim of figuring out how best to address them."

Resources are being sought from the Department (DHPCLG) to enable this to be carried out. Community and stakeholder engagement will also play an important role in the process which is being facilitated by the new Waters and Community Office (http://watersandcommunities.ie). The philosophy is that to see water quality improvements we need to invest in identifying and implementing "the right measure in the right place", and to support local communities in playing an active role in protecting their water resources.

Recent research shows that the form of fertiliser used on farms has the potential to decrease greenhouse gas emissions without reduction of the fertiliser rates which underpin productivity.

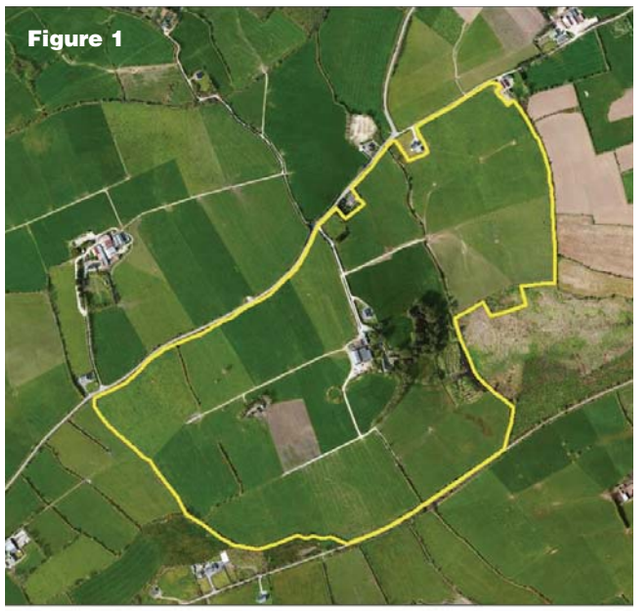

Figure 1

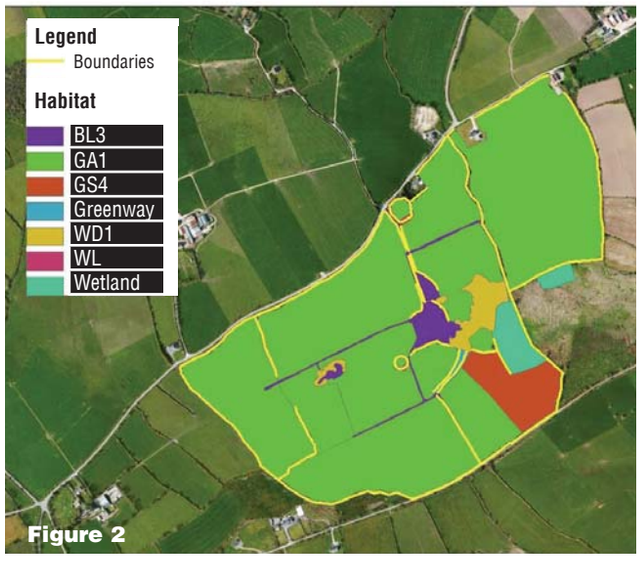

Figure 2

Fertiliser

Recent research led by Dr Patrick Forrestal at Teagasc Johnstown Castle shows that the form of nitrogen fertiliser used on farms has the potential to decrease greenhouse gas emissions without reduction of the fertiliser rates which underpin productivity. The type of nitrogen used, as well as the quantity, is therefore a key metric in sustainability.

In Patrick Forrestal's work, unprotected urea had a lower recovery efficiency compared with CAN and protected urea had the highest N recovery efficiency. At lower N application rates (<40kg/ha/application) differences were non-significant, but as the N rates increased the efficiency gap between urea and the other two products widened. The practical implication of this is that protected urea is consistently as efficient as CAN, and urea is less efficient during the summer or at higher N rates, e.g. silage.

When applied throughout the year CAN, urea, and urea protected with the urease inhibitor NBPT gave comparable annual grass dry matter yields. On average, urea was a little better yielding than CAN for spring with 103.5% of the yield of CAN. In contrast, summer-applied urea was a little poorer yielding than CAN with 98.9% of the yield of CAN.

These results are as important for the environment as they are for production costs. When N fertiliser is applied to soil, a portion of this N is lost as the very potent greenhouse gas (GHG) nitrous oxide. Nitrous oxide is approximately 300 times as damaging as CO_2 emitted from your car and 12 times more damaging than the methane emitted by dairy cows. Ireland has committed to reducing national greenhouse emissions and the agriculture sector, which is growing, accounts for one third of these emissions.

Recent research has shown that of the three fertiliser N options, CAN has the highest and most variable GHG loss in Irish grassland conditions. In comparison, the urea-based options reduce losses of the potent GHG by approximately 70%.

Ireland has committed to reduce ammonia gas emissions by 5% by 2030. This is a significant challenge for a growing agricultural sector which produces 98% of national ammonia emissions. Urea protected with NBPT has been show to cut ammonia loss by 79% on average compared with untreated urea under Irish conditions. The result is that ammonia loss from protected urea was not significantly different to CAN which has minimal ammonia gas loss. Each fertiliser N option has strengths. However, based on research in Irish grassland conditions, across three contrasting soils and two years, protected urea fertiliser (urea plus NBPT) is a promising option for an agriculture industry seeking to grow sustainably.