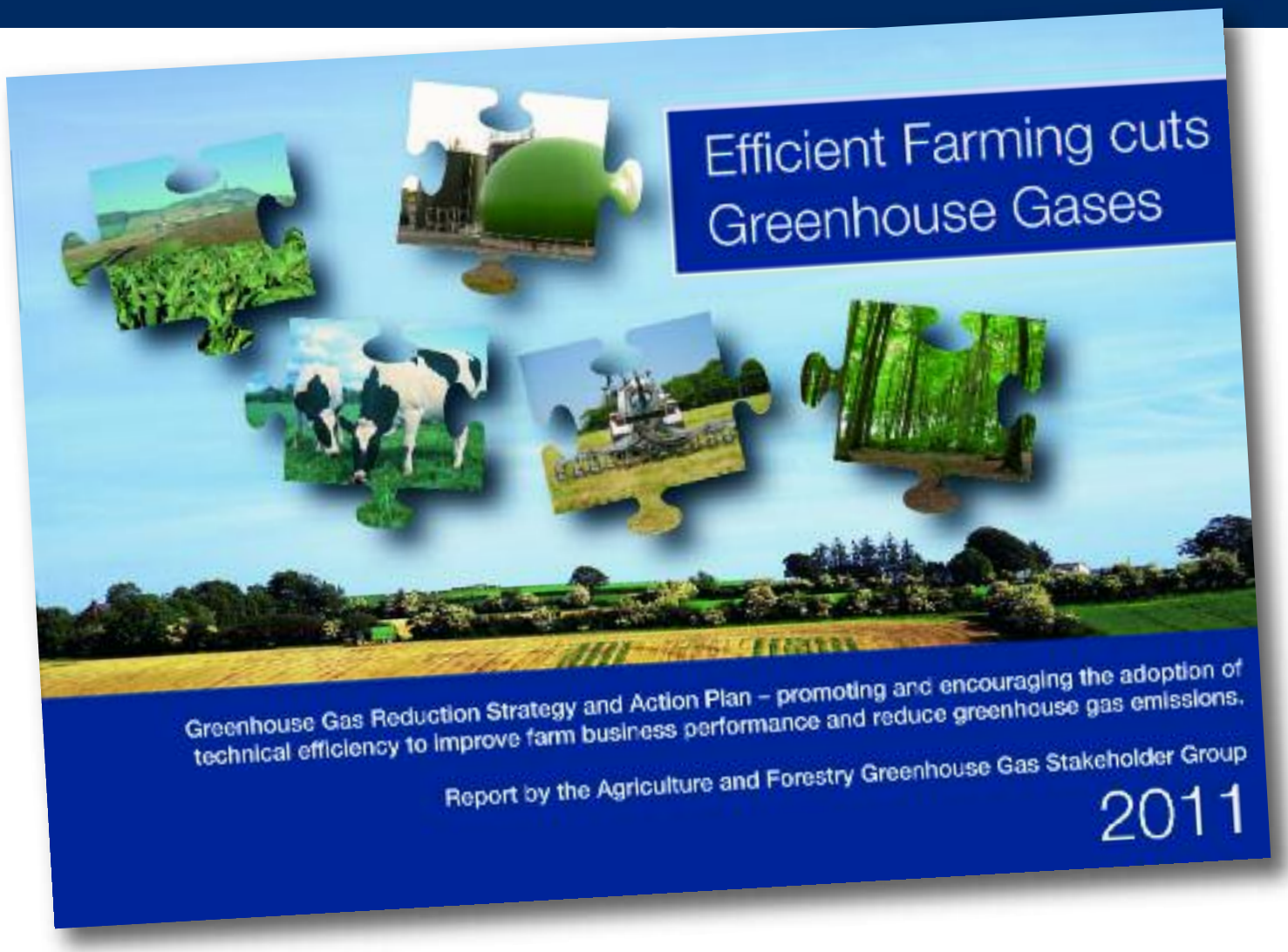
Farmer Case Studies

How to reduce costs and cut Greenhouse Gas (GHG) Emissions



http://www.dardni.gov.uk/efficient-farming-cuts-greenhouse-gases-2.pdf

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AN ROINN
Talmhaíochta agus Forbartha Tuaithe

MÄNNYSTRIE O
Fairms an Kintra Fordèrin

Case Studies Index

Case Study 1

Dairy – Nutrient Management

Pat Lavery farms on the edge of Lough Neagh in County Armagh. The farm land runs down to the banks of the River Bann. The layout of the farm requires Pat to farm in an environmentally sensitive manner, with continual monitoring that the high standards set for the farm are maintained.

Currently the farm runs a dairy herd of 90 Holstein / Friesian cows plus followers. High physical and financial performance is achieved, with a rolling yield of 8,100 litres of milk sold per cow per year and over 4,000 litres taken from forage. This level of production coupled to controlled overhead costs places the farm business in the top quartile of CAFRE benchmarked farms.

To achieve these results the focus for Pat is growing and utilizing quality grass for either grazing or silage by the herd. Stocking rate is maintained to ensure the organic nitrogen loading on the farm remains less than 170 kg N/Ha.

To consistently meet these targets for herd performance and environmental standards, Pat recognises the importance and value of nutrient management planning. Soil analysis is a matter of routine on this farm with all fields analysed on a 5-6 year cycle. To help plan fertilizer applications throughout the year, Pat uses the on-line nutrient management calculators developed by DARD. Zero-P fertilizer has been used since 2003 with phosphate only purchased and applied where soil analysis and crop demand show a requirement.

The Lavery farm has been part of an AFBI research project since 2005 monitoring the impact of management practices on soil fertility and crop yields. As a result of this work lime is spread annually to ensure optimum pH for fertilizer efficiency and inorganic fertiliser with added sulphur is used to grow grass for second cut silage.

The farm always had sufficient slurry storage capacity but to ensure all slurry could be stored and used at the correct time an additional tank was constructed under the Farm Nutrient Management Scheme. Over the past three years the farm has fully utilized slurry nutrients by a combination of soil analysis, correct timing of application as a result of storage flexibility and using the services of a contractor to spread the slurry by either trailing shoe or shallow injection.

Case Study 1

Pat says – “some farmers may consider nutrient management planning as a waste of time, however to me it is essential as it makes good economic sense. The results I have achieved testify to the benefits. In addition the latest information from research shows that efficient farming and utilizing all farm resources effectively has a positive environmental impact, reducing green house gas production. Efficient farming to make money is my aim and I want my system to be sustainable for whoever farms after me – in essence it is commonsense”.

Benefits seen:

- Annual planning of fertilizer requirements.
- Since 2005 a 50% reduction in chemical fertilizer usage.
- Improved herd profitability.
- Reduced N fertilizer usage leading to less nitrous oxide production.
- Improving efficiency has reduced greenhouse gas emission per litre of milk.

Challenges faced:

- Maintaining sward productivity under difficult weather conditions.
- Ensuring compliance with regulations.
- Milk price volatility.

Case Study 2

Arable (Potatoes) – Nutrient Management

Ian McMaster, Broughshane

Ian has been developing the family potato business with his wife Laura outside Broughshane since the year 2000 and has recently been joined by his son Robert. Ian's potato enterprise involves the growing of 35-40ha of processing potatoes annually. These are processed through the diversification business 'Chip Master' which supplies local chip shops and restaurants with fresh pre-prepared potato and vegetable products.

Attention to detail with Potato production and storage

Ian's approach to growing the crop focuses on careful field selection to maximise yield potential. This involves selecting free draining fields which allow flexibility in field operations and where possible larger fields which allow for more efficient field operations. Ian also aims to rent grassland from dairy farms which generally has higher nutrient content and this approach combined with detailed nutrient management planning ensures efficient fertiliser usage taking account of any available organic manures. This attention to detail has consistently enabled Ian to grow high yields of suitable quality potatoes to be processed through the 'Chip Master' business. The crop is stored on the farm in a combination of ambient and refrigerated storage. The stores are computer controlled to ensure efficiency and the refrigerated section was sized to fit with the requirements of the business helping to reduce empty space in the store which would make the refrigerated store require more energy. When possible any extra space in the store is sub-let to ensure the store is as full as possible. This practice combined with empty boxes being returned to the store as it is emptied, further reduce energy use.

Case Study 2

Reduction of food miles

The 'Chip Master' business supplies over 1500 tonnes of processed potatoes and vegetable products directly to shops and restaurants each year. The result is that Ian's potato crop is grown processed and consumed within a 50 mile radius, having a major beneficial effect on the food miles incurred and hence carbon footprint as much of his product has substituted previously imported frozen chips and potatoes.

Improvement of processing facilities

Ian continues to strive for improved efficiency and has recently upgraded the processing facilities with the help of DARD's Processing and Marketing grant scheme which has streamlined handling of the crop.

Benefits seen

- Reduced growing costs.
- Improved yields.
- Returns improved by adding value to the crop.
- Improved efficiency in the field and in the factory.
- More efficient practices have helped to reduce carbon output.

Challenges faced

- Diversifying into a new business.
- Ensuring there is attention to detail at all stages to maintain quality.

Case Study 3

Arable (Barley & Wheat) and Woodland – Nutrient Management & Locking in Carbon

Allan Chambers, Downpatrick

Allan farms 284 hectares near Downpatrick in partnership with his brother David. The farm has always been renowned for efficient farming, typified by the fact that the first grey Ferguson tractor in the north of Ireland was purchased by their father following a demonstration in 1936. The openness to adopt new technology to improve efficiency remains in the business today, but not at the expense of good traditional husbandry methods, which help maximise yields.

The cereal yield figures for the farm are impressive, with 2011 harvest yields currently 9.98t/ha for Winter Barley 9.96t/ha for Spring Barley, and Winter Wheat so far yielding 12.1t/ha.

These yield figures are achieved through 3 key areas, all of which help reduce the emissions per ton of cereal produced.

1. Efficient use of nutrients

Allan applies all crop nutrient requirements on the basis of soil analysis and according to the DEFRA RB209 fertiliser manual to maintain yields and avoid waste. Allan has also achieved further efficiency and carbon reductions through the use of organic manures, especially broiler litter of which the farm uses 1000 tonnes per annum, replacing approximately 100 tonnes of chemical fertiliser. This has brought two benefits firstly a cheaper nutrient source but secondly improved soil condition and earthworm activity have helped ease cultivations.

2. Good crop rotations

Allan has always focused on the overall farm efficiency and recognises the benefits of break crops both in improving soil structure and in spreading workload. Spring break crops are the key focus as these fit best with the efficient use of organic manures by ensuring the maximum availability of the nitrogen. The current break crops are potatoes, linseed, forage maize and 2 year Italian ryegrass for haylage production.

3. Effective land use

Thirteen years ago Allan recognised that there were areas of the farm which were less productive and difficult to farm which were limiting field operations and reducing average yields. With the assistance of the woodland grant scheme, 16 Ha of native woodland were established to produce wood from these less productive cropping areas. This resulted in a more efficient arable crops enterprise, improved biodiversity, and also created a carbon sink on the farm.

Case Study 3

Efficient machinery and equipment policy

Following their fathers approach to the grey Ferguson tractor, Allan and David recognise the benefits of new efficient machinery developments in improving work rates and timeliness of operations. However, they are also focused on maximising the working life of equipment through good maintenance, helping to reduce costs and their carbon footprint further. Where sufficient work does not exist on the farm to fully justify owning a machine, long standing relationships have been developed with local contractors to supply these services, reducing costs and improving efficiency.

Benefits seen

- Costs have decreased.
- Chemical fertiliser usage has decreased.
- Improved soil condition.
- Easier cultivation.
- Spread of workload.
- Better field efficiency.
- Improving efficiency has reduced carbon emissions.
- Increased yield.
- Improved biodiversity.

Challenges faced

- Increased management required.
- More co-ordination of field operations required.
- Ensuring timing of operations fits with rotations.
- Making sure nutrition levels are optimised for each crop.
- Ensuring compliance with regulations.

Case Study 4

Sheep – Livestock Management - Improving Upland flock performance

Maurice McHenry, Ballintoy.

Maurice and his family farm a 120 ha hill farm on the North Antrim Coast. This is an extensive hill farm comprising of large areas of heather moorland and rough grazing, with only 6 ha of improved grassland. They run a crossbred ewe flock of 260 ewes and 50 replacement hoggets.

His emphasis has been to develop a closed crossbred flock that will achieve a good lamb output by, selection of breeding stock based on recorded information through his Electronic Identification recording system.

Maurice has been involved in assessing a wide range of breed crosses on his farm as well as a number of research projects including resistance in fluke/worm drenches, lameness in sheep and the use of selenium/iodine boluses. Through these projects he has recognised the benefits of crossbreeding and changed his system from a blackface flock to a crossbred flock.

Maurice states that:

“I am more interested in how a sheep performs than how she looks. This is why the EID recording package has been so useful to us, as we can now select replacements which exploit genetics selected for hybrid vigour and performance.”

Case Study 4

Benefits seen:

- Lamb rearing % has increased by 20% over the last five years.
- Kgs carcase produced/ha has increased by 25% over this period.
- Kgs carcase sold per ewe has increased from 21kg to 28kg over the 5 year period.
- Gross Margin /Ewe has improved by 22%.
- The flock is now a self replacing flock.
- The improvement in performance has helped to lower the carbon emissions per kg carcase.

Challenge faced:

- Getting Rams with recorded figures.
- Making more and better use of the information within the EID recording package.
- Getting more out of grass through better utilisation and management.

Case Study 5

Sheep – Livestock Management using records to build an efficient ewe flock

John Martin, Greyabbey

John farms the 78 ha Gordonall Farm in Greyabbey. Sheep are the main enterprise with 450 breeding sheep, including 100 homebred ewe lambs.

The emphasis is to develop a composite flock of breeding sheep with reduced labour requirement and high output, by focusing on genetics, animal health and feed efficiency.

Crossbreeding is a top priority. All sires purchased are performance recorded with selection for maternal traits.

To make best use of grazed grass, a significant proportion of the flock are turned out to grass 4 weeks before lambing and lambed outside.

John is involved in the easy-care management research through AFBI, Hillsborough.

“I used to select my ewe lamb replacements on appearance. But for the past 4 years I’ve been using the Hillsborough Management Recording Scheme to identify my best performing ewes - those for fertility, high growth rates and no lambing problems. The recording takes time but if I can increase my lamb output while reducing labour, in the long term it is worth it. ”

Case Study 5

Benefits seen:

- Feed costs and labour costs have decreased.
- Overall flock health has improved.
- Lambs sold per ewe has increased by 11%.
- Kgs carcase produced / ha has improved by 30%.
- Gross Margin per ewe has increased by 44%.
- Improving the technical performance of the sheep has lowered costs of production and carbon emissions per kg of carcase produced.

Challenges faced:

- Sourcing quality performance recorded rams.
- Getting into the mindset of recording all lambing and other flock data on a Personal Digital Assistant (PDA).

Case Study 6

Dairy – Livestock Management (2)

Drew McConnell

Drew and Val McConnell and family, farm in the very scenic area of Carrigans, Co Tyrone just on the edge of the Sperrins. The home farm is now in the third generation of McConnells and extends to 77 Ha. An additional 48 Ha is rented annually and all the land farmed in Less Favoured Area of predominantly heavy clay soil type. Rainfall is over 1250 mm each year thus the farm requires attention to detail and flexibility in management practices to avoid poaching and structural damage to allow the farm to remain productive and profitable.

Since taking over the farm in 1993 Drew and Val have undertaken significant farm development with investment in land improvements, milk quota and new buildings. The main enterprise on the farm is a 150 cow autumn/winter calving Holstein / Friesian herd rearing 80 dairy heifers for own use and sale. As some of the farm rises to over 230 metres, suckler cows and a flock of breeding ewes utilize this severely disadvantaged land.

Drew says “the key objectives for the farm are four fold –

- to maximise profit per hectare
- to improve cow comfort and welfare
- to have a labour efficient working environment
- farm in an environmentally positive manner
- to continue farming in a manner which gives satisfaction and enjoyment within the constraints of farm resources.

To try and meet these objectives is a team effort by all involved, everyone has an important role to play.”

The results achieved demonstrate how effectively the farm is managed. The dairy herd has an average 305 day yield of 9,529 litres of high compositional quality at 4.24% B.F. and 3.38% Protein. A target has been set to increase life time yield to 40,000 litres by improving cow longevity. This will reduce greenhouse gas emissions by X% through reductions in replacement rate.

Drew continues “to do so means cows which are bred for improved health and fertility, with good legs and feet and the capacity to effectively utilize grass and grass silage. Through our management input we must seek to provide an environment where the cow can achieve her genetic potential and maintain a high herd health status.

Case Study 6

This is why we place so much emphasise on cow comfort and welfare. The milk market is demanding and we must try to meet these market requirements through a sustainable production system."

The McConnell family are actively involved in a number of research and knowledge and technology transfer projects with AFBI, CAFRE and private sector partners. A comment was made by the family "all the research evidence shows the importance of having healthy productive livestock to minimize the number of lost or empty days. This is what good farming is all about and if we can help get this simple message across through our involvement in these projects. We have applied the research findings across a range of areas on the farm. Particular emphasise have been placed on heifer rearing, dry cow management and milk compositional quality and all have contributed to the successful and better management of the farm and in doing so addresses the real need to produce milk with a low carbon footprint. In fact through a DARD Research Challenge Fund led by Agri-Search we are piloting a new Greenhouse Gas Calculator currently being developed by AFBI. If our farm can be used to demonstrate the benefits to other farmers of implementing research and using new tools such as the carbon calculator, then we are only too pleased."

Benefits seen:

- Milk production from forage is 3400 l, 50% than the average farm.
- Costs of production per litre 20% lower than the average farm.
- Improved herd fertility and lower replacement rates reducing GHG emissions by X%.
- Profitable and sustainable dairy farming system.

Challenges faced:

- Dairy farming in the Less Favoured Area.
- Increasing costs of production.
- Further legislation.

Case Study 7

Beef – Livestock Management improving productivity from the suckler herd

Billy O'Kane, Ballymena.

Billy O'Kane runs a 400 acre all grass farm at Crebilly near Ballymena. The main enterprises are beef and sheep production and the farm currently carries 90 spring calving beef cows and 1,000 outdoor lambing ewes.

His emphasis is to maximize returns through efficient production and enjoy farming by adopting lower input beef system. Key to this is utilising genetics selected for fertility, docility and easy calving. This has enabled heifers to be calved down at 24 months of age rather than 36 months and beef to be produced from a predominately grass based system.

In 2005 the decision was made to introduce the Stabiliser composite breed. The Stabiliser was developed through a large scale research programme in Nebraska. Stabiliser bulls have been used on the herd over the past six seasons and the herd will be 85% Stabiliser bred by 2012.

Billy states that 'calving at 24 months of age rather than 36 months brings financial benefits to my business of £44 for every cow in my herd and reduces the environmental impact of every kilo of beef I produce'.

Benefits seen:

- A tight calving period.
- Fewer resources are invested in the heifer.
- By calving heifers at 24 months, there are 12% less stock on the farm.
- Calving index less than 365 days.
- Weaning 96 calves per 100 cows put to the bull.
- Producing 350kg carcases in 14 months from bulls fed less than 1 tonne concentrates.

Challenge faced:

- Producing heifers weighing 420kg ready for bulling at 15 months.
- Making more use of grass/clover swards.

Case Study 8

Beef & Sheep – Livestock Management increased reliance on clover reduces GHG emissions

John Milligan, Castlewellan

John farms 79 ha of LFA land, 36 ha on his home farm between Spa and Castlewellan, with the remaining block near Dromara. His main enterprise is beef and sheep. The 55 suckler cows, producing stores and finished beef, are served with a Limousin bull and some A.I. Additional dairy bred Angus and Hereford cross calves are bought in to improve output per cow. The 220 ewes, served with Texel, Charollais, Lleyn and Rouge rams, have a lambing percentage of around 170%. The overall stocking rate is 1.9 CE/ha.

John's aim is to maximise stock liveweight gain from grass and clover. This involves planned reseeding and sward improvement using a range of methods to ensure high quality grass and clover and attention is paid to grazing management.

Grass and clover varieties sown are selected from AFBI's recommended list. Fertilizer nitrogen application is minimised by increasing reliance on clover and making more efficient use of slurry. Grazing is rotational on the main farm block to maximise efficiency in grass utilization. This allows grass and clover to be rested and given a chance to build up high quality herbage for the next grazing in the rotation.

John says 'While I have raised stocking rate and made significant cuts in some inputs I intend to continue to improve profitability by further increase in stocking rate without significant increase in inputs. With this higher efficiency I expect to make further reduction in GHG emissions.'

Case Study 8

Benefits seen:

To farm business

- Liveweight gains have increased.
- Target weights are reached earlier.
- Less concentrates are needed during the winter.
- More grass is available to flush ewes in autumn.
- Profitability has increased.

To GHG emissions

- Reduced by more than 10% due to:

  - minimum cultivation (less carbon dioxide)

  - reduced N fertiliser usage (less nitrous oxide)

  - improved animal production efficiency (less methane).

Challenges faced:

- Maintaining adequate clover in swards.
- Continuing:

  - to increase stocking rate and output at current input

  - to reduce emissions.

Case Study 9

Horticulture – Mushrooms - Energy Efficiency Cuts Carbon

McKeever Bros

The Co Tyrone mushroom unit of Anthony and Declan McKeever produces over 200 tonnes of mushrooms annually from seven tunnels.

Following an energy audit on their unit carried out by CAFRE they have introduced a number of energy efficiency measures.

A new 70 kW condensing boiler was installed in January 2011 to supply hot water for a number of the tunnels, replacing an old inefficient oil boiler. The new boiler works at above 90% efficiency compared to the 65% level of the original boiler.

Oil Savings

This change is reflected in the oil consumption figures for the unit. In 2010 total usage was 23,760 litres. To mid September 2011 the usage has been 14,000 litres. Considering the seasonality of production this indicates a total usage in 2011 of around 18,500 litres, a 22% reduction on the previous year. This has been achieved in spite of an increase in the tonnage of mushrooms produced in the unit. **The use of 5,260 litres less oil means a reduction in emissions of 14 tonnes of CO2 annually on an ongoing basis.**

Insulation

Insulation of the water distribution pipe-work was inadequate and this is currently being upgraded with proprietary district heating pipe-work costing £42 per metre.

Studies indicate that using this type of insulation can reduce heat loss by up to 70% compared to the previous thinner nitrile rubber covering

Reducing heating and cooling costs

The tunnels have been covered externally with Nicotarp. This costs £2,000 more than the conventional plastic covering. However, it has better insulating properties and therefore reduces both the heating and cooling costs for the unit.

The energy efficiency measures made to date have contributed both to an improved financial margin and a reduced carbon footprint for the unit.

Case Study 9

Lighting

The lighting in the tunnels is being progressively upgraded from switch start fluorescent tubes to electronic start fluorescents. These are 20% more efficient. These changes are reflected in the changes in the annual electricity usage. Total electricity usage in 2010 was 48,025 kWh and based on bills to date will be around 40,000 kWh in 2011. This reduction of 16.7% represents an annual CO2 emission reduction of 4.4 t.

Benefits seen:

- Costs have decreased.
- 22% reduction in oil use.
- 16.7% reduction in electricity use.
- 18 t CO2 emissions saved annually.
- Better energy efficiency.
- Heat losses reduced.
- Carbon footprint reduced.

Challenges faced

- High cost of pipework.

Case Study 10

Arable – Wheat - Renewable Energy Cuts Carbon

Kane Bros, Limavady

Michael and Boyd Kane grow 180 ha of cereals and 15 ha of SRC willow in Limavady. In 2008, they installed a 110kW woodchip boiler to provide the heat for their grain drying floors. Around 1500 tonnes of winter and spring crop is dried with this system. The drying floors are also used to dry around 200 tonnes of willow-chip each year which is used to fuel the boiler and provide a high quality fuel for sale. Heat is also provided to the dwelling house and self catering apartments when the dryer is not in use.

What are the financial savings?

We had been using around 30,000 litres of oil for drying, and a further 10,000 litres for heating the house and letting apartments. This oil has been replaced by roughly 160 tonnes SRC willow at 20%MC at a value of £80 per tonne. At a current oil price of £0.58 per litre, the biomass heating system saves us almost £10,500 per year. We still have a bit to go as the recently installed second chip boiler is not yet running to its full capability and we have to supplement peak heating demands with oil. Government figures assume 90% efficiency for oil, whereas we get about 95% using a space heater which blows straight into the drying tunnels.

What other benefits have you seen?

It is encouraging when we hear continually of the rising cost of oil, that we are able to utilise a product grown on the farm to supply a considerable portion of our energy needs, and that the savings increase each time the price of oil goes up. As burning home produced is carbon neutral, it helps to know that we are reducing the carbon footprint of the farm and the grain we produce quite considerably.

What challenges have you faced?

One of the major challenges we faced was the loss of farming income during the establishment of the SRC willow, building up the knowledge base, and the time that this took whilst carrying on intensive cereal farming and diversifying into tourism. Finding local installers with a sufficient understanding of the infrastructure requirements of the system was quite difficult and at times frustrating.

Case Study 10

What about the future?

We have already installed a 5kW Iskra wind turbine to help reduce our electricity bill and to give some extra income from the portion we sell to the Grid.

A second biomass boiler has now been installed which indicates how satisfied we are with the contribution renewable energy can make to the efficiency of our farming operations.

We have also decided to replace a 35 year old fan with a more energy efficient motor, and have began to fine-tune the system through the use of data-logging and monitoring and control software. This enables us to use heating and electricity for the drying fans more efficiently, and hopefully achieve better savings and more efficient energy use in the future.

Benefits seen:

- Costs have decreased.
- Savings of £10,500 per year.
- Reduction in oil use.
- 150 t CO2 emissions saved annually.
- Better energy efficiency.
- Future energy price rises controlled.
- Carbon footprint reduced.

Challenges faced:

- Initial cashflow interrupted.
- Knowledge level of technology.

Future Plans:

- Wind turbine installed.
- Second biomass boiler.
- More energy efficient motors.
- More monitoring and control.

Case Study 11

Pigs - Energy Efficiency Cuts Carbon

Co Down Farmer

Following an energy audit carried out by CAFRE, a Co Down pig producer has made a number of energy saving changes on his unit.

Home mixing

As part of the home mixing process, ground material on this unit was blown by fan from the hammer mill to the mixer. The energy audit identified this process as highly inefficient in terms of energy usage. In mid 2010 the producer took the opportunity to replace the hammer mill with one without a fan. The ground feed is now augered from the hammer mill to the mixer. At the same time the original one tonne mixer was replaced with a four tonne mixer. Installation of the larger mixer allows four times the amount of feed to be mixed in the same amount of time. In the 12 months since the installation of the new hammer mill and mixer the producer has seen a reduction in his electricity bill despite over twice as much pig feed now being mixed.

Lighting

On pig units lighting is required by both stock and stock people.

It is estimated that lighting accounts for 10-15 percent of electricity supplied to a unit. On this unit although efficient lighting had been installed in the newer pig housing tungsten bulbs were still in use in an older finishing house. The tungsten bulbs, which are only 5 percent efficient at converting energy to light, were replaced with compact fluorescent lights. Compact fluorescent lights are four to five times more efficient than tungsten bulbs. Replacing the 100 watt tungsten bulbs with 20 watt compact fluorescent lights reduced the annual energy usage by 1600 kWh. This 1600 kWh saving represents an annual reduction in CO_2 emissions of 880kg.

Monitoring heat pads

Investigations carried out by the Farm Energy Centre show that at least 25 percent of energy consumption occurs in the farrowing house. This equates to a usage of approximately 160 kWh per sow per year. On this unit supplementary heat is provided by water heat pads and the owner is currently monitoring their energy consumption. His aim is to calculate the running costs of the heat pads and to benchmark this cost with the cost of other supplementary heating systems. He also regularly checks the actual temperature of the heat pads as experience has shown that temperature control of heat pads often lacks precision. Poor temperature control leads to overheating of pads resulting in wasted energy. A 20 percent reduction in energy usage as a result of improved control equates to a saving of 1000 litres of oil per year on this unit. This saving in oil represents an annual reduction in CO_2 emissions of 2.65t.

Case Study 11

The energy efficiency measures made to date on this unit have resulted in both reduced electricity costs and a lower carbon footprint.

Benefits seen:

- Milling & mixing costs halved per tonne output.
- Less electricity used for lighting.
- Improved temperature control on heat pads.
- 1000 litres of oil saved annually.
- Over 3.5 t CO_2 emissions saved annually.
- Carbon footprint reduced.

Case Study 12

Sustainable Forestry

Baronscourt Estate has 1,442ha of woodland located in the west of Tyrone which is being transformed to and managed under a continuous cover permanent forest system.

The transformation process began in 2001 after a trip to Lower Saxony in Germany where we saw what could be achieved with such a system.

The productive forest areas are thinned every four years, when the trees are selected for harvest on an individual basis, removing the poor quality stems early on to allow the better quality specimens to grow on to their maximum value.

All the trees are removed as a thinning, the intensity of which is calculated to remove only the volume produced by the forest since the last harvesting operation.

This ensures the forest remains intact and that our harvest is sustainable.

Benefits Seen:

- No clearfelling which ensures a permanent forest cover.
- Which provides a rich, diverse and secure habitat.
- Maintenance and enhancement of the local landscape.
- Maintenance of the forest microclimate.
- Flood mitigation.
- Permanent carbon sink.
- Reduction in the use of chemicals.
- Production of carbon neutral products and fuel.

Challenges Faced:

- Initial unpredictability of yield and therefore income.
- Initiating natural regeneration of tree species.
- Rhododendron ponticum control.
- Reduction of the Sika deer herd.
- Introduction of mixed tree species.
- Selling mixed quality, mixed species parcels.
- Unknown system in the locality, advice and training has to be sought abroad.

Case Study 13

Biomass Boiler - Renewable Energy and Fuel Efficiency

John and Patricia Best

J & P Best own and operate an 850 acre arable farm. The farm is environmentally aware and has developed an active interest in sustainability and in particular renewable energy technology. The farm has been growing short rotation willow coppice for the past 8 years and as such has installed a woodchip boiler to utilise the crop produced at source.

Project Overview:

Installation of 120kW boiler, generating 451,777Kwh per annum using farm produced willow chip to provide heat for farm buildings and drying. Expected carbon savings amount to 114 tonnes per annum. Capital grant support towards the cost of the installation was provided through the DARD Biomass Processing Challenge Fund and part financed by the European Regional Development Fund under the European Sustainable Competitiveness Programme for Northern Ireland.

Expected Benefits

- Reduction in use of fossil fuel usage on the farm
- Cost savings through the production of renewable energy from biomass at farm level.
- Added value to willow enterprise reflected in the fuel savings to the farm business – complete supply chain on farm
- Fuel security through use of farm produced fuel
- Improvement in waste management - SRC grown on site as fuel used as bioremediation

Challenges faced:

- Selection of most appropriate boiler system – many suppliers in the marketplace
- Initial cost of production of willow chip – aim to improve this
- Optimisation of boiler – ensuring equipment programmed to deliver greatest efficiency
- Optimisation of boiler to utilise local fuel type

Case Study 14

Anaerobic Digester - Renewable Energy and Fuel Efficiency

BH Energy

250 kW Anaerobic Digester

Blakiston Houston Estate's Carrowreagh farm is a 300 ha dairy farm with 400 dairy cows and followers. A 250 kW Anaerobic Digester has been constructed beside one of the dairy units to produce electricity and heat from the farm slurry and silage grown on the farm.

The digester is a ring-in-ring system with a 32m outer ring and a 22m inner ring, 6m deep. A surface mixer in the outer ring ('Mississippi paddle wheel') with a below surface mixer through the side keeps the digestate moving round this outer ring. Slurry is fed in to the outer ring through a reception tank connected to a central pumping station and silage is fed in through a Fliegl feeder. Digestate flows from the outer to the inner ring as feedstock is added. The floor, wall and lid of the tanks are insulated and it is intended to run the digester at a temperature around 42°C. An additional 22m diameter by 6m deep store has been built for storage and future expansion of the system.

A 62m by 26m feedstock store has been built beside the AD unit to store and supply non-liquid energy materials – mainly grass silage.

Inputs to the system are projected at around 5500 tonnes slurry and 6500 tonnes silage per year with an estimated annual output of about 2m kWh electricity and 2.25m kWh heat from the CHP. About ⅓ of the heat produced will be required to maintain the plant temperature and the remaining heat used to dry wood for the estate wood chip enterprise, residual electricity exported to the grid has the potential to attract NIROCs payment.

Digestate from the system (estimated at 11000 t per annum) will be spread back on the land with a potential saving of fertiliser.

Case Study 14

Capital grant support towards the cost of the installation was provided through the DARD Biomass Processing Challenge Fund and part financed by the European Regional Development Fund under the European Sustainable Competitiveness Programme for Northern Ireland.

Expected Benefits:

- Processing the farm waste through the AD unit will reduce the carbon dioxide and methane emissions from the farm.
- Reduced use of fossil fuels on the farm directly through reduced import of energy and indirectly through reduced fertiliser use.
- The AD unit is integrated with the existing farm business through utilisation of farm waste and growing energy crops, reducing farm energy costs and utilisation of farm staff and farm equipment thereby helping to maintain the viability of the farm and employment.

Challenges faced:

- When installing new technology there are the inevitable frustrations and delays dealing with the authorities to achieve the necessary approvals.

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