Decision support for dairy farm energy projects

John Upton[1], Michael Breen[1], Philip Shine[2] and Michael Murphy[2]

[1]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [2]Cork Institute of Technology, Bishopstown, Cork

Summary

- Teagasc has partnered with CIT and SEAI to develop the Dairy Energy Decision Support Tool to aid farmers in making decisions regarding energy efficiency and renewable energy investments.
- This on-line tool can be used to obtain farm specific recommendations related to energy use, technology investments, CO_2 mitigation and renewable energy generation.

Introduction

The average cost of electricity on Irish dairy farms is €5/1,000 litres of milk produced. There is a large variation in that figure — from €2.60 to €8.70/1,000 litres produced, or from €15-€45/cow/year. The main drivers of electricity consumption on dairy farms are milk cooling (31%), the milking machine (20%) and water heating (23%). It is challenging to deliver a set of generalised recommendations to farmers to improve energy efficiency, because every farm is different in some key areas. These include herd size, infrastructure specification, farmer age and eligibility for grant aid and availability of grant aid for specific technologies. Hence, it is necessary to evaluate the cost/benefit of key energy efficient and renewable technologies on a case by case basis on individual farms.

Dairy energy decision support

Teagasc has partnered with Cork Institute of Technology and the Sustainable Energy Authority of Ireland to deliver an on-line decision support tool to aid farmers making decisions regarding energy efficiency and technology investments. The tool, known as the Dairy Energy Decision Support Tool (DEDST) is available to use for free at: http://messo.cit.ie/dairy

The DEDST can be used to obtain farm specific recommendations related to energy use, technology investments, CO_2 mitigation and renewable energy generation. It is an interactive and easy to use tool aimed at farmers, farm managers and farm advisors. It provides information to the user regarding key decisions that determine the energy efficiency and cost effectiveness of the milk production process, such as investment in certain technologies and changes in farm management practices. It can also be used to support government bodies in forming new policy relating to provision of grant aid for energy efficient and renewable energy technologies.

Description of the tool

The DEDST operates as a web based platform. The user enters details of a specific farm, including farm size, milking times, number of milking units, milk cooling system, water heating system and electricity tariff. Details of an alternative technology to be evaluated on that farm can then be entered. Possible alternative technologies include plate coolers, variable speed drives, heat recovery systems, solar photovoltaic systems, wind turbines and solar thermal water heating systems. The user may also enter economic details regarding potential future grant aid for specific technologies, as well as renewable energy feed-in tariffs and inflation. All energy and economic calculations are then computed, and the outputs are displayed on an easy to interpret output screen.

Example — Investment in a solar photovoltaic system

Solar photovoltaic (PV) cells generate electricity using energy from the sun, which in turn can be used by the farm. These systems can be stand-alone (i.e. the generated electricity is only used by the farm) or grid connected (where surplus electricity is fed into the national electricity grid). Unfortunately, in Ireland there is no payment for export of electricity to the grid from small scale PV systems. Hence, the most logical solution for Irish farmers would be a stand-alone system, sized so that all electricity generated is consumed by the farm. For a 100 cow spring calving herd, the ideal PV system size falls at around 6 kW of installed capacity, which would cost in the region of €7,500. In the absence of a capital investment grant, this system would have a payback period of 13 years. If a 40% grant was available, the payback period would fall to eight years, while a 60% grant would make the payback period fall to five years. The inclusion of a 6kW PV system would result in 28% of the farm's electricity being provided by a renewable source and would offset more than 2.4 tonnes of CO_2 per year. PV systems qualify for accelerated capital allowances (i.e. the entire cost of the installation can be written off against tax in the year of purchase), which would further reduce the payback period.

Conclusions

The methods deployed in the development of this tool utilised resources from multiple sources to package a suite of scientific outputs into a user friendly decision support tool. The DEDST can now be used by farmers and advisors to make informed decisions around energy use and technology investments on a case by case basis. It will also allow policy makers to conduct macro-level analyses to inform decisions regarding provision of grant aid for energy efficient and renewable technologies.