

Project Description

1. Concept

Energy Positive is a project to create a strategic energy management tool for farms. The immediate practical aim is to help farmers reduce their exposure to fluctuations and long-term increases in the cost of energy. At its heart is a calculator which uses a combination of established data sources to estimate the total energy requirements of different farm production systems. We take a life cycle analysis approach, so the 'total energy' includes the 'embodied' energy in products brought onto the farm, such as feed and fertilizer; not just energy expended directly on-site.

Based on a set of straightforward input variables, the Energy Positive tool can estimate the energy footprint of a farm, and generate a set of analyses and breakdowns about the energy intensity of each of its main product outputs. Perhaps more significantly, the tool also enables us to create and compare alternative management scenarios on the farm – allowing farmers to see how structural changes to their farm system would influence their energy budget in the future.

All of these outputs can be linked to financial data, and given existing concerns about energy costs, we think this will motivate farmers to take a fresh look at their farm systems. We also think the energy intensity of farms and their products will be of interest to people further along the food chain, in particular retailers, who are increasingly aware of the need to manage risk in their supply chains. Ultimately, we think this sort of work is important for everyone; we all need to eat, and to do so we need farm systems which are responsive to the constraints we face living in a finite world.

The critical differences between Energy⁺ and existing tools are:

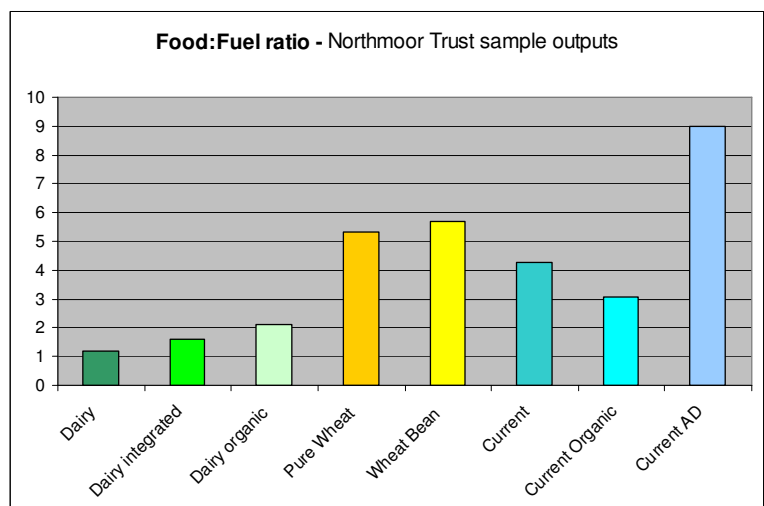
- E⁺ is focused on energy and energy cost risk management, not carbon or GHG emissions. Our experience is that Farmers find this much more compatible with their business needs.
- E⁺ uses comprehensive Life Cycle Analyses (LCA) to quantify full energy exposure. This means that critical supply chain risk sources, such as Nitrogen fertilizer manufacture, are integral to our calculations.
- E⁺ is a scenario-based strategic planning tool, not a detailed auditing tool. This allows the user to think beyond simple 'efficiency adjustments'; it allows compare the implications of, structural changes to their land management system, and make strategic-level decisions.

2. What we've done so far

Phase One of the Energy Positive project focused on creating and testing a prototype farm energy calculator. This allows us to (1) rapidly calculate the embodied energy inputs in an existing farm system, based on typical farm management variables, and (2) create new, alternative farm system scenarios, and estimate the likely embodied energy inputs for these. We have tested the scenarios planner on an estate, in Oxfordshire.

The prototype generates a number of useful outputs. Some of these are straightforward data breakdowns, for example the energy requirements of each part of the farm system, and breakdowns of the farm energy budget by life cycle stage (e.g. field diesel, fertilizer manufacture etc).

Other outputs are more analytical and comparative, for example comparisons of the energy intensity of different farm system scenarios, expressed as a ratio of food energy out to fuel energy in (see chart right). Or comparisons of the cost of energy embodied in different farm systems (energy cost exposure – see chart overleaf).



3. The next phase

Phase 2 of the project aims to develop the prototype into something which is easy and reliable to use on a wide range of estates and farms. This will involve three main technical objectives:

- 1) Improving the tool's accuracy, by 'ground-truthing' it against data from a range of farms and estates, and developing a simple means of calibrating the tool to specific site types.
- 2) Increasing its sophistication, by increasing its ability to model novel scenarios, and by building in the capacity to analyse financial implications – in particular the ability to track performance under different energy / food price combinations.
- 3) Making it easier to use, by creating an accessible user-interface, and establishing a simple working protocol for information gathering, scenario analysis, and reporting.

4. Work Plan

In order to carry out the second phase of the project, we need to find four or five farmed estates on which to carry out 'applied development'; where we carry out analyses for the estate whilst at the same time developing the Energy Positive technology. For each of the estates, we will carry out the following tasks:

- 1) **Data gathering.** This will be required at two levels: (1) Basic information to characterise the farm system; for example: breakdown of crop rotations, livestock numbers, basic feed regimes etc, and (2) More detailed statistics, where available, on fuel, power, feed, agronomy, tillage etc. Data gathering will involve a structured interview with the farm manager, who will need to have farm records to-hand.
- 2) **Scenarios planning.** We will construct a range of potential future farm scenarios for the estate. This will include a combination of standard hypothetical scenarios, along with other more estate-specific scenarios, developed in discussion with the farm manager. In practice, this will be carried out in parallel with stage III, as detailed below:
- 3) **Analysis.** Two types of analyses will be carried out: (1) analysis and development of the farm scenarios, to assess and optimise their energy performance; and (2) testing of our databases; comparing the assumptions in our calculator against actual data.
- 4) **Reporting.** This will include: (1) detailed breakdowns and comparisons of current and potential future farm management scenarios, and (2) analysis and commentary on implications for future farm business planning, including identification key areas of exposure to risk, and opportunities to reduce risk.

Off-estate work will be focused on finalising the development of the Energy Positive tool. Tasks will include testing and upgrading of the structure and content of our databases; to increase accuracy, and upgrade functionality. It will also involve the construction of a user-friendly interface for the calculator, and finalising the protocol for applying Energy Positive in the field.

5. Outputs

The tangible outputs at the end of the project will be:

- A computer-based farm energy calculator, with a user-friendly interface. This will be in a Flash Player or equivalent format, which could be launched and operated online.
- A short How-To guide.
- A report, presenting worked examples, and collating the main findings from the project.

These resources are intended to form the basis for wider adoption of the Energy Positive work.

