

The Comparative Energy Efficiency of Organic Farming

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Abstract

Agricultural fossil fuel energy use is important for its contribution to climate change via carbon dioxide emissions and also has socioeconomic implications because of the link between rising energy costs and food prices. In the United Kingdom, farming has largely been industrialized, which means that most of the energy used in agriculture is now used before the farm in the manufacture of inputs such as fertilizers, pesticides, animal feed grain, and veterinary drugs. Organic farming aims, as far as possible, to replace industrial processes with natural processes. It is intended to be a more sustainable system, so it is important to know to what extent this is true for energy.

In 2006, the UK government funded Life Cycle Analyses for ten organic and nonorganic farming sectors, having undertaken a desktop study of five other sectors in 2000. We multiplied these results by the annual national production of these foods to determine the total energy use for each sector, and to assess the energy reductions if the whole production of these sectors were organic.

On average, UK organic farming is shown to be about 26% more energy efficient per ton. According to these studies, UK organic farming is more energy efficient than nonorganic production in nine sectors, similar in one, and less efficient in four sectors. Organic farming is more energy efficient for the production of wheat, green vegetables (calabrese, leeks, cabbage), carrots, onions, milk, red meat (beef and sheep), and pigs. On average, these sectors used 40% less energy per ton when produced organically, with the biggest energy savings in green vegetables and red meat. Energy use for oilseed rape was similar in both systems, while organic farming was found to be less energy efficient for potatoes, poultry meat, eggs, and "long-season" heated glasshouse tomatoes.

When total national energy use is considered, it can be seen that switching current UK production to organic farming would reduce agricultural fossil energy use by around 20%. Organic farming offers the greatest contribution to reducing national energy use in the milk and beef sectors, also with significant energy savings for sheep and pigs, and smaller savings for wheat.

The main reason for the energy efficiency of organic farming is that it does not use inorganic nitrogen fertilizer. Nitrogen (N) fertilizer is the single main use of energy in farming, accounting for 37% of the total energy use (Defra 2005). N fertilizer is extremely energy intensive, because the raw material is fossil fuels (usually natural gas) and also because of the high energy demands of the manufacturing process.

In conclusion, the harnessing of natural biological and ecological processes employed by organic farming is more energy efficient than using industrially manufactured farm inputs. Policy makers should therefore promote a wider uptake of organic farming to reduce agricultural energy use. Food choices are important too; for an energy-efficient and climate-friendly diet it is recommended that people and businesses buy food that is organic, seasonal, local, unprocessed, and with less meat.

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