**The Role of Organics in Meeting Market Demand**

**Is Organic farming better than conventional farming at meeting the public’s demand for lower emissions and more environmentally friendly farming?**

The widely held public perception is that organic farming is better for the environment. Indeed, the development of organic production systems are a result of consumer demand more than being a producer led movement. In other words, farmers changing to meet the market demand.

However, when it comes to emissions and contribution to climate change, is the public perception that organic systems are better backed up by science? This article will focus solely on research which has taken place within the European Union (EU), this will allow us to compare the results of research based on a wide range of businesses and environments that are all governed by the same regulations. The rules governing organic farming practises in the EU are outlined EU Regulations 834/2007 and 889/2008. (EC, 2008)

**Emissions**



Figure 1 Sources of Greenhouse Gas Emissions (GHG) from Agriculture. (agrecalc, 2020)

The main GHGs from farming are outlined in figure 1, these are the emissions that current research focuses on.

There has been a lot of research into the carbon footprint of organic and conventional farming systems and their contribution to climate change. However, a major difficulty in drawing a conclusion between what system is more carbon efficient is that there is so much variation within organic and conventional systems. With some conventional farms, in terms of farm practises, being closer to organic than they are to other conventional farms and vice versa. This is mentioned as a challenge in the majority of the literature on this subject.

**The Research**

**Pro Organic**

Research in Denmark by (Knudsen *et al.*, 2014) looked at the emissions per kg DM (dry matter) of saleable product in five different systems; four with organic nutritional inputs (biogas, slurry, mulching and no input) and one with conventional inorganic fertiliser. The study looked at these systems with three different cash crops; potatoes, spring barley and winter wheat. The study found that that the organic ‘no input’, ‘slurry’, ‘mulching’ and ‘conventional’ systems had similar carbon footprints. However, the other organic system ‘biogas’, where legumes fixed nitrogen into the soil and were then harvested and fermented in an anaerobic digester, creating renewable energy, before being spread back on the crop, had a significantly lower carbon footprint.

However, this research found that the conventional system had the greatest emissions per hectare. Although, thanks to its higher yield, when looking at emissions per kg of output, there was no significant difference between the methods, apart from the biogas system. The research also pointed out that many of the organic systems analysed in the research were dependant on manure from conventional livestock farms to meet the nutritional needs of their crops. (Knudsen *et al.*, 2014).

Research in the Netherlands by (Bos *et al.*, 2014) also found mixed results when comparing emissions from conventional and organic farming systems. This particular research used modelling to calculate energy use and GHG emissions in organic and conventional farming systems in the Netherlands. The research found that energy use in conventional dairy farms was around 25% higher than their organic counterparts and that GHG emissions were also between 5 and 10% higher.

**Pro Conventional**

However, when looking at arable production, with regards to energy use, the conventional systems were between 10% and 30% lower and with regards to GHG emissions conventional systems were between 0 and 15% lower than their organic counterparts. When looking at vegetable production, the difference was even greater than in the arable model, with conventional systems using between 40 to 50% less energy and producing between 35 and 40% less GHG emissions.

The researchers in this particular study were clearly surprised by their findings, stating alongside their findings that their results “correspond with other studies for dairy farming, but not for crop production.” The researchers attributed the unexpected results to the uniquely intense nature of Dutch agriculture. Although, it is clear that when looking to utilise the most emission efficient production system it is not going to be a one size fits all solution.

Research in Italy looking at the carbon footprint of the production of organic and conventional wholemeal bread, covering the entire process from field to retail, found that the carbon footprint of the conventional wholemeal bread was 24% less than the same quantity of organic bread. However, if the carbon footprint was calculated per hectare instead of per kilogram of bread, the organic bread had a carbon footprint which was 60% lower than the conventional bread. (Chiriacò *et al.*, 2017).

When comparing the GHG emissions of both organic and conventional farming systems another important consideration is profitability. Farms are businesses and even if one system has lower emissions it won’t survive for long if it is not profitable. Research in Germany analysed the emissions and profitability of 81 organic and conventional dairy farms, trying to identify management factors which would aid a business in lowering its carbon footprint while increasing its profitability. The research found that organic farms were more profitable than the conventional systems. However, the emissions per kg of output were significantly higher than that produced by the conventional farms. (Kiefer, Menzel and Bahrs, 2014). Therefore, in this case, the more environmentally sustainable conventional systems were not as economically sustainable as the organic system. These results are worrying for conventional farming, as without profitability, the business will not be resilient to market volatility, which could be a feature of BREXIT and changing consumer trends.

**Other considerations**

When trying to choose an agricultural production system to feed the planet while producing the least emissions possible, the argument can be made by conventional agriculture that due to its higher productivity and lower carbon footprint per kg in 4 out of 6 of the research looked at. The greater productivity per hectare in conventional farming could allow some land to be used for to produce other products/services. This could be achieved by intensifying production on some land and setting aside other land, which would enable the conventional system to meet other aims, such as climate change mitigation and increasing biodiversity by creating wildlife habitats.

The above argument is backed up by research conducted in Sweden on the consequences of the yield gap between organic and conventional agriculture. The study concluded organic producers would require up to 50% more land in production to match the yield of their conventional counterparts. Wholesale adoption of organic farming would require serious land use change, which would have wide ranging implications. Examples explored in the study include lost products such as timber, fibre and energy, as well as lost ecosystem services such as carbon sequestration, wildlife habitat and biodiversity. The study also concludes that organic farming was assumed to be superior because of its emphasis on natural system and the abandonment of synesthetic fertiliser, but this is not corroborated by the science. (Kirchmann, 2019). Although, when it comes to biodiversity, Organic producers would counter this by stating that organic systems foster a greater level of biodiversity than conventional farms. This is supported by research, a comprehensive review of current research of biodiversity levels on organic farms in Germany by (Rahmann, 2011) found that in 327 out of 396 research projects on the subject, biodiversity levels were higher on organic farms, than on their conventional counterparts.

The consumer and retailers must also play their part, a lot of produce is bought from abroad when there is similar produce available locally. This adds unnecessary food miles and GHG emissions into the supply chain. In addition to this, 6% of global GHG emissions come from food waste. This encompasses food lost in the supply chain due to incorrect storage as well as food discarded by retailers and consumers (Hannah, 2020). For sustainable food supply in the future both of these issues must be addressed.

**Conclusions**

It is clear that a wholesale adoption of either organic or conventional farming systems would not solve the issue of agriculture’s contribution to climate change. The solution, with everything in life is more nuanced. With both systems having been found to be more carbon efficient in different scenarios. Organic and conventional producers should not see one another as adversaries for the public’s admiration, as has happened in some cases in the past. Both systems can learn a lot from one another and both can meet the public’s demand for sustainable produce, climate change mitigation, habitat creation and combating biodiversity loss, whether it is through a “natural organic system” or through intensification of production on some land allowing other land to be utilised to provide other services or through a combination of both.

For those interested in exploring organics additional advice and information on this can be found at <https://www.fas.scot/topic/organics/>. Sign up to the FAS newsletter to receive updates on news, events and publications from Scotland’s Farm Advisory Service. You can also follow FAS on Facebook and Twitter @FASScot.

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