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Response to 'Does certified organic farming reduce greenhouse gas emissions from agricultural production?'

August 4, 2015

Response to the article published in the mail online on the paper 'Does certified organic farming reduce greenhouse gas emissions from agricultural production?' The paper presents no scientific evidence that organic farms put out more greenhouse gases than other farming systems and uses unfounded assumptions to form conclusions. The published peer-reviewed science shows that these assumptions and conclusions are clearly wrong.

The simplistic analysis concludes that because there has been an increase in the amount of acres of organic farming in the US and an increase in the amount of greenhouse gases from farming in the US, organic agriculture increases greenhouse gases. Correlation does not prove causation. Most correlations are coincidences. Causation needs to be proved to show that the correlation is not a coincidence. The paper offers no proof of causation; only data-free assumptions.

It would be more logical to use the same methodology to show that the rise in GMO farming in the US correlates with the increase in greenhouse gases from farming; given that GMO farming now comprises substantial part of US production while organic farming is only one percent.

There is a good body of peer-reviewed science clearly showing that not only does organic farming emit less greenhouse gases, because it captures CO_2 and stores it in the ground as soil organic matter, organic farming also reduces greenhouse gas emissions.

One of the data-free assumptions in the paper is that the increase in large-scale organic farms is contributing to the increase in greenhouse gases because of the need for machinery.

A peer reviewed scientific study of the Rodale Farming Systems Trial, (in the USA) a long-term comparison trial of conventional and organic systems, found that the organic systems use less fossil fuels and emit 30% less greenhouse gases. (Pimentel et al. 2005)

The long-term apple comparison trial conducted by Reganold et al. in Washington, USA showed that the organic system was more efficient in its energy use, which means emitting less greenhouse gases. (Reganold et al 2001)

The Rodale Institute's organic rotational no-till system can reduce the amount of fossil fuels needed to produce each no-till crop in the rotation by up to 75 per cent compared to standard-tilled organic crops. (LaSalle and Hepperly 2008)

The best organic systems can have significantly lower energy use than conventional systems, resulting in significantly less greenhouse gas emissions. A peer-reviewed analysis of different production systems found:

Energy Used in Different Corn Production Systems Expressed in Litres of Diesel per Hectare:

- Conventional Tillage: 231 litres per hectare
- Conventional No-till: 199 litres per hectare
- Organic Tillage: 121 litres per hectare
- Organic No-till: 77 litres per hectare (Pimentel et al. 2005)

Furthermore, the majority of greenhouse gases in farming come from the use of nitrogen fertilizers, not from farm machinery emissions. (Pimentel et al. 2005) Synthetic chemical fertilisers are significant contributors to climate change in terms of the energy used to manufacture them and their contribution to nitrous oxide (N_2O) and methane (CH_4).

Nitrous oxide is one of the most significant of the greenhouse gases emitted by agriculture. One N_2O molecule is equivalent to 310 carbon dioxide (CO_2) molecules in its greenhouse effect in the atmosphere. It has a mean residence time in the atmosphere of 120-150 years and also contributes to the depletion of the ozone layer in the atmosphere.

The biggest contributor to human-produced N_2O pollution is the use of synthetic nitrogen fertilisers such as urea and ammonium nitrate in agriculture. The contribution of nitrogen fertilizers is even higher when all the CO_2 and N_2O that is emitted in the production of these energy-intensive fertilisers are included in the totals.

The use of synthetic nitrogen fertilizers in farming also make a significant contribution to the emissions of CO_2, the gas that accounts for 80% of all greenhouse gas emissions. Scientists from the University of Illinois analysed the results of a 50-year agricultural trial and found that synthetic nitrogen fertilizer resulted in all the carbon residues from the crop disappearing as well as an average loss of around 10,000 kg of soil carbon per hectare. This is around 36,700 kg of carbon dioxide per hectare on top of the many thousands of kilograms of crop residues that are converted into CO_2 every year. (Khan et al 2007, Mulvaney et al 2009)

The researchers found that the higher the application of synthetic nitrogen fertilizer the greater the amount of soil carbon lost as CO_2.

Synthetic nitrogen fertilizers are not used in organic farming, so the rise in organic farming in the USA cannot be the cause of the rise in greenhouse gas emissions that come from farming.

On top of emitting less greenhouse gases, organic systems sequester CO_2 and store it in the soil as soil organic matter resulting in organic farms sequestering more greenhouse gases than they emit.

In a peer-reviewed meta-analysis study, published by the Proceedings of the National Academy of Sciences (PNAS), that used 41 international comparison trials, including trials in the USA, Gattinger et al. reported that organic systems sequestered 2018.5 Kgs CO_2 per hectare per year.

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A meta-analysis by Aguilera et al. published in the peer reviewed journal, Agriculture, Ecosystems & Environment, of 24 comparison trials in Mediterranean climates between organic systems and conventional systems found that the organic systems sequestered 3559.9 kg of CO_2/ha/yr. The data came from comparison trials from Mediterranean climates in Europe, the USA and Australia and if extrapolated globally would sequester 17.4 gigatonnes (Gt) of CO_2.

The Rodale Institute Farming Systems Trial (FST) of organic and conventional cropping systems confirm that organic methods are effective at removing CO_2 from the atmosphere and fixing it as organic matter in the soil. (La Salle and Hepperly 2008, Rodale 2011)

The FST legume-based organic plots showed sequestration rate of 2,055.2kg of CO_2/ha/yr. Other organic systems produced higher rates of sequestration. The FST manured organic plots showed a sequestration rate of 3,596.6 kg of CO_2/ha/yr and if extrapolated globally would sequester 17.5 Gt of CO_2.

The Compost Utilization Trial showed a sequestration rate of 8,220.8 kg of CO_2/ha/yr and if extrapolated globally would sequester 40 Gt of CO_2. According to the United Nations Environment Programme (UNEP) the estimates of global greenhouse gas emissions in 2010 were 50.1 gigatonnes of carbon dioxide equivalent (Gt CO_2e) per year. (UNEP 2013) This means that the widespread scaling up of organic farming systems can make significant contribution to mitigating greenhouse gases and stopping climate change.

The science shows that the correlation is a non-substantive coincidence. There is no scientific basis to say that organic farms contribute to climate change. In fact the opposite is true – organic farming mitigates climate change.

For more information contact Andre Leu, President of IFOAM – Organics International, a.leu@ifoam.bio

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