



## Sustainable agriculture: wider debate of farming techniques needed

**There is a need** to broaden the debate on sustainable food security from a straight comparison between organic and conventional farming to a consideration of a variety of farming techniques. This is the conclusion of a new review of research that indicates, for some crop types, organic yields can nearly match conventional yields under good management practices and growing conditions.

**The global food system** needs to feed a growing population whilst minimising its environmental impact. Organic farming aims to produce food with the least harm to the environment. However it has been argued that, because it often has lower yields, it requires more land to produce the same amount of food than its conventional counterparts, which leads to deforestation and biodiversity loss.

A systematic review of research analysed the relative yields of organic and conventional farming. It includes only studies on certified organic systems and the research must compare organic and conventional farming on the same temporal and spatial scale. This provided 66 studies, reporting 316 comparisons on 34 different crop species.

The review calculated that the average ratio of organic-to-conventional yield was 0.75, indicating that overall organic yields are 25% lower than conventional yields. The performance of organic farming systems varied across the type (e.g. fruits or vegetables) and species of crop (e.g. maize and barley). For example yields of organic fruits and oilseed crops are less than those for the same crop types grown conventionally but not to a significant degree (3% and 11% less respectively). In comparison, organic cereals and vegetables have significantly lower yields than their conventional counterparts (26% and 33% less respectively).

These differences in yields can be partly explained by differences in the inputs of nutrients such as nitrogen and phosphorus. Conventional agriculture uses fertilisers that contain these nutrients in a form that can be taken up directly by the crop, whereas the release of plant-available nitrogen from organic sources such as compost or animal manure is slow and often does not keep up with demand during the peak growing period. The relatively better performance of legumes (plants with pods such as peas, beans etc.) and perennials (plants that live for more than two years) is because these plant types are more efficient at using nitrogen so their performance is not so dependent on the nitrogen source. It also appears that organic crops grow better on relatively neutral soils (weak-acidic to weak-alkaline). This could be because in strongly alkaline or acidic conditions, another important nutrient – phosphorus - is less available to plants.

The performance of organic agriculture also depends on water delivery. Under irrigation, yield is 35% less than conventional crops, whereas in rain-fed conditions the yield is only 17% less. This could be because organic crops grow relatively better in the variable moisture conditions of rain-fed systems due to better soil conditions. Another possible reason is that for irrigation to have a significant influence on organic crops there needs to be a high level of nutrients which, as mentioned above, is likely to be a factor limiting organic yields.

The review shows that yield differences between organic and conventional agriculture depend on context. When using best organic practices under certain conditions, better yields can be achieved, for example rain-fed legumes and perennials on almost neutral soils can produce yields only 5 % less than conventional yields. However the research highlights that yields are only part of the picture and suggests that the organic versus conventional debate is broadened to evaluate different management options as well as different indicators of sustainable agriculture.

**Source:** Seufert, V., Ramankutty, N. & Foley, J.A. (2012) Comparing the yields of organic and conventional agriculture. *Nature* 485: 229-232  
doi:10.1038/nature11069

**Contact:** [verena.seufert@mail.mcgill.ca](mailto:verena.seufert@mail.mcgill.ca)

**Theme(s):** Agriculture, Sustainable consumption and production

The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)"; European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.