



The Peak Body for the Australian Organic Sector

From the desk of:

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Scientific Studies that Validate High Yield Environmentally Sustainable Organic Systems

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Introduction

Organic agriculture is often attacked as unsustainable and not capable of feeding the world due to lower yields. While many organic systems have lower yields, there are numerous studies showing that best practice organic agriculture can achieve comparable yields to intensive conventional agriculture, including (Pretty 1995, Pretty 1998a, Welsh 1999, Reganold et al 2001, Parrot 2002, Pimentel 2005 and Wynen 2006)

This article will look at some of the published research that shows that best practice organic systems can get yields that are equal or higher than comparable conventional systems. We need to see more research and extension this area to ensure that all organic farmers can improve their yields by adopting the appropriate best practice organic systems.

Reputable studies by major universities are finding organic agriculture can feed the world as well. A recent study by Badgley et al. from the University of Michigan showed that organic farming can yield up to three times more food on individual farms in developing countries, as compared to conventional farms. These findings refute the long-standing claim that organic farming methods cannot produce enough food to feed the global population. (Badgley et al, 2007)

Yields

The assumption that greater inputs of synthetic chemical fertilisers and pesticides are needed to increase food yields is not always accurate. In a study published in *The Living Land*, Professor Pretty looked at projects in seven industrialised countries of Europe and North America. *'Farmers are finding that they can cut their inputs of costly pesticides and fertilisers substantially, varying from 20-80%, and be financially better off. Yields do fall to begin with (by 10-15% typically), but there is compelling evidence that they soon rise and go on increasing. In the USA, for example, the top quarter sustainable agriculture farmers now have higher yields than conventional farmers, as well as a much lower negative impact on the environment.'* (Pretty 1998a).

Below are examples of studies into organic systems that show high yields and good environmental outcomes.

United Nations Study - organic agriculture increased yields by 116%.

The report by the United National Conference on Trade and Development (UNCTAD) and the United Nations Environment Programme (UNEP) found that organic agriculture increases yields in Africa. *'...the average crop yield was ... 116 per cent increase for all African projects and 128 per cent increase for the projects in East Africa.'*

The report notes that despite the introduction of conventional agriculture in Africa food production per person is 10% lower now, than in the 1960s.

'The evidence presented in this study supports the argument that organic agriculture can be more conducive to food security in Africa than most conventional production systems, and that it is more likely to be sustainable in the long term.' Supachai Panitchpakdi, Secretary general of UNCTAD and Achim Steiner, Executive Director of UNEP stated. (Unep-Unctad 2008)

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US Agricultural Research Service (ARS) Pecan Trial

The ARS organically managed pecans out-yielded the conventionally managed, chemically fertilized Gebert orchard in each of the past five years. Yields on ARS' organic test site surpassed the Gebert commercial orchard by 18 pounds of pecan nuts per tree in 2005 and by 12 pounds per tree in 2007. (*Bradford J.M .2008*)

The Wisconsin Integrated Cropping Systems Trials

The Wisconsin Integrated Cropping Systems Trials found that organic yields were higher in drought years and the same as conventional in normal weather years.

In years with wet weather in the spring the organic yields can suffer when mechanical cultivation of weeds is delayed and were found to be 10% lower. This could be corrected by using steam or vinegar for weed control, rather than tillage.

The researchers attributed the higher yields in dry years to the ability of soils on organic farms to more quickly take in rainfall. This is due to the higher levels of organic carbon, making the soils more friable and better able to store and capture rain. (*Posner et al. 2008*)

Scientific Review by Cornell University into 22 year-long Rodale Field Study

The scientific review found:

- The improved soil allowed the organic land to generate yields equal to or greater than the conventional crops after 5 years
- The conventional crops collapsed during drought years.
- The organic crops fluctuated only slightly during drought years, due to greater water holding capacity in the enriched soil.
- The organic crops used 30% less fossil energy inputs than the conventional crops.

(*Pimentel D et al 2005*)

Rodale Organic Low/No Till

The Rodale Institute has been trialling a range of organic low tillage and no tillage systems.

'The 2006 trials resulted inorganic yields of 160 bushels and acre (bu/ac) compared to the Country average of 130 bu/ac.

'..the average corn yield of the two organic no-till production fields was 160 bu/ac, while the no-till research field plots averaged 146 bu/ac over 24 plots. The standard-till organic production field yielded 143 bu/ac, while the Farming Systems Trial's (FST's) standard-till organic plots yielded 139 bu/ac in the manure system (which received compost but no vetch N inputs) and 132 bu/ac in the legume system (which received vetch but no compost). At the same time, the FST's non-organic standard-till field yielded 113 bu/ac.'

'To compare, the Berks County average non-organic corn yield for 2006 was 130 bu/ac, and the average yield for Southeastern Pennsylvania was 147 bu/ac' (Rodale 2006)

IOWA trials

The results from the Long Term Agroecological Research (LTAR), a 12 year collaborative effort between producers and researchers led by Dr Kathleen Delate of Iowa State University shows that organic systems can have equal to higher yields than conventional systems.

Consistent with several other studies, the data showed that while the organic systems had lower yields in the beginning, by year 4 they started to exceed the conventional crops.

Across all rotations, organic corn harvests averaged 130 bushels per acre while conventional corn yield was 112 bushels per acre. Similarly, organic soybean yield was 45 bu/ac compared to the conventional yield of 40 bu/ac in the fourth year.

Cost-wise, on average, the organic crops' revenue was twice that of conventional crops due to the savings from non-utilization of chemical fertilizers and pesticides.

Sources: <http://www.twinside.org.sg>, <http://www.biosafety-info.net>, http://www.non-gmoreport.com/articles/feb10/organic_corn_soybean_yields_exceed_conventional.php

Other Examples

Professor George Monbiot, in an article in the *Guardian*, 24th August 2000, wrote that wheat grown with manure has produced consistently higher yields for the past 150 years than wheat grown with chemical nutrients, in trials in the United Kingdom (*Monbiot 2000*).

The study into apple production conducted by Washington State University compared the economic and environmental sustainability of conventional, organic and integrated growing systems in apple production and found similar yields. *'Here we report the sustainability of organic, conventional and integrated apple production systems in Washington State from 1994 to 1999. All three systems gave similar apple yields'* (*Reganold et al. 2001*).

In an article published in the peer review scientific journal, *Nature*, Laurie Drinkwater and colleagues from the Rodale Institute showed that organic farming had better environmental outcomes as well as similar yields of both products and profits when compared to conventional, intensive agriculture. (*Drinkwater 1998*.)

Dr Rick Welsh, of the Henry A Wallace Institute reviewed numerous academic publications comparing organic production with conventional production systems in the USA. The data showed that the organic systems were more profitable. This profit was not always due to premiums but due to lower production and input costs as well as more consistent yields. Dr Welsh's study also showed that organic agriculture produced better yields than conventional agriculture in adverse weather events, such as droughts or higher than average rainfall (*Welsh 1999*).

Nicolas Parrott of Cardiff University, UK, authored a report, 'The Real Green Revolution'. He gives case studies that confirm the success of organic and agroecological farming techniques in the developing world (*Parrott 2002*).

- *In Madhya Pradesh, India, average cotton yields on farms participating in the Maikaal Bio-Cotton Project are 20 per cent higher than on neighbouring conventional farms.*
- *In Madagascar, SRI (System of Rice Intensification) has increased yields from the usual 2-3 tons per hectare to yields of 6, 8 or 10 tons per hectare.*
- *In Tigray, Ethiopia, a move away from intensive agrochemical usage in favour of composting has seen an increase in yields and in the range of crops it is possible to grow.*
- *In the highlands of Bolivia, the use of bonemeal and phosphate rock and intercropping with nitrogen fixing Lupin species have significantly contributed to increases in potato yields (Parrott 2002).*

Farm Income

A viable income is an essential part of farm sustainability. Published studies comparing the income of organic farms with conventional farms have found that the net incomes are similar, with best practice organic systems having higher net incomes (*Cacek 1986 and Wynen 2006*).

The United Nations report found that: *'Organic production allows access to markets and food for farmers, enabling them to obtain premium prices for their produce (export and domestic) and to use the additional incomes earned to buy extra foodstuffs, education and/or health care.'*

The report noted: *'A transition to integrated organic agriculture, delivering greater benefits at the scale occurring in these projects, has been shown to increase access to food in a variety of ways: by increasing yields, increasing total on-farm productivity, enabling farmers to use their higher earnings from export to buy food, and, as a result of higher on-farm yields, enabling the wider community to buy organic food at local markets.'* (*Unep-Unctad 2008*)

A study in the USA by Dr Rick Welsh of the Wallace Institute has shown that organic farms can be more profitable. The premium paid for organic produce is not always a factor in this extra profitability. Dr Welsh analysed a diverse set of academic studies comparing organic and conventional cropping systems. Among the data reviewed were six university studies that compared organic and conventional systems (Welsh 1999.)

The study into apple production conducted by Washington State University showed that the break-even point was nine years after planting for the organic system and 15 and 16 years respectively for conventional and integrated farming systems (Reganold et al. 2001.)

'When compared with the conventional and integrated systems, the organic system produced sweeter and less tart apples, higher profitability and greater energy efficiency' (Reganold et al. 2001).

Conclusion

There is very good research that clearly shows organic agriculture can get the yields that are needed to feed the poor. This is especially the case in small holder agriculture – the majority of the world's farmers

The United Nations report stated: *'All case studies which focused on food production in this research where data have been reported have shown increases in per hectare productivity of food crops, which challenges the popular myth that organic agriculture cannot increase agricultural productivity.'* (Unep-Unctad 2008)

Organic agriculture is a low cost and effective way to help many of the world's poorest people to have good levels of nutrition and a better quality of life.

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