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Going organic

Why is the organic food industry on the rise worldwide? Can it be both economically and environmentally viable, and feed the exploding world population – or is conventional broad scale agriculture, with its high farm inputs, the only way to meet the rising challenge? There are proponents of organic farming, passionate in their belief of its overwhelming advantages, but the approach also has its critics.

Once regarded as a peculiarity for its attention to the health of soil, organic farming is moving steadily into the mainstream as demand for organic produce has surged. The United States Department of Agriculture estimates that the US, European Union and Japanese markets alone will be worth more than US$100 billion by 2010 and that organic farming will comprise more than half of US agriculture by 2020 if current trends continue – a staggering prediction.

Australia produces $250 million worth of organic food a year and it is expected that, by 2013, some 30 per cent of Australian food will be organic (*Ground Cover*, April 2003, GRDC). But some suggest this and the above US prediction are dubious, being based on a high current rate of increase (and small current percentage), without taking into account other limiting factors likely to come into play.

Nevertheless, such projections, even if proved optimistic, make it hard to dismiss organic agriculture as a mere fad or fringe activity, although this is still a surprisingly prevalent response.

What exactly is organic farming?

Organic farming is agricultural production without the use of synthetic chemicals, such as artificial fertilisers and pesticides, or genetically modified organisms. Soil health and the encouragement of natural processes are central aims, and farms require a high level of management, particularly of soils, weeds and pests. Today, beyond the basic fundamentals of the concept, strict certification standards are applied to organic farms to ensure they meet chemical and environmental criteria.

Customers accept more imperfections in organic produce in favour of natural practices. Betsy Dupuis

The International Federation of Organic Agriculture Movements (IFOAM), defines organic agriculture as '*…a whole system approach based upon a set of processes resulting in a sustainable ecosystem, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs.*'

Certified organic produce has been not only organically grown, but also harvested, prepared and transported in systems that guarantee the produce is not contaminated by synthetic chemicals, fumigated or irradiated. To guarantee that a product is organic it must be labelled as 'certified organic' with the registration number and certifying body's name on it.

Under the broad definition of organic agriculture are some particular subcategories of farming practice: biodynamic

farming and permaculture are perhaps the two best known.

Biodynamic farming is based on the principles of Austrian philosopher Rudolf Steiner. Special – and to the outsider somewhat mysterious – composts, specific preparations and plant activators are used in accordance with those principles.

Permaculture (**perma**nent agri**culture**), like organic agriculture, works with rather than against nature. It is 'the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability and resilience of natural ecosystems'. It aims to build 'complex, stable and productive systems, whether they be home blocks, hobby farms or commercial enterprises' (www.dpi.vic.gov.au).

Is organic farming more sustainable?

Organic farming is almost seen as synonymous with sustainable agriculture, says IFOAM. 'Organic farming enhances soil structure, conserves water and ensures the conservation and sustainable use of biodiversity.' On conventional agriculture IFOAM says, 'Agricultural contaminants such as inorganic fertilisers, herbicides and insecticides from conventional agriculture are a major concern all over the world.'

'Conventional farming systems have a very short history,' adds Tim Marshall, an organic consultant and a co-founder of NASAA (the National Association for Sustainable Agriculture, Australia), 'and while they have a satisfactory record of yield, their performance from a land protection and sustainability perspective has been poor.'

The Brookman family's successful Food Forest permaculture farm on the outskirts of Adelaide grows well-adapted species such as pistachios, with a legume/grass mix in the inter-rows, and uses soft-footed animals to handle weed and pest control. This gives extra yields with minimal management, helping the property to achieve an enviable product energy to input energy ratio. Graham Brookman

So is organic agriculture more sustainable, full stop, or does a more complex picture emerge?

It seems to be agreed that, by and large, organic farming is good for biodiversity. A 2003 report from a project funded by the UK Department for Environment, Food and Rural Affairs (DEFRA) assessing the environmental impacts of organic farming, concluded that 'on average, there is a positive benefit to wildlife conservation on organic farms … whereas there are few studies where a disbenefit is shown'.

Biological Farmers of Australia (BFA) point out that at a farm level the requirement is to set aside more than five per cent of farm land for non-productive areas such as remnant vegetation, natural wetlands, or similar. Marshall says this is the minimum requirement and most farmers do much better. Organic farms use no synthetic pesticides or herbicides, which can potentially harm native fauna and flora.

A recent paper in *Biological Conservation*[1] that examined the issue concluded that three management practices on organic farms – prohibition or reduced use of chemical pesticides and inorganic fertilisers, sympathetic management of non-cropped habitats and preservation of mixed farming – are particularly beneficial for wildlife.

However, the authors also said that it remains unclear whether a holistic (whole-farm) organic approach provides greater benefit to biodiversity than carefully targeted prescriptions applied to relatively small areas of habitat within conventional agriculture.

An analysis of published reports comparing organic and conventional farms[2] concluded that, although there is considerable variation, organic farming usually increases species richness, on average by 30 per cent, and also abundance of organisms, on average by 50 per cent. Birds, predatory insects, soil organisms and plants responded positively to organic farming, in abundance, while non-predatory insects and pests did not.

Organic growing absorbs more labour but less non-renewable resources. Graham Brookman

What about other aspects of sustainability?

Professor David Pimentel and his colleagues at Cornell University, New York, reporting on 22-year farming trials at the Rodale Institute[3], concluded that 'among the benefits of organic technologies are higher soil organic matter and nitrogen, lower fossil energy inputs … and conservation of soil moisture and water resources'.

On energy efficiency, there is some disagreement over the merits of organic versus conventional farming. The UK DEFRA study concluded that the literature shows organic methods generally use less energy per unit area and per unit of output, both for individual crops and livestock types, and overall on a whole-farm basis, but calls for a standard methodology for comparisons.

Organic industry expert Tim Marshall. Graham Brookman

Dr Megan Ryan, formerly at CSIRO and now with the University of Western Australia, disputes this, at least in this country. She says generally lower yields on organic farms, stemming from our low-phosphorus soils in Australia, have several

1. Hole, D.G., Perkins, A.J., Wilson, J.D., Alexander, I.H., Grice, P.V. and Evans, A.D. (2005). Does organic farming benefit biodiversity? *Biological Conservation* **122**, 113–130.
2. Bengtsson, J., Ahnström, J. and Weibull, A, (2005). The effects of organic agriculture on biodiversity and abundance: a meta-analysis. *Journal of Applied Ecology* **42**, 261–269.
3. Pimentel, D., Hepperly, P., Hanson, J., Douds, D. and Seidel, R. (2005). Environmental, energetic, and economic comparisons of organic and conventional farming systems. *BioScience* **55**, 573–582.

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Geese and native bettongs, which are run through the organic orchards and vineyards at The Food Forest, provide very efficient weeding and de-pesting services. Graham Brookman

Given that synthetic pesticides are not used on organic farms it stands to reason that residues are much less likely to be present in the foods they produce.

implications for sustainability. 'They can reduce energy use efficiency, increase the area needed for production, and reduce ability of the system to respond in a flexible manner to problems such as dryland salinity.'

Others might add that conventional agriculture has already made a profound contribution to dryland salinity in this country.

And so it goes on … the various environmental benefits or otherwise of organic farming tending to be hotly debated, whether in relation to leaching of nutrients like nitrates and phosphorus and subsequent algal blooms, methane emissions, carbon dioxide emissions and carbon sequestration in soil, or even the holy grail of soil quality. It appears dangerous to generalise about any aspect of organic agriculture at this point.

The economic sustainability issue is tied up with the 'yields/feeding the world' debate (see below), but on social outcomes, organic farming may just have the edge. Chairman of the Organic Federation of Australia (OFA), Andre Leu, says many areas of Australia and the US have fewer farmers now than a hundred years ago and the small rural centres they support are disappearing off the map.

Scott Kinnear of BFA says family farmers are being driven from the land and replaced by corporate farms, whereas organic farms are generally family run in both developed and developing countries. This helps counter rural decline. The Australian Bureau of Statistics reports that the number of farms in Australia fell by an appreciable 20 000 in just 10 years between 1994 and 2004, but with little change in the total area of farming land.

For any current farmers wishing to assess the sustainability of their enterprises, Graham Brookman, of The Food Forest, an award-winning organic farm, open to the public, in Gawler, South Australia, has developed a practical technique that allows a farmer to quantify on-farm sustainabiliity using some key indicators (www.foodforest.com.au).

Is organically produced food better for you?

Many consumers – for example, 56 per cent of Americans, according to IFOAM – and organic advocates believe that organic foods are healthier. The three main issues here seem to be pesticide residues, nutritional value, and GMOs (which still concern many consumers). But are organic foods really better in these respects?

Given that synthetic pesticides are not used on organic farms it stands to reason that residues are much less likely to be present in the foods they produce. This point alone is becoming an increasingly important consideration for certain consumers.

Tim Marshall of NASAA says that, although it makes sense that food grown in soil with careful attention to complete mineral nutrition (rather than just nitrogen, phosphorus and potassium) would have better trace element nutrition, these claims are still disputed.

However, Andre Leu presents a number of studies, several in peer-reviewed journals, supporting the view 'that organically-produced food has negligible chemical residues, pathogens and higher nutritional values when compared to conventionally grown food' (www.ofa.org.au). For example, a study published in the *Journal of Applied Nutrition* (1993) found that organically grown food, on average, was 63 per cent higher in calcium, 73 per cent higher in iron, 118 per cent higher in magnesium, and 125 per cent higher in potassium.

Megan Ryan's studies revealed that wheat from organic farms in south-eastern Australia had higher copper and zinc concentrations – a good thing as many people in both developed and developing nations are deficient in zinc – but lower manganese and phosphorus.

'Overall, some scientific studies find organic food is more nutritious and others

Urban greenwaste is recycled as rich compost at The Food Forest. Graham Brookman

after a short period of investment in soil capital, organic crop rotations can produce per-acre returns competitive with and sometimes greater than conventional rotations.

find conventional more nutritious,' she says. 'I would definitely say that it's inaccurate to claim that organic food is more nutritious generally.' The debate continues.

If you're concerned about genetically modified organisms (GMOs), you are probably willing to pay more for organic food. In a precautionary approach, GMOs are expressly prohibited within the organic production chain in Australia, as are food additives such as antibiotics, anti-microbials, hormones and other growth promotants.

What about yields and profitability?

Whether or not organic farming can generate the same yields and profitability as conventional farming is a contentious issue … and the answer depends on who you ask, what research you look at, and the nature of the enterprise – whether it be intensive or broadacre farming, crops or livestock.

Last year a provocative media release emanating from the 4th International Crop Science Congress further inflamed the debate. It said that research by Dr Holger Kirchmann of the Swedish University of Agricultural Sciences and Dr Meg Ryan, University of Western Australia, had revealed that 'yields in organic farming are 25 to 45 per cent lower than in conventional agriculture, requiring 33 per cent more land to sustain food production in farming systems that include animals and 82 per cent more land in farming systems without animals.' The yield data were from a combination of European and Australia studies.

By contrast, a global review by Christos Vasilikiotis of the University of California cited innumerable studies that had concluded that organic farming methods could produce yields that are comparable to those of conventional methods or greater. Crops covered in the various studies included tomato, safflower, corn, beans, soybeans and wheat. Vasilikiotis wrote that 'the results clearly show that organic farming accomplishes many of the FAO's (Food and Agriculture Organization) sustainability aims, as well as showing promise in increasing food production ability.'[4]

Scientists reporting on the long-running Rodale Institute trials of organic versus conventional grain production in the United States have some interesting findings. They conclude that after a short period of investment in soil capital, organic crop rotations can produce per-acre returns competitive with and sometimes greater than conventional rotations. However, they identified other barriers to adoption of sustainable methods – higher labour requirements hinder a farmer's ability to continue organic farming while working full-time off the farm, a significant 'opportunity cost'.

Marshall bristles at the suggestion of lower yields on organic farms. 'The generalisation is that organic growers are driven by quality rather than yield, and their premiums pay the deficit,' he told *Ecos*. 'In fact, the decrease in yield need not be significant, at least after the conversion years, depending on the skill of the operator.'

'Generally speaking, the more intensive the land use, the better the return from organic. I know of small-scale organic horticulture enterprises that are probably producing equivalent yield, and higher return per square metre, than any other legal land use…! Broadacre farmers tend not to fare so well compared to neighbouring conventional farmers, but even here the differences can be negligible,' says Marshall.

Agricultural economist, Dr Els Wynen, told *Ecos* her research indicated that on broadacre grain-livestock farms in eastern Australia, organic farmers can have similar yields to those on conventional neighbouring farms, and experienced less year-to-year variability in yields than conventional ones. They didn't do as well as conventional farmers in good seasons, but fared better in bad seasons.

'The organic farms did notably better than conventional ones in dry years,' said Wynen, 'although all farmers naturally struggle during droughts. Organic cereal crops seemed to "hang in there" longer during dry spells and so were often able to recover more strongly when rain eventually came.'

A Rural Industries Research and Development Corporation (RIRDC) report released in August this year covering an economic survey of five organic and five conventional farms, concluded that relative yields per hectare were estimated to be lower on those organic farms in the late 1990s, but premium prices for organic wheat were higher than in previous surveys. Organic farmers who had recently converted had lower financial returns than farmers who had been certified as organic for a longer time, reflecting the initial risk that conversion entails for broadacre farmers (www.rirdc.gov.au).

'No farming is easy, but many farmers have made organic farming pay and have improved their lifestyle at the same time,'

Organic farming's basic tenet is the creation of a healthy, fertile soil that achieves a better physical structure. It's 'aliveness' or dynamic nature is the basis of the farm agro-ecosystem.
Clayton Hansen

4. www.cnr.berkeley.edu/~christos/articles/cv_organic_farming.html

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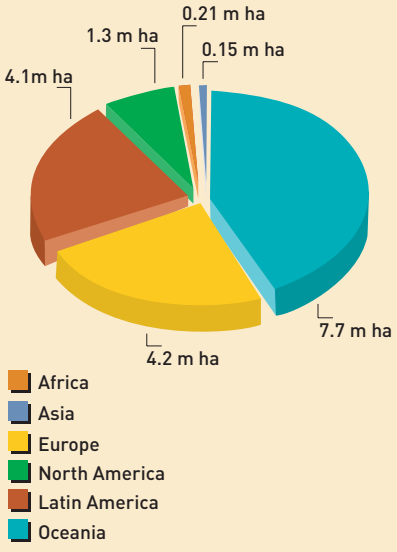
More organic statistics

Oceania (including Australia) holds some 45 per cent of the world's organic land, followed by Latin America and Europe. Australia is ranked 36th in the world in terms of numbers of organic farmers (Biological Farmers of Australia (BFA), 2004).

According to the International Federation of Organic Agriculture Movements (IFOAM), in 2005 some 10 million hectares will be certified as organic in Australia and Oceania, involving approximately 2000 farms, including vast cattle stations. BFA puts the figure at closer to 12.5 million hectares currently under certified organic management in Australia, or more than two per cent of land area.

Over the last six years, China has increased its organic farm acreages nearly 10-fold and is well on the way to becoming the number one organic producer in the world.



Proportions of worldwide organic agricultural production per region.

Global sales of organic produce are rising by about 20 per cent a year. North America and Europe account for 97 per cent of global organic food and drink sales, but nearly half the world's organic farmland is found in Asia, Australia and Latin America (*Nature*, 2004).

Growth in Australian organic production is estimated at 15–25 per cent per annum and we are in a good position to supply expanding markets overseas, particularly in Asia (RIRDC, 2004).

A Department of Agriculture, Fisheries and Forestry study estimated that organic farm production in Australia was worth about A$140 million in 2003 and IFOAM says the worldwide organic market reached US$26 billion in 2004. The study found growing numbers of organic producers representing industries as diverse as meat, horticulture, grains, viticulture, dairy, wool and coffee.

says Marshall. 'The problem with most comparisons is that the negative effects of so-called "high-production" conventional agriculture are not fully costed in – land restoration, for example, is not included in the price consumers normally pay for food.'

When Wynen examined economic issues for organic farms, including yields, inputs, outputs and returns, she found that, fundamentally, the financial performance of organic farms could be equivalent to conventional farming, but that the details of each particular situation, such as the history of the farm, were a very important consideration.

'Organic farmers may use fewer inputs such as fertilisers and pesticides than conventional farmers. The general picture is one of similar or lower yields (for example 30–35% less milk per hectare on organic dairy farms), but lower input costs and higher output prices on organic farms than on conventional ones,' says Wynen. In Australia, the average price premium for all organic goods has been put at 80 per cent.

'The burning question, to me, is whether it is possible for a farmer to achieve organic management without going broke in the transitional stage,' Wynen says. 'This would seem easier in countries, such as those of the EU, where governments support organic agriculture with subsidies, be they in the form of direct payments to farmers, research subsidies or taxes on inputs like pesticides.'

Rush hour at the popular Organic Market, in Stirling, near Adelaide. Graham Brookman

Can organic farming feed the world?

Andre Leu strongly rejects the assertion that the world would starve if we all converted to organic agriculture. He cites numerous successful organic farming stories around the world, including for example, 200 000 farmers across Kenya who, as part of sustainable agriculture programs have more than doubled their maize yields to about 2.5 to 3.3 tonnes per hectare and substantially improved vegetable production through the dry seasons (www.ofa.org.au).

'Simple community-based organic agricultural models, such as this one in Kenya, are what is needed around the world to end rural poverty and starvation, rather than GMOs and expensive chemicals,' says Leu. 'An important aspect of teaching sustainable and organic methods in developing regions is that the food and fibre is produced close to where it is needed and in many cases by the people who need it … not halfway around the world, transported and sold to them.'

Leu concludes that data from both the developing and developed world show that it is possible to get very good yields using organic systems. He concedes, though, that this is not uniform at the moment, with many organic growers not producing at the levels that are achievable.

'More education on organic practices is what is needed,' says Leu. 'However, I have no doubt that organic agriculture is a viable solution to preventing global hunger. It is the quickest, most efficient, cost effective and fairest way to feed the world,' he said.

● **Steve Davidson**

More information:
The Organic Federation of Australia: www.ofa.org.au
The National Association for Sustainable Agriculture, Australia: www.nasaa.com.au
Biological Farmers of Australia: www.bfa.com.au
International Federation of Organic Agriculture Movements: www.ifoam.org
Rural Industries Research and Development Corporation: www.rirdc.gov.au