

# Organic Agriculture Can Feed the World

Leu, Andre F.

Chairman, Organic Federation of Australia

## Abstract

Proponents of industrial agriculture state that synthetic biocides, soluble fertilisers and genetic engineering are necessary to feed the worlds growing population. Several authorities further state organic agriculture is not capable of this task.

This paper looks at numerous and diverse data sets from around the world, showing that given the right conditions, organic agriculture can deliver sustainable high yields. Organic agriculture programs initiated by several organisations have substantially increased yields for many third world communities. This has been done with very low input and infrastructure costs to these communities and has substantially increased their standard of living. Data from the advanced agricultural economies of North America, Australia and Europe show that best practice organics can deliver equal and to significantly better yields than current conventional agricultural practices.

## Introduction

Several of the high profile advocates for conventional agricultural production have stated that the world would starve if we all converted to organic agriculture. They have written articles for science journals and other publications saying that organic agriculture is not sustainable and produces yields that are significantly lower than conventional agriculture. *Avery (2000) Trewavas (2001)*

The push for genetically modified organisms (GMOs), growth hormones, animal feed antibiotics, food irradiation and toxic synthetic chemicals is being justified, in part, by the rationale that without these products the world will not be able to feed itself.

Since Thomas Malthus, wrote 'An Essay on the Principle of Population' in 1798 and first raised the spectre of overpopulation, various experts have been predicting the end of human civilisation because of mass starvation. *Malthus (1798)*

The theme was popularised again by Paul Erlich in his 1968 book, *The Population Bomb*. According to his logic, we should all be starving now that the 21<sup>st</sup> century has arrived. *'The battle to feed all of humanity is over. In the 1970s the world will undergo famines; hundreds of millions of people are going to starve to death in spite of any crash programs embarked upon now.'* *Erlich (1968)*

The only famines that occurred since 1968 have been in African countries saddled with corrupt governments, political turmoil, civil wars and periodic droughts. The world had enough food for these people. It was political and logistical events that prevented them from producing adequate food or stopped aid from reaching them. Hundreds of millions of people did not starve to death.

The spectre of mass starvation is being pushed again as the motive for justifying GMOs. In June this year (2003) President Bush stated at a biotechnology conference '*We should encourage the spread of safe effective biotechnology to win the fight against global hunger.*' Dayton (2003)

### Is global hunger due to a shortage of food production?

In this first decade of the 21<sup>st</sup> century, many farmers around the world are facing a great economic crisis of low commodity prices. These low prices are due to oversupply. The laws of supply and demand, in current economic theories, show that prices decrease when supply is greater than demand.

Most of our current production systems are price driven, with the need for economies of scale to reduce the unit costs. The small, profit margins of this economic environment favor enterprises working on large volumes and as a result the family farm is declining. Many areas of the USA and Australia have fewer farmers now than 100 years ago and the small rural centres they support are disappearing off the map. Hundreds of thousands of farmers have had to leave their farms in Argentina due to higher production costs and lower commodity prices. *Lehmann (2000)* The sugar industry in Australia is on the verge of collapse for the same reason. Australian dairy farmers continue to leave the industry since deregulation forced down the prices they receive. Most of the major industrial countries are subsidising their farmers so that their agricultural sectors do not collapse.

Europe, North America, Australia and Brazil are in the process of converting a large percentage of their arable land from food production to bio fuels such as ethanol in an effort to establish viable markets for their farmers. The latest push in GMO development is BioPharm where plants such as corn, sugarcane and tobacco are modified to produce new compounds such as hormones, vaccines, plastics, polymers and other non-food compounds. All of these developments will mean that less food is grown on some of the world's most productive farmland.

Grain farmers in India have protested about cheap imports that are sending them deeper into poverty. Countries like India and China, once considered as overpopulated basket cases, export large quantities of food. In fact, India, one of the world's most populated countries, is a net food exporter in most years.

South American rainforests are cleared for pasture that is grazed with beef destined for the hamburger chains of North America. Once the soil is

depleted, new areas are cleared for pasture and the old degraded areas are abandoned to weeds. In Asia, most of the forests are cleared for timber that is exported to the developed industrial economies. One of the saddest things about this massive, wasteful destruction of biodiversity is that very little of the newly cleared land is used to feed the poor. Most of this production of timber and beef is exported to the world's richest economies.

The reality is that the world produces more than enough food to feed everyone and has more than enough suitable agricultural land to do it. Unfortunately due to inefficient, unfair distribution systems and poor farming methods, millions of people do not get adequate nutrition.

### Can Organic Agriculture feed the world?

Organic agriculture needs to be able to answer two major questions.

- 1: Can organic agriculture get high yields?
- 2: Can organic agriculture get the food to the people who need it?

The editorial of *New Scientist* February 3, 2001 stated that low-tech sustainable agriculture is increasing crop yields on poor farms across the world, often by 70 per cent or more. This has been achieved by replacing synthetic chemicals in favor of natural pest control and natural fertilizers. *New Scientist (2001)*

Professor Jules Pretty the Director of the Centre for Environment and Society at the University of Essex in the UK wrote: *'Recent evidence from 20 countries has found more than 2 million families farming sustainably on more than 4-5 million hectares. This is no longer marginal. It cannot be ignored. What is remarkable is not so much the numbers, but that most of this has happened in the past 5-10 years. Moreover, many of the improvements are occurring in remote and resource-poor areas that had been assumed to be incapable of producing food surpluses.'* Petty (1998b)

An excellent example of this type of agricultural extension has been published in the January 2003 edition of *World Vision News*. Working in conjunction AusAID, World Vision linked farmers from the impoverished Makuyu community in Kenya with the Kenya Institute of Organic Farming (KIOF). (*World Vision 2003*)

They arranged workshops where KIOF members taught the principles of organic farming, including compost making, preparing safe organic pesticides, vegetable gardening and organic care of livestock.

Maize yields increased from four to nine times above previous levels. The organically grown crops had yields that were 60% higher than crops grown with expensive chemical fertilisers.

The wonderful thing is that many of these farmers now have a surplus of food to sell, whereas previously they did not have enough to eat. They are organising marketing co-ops to sell this surplus.

The profits are going back to the community. They have distributed dairy goats, rabbits, hives and poultry to community members and have planted out 20,000 trees including 2,000 mangos. Several of the organic farmers are training many other farmers in the district and helping them to apply organic farming techniques to their farms.

The mood of the community has changed. They are now confident and very importantly they are empowered with the knowledge that they can overcome the problems in their community.

These types of simple community based organic agricultural models are what is needed around the world to end rural poverty and starvation, rather than GMOs and expensive toxic chemicals.

The Makuyu community in Kenya is not an isolated example. Professor Pretty gives other examples from around the world of increases in yield when farmers have replaced synthetic chemicals and shifted to sustainable/organic methods.

- *223,000 farmers in southern Brazil using green manures and cover crops of legumes and livestock integration have doubled yields of maize and wheat to 4-5 tons/ha;*
- *45,000 farmers in Guatemala and Honduras used regenerative technologies to triple maize yields to 2-2.5 tons/ha and diversify their upland farms, which has led to local economic growth that has in turn encouraged re-migration back from the cities;*
- *200,000 farmers across Kenya as part of sustainable agriculture programs have more than doubled their maize yields to about 2.5 to 3.3 t/ha and substantially improved vegetable production through the dry seasons;*
- *100,000 small coffee farmers in Mexico have adopted fully organic production methods, and increased yields by half;*
- *A million wetland rice farmers in Bangladesh, China, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam have shifted to sustainable agriculture, where group-based farmer-field schools have enabled farmers to learn alternatives to pesticides increased their yields by about 10%.*

*Pretty (1995), Pretty (1998b)*

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.

- *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.*

One of the most important aspects of the teaching farmers in these regions to increase yields with sustainable/organic methods is that the food and fibre is produced close to where it is needed and in many cases by the people who need it. It is not produced half way around the world, transported and sold to them.

Another important aspect is the low input costs. They do not need to buy expensive imported fertilisers, herbicides and pesticides. The increase in yields also come with lower production costs allowing a greater profit to these farmers.

Thirdly the substitution of more labour intensive activities such as cultural weeding, composting and intercropping for expensive imported chemical inputs, provides more employment for the local and regional communities. This employment allows landless laborers to pay for their food and other needs.

As in the example of the Makuyu community in Kenya, these benefits see a positive change in the wealth and the mood of the community. These communities are revitalised, proactive and empowered to improve their future.

### **Can organic agriculture achieve high yields in developed nations?**

Since 1946, the advent of chemical fertilisers, pesticides, herbicides, improved crop varieties and industrial paradigms are credited with producing the high yields of 'green revolution'. Because organic agriculture avoids many of these new inputs it is assumed that it always results in lower yields.

The assumption that greater inputs of synthetic chemical fertilisers and pesticides are needed to increase food yields is not 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 (1998b) Pretty (1998a)

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. The organic system had equivalent yields to the other systems. The study also showed that the break-even point was 9 years after planting for the organic system and 15 and 16 years respectively for conventional and integrated farming systems. *Reganold (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)*

Gary Zimmer, one of the American pioneers of biological farming runs an organic dairy farm with his son in Wisconsin. In 2000 one of his remineralised alfalfa (lucerne) fields produced a yield 4 times greater than the average for the district. He has increased the nutrient value of pasture by 300% and currently calves 150 cows every year without one health problem *Zimmer (2000) Zimmer pers. com.*

Dick Thompson, a founding member of the Progressive Farmers of Iowa, engages in organic farm research in conjunction with the University of Iowa, the Rodale Institute and the Wallace Institute. He obtains some of the highest yields in his district using composts, ridge tilling and crop rotations. *Thompson (2000)*

The innovative system of rotationally grazing several species of animals developed by Joel and Therese Salatin, in Virginia, is one of the best examples of a high yield organic system. They use 100 acres of dry land pasture to cell graze cattle, sheep, pigs, meat chickens, laying hens, turkeys, pheasants and rabbits.

The system has been based on native pastures, without cultivation or new 'improved' pasture species. The only input has been the feed for the poultry. This multi-species rotational grazing system builds one inch of soil a year and returns the family 15 times the income per acre than is received by neighbouring farms using a set stocking of cattle

*Salatin pers. com.*

Steve Bartolo, President of the Australia Organic Sugar Producers Association produced similar yields of commercial sugar per hectare from his organic Q124 cane to his conventional cane in 2002. The average yield of sugar for his best organic cane '*...achieved higher tonnes [of sugar] per hectare compared to the average of all conventionally grown Q124.*'  
*Bartolo (in publication)*

Greg Paynter, an organic farmer who works for the Queensland Department of Primary Industries conducted the organic section of grain comparison trials at Dalby Agricultural College in 2002. The organic wheat produced 3.23 tonnes to the hectare compared to the conventional wheat of 2.22 tonnes. This trial was conducted during one of the worst droughts on record.  
*Paynter pers. com. In publication*

Graham McNally of Kialla Farms, one of Australia's significant organic pioneers, consistently achieves comparable yields to the conventional farms in his region. *McNally In publication*

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)*

Will GMOs feed the world?

Argentina is a good example of what happens when a country pursues the policies of market deregulation and GMO crops.

Argentina is the third largest producer of GMO crops with 28% of the world's production. By the 1999/2000 season, more than 80% of the total soybean acreage or 6.6 million hectares had been converted to GMOs. These are some of the results according to a study published by Lehmann and Pengué in the Biotechnology and Development Monitor.

· Declining profit margins: Prices for soybeans declined 28% between 1993 and 1999.

- Farmers' profit margins fell by half between 1992 and 1999, making it difficult for many to pay off bank loans for machinery, chemical inputs and seeds.
- A 32% decrease in producers: Between 1992 and 1997, the number of producers dropped from 170,000 to 116,000. 54,000 farmers were forced to leave the industry.
- At least 50% of the acreage is now managed by corporate agriculture.
- Increasing role of transnational companies in the agricultural sector:  
Industrialization of grain and soybean production has boosted dependence on foreign agricultural inputs and increased foreign debt.
- Removal of import tariffs led to the bankruptcy of domestic farm machinery manufacturers and a loss of employment.
- The commercial seed sector has become increasingly controlled by subsidiaries of transnational corporations. *Lehmann (2000)*

Since the above data was published, the Argentinean economy collapsed causing riots and the resignations of several governments. The country is now currently in deep debt with its economy under the control of the International Monetary Fund and the World Bank. Its standard of living has declined and thousands more farmers have been forced off their farms. Rural and urban poverty and hunger has increased.

According to Caritas Argentina, the social services agency of the Catholic Church in Argentina, over 40% of all Argentinean children are now undernourished. "World Health Organization standards for daily caloric intake are unmet for nearly 40 percent of Argentinean children under 18, and for up to half in the poorer northeast region of the country. Even in the comparatively wealthy capital city Buenos Aires, at least 19 children have died of malnutrition in recent months." *Caritas 2003*

If GMO's cannot feed the children in the country that is the world's third largest producer of GMO crops, how will they feed the rest of the world?

## Conclusion

The data shows that it is possible to get very good yields using organic systems. This is not uniform at the moment with many organic growers not producing at the levels that are achievable. Education on the best practices in organic agriculture is a cost effective and simple method of ensuring high levels of economically, environmentally and socially sustainable production where it is needed.



Organic agriculture is a viable solution to preventing global hunger because

- 1: It can achieve high yields
- 2: It can achieve these yields in the areas where it is needed most
- 3: It has low inputs.
- 4: It is cost effective and affordable
- 5: It provides more employment so that the impoverished can purchase their needs
- 6: It does not need any expensive technical investment

**It costs tens of millions of dollars and takes many years to develop one genetically modified plant variety. This money would be more productive being spent on organic agricultural education, research and extension in the areas where we need to overcome hunger and poverty.**

Organic agriculture is the quickest, most efficient, cost effective and fairest way to feed the world.

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