Organic agriculture and food security –not a contradiction

Organic farming is not going to succeed in feeding the world's growing population, its critics say. This is wrong, our author maintains, for there are numerous studies that refute the notion that conventional agriculture turns out higher yields in all circumstances. Moreover, increases in production levels achieved over the last few years have not been able to solve the problem of hunger either.

Ever since economist 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 predicted that human society would starve in the 1800s.

The theme was again popularised by Stanford University Professor Paul Ehrlich in his 1968 book, 'The Population Bomb'. According to his logic, we should all be starving now that the 21st 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.'*

The only famines that occurred since 1968 have been in countries saddled with corrupt governments, political turmoil, civil wars and periodic droughts. The world had enough food for the affected people. It was political and logistical events that prevented them from producing adequate food or stopped aid from reaching them.

Although the world produces more than double the amount of food to feed everyone, around one billion people suffer from hunger.

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Photo: J. Boethling

Photo: Courtesy of the Rodale Institute

Organic (left) vs. conventional: Better water infiltration, retention and delivery to plants help to sustain yield during drought.

Hundreds of millions of people did not starve to death.

The spectre of mass starvation is again being pushed, based on highly questionable and contestable assumptions, as the motive for justifying genetically modified organisms (GMOs) and the unsustainable use of toxic chemicals to push for higher yields.

Enough food for everyone

According to the UN Food and Agriculture Organization (FAO) and other figures, the world produces more than double the amount of food to feed everyone. Despite this, around one billion people suffer from hunger and another billion are malnourished, lacking the essential micronutrients they need to lead healthy lives. Clearly, our current market-based distribution systems are failing the poorest as they cannot afford to buy this food. The market-based systems concentrate the food in the areas where people have the money to pay for it. Consequently one billion adults are overweight and almost half of them are obese.

Food losses also are staggering. About one-third of the food produced for human consumption is lost or wasted every year, amounting to about 1.3 billion tons annually (FAO, 2011). Reducing food losses and food waste, and improving food access, is highly relevant to efforts to combat hunger, raise income and improve food security in the world's poorest countries. Simple affordable measures such as village grain silos and better transport would prevent most of these losses. The problem of hunger is mostly due to poor distribution systems and inadequate production in the poorest communities. It has very little to do with the total amount of food produced in the world.

Where Organic has higher yields: Conditions of climate extremes ...

Research has shown two significant areas where organic systems have higher yields than the conventional system. These are under conditions of climate extremes and in traditional smallholder systems. Both of these areas are critical to achieving global food security.

According to research by NASA and others the world is seeing increases in the frequency of extreme weather events such as droughts and heavy rainfall. Even if the world stopped polluting the planet with greenhouse gases tomorrow, it would take many decades to reverse climate change. This means that farmers have to adapt to the increasing intensity and frequency of adverse and extreme weather events such as droughts and heavy, damaging rainfall.

Published studies show that organic farming systems are more resilient to the predicted weather extremes and can produce higher yields than conventional farming systems in such conditions (Drinkwater, Wagoner and Sarrantonio, 1998; Welsh, 1999; Pimentel, 2005). For instance, the Wisconsin Integrated Cropping Systems Trials found that organic yields were higher in drought years and the same as conventional yields in normal weather years (Posner et al., 2008).

Similarly, Farming Systems Trials (FST) of the US-based Rodale Institute showed that the organic systems produced more maize than the conventional system in drought years (see photo). The average maize yields during the drought years were from 28 per cent to 34 per cent higher in the two organic systems. The yields were 6,938 and 7,235 kg per hectare in the organic animal and the organic legume systems respectively, compared with 5,333 kg per hectare in the conventional system (Pimentel, 2005). The researchers attributed the higher yields in the dry years to the ability of the soils on organic farms to better absorb rainfall. This is due to the higher levels of organic carbon in these soils, which makes them more friable and better able to store and capture rainwater which can then be used for crops (La Salle and Hepperly, 2008).

Improved efficiency of water use. Research also shows that organic systems use water more efficiently due to better soil structure and higher levels of humus and other organic matter compounds (Lotter, Seidel and Liebhart, 2003; Pimentel, 2005). Lotter and colleagues collected data over ten years during the Rodale Farming System Trials. Their research showed that the organic manure system and organic legume system (LEG) treatments improve the soil's water-holding capacity, infiltration rate and water capture efficiency. The LEG maize soils averaged a 13 per cent higher water content than conventional system (CNV) soils at the same crop stage, and 7 per cent higher than CNV soils in soybean plots (Lotter, Seidel and Liebhart, 2003).

The more porous structure of organically treated soil allows rainwater to quickly penetrate the soil, resulting in less water loss from run-off and higher levels of water capture. This was particularly evident during the two days of torrential downpours from Hurricane Floyd, which hit the eastern United States and the Bahamas in September 1999, when the organic systems captured around double the water than the conventional systems captured (Lotter, Seidel and Liebhart, 2003).

This is very significant information as the majority of the world farming systems are rainfed. The world does not have the resources to irrigate all of the agricultural lands. Nor should such a project be started as damming the world's watercourses, pumping from all the underground aquifers and building millions of kilometres of channels would be an unprecedented environmental disaster.

Improving the efficiency of rainfed agricultural systems through organic practices is the most efficient, cost effective, environmentally sustainable and practical solution to ensure reliable food production in the increasing weather extremes being caused by climate change.

... and smallholder farmer systems

The other critical area where research is showing higher yields for good practice organic systems is in traditional smallholder systems. This is very important information as over 95 per cent of the world's farmers fall into this category. A report by the United Nations 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.'*

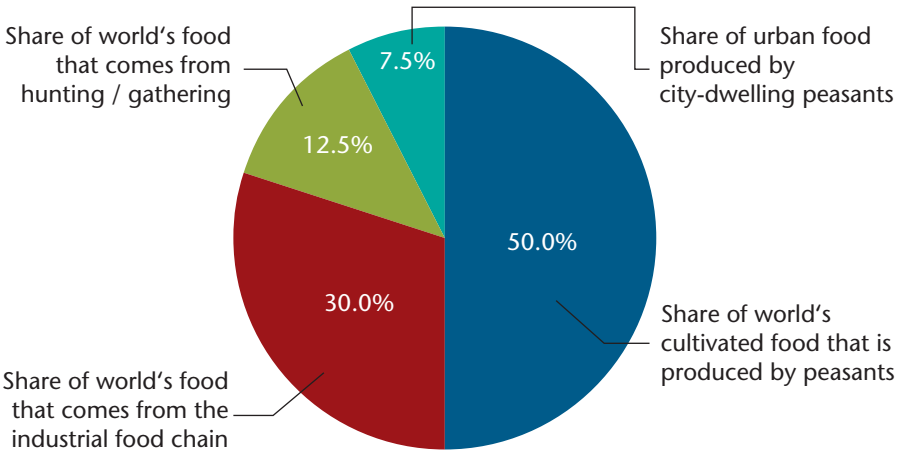
The report notes that despite the introduction of conventional agriculture in Africa, food production per person is 10 per cent lower now, than in the 1960s. *'The evidence presented in this study supports the argument that organic agriculture can be more conducive to food security in Africa than most conventional production systems, and that it is more likely to be sustainable in the long term'*, Supachai Panitchpakdi, Secretary General of UNCTAD and Executive Director of UNEP Achim Steiner stated.

This is crucial information as FAO data shows that 80 per cent of the food in the developing world comes from smallholder farmers such as those in Africa. The developing world is also the region where most of the one billion undernourished people live, the majority of which are smallholder farmers. With a more than 100 per cent increase in food production in these traditional farming systems, organic agriculture provides the ideal solution to end hunger and ensure global food security.

The key to food security

Information published by the ETC group, an international organisation dedicated to "the conservation and sustainable advancement of cultural and ecological diversity and human rights", shows that 70 per cent of the world's food is produced by smallholders and only 30 per cent by the agribusiness sector (ETC group, 2009; see Figure below). Increasing the yields in the 30 per cent that comes from the agribusiness sector will show little benefit for two reasons. Firstly, this sector is already high-yielding, and it has very little scope for large increases in yields such as the more than 100 per cent that can be achieved by organic methods in traditional smallholder systems. Secondly, this sector is largely focused on the commodity supply chain. The

Where the world's food comes from



Source: ETC group

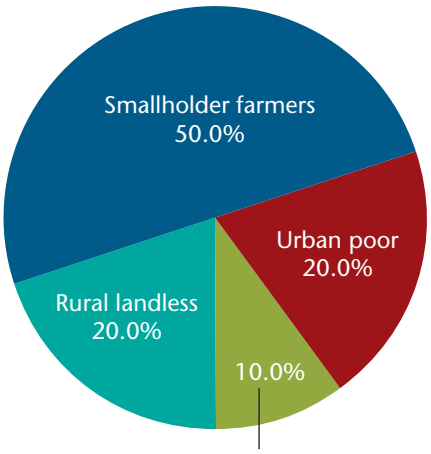
large food surpluses produced in the sector have not lowered the number of people who are hungry. According to FAO figures, this number has been steadily increasing since 1985.

Fifty per cent of the world's hungry are smallholder farmers and 20 per cent are the landless poor who rely on smallholders for their employment (see Figure). Logically, increasing the yields in this sector is the key to ending hunger and achieving food security. Organic methods are the most suitable as the necessary methods and inputs that are needed to do this can be sourced locally at no or very little cost to the farmers. Conventional systems have largely failed to provide consistent higher yields to the poorest farmers as the expensive synthetic chemical inputs have to be purchased. Most of these farmers do not have the income to do this. It is an inappropriate economic model for the world's most vulnerable farmers whereas organic agriculture is an appropriate one. A good example is a project managed by the Institute of Sustainable Development in Tigray, Ethiopia (see Box).

What about yields and farm income?

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 Jules Pretty of Essex University 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 to 80 per cent, and be financially better off. Yields do fall to begin with (by 10 to 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). Numerous studies into organic systems confirm this insight – the following refers to only a few of them:

Who the hungry are



Source: ETC group

US Agricultural Research Service (ARS) Pecan Trial. The ARS organically managed pecans out-yielded the conventionally managed, chemically fertilised 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).

Rodale Organic Low/No Till. The Rodale Institute (Pennsylvania, USA) has been trialling a range of organic low tillage and no tillage systems. The 2006 trials resulted in organic yields of 160 bushels an acre (bu/ac) compared to the County average of 130 bu/ac.

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 (Iowa, USA) showed that while the organic systems had lower yields in the beginning, by year four 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-utilisation of chemical fertilisers and pesticides (Delate, 2010).

Developing countries. 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 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.

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). A study by Dr Rick Welsh of the Wallace Institute, USA, has also shown that organic farms can be more profitable. The premium paid for organic produce is not always a factor in this extra profitability. While many organic farmers have higher incomes due to the premium they receive, others have higher net incomes due to their lower input costs rather than from the premium.

The United Nations report already cited notes: *'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.'

Conclusion

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

'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', the UN report stated.

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. We need to see more research and extension in this area to ensure that all farmers can improve their yields and resilience by adopting the appropriate best-practice organic systems (see article on pages 32 – 34).

Most importantly, the world urgently needs to increase the training in good organic practices to ensure that the poorest smallholder farmers can have the increases in yield that are needed to achieve food security.

A full list of references and literature cited can be accessed from the website: **www.rural21.com**

Simple methods, big success: Sustainable development in Tigray, Ethiopia

The Tigray Project started in 1996 in four local communities in the central, eastern and southern parts of the Tigray Regional State of Ethiopia. It was initiated by an Ethiopian NGO, the Institute of Sustainable Development (ISD). The ISD worked in cooperation with the farmers to revegetate their landscape to restore the local ecology and hydrology. The biomass from this revegetation was then sustainably harvested to make compost and to feed biogas digesters. This was applied to the crop fields. The result after a few years was more than 100 per cent increases in yields, better water use efficiency and greater pest and disease resistance in the crops.

The farmers used the seeds of their own landraces which had been developed over millennia to be locally adapted to the climate, soils and the major pests and diseases. These farmerbred varieties proved to be very responsive to producing high yields under organic conditions, whereas under conventional input practices they were susceptible to diseases such as rust.

The major advantage of this system was that the seeds and the compost were sourced locally at no or little cost to the farmers whereas the seeds and synthetic chemical inputs in the conventional systems had to be purchased. The organic system had both higher yields and a much better net return to the farmers.

This project using simple appropriate organic methods took a region that was previously regularly affected by severe famines that killed people through to a food surplus and relative prosperity. The people could now afford to eat well, buy clothes, send their children to school, pay for medical treatment, afford transport into town and build adequate houses.

The Third World Network provided the initial funding for the project. Today ISD is working with the Ethiopian Bureau of Agriculture and Rural Development (BoARD), district (woreda) experts and development agents to continue implementing the Tigray Project. The funding from several donor agencies is assisting the scaling up so that more regions in Ethiopia can adopt the practices (Edwards S., Egziabher T., Araya H., 2011).

Average mean grain yields in kg/ha for four cereals and one pulse crop from Tigray, northern Ethiopia, 2000 – 2006 inclusive