

INNOVATIVE SCIENCE

ISSUE 1: AGRICULTURE AND FOOD EDITION



THE FUTURE OF ORGANIC AGRICULTURE: OTOPIA OR OBLIVION?



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Organic agriculture could feed the world, but will it? A state of Otopia, an organic Utopia of 100% organic food and organic agriculture, is a dream, or is it a pipe-dream? And if a dream, might it manifest in four decades or 54 decades? Two roads to Otopia are extrapolated from the current state of global organics.

A meta-study of organic versus chemical agriculture by a research team from the University of Michigan, and headed by Catherine Badgley, found that if the world made a switch to organic agriculture then the global food supply could increase. And importantly the increases would be greatest in areas of greatest need. Allied with increases for most of the world's farmers, Badgley's team showed that yields would reduce in areas of the least need, for example USA, where there is overproduction from industrialized agriculture that is now heavily subsidized by US taxpayers.

Ancien regime organic agriculture fed the world for ten millennia. Ghengis Khan, Beethoven, Socrates, Michelangelo - select your own heroes or villains up to and including the nineteenth century - and all the great and ungreat figures of history, had a diet of *de facto* organic food.

Since the development of the Haber-Bosch process of nitrogen fixation a century ago we have witnessed the relentless colonization of the agricultural space by synthetic fertilizers. Then, chemical warfare agents developed in WWI, and more especially in WWII, have been repurposed for agriculture, sending *de facto* organic agriculture into a near-terminal decline.

Yet, that terminus has not been reached. Through a series of agricultural innovations, including the development of organic standards, the certification of the production process, the implementation of traceability pathways, and the labelling of organic food, the decline of *de facto* organic has been met with the rise of certified organic. Oblivion now appears unlikely with the certified organic sector often popularly described as "the world's fastest growing food sector".

ORGANIC VS. CHEMICAL AGRICULTURE

The reaction against synthetic fertilizers and pesticides dates at least back to Rudolf Steiner who delivered a series of lectures, in what is now Poland, in 1924. From that series of eight lectures delivered

over 10 summer days, bio-dynamic agriculture has developed into a worldwide phenomenon.

The British agriculturalist Lord Northbourne introduced the term "organic agriculture" in his 1940 book "Look to the Land". He presented the idea that the agricultural space is a contested space: "organic versus chemical farming".

In 1972, three decades on from Northbourne, all streams of agriculture that eschewed synthetic fertilizers and pesticides - including biodynamic, organic, bio and ecological - were united in France under the umbrella of the newly formed *International Federation of Organic Agriculture Movements* (IFOAM). This development laid the grounds for sharing, extending, and the harmonizing of local innovations, including innovations of agricultural practice, of standards, of certifications, of labelling, and of training and advocacy into the international arena.

The United Nations Environment Programme (UNEP) has estimated that there are 150 dead zones in the oceans due to fertilizer and pesticide runoff. These dead zones are silent witnesses to the wisdom of those early organic pioneers. Since the first articulation of organic standards, the exclusion of synthetic fertilizers and pesticides has been extended to excluding irradiated food and genetically modified organisms (GMOs) from the certified organic food stream.

Most recently there has been the call, and in several countries the action, to exclude engineered nanoparticles from organic food production. Nanoparticles are of a size from 1 to 100 billionths of a metre. That is small enough to pass through bio-barriers, including the skin, animal membranes in general, and the blood/brain barrier. Excluding nanotechnology from certified organic food is a logical progression for an agricultural methodology that aims to exclude cryptic technologies - that is, techno-stuff that you have no way of knowing is present or not - from the dinner plate.

ORGANIC TIMELINE

Willer and Kilcher in IFOAM's *The World of Organic Agriculture, Statistics and Emerging Trends 2009*, record a worldwide total of 32,221,311 organically managed agricultural hectares. By their calculation, that represents 0.8% of the total worldwide agriculture

hectares. Their figure is a total of hectares reported by organic certifiers as certified organic or organic in-conversion. Farms that are de facto organic for whatever reason, perhaps remoteness, are not included in the Willer & Kilcher figure, so their figure is a lower bound estimate of organically managed land.

IFOAM have reported the global total of organic hectares in annual reports since 2000 (Figure 1). Over that nine year period the total organic hectares has tripled from 10.6 million to 32.2 million hectares. That is an impressive rate of growth. However the timeline is too short to declare that the style of growth exhibited is either arithmetic or geometric growth. As Thomas Malthus pointed out in 1798, and also perhaps your high-school economics teacher, these two styles of growth produce dramatically different outcomes when tracked over a longer time frame.

IFOAM reported a total of 10,550,311 organic hectares in 2000, and 32,221,311 organic hectares in 2009. Based on these IFOAM statistics, organic agriculture has grown at the rate of 13.2% per annum- if we take that growth to be geometric (i.e. growing year on year like compound interest).

On the other hand, using the same IFOAM data, organic agriculture has grown at a rate of 22.8% per annum - if we take the growth to be arithmetic (i.e. growing like simple interest since 2000).

ORGANIC SCENARIOS

What is clear is that the worldwide growth of organic agriculture has a certain momentum; just what kind of momentum it has, however, is unclear. Here I examine two futures, two scenarios if you prefer.

In Scenario 1, organic agriculture continues to grow geometrically at 13.2% per year (Figure 2). Under this scenario organic agriculture will represent 2.8% of agriculture in 10 years (2019), 9.6% in 20 years (2029), 33.0% in 30 years (2039), and 100% in 39 years (2048).

In Scenario 2, organic agriculture continues to grow arithmetically at 22.8% per year (Figure 2). Under this scenario, organic agriculture will account for 2.6% of agriculture in 10 years (2019), 4.5% in 20 years (2029), 6.3% in 30 years (2039), and 8.1% in 40 years (2049). If this rate of increase were to continue, a state of Otopia, 100% organic agriculture, would be achieved in 544 years (2553).

As the Intergovernmental Panel on Climate Change (IPCC) reiterates in reference to their own work, “scenarios are not predictions”. Scenarios are mathematical extrapolations from the present based on some modelling hypothesis. We would need a crystal ball to really see into the future. Scenarios, nevertheless, can be used to generate insights. The future is not merely some place we are sailing into, it is the fruit of the present, and it is under construction now.

ORGANIC TARGETS

Many countries have set targets for conversion to Organic Agriculture. Brazil has set the goal to be 20% organic by 2012. France has set a goal of 20% organic by 2020. The Indian state of Kerala has set the bar even higher with the aim of 100% by 2012.

Liechtenstein has already achieved 29.7% of its agricultural land as

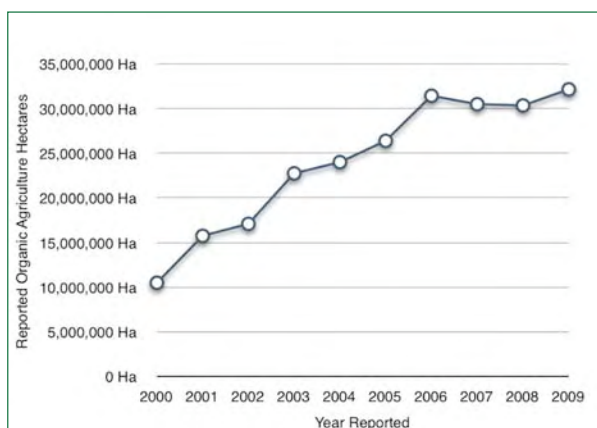


Figure 1. The growth of worldwide Organic Agriculture (sources: IFOAM reports dated from 2000 to 2009).

organic. Austria has 13.4% of its agricultural land as organic, and the figure is 11.0% for Switzerland. Australia, with 37% of the world's organic hectares is 2.7% organic.

There are also some significant achievements in reaching toward a crop-specific Otopia. Mexico coffee production is 30% organic, and its coconut production is 67% organic, according to the latest IFOAM statistics. And the Dominican Republic is 70% of the way to becoming a banana-Otopia.

The sciences driving organic agriculture and chemical agriculture have rarely coincided. Organic agriculture has drawn substantially from the ecological sciences, while chemical farming has drawn substantially from the toxicological sciences, and more recently from genetic modification and nanotechnology.

Organic and chemical agricultures are competing paradigms, and as such they engage science differently. A current spat is the effort to proprietise the work of the first 10 thousand years of agriculturalists by tweaking the fruits of that enterprise via GM technologies and proceeding to claim patent rights over an organism. This is seen as bio-piracy by some including the organic sector and rests on philosophical differences including the question: is it right or proper or in the common interest for a company to have a patent over a life form? Humans are the only species that, as a general modus operandi, spray their food with poisons prior to consumption. There are eco-issues with this for the farm, the farmer, and the planet. Because “no farm is an island”, and what goes on the farm doesn't stay on the farm, this becomes everyone's issue.

Organic versus chemical farming is a “clash of fundamentalisms”. These two agriculture paradigms are underpinned by different values and different approaches to science. Organic agriculture looks to engaging the precautionary principle, to dancing with biodiversity, and to seeking eco-harmony. Chemical agriculture is weighted towards engaging the postcautionary principle, to waging a “war on weeds”, and to vesting faith in techno-fixes. These are two different paths, leading to two different futures.

The stated goal of the organic movement is the adoption worldwide of organic agriculture. That task has a long path to travel, with organic agriculture currently accounting for 0.8% of agricultural land worldwide. If an arithmetic rate of growth of 22.8% pa were to con-

tinue indefinitely then what Liechtenstein has already achieved, a 30% organic share, would take 160 years to achieve worldwide, and a state of Otopia would take 544 years (2553). Under a geometric growth scenario - think compound interest - Otopia would be reached in 39 years (2048). Can we afford four more decades of chemical agriculture, let alone 54 decades?

REFERENCES

Badgley C., Mogtader, J., Quintero, E., et al. (2007). Organic agriculture and the global food supply. *Renewable Agriculture and Food Systems*, 22(2), 86-108.

Willer, H. & Kilcher, L. (2009). *The World of Organic Agriculture, Statistics and Emerging Trends 2009*, International Federation of Organic Agriculture Movements (IFOAM), Bonn, Germany & Research Institute of Organic Agriculture (FiBL), Frick, Switzerland.

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NEW BOOK PUBLICATION FROM THE AUTHOR

The Value of Eco-Labeling: Price Premiums & Consumer Valuations of Organic, Natural and Place of Origin Food Labels

by, John Paull, 2009, VDM Verlag, Saarbrücken, DE.

ISBN: 3639154959, Available at: www.amazon.de

This book does three things well. Firstly, it clearly demonstrates that eco-labels and geo-labels have value for consumers. Secondly, it provides a wealth of specific actionable research results for both food producers and marketers. And thirdly, it provides an efficient, elegant, and replicable methodology for researchers to measure such value, to pursue this growth area further, and to generate multi-factor results. Consumers are increasingly concerned, and with good reason, to know the provenance of their food - where it came from and how it was produced. An eco-label is an environmental claim on a product. A geo-label is a geographical claim on a product. Such labelling can jointly serve food producers, marketers and consumers. Which eco-labels and which place-of-origin labels add value to food items? Just how much value do they add? And for which consumers? "The Value of Eco-Labeling" demonstrates that a knowledge of the somehow and the somewhere of food can add measurable, quantifiable, monetary value for consumers. The study sets out to establish the value to consumers of particular eco-labels and geo-labels. "The Value of Eco-Labeling" reports the values of selected eco-labels (Organic, Certified Organic, Natural and Eco) as well as

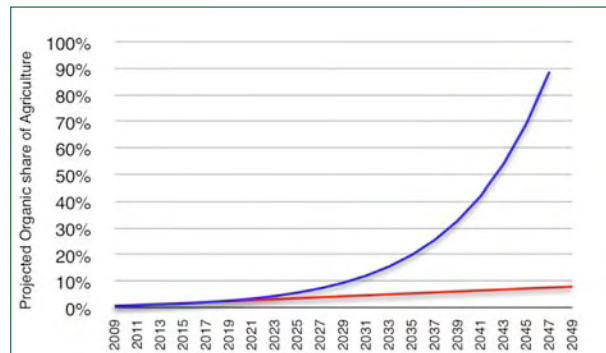


Figure 2. Two global scenarios for the future of Organic Agriculture. Scenario 1 assumes continuing compounding growth at 13.2% pa, and reaching Otopia in 39 years. Scenario 2 assumes continuing arithmetic growth at 22.8% pa, and reaching Otopia in 544 years. [Dark blue: Scenario 1 (geometric growth), Red: Scenario 2 (arithmetic growth)]

particular geo-labels (country-of-origin labelling (CoOL) and regional provenance labelling). The analysis includes China, and the background includes data on the dramatic rise of Chinese organic food production. The interaction effects of multiple food labelling claims are identified. Based on a raft of demographic measures, "The Value of Eco-Labeling" identifies just which consumers are responsive to which claims. This book reveals an effective methodology for quantifying consumer value. "The Value of Eco-Labeling" presents a treasure trove of data, analysis, insights and surprises. This book will be essential reading for food producers, marketers and certifiers, as well as for agricultural departments, organizations, advisers, policy makers, consumer advocates and researchers.



John Paull

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