

Chapter 1

Organic Farming - principles, practices, and current scope in a global perspective

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Abstract

Organic agriculture is the quest for pure food. The principles and practices of organic agriculture have evolved over the past century. The New Age philosopher Dr Rudolf Steiner, in 1924, called for a differentiated agriculture that relied on biology rather than synthetic chemicals. Subsequently, a biodynamic farmer in Kent, Lord Northbourne, coined the term 'organic farming' and launched his manifesto of organic agriculture in 1940, amidst the chaos of World War II. The six exclusions from organic production are: synthetic fertilisers, pesticides, genetically modified organisms (GMOs), Irradiation, synthetic medications, and nanotechnology. Organic agriculture is now practiced in 191 countries, it accounts for 76.4 million hectares globally, and €125 billion (US\$136 B) sales per annum. Australia has the most organic hectares, and Germany has the most biodynamic hectares. The long term growth trend of the organic sector is an increase of 10.15% per annum. The goal of Europe is 25% organic by 2030. Two European countries already meet this goal, Lichtenstein with 40% organic agriculture, and Austria with 27%. India's hill state of Sikkim is the world's first 100% organic state. Glyphosate is the world's most used herbicide, it has been linked to the development of multiple chronic diseases and conditions including autism, irritable bowel syndrome, and cancer. Most non organic food contains pesticides. Most organic food does not contain pesticides. Eating organic is a sound strategy for consuming less pesticides.

Keywords: Organic agriculture, biodynamics, Rudolf Steiner, Lord Northbourne, glyphosate, certification, statistics, world map.

Introduction

Organic agriculture is the quest for pure food. A primary driver of the market for organic food is to avoid ingesting pesticides (ACNielsen, 2005; GfK, 2017). The data supports the soundness of that proposition. Most organic food (86%) does not contain pesticides. Most non-organic food (85%) contains pesticides (DEFRA, 2007; Paull, 2023) (Fig1).

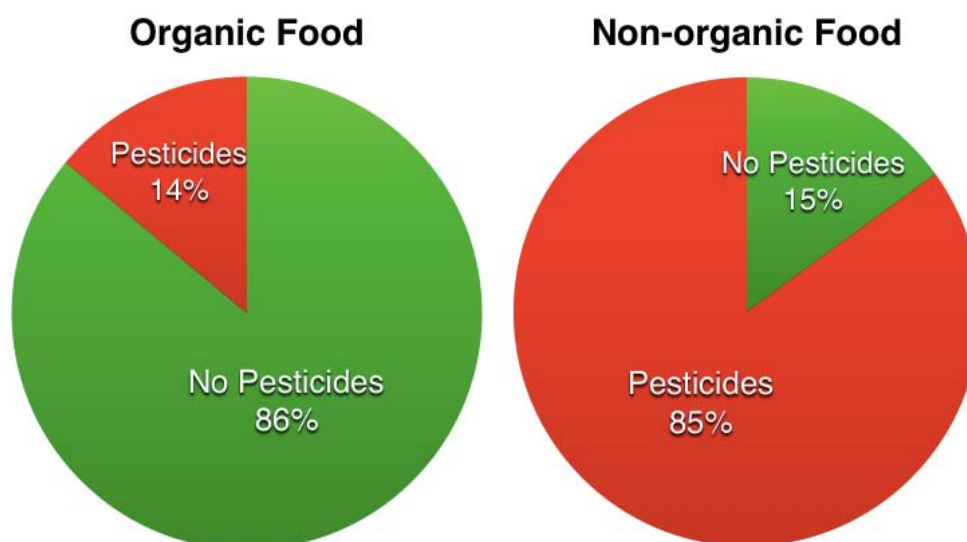


Figure 1. Pesticides in food: most non-organic food has pesticides, and most organic food does not have pesticides (graph source: Paull, 2023).

A century ago a group of farmers approached the New Age philosopher Dr Rudolf Steiner about their concerns for the nutritive value of crops produced by farms using synthetic fertilisers (Fig,2). These farmer's concerns were in the wake of the rapid proliferation of synthetic fertiliser, as the output of the explosives factories of World War I were rapidly repurposed to produce synthetic nitrogenous fertilisers (Charles, 2005; Freemantle, 2015).

To an audience of over one hundred farmers and others, in the rural village of Koberwitz (then Germany, now Kobierzyce, Poland), Rudolf Steiner called for a differentiated agriculture that was focussed on natural biological processes rather than on a chemical industrial approach (Paull, 2020; Steiner, 1924). Steiner's core precept was that 'the farm is an organism' (rather than, say, 'a factory' or 'an economic unit of production') (Paull, 2006). That 'Agricultural Course' was held in 1924. At Koberwitz, Steiner founded the 'Experimental Circle of Farmers and Gardeners' to test and develop his ideas. Steiner called them 'hints', the Experimental Circle evolved the ideas, and by 1938 Ehrenfried Pfeiffer published 'Bio-dynamic Farming and Gardening' in which he presented principles and practices of this newly differentiated agriculture (Paull, 2011; Pfeiffer, 1938).

Organic Manifesto

In 1940, just two years after the public launch of Pfeiffer's 'Bio-dynamic Farming', Lord Northbourne, coined the term 'organic farming' (Northbourne, 1940). It was a logical derivation from Steiner's view that 'the farm is an organism'. Launching his book in the midst of World War II, Northbourne could not have been unaware of the irony of declaring: "We have invented or imagined a fight between ourselves and nature; so, of course the whole of nature, which includes ourselves as well as the soil, suffers ... We have tried to conquer nature by force and by intellect. It now remains for us to try the way of love" (Northbourne, 1940, pp.191-192).

Northbourne was an Oxford University graduate in Agriculture, the Governor of Wye College (aka South-Eastern Agricultural College), and a Biodynamic farmer with an estate in Kent, England

(Paull, 2014). He juxtaposed 'organic versus chemical farming' in his book 'Look to the Land' . The book is the foundational manifesto of organic agriculture. To this day, 'Look to the Land' remains salient, articulate, compelling, and is unsurpassed in making the case for farming with Nature, rather than against Nature, and for farming as a collaboration rather than a 'war' (Northbourne, 1940).



Figure 2. Rudolf Steiner first proposed a differentiated agriculture with a focus on biological management rather than chemical management (image source: Kleeberg, 1928).

Organics Proliferation

The notion of 'organic farming' quickly gained traction internationally - despite its launch in the midst of the raging catastrophe of World War II. In USA, the entrepreneur Jerome Rodale released the first issue of his periodical 'Organic Farming and Gardening' in 1942. Rodale promptly reversed the name to read 'Organic Gardening and Farming', realising that there were lots more gardeners than farmers, that gardeners were apparently more hungry for 'know-how', and gardeners were more likely candidates to purchase his magazine. Rodale's Organic journal appeared regularly (mostly monthly) for the next seventy years (Gross, 2008; Rodale, 1965).

In Australia, in a world first, farmers founded the 'Organic Farming and Gardening Society' in 1944 to advocate the uptake of organic farming (Paull, 2008). In the footsteps of the Australians, in the UK the 'Soil Association' was founded in 1946 (Soil Association, 1946). In France, the International Federation of Organic Agriculture Movements' (now 'Organics International') was founded in 1972

as an international umbrella group for the (by then) many and diverse organic farming groups around the world (Geier, 1998; Paull, 2010).

Since those earliest fledgling steps, organic agriculture has evolved and proliferated to be a global phenomenon (Fig.3). Exclusions have evolved to six: synthetic fertilisers, synthetic pesticides, genetically modified organisms (GMOs), radiation, synthetic medications, and nanotechnology. Organic agriculture is now reported in 191 countries (Fig.3), accounting for 76.4 million hectares of farmland, 3.7 million farmers, and €125 billion (US\$136 B) of annual sales (Willer, Schlatter, & Trávníček, 2023a).

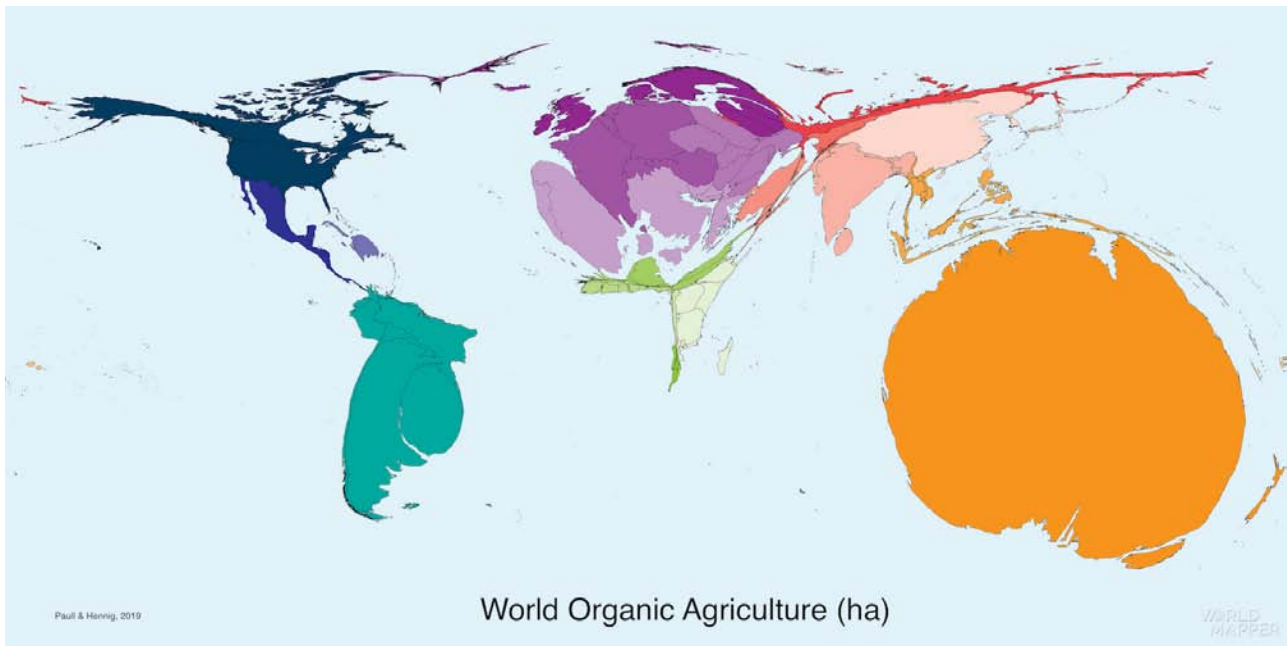


Figure 3. World map of organic agriculture (countries are resized according to their tally of reported certified organic hectares) (image source: Paull & Hennig, 2019).

Women of Organics

Women have played a key role in advancing the organics movement (Inhetveen, Schmitt, & Spieker, 2021). At a London Anthroposophy conference in London in 1928, Marna Pease took up the challenge of advocacy. She spent the remaining two decades of her life advancing the cause of biodynamic agriculture throughout the Anglo-world, editing the earliest English language journal ('Anthroposophical Agricultural Foundation Notes and Correspondence') hosting the earliest conferences, maintaining an international correspondence, and fielding questions from both the curious and the converted (Paull & Harvey, 2023).

Eve Balfour founded the Soil Association in London in 1946 and was later a co-founder of the umbrella advocacy group, the International Federation of Organic Agriculture Movements (IFOAM, now rebranded as 'Organics International') at Versailles in 1972 (Brander, 2003; Paull, 2010).

Two biodynamic farmers, Marjorie Spock and Mary T. Richards, of Long Island, New York State, sued the US government to stop the aerial spraying of DDT. Spock and Richards did not win their protracted and expensive legal proceedings, but they passed their extensive trove of research and data to Rachel Carson who used it as her primary source to write her 1962 eco-bestseller 'Silent

Spring'. The publication of the book precipitated the environmental movement and led to the establishment of the first Environmental Protection Authority (EPA) (in USA, and since then many countries have since created their own EPA) (Carson, 1962; Matthiessen, 1999; Paull, 2013c).

Goal setting for Organics

The setting of goals is somewhat problematic. A goal, per se, is never enough, some 'goal shooting' activity is required for a goal to be realised. Bhutan is a standout fail when it comes to organics goals - there was (and perhaps still is?) the goal, announced in 2013 to be 100% organic. Bhutan's Minister for Agriculture and Forestry, Dr Pema Gyamtsho, admitted that "Going organic will take time ...We have set no deadline" (Paull, 2013aa). There was and surely remains an uncertain number of de facto organic farmers in Bhutan, producing crops as they have for centuries past, and who are perhaps too isolated and/or too poor to purchase chemical inputs. Nevertheless, the goal setting was insufficient to reify the goal. Presently, Bhutan reports just 1.1% of its agricultural land as certified organic (Willer, Schlatter, & Trávníček, 2023b).

The Indian north eastern hill-state of Sikkim is a standout success when it comes to organic goal setting. The Chief Minister of Sikkim, Pawan Chamling, in 2003 declared the bold decision for the state to be 100% organic. This was backed up by four point action plan: "(1) promotion of on-farm production of organic manures; (2) capacity building; (3) establishment of bio-fertilizer production units; and (4) establishment of soil testing laboratories" (Chief Minister's Office, 2016. p.392). The goal was achieved in little more than a decade with a mix of push and pull (including capacity building for farmers, and banning the import of pesticides). The Indian Prime Minister, Narendra Modi, declared Sikkim as India's first fully organic state in 2016. In the light of this success, other Indian states are on the path to replicate this success (Paull, 2017).

Europe has set the goal of 25% organic by 2030. "The Commission has set out a comprehensive organic action plan for the European Union. Through it, the Commission will aim to achieve the European Green Deal target of 25% of agricultural land under organic farming by 2030" (European Commission, 2021, p.1). Can it be done? Well yes, organic agriculture in Liechtenstein already account for 40% of its agriculture hectares, and in Austria the figure is 27%, so both have already met the '25% by 2030' goal. Estonia and Sweden are in 'striking distance' of the goal, at 23% and 20% respectively. There are a further eleven European countries that are 'well on the way' to the 25% goal, with organics accounting for between 10% and 20% of their agriculture (viz. Switzerland, Italy, Czech Republic, Latvia, Finland, Slovakia, Denmark, Germany, Spain, Slovenia, and Greece). Europe's 25% is a fine goal, and it looks achievable; each European country to be $\geq 25\%$ organic is a finer goal in which each country 'pulls its weight' to make the fruits of the goal uniform.

Australia has achieved the largest area of certified organic agriculture of any country, accounting for near half of the world's certified organic hectares, and 9.9% of Australia's agricultural land (Paull, 2019; Willer et al., 2023). This has been achieved without the benefit of national goal setting nor of government support. This success has been driven by 'market forces'. There have been no government incentives to adopt organic practices. Australian Federal and State governments have been generally indifferent to organic agriculture Nevertheless, Australia has been an 'early adopter' of organics with Biodynamics in the country by 1928, and the world's first organics advocacy society in 1944 (Paull, 2013bb).

Scope for Good News

Organics is a good news story: 'Your food is produced without synthetic fertilizers, pesticides, GMOs, irradiation, antibiotics, and nanotechnology'. There are likely no consumers clamouring: 'I want to feed myself and my family food laced with glyphosate and insecticides' or 'I want to feed my children GMOs'.

The six exclusions for organics can be cryptic aspects of chemical food production - pesticides et al. are not detected by a visual inspection. There is no transparency for consumers buying chemically produced food. The producer and the retailer are entirely silent as to which smorgasbord of synthetic biocides and technologies have been applied to the food in its path from field to shopping cart. Mandatory reporting of pesticides applied in production would be informative to consumers. That would add transparency to the consumer decision to purchase (or not).

There is scope for consumer engagement by organic producers, retailers, and certifiers (Fig.4). There is a congruence of interests - producers are interested in producing foodstuffs without pesticides et al., and consumers are interested in consuming foodstuffs without these 'nasties'. There is room for a conversation between farms and families. There is room for a shared understanding as to why a differentiated product will and should attract a premium price, and why the price premium is 'worth it'. There is scope to discuss what is a fair and reasonable premium perceived to be, from both the producer and the consumer perspectives.

The organic message in the busy market place is a whisper rather than a roar. There is scope to advertise organic food - its advantages for consumers, the environment, the planet, farm workers, and farm animals. There is scope for producers to get the message across that their production methods exclude synthetic chemicals and other technologies that most consumers will regard as less than desirable for their family's diet.



Figure 4. Supermarket in-store promotion of Organics, Shanghai, China (image: J Paull).

Avoiding pesticides

What are the unintended consequences of chemical agriculture's addiction to pesticides and other deviations from 'natural'? Is there a price to pay for loading the food chain with synthetic fertilisers, pesticides, GMOs, nanotechnology and irradiation?

Modern maladies that are now prevalent, obesity, diabetes, autism, attention deficit hyperactivity disorder (ADHD), and various cancers, were generally unknown or little known, to previous generations,. What has been the role of the proliferation of a smorgasbord of pesticides in the proliferation of these maladies?

Pesticides have a 4-step life cycle: discovery, enthusiasm, doubt, and, finally, ban. DDT was the 'wonder' chemical of its day. Most people carry a load of DDT and/or its metabolites despite that it has been banned for half a century (CDC, 2021; EPA, 1972). Glyphosate is the present 'wonder' herbicide for chemical farming, and for weed control by Councils and householders. Glyphosate (the active ingredient in Bayer Monsanto's 'Roundup' herbicide) is cheap, available, and ubiquitous in the food chain. This continues despite the WHO declaring glyphosate a carcinogen (WHO, 2018).

In a review of the toxic effects of glyphosate, the authors conclude: "Contrary to the current widely-held misconception that glyphosate is relatively harmless to humans, the available evidence shows that glyphosate may rather be the most important factor in the development of multiple chronic diseases and conditions that have become prevalent in Westernised societies. In addition to autism, these include gastrointestinal issues such as inflammatory bowel disease, chronic diarrhea, colitis and Crohn's disease, obesity, cardiovascular disease, depression, cancer, cachexia, Alzheimer's disease, Parkinson's disease, multiple sclerosis, and ALS, among others" (Samsel & Seneff, 2013, p.1443).

These authors continue: "While glyphosate is obviously not the only environmental toxin to contribute to these diseases and conditions, glyphosate's ability to disrupt the gut bacteria, to impair serum transport of sulfate and phosphate, and to interfere with CYP enzymes, logically progresses to this multitude of diseased states, through well-established biological processes. And glyphosate's disruption of the body's ability to detoxify other environmental toxins leads to synergistic enhancement of toxicity. While genetics surely play a role in susceptibility, genetics may rather influence *which* of these conditions develops in the context of glyphosate exposure, rather than *whether* any of these conditions develops" (Samsel & Seneff, 2013, p.1443).

The Australian experience of requiring GMO food to be labelled as GMO has resulted in Australian retailers offering no GMO food. That avoids its rejection at the point of sale. The zero presence of GMOs in the supermarket aisles in Australia is contrasted with the situation in USA (food packaging does not disclose the presence of GMOs) where most processed food items have GMO ingredients (often GM soy and /or GM corn) and most US soy and corn (59%) contains glyphosate (USFDA, 2022).

The best assurance for avoiding pesticides is to purchase organic.

Organic Certification

The data for organic farming are statistics of *certified* organic farming. A consequence is that the published statistics of organic agriculture are underestimates of the sector. There are traditional

farmers who are using traditional biological practices, unaware that they are 'organic farmers'. There are other producers who are intentionally 'organic farmers' but are intentionally not certified (perhaps because of the small scale of the operation, the cost of certification, because of the intrusiveness of the certification process, because of a philosophical objection to the 'organocrats', or they cannot secure a premium for their product at their location, perhaps because a market has not been established).

Certification preserves the differential identity of organic produce as it moves through the supply chain, from producer to consumer. Certification provides oversight for producers, protection for retailers, tracking of produce, confidence for consumers that they are 'getting what they are paying for', and it secures the price premium for producers and retailers.

Carbon sequestration

The global push for 'zero-carbon', on a planet where all life forms are carbon-based, is curious. Carbon dioxide is the essential ingredient of all food - no CO₂ means no food - means we all starve. Photosynthesis (plants creating complex carbohydrates (and oxygen) from two ingredients, CO₂, and water, in the presence of sunlight), is the superstar of biology, the underpinning of all carbon-based life and biology.

Organic farms are natural 'carbon sinks' because there is an emphasis on maintaining and enriching soil quality, considering humus, composting, and the microbiome. Organic farms naturally sequester carbon. However, claiming carbon credits (directly monetising carbon sequestration) may be an expensive and protracted process for a farm (DAFF, 2023).

Technology

Organic farmers face many of the same challenges as chemical farmers, including weeds, diseases, the price of labour, the price of other inputs, and farm gate prices (where they are often 'price takers' rather than 'price makers'). Both may be 'tech-savvy' and using, for example, drones, GPS, and robots. Labour can be a greater input in organic production and this is prompting a growing uptake of robots, especially to pick and pack produce.

Organic producers eschew certain technologies such as GMOs which rely on the legal fiction that living things can be patented, based on the claim that living things can be 'invented'. Northbourne made the point succinctly: "No chemist has ever analysed or described in chemical terms a living creature, however humble; and there is not the slightest chance that he ever will" (Northbourne, 1940, pp.159-160). Patents on living things continues to be contested (Then & Eckhardt, 2023).

Global Organics

The global 'penetration' of organic agriculture is a niche of 1.6% as a percentage of global agricultural hectares (Willer et al., 2023b).

Global leadership in organics is diffuse (Paull & Hennig, 2020; Willer et al., 2023):

- Australia has the most certified organic agriculture (35,687,799 hectares);
- India has the most organic farmers (1,599,010 producers);

- Finland has the most organic wild-culture (6,928,693 ha);
- Albania has the most organic silviculture (662,790 ha);
- Vietnam has the most organic aquaculture (40,623 ha);
- China has the most organic cereals (1,425,060 ha);
- Ethiopia has the most organic coffee (226, 389 ha);
- Spain has the most organic viticulture (142,177 ha);
- Germany has the most biodynamic hectares (84,426 ha);
- Denmark has the highest share of the domestic market (13% organic);
- Switzerland has the highest per capita consumer spend (€425pa; US465pa);
- USA has the highest retail sales of organic (€48.6 million; US53.1 m).

This diffusion of leadership, coupled with many factors including the 10.15% compounding annual growth of organic hectares over the past two decades (Fig.5), the growing affluence and education of consumers, the growing body of evidence linking ‘bad’ food to bad health outcomes, the growing consumer concern with animal welfare, the growing concern for the environment, the growing concern for climate change coupled with the aspiration for ‘zero-carbon’, along with declarations of aspirational goals, all augur well for the future health, growth, and valorisation of the organic sector.

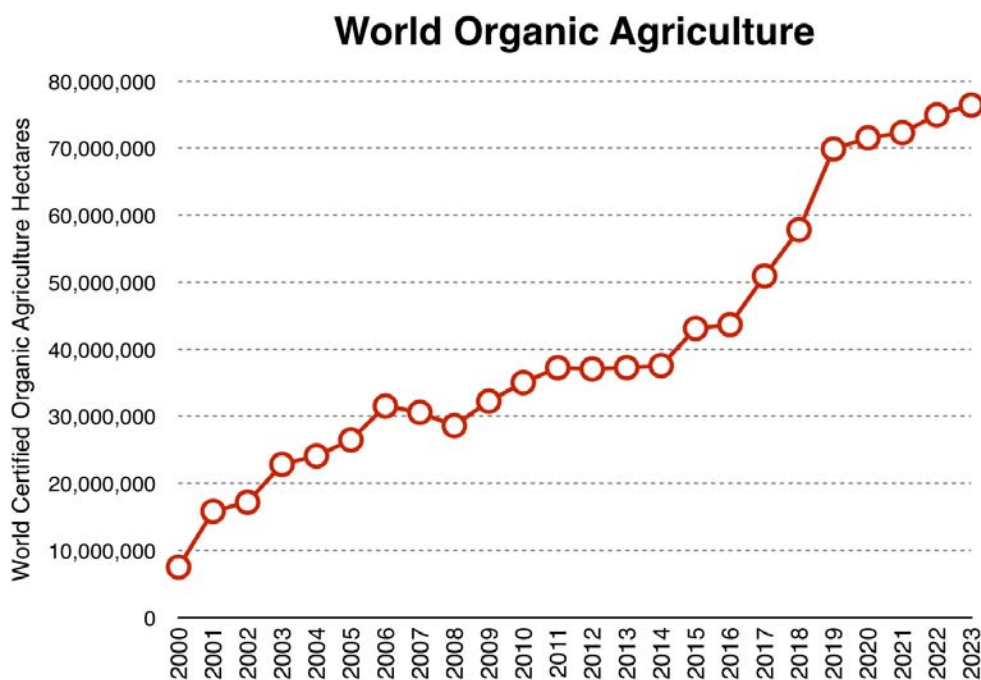


Figure 5. Global Growth of organic agriculture (year reported) (data sources:annual reports to Willer et al., 2023b).

Organics Future

Organic agriculture has survived its first century from its Koberwitz start in 1924. It has grown at 10.15% year on year over more than the past two decades . What of the future?

The customers for organics are more affluent and better educated than average. That cohort of 'affluent and educated' consumers is expanding. Affluent countries grow in affluence and education levels. Other countries, most notably China, are rapidly shifting much of their population out of poverty and into middle class affluence, and also despatching contingents of tertiary students to Western universities, notably to UK, Australia and USA.

Is there a future for organic agriculture, and if so what is it?. The foundational aspiration of organic farming is the quest for pure food. That is an enduring quest, not a fad. 'Certified Organic' and 'Certified Biodynamic' are manifestations of the quest.

Organic agriculture is an important niche agriculture that has long aspired to be the mainstream. When Northbourne introduced the term 'organic farming' he was clear that this was an adversary of 'chemical agriculture'. He saw a contest of 'organic versus chemical farming'. He was under no illusions, realising that the quest for pure food would be a task for generations: "It is a task for generations of concentrated effort, slow and laborious, needing all available skill and resources ... A combination of cooperation and individual effort ... And those engaged will be fighting a rearguard action for many decades, perhaps for centuries" (Northbourne, 1940, p.115).

Northbourne's contest of 'organic versus chemical farming', is an oddly asymmetrical contest. A handful of mega multinational chemical companies (for whom the stakes are high) versus 8 billion consumers (many of whom are quite oblivious to the prevailing contest, because of, perhaps, poverty, ignorance, or indifference).

The organics sector has survived a century of the 'onslaught' of technological intrusion into the food realm coupled with the market force of the multinational chemical companies who are presently consolidating their grip on the global food chain. Meanwhile there is no 'right to pure food'. No right to nutrient dense food. Northbourne observed that: "The delusion is that cheapness leads to plenty. But of what use is plenty of rubbish?" (Northbourne, 1940, p.66).

"We have plenty, actual and potential; but plenty of what? That is the real question" (Northbourne, 1940, p.73). Perhaps one day chemical agriculture will be reduced to a niche of 1.6% of global agriculture, and organic agriculture will have grown to 98.4%?

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