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Atlas of Organics: Four maps of the world of organic agriculture

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Abstract

This paper presents four maps of the world of organic agriculture. Density equalising maps (cartograms) have previously been published of the world of organic agriculture based on the reported hectares of certified organically managed agriculture land. The four maps in the present atlas of organic agriculture are visual presentations of current global organics data: (a) certified organic agriculture hectares; (b) certified organic wildculture hectares; (c) total certified organic production hectares (organic agriculture plus wildculture plus forestry plus aquaculture); (d) certified organic producers. Australia dominates in the world map of the organic agriculture hectares, Europe is strongly represented, and Africa is weakly represented. Finland dominates in the world organics map of organic wildculture, Zambia is a strong representative from Africa, and India is a strong representative from Asia. Australia dominates in the map of the organics world map of total organic production hectares (the aggregation of agriculture, wildculture, forestry, and aquaculture), followed by Finland. India dominates in the world organics map of organics producers. The maps illustrate the broad global diffusion of the organics meme, visually highlight leaders and laggers, and indicate opportunities for growth and better reportage. These maps are generated by the Worldmapper GIS algorithm developed at the University of Sheffield as a cartographic visualisation tool.

Keywords: organic farming, organic food, organic producers, Worldmapper, GIS, cartography, cartograms, density equalising maps, global, certified organic producers, organic movement, naked organics, Australia, Finland, India.

Introduction

The world of agriculture was formerly a world of organic agriculture. As such, it fed the world for many millennia. The disruptive technology of Haber and Bosch in 1909 is a process of capturing nitrogen from the atmosphere, it ushered in the era of chemical agriculture (displacing organic agriculture) with its cheap and abundant synthetic fertiliser (as well as cheap and abundant explosives in time for WWI) (Charles, 2005; Haber, 1920; Smil, 2001).

In the century that followed the rapid uptake of the Haber and Bosch process, traditional agriculture has been further disrupted by successive waves of technology, including synthetic pesticides, irradiation, genetic modification, and nanotechnology (Paull & Lyons, 2008).

The organic agriculture movement has stood as a bastion against the encroachment of synthetic chemicals and technologies into the food supply, and against its industrialisation. That 'bastion' can be viewed, as a vestigial agriculture accounting for less than one percent of global agriculture (reported as 0.98% by Willer & Lernoud, 2015) and/or alternatively, as the world's fastest growing food sector and the world's fastest growing agriculture-based industry (Brumby, 2007; OFA, 2011). The pioneers of organic agriculture saw the universal adoption of organics as the goal of the organics movement (Northbourne, 1940; Pfeiffer, 1938; Steiner, 1924).

Gall (1885) and Peters (1983) proposed maps where equal territorial areas are represented equally when mapped, in contrast to, say, a Mercator projection where areas are distorted in the process of mapping a three dimensional world onto a two dimensional surface. The achievement of the Worldmapper project of the University of Sheffield (worldmapper.org) has been to create equal-area cartograms (Tobler, 2004) so that map areas are proportional to a particular territorial parameter. An algorithm developed by Gastner & Newman (2004) achieves the appropriate resizing.

Tabulated data of the world of organic agriculture is published annually (e.g. Willer & Lernoud, 2015). Individual cartograms of the world of organic agriculture based on a single parameter (certified organic agriculture hectares) have been published by Paull & Hennig (2011, 2013). In the present paper four organics parameters are selected for mapping:

(a) certified organic agriculture hectares;
(b) certified organic wildculture hectares;
(c) total certified organic production hectares (organic agriculture plus wildculture plus forestry plus aquaculture); and
(d) certified organic producers.

Methods

The Worldmapper algorithm was applied to four data sets of world organic agriculture to produce the four maps which comprise the atlas of world maps of organics. Data were available for 170 territories.

A method for producing a density-equalizing map was described by Gastner & Newman (2004) and this is the method used. The Worldmapper project (worldmapper.org) relies on a world map comprising 200 territories and an algorithm to apply the values of a variable (in this case various organics data) to the corresponding territories so that the territories expand or contract to achieve an equal density of the variable across the world map. The reference map, with equal territorial areas represented by equal map areas, appears as Figure 1.

Data sets of worldwide organic agriculture hectares have been published as tables, annually since 2000 (viz. Willer & Yussefi, 2000). The present paper uses the data set published by Willer & Lernoud (2015) which reported data from 170 territories. Data sources for that 2015 data set are various (pp.281-300), and include "organisations of the private sector" (p.34), government departments and certifying agencies. The data are stated to be variously from: 2006; 2009; 2010; 2011; 2012; 2013 (mostly); and 2014. The data set is of "organic agricultural land (including in-conversion areas)" (p.35), however some countries provide data only on the certified organic area (and not including in-conversion land).

Results

A reference world map (Fig. 1) and four organics world maps (Figs 2, 3, 4 & 5) are presented. The reference map is a Gall-Peters projection map where equal map areas represent equal territorial areas (in achieving this, intercontinental distances are not conserved).

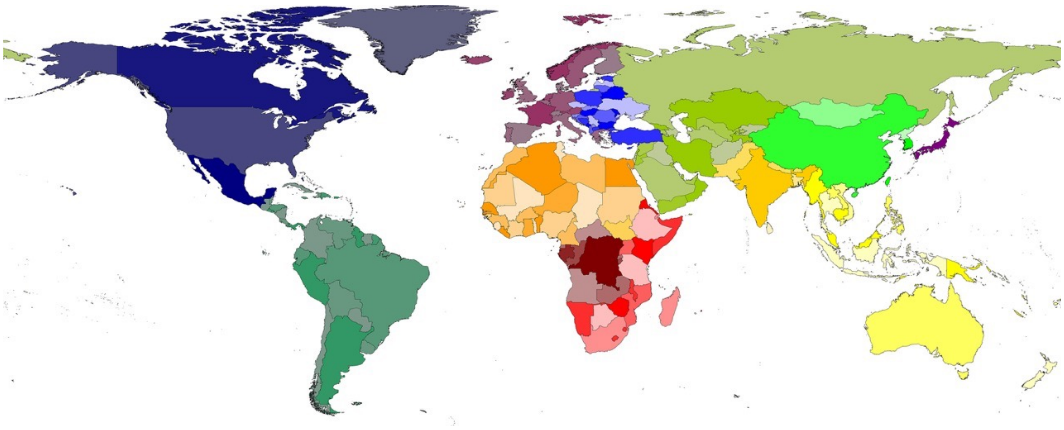

Figure 1. Reference world map - Gall-Peters projection (equal map areas represent equal territorial areas) (worldmapper.org).

The density-equalising map for worldwide organic agriculture hectares is presented in Figure 2. Equal map areas represent equal areas of organic agriculture; i.e. the density of organic hectares is constant across the territories. The world map of organic agriculture hectares accounts for 43,095,884 hectares of organic agriculture land reported for 170 countries and territories (Willer & Lernoud, 2015, p.280, who report the total as 43,091,113 ha).

The world map of organic agriculture (Fig.2) illustrates the broad global diffusion as well as the great unevenness of the global uptake of organic agriculture. The map is dominated by the presence of Australia which appears especially bloated, and this reflects its world leadership position in terms of its number of organic agriculture hectares (17,151,000 ha, which is 39.8% of the world total).

Europe is strongly represented in the world map of organic agriculture (Fig.2). Europe accounts for 11,460,773 ha, which is 26.6% of the world total. Europe collectively has a strong presence with substantial contributions from many states, with organic agriculture leaders including: Spain (1,610,129 ha), Italy (1,317,177 ha), France (1,060,756 ha), Germany (1,060,669 ha), Poland (661,956 ha), UK (567,751 ha), Austria (526,689 ha), Sweden (500,996 ha), the Czech Republic (474,231 ha), and Turkey (461,396 ha) (Willer & Lernoud, 2015).

South America has a strong presence accounted for in large measure by three countries, Argentina (3,191,255 ha), Uruguay (930,965 ha), and Brazil (705,233 ha) (Willer & Lernoud, 2015).

China and India dominate the Asian representation (2,094,000 ha and 510,000 ha respectively). Collectively Asia accounts for 8.0% of world organic agriculture hectares. North America accounts for 7.1% of world organic hectares with USA reporting 2,178,471 ha and Canada 869,239 ha.

Africa has an eviscerated presence (accounting for just 2.8% of the world organic agriculture hectares), with Uganda the organics leader of the continent with 231,157 ha. Russia appears anorexic, and the Middle East is emaciated, in each case reflecting the poor diffusion of organic agriculture into these regions - and perhaps the great opportunities for future organic penetration into these territories. The map presence of the Falkland Islands (Malvinas) reflects their recent commitment to the adoption of organics (BFA, 2009) and the newfound status of the Falkland Islands as a current world leader with 36.3% of its agricultural land classified as organic. The map highlights the abundance of opportunities for the uptake and further growth of organic agriculture.

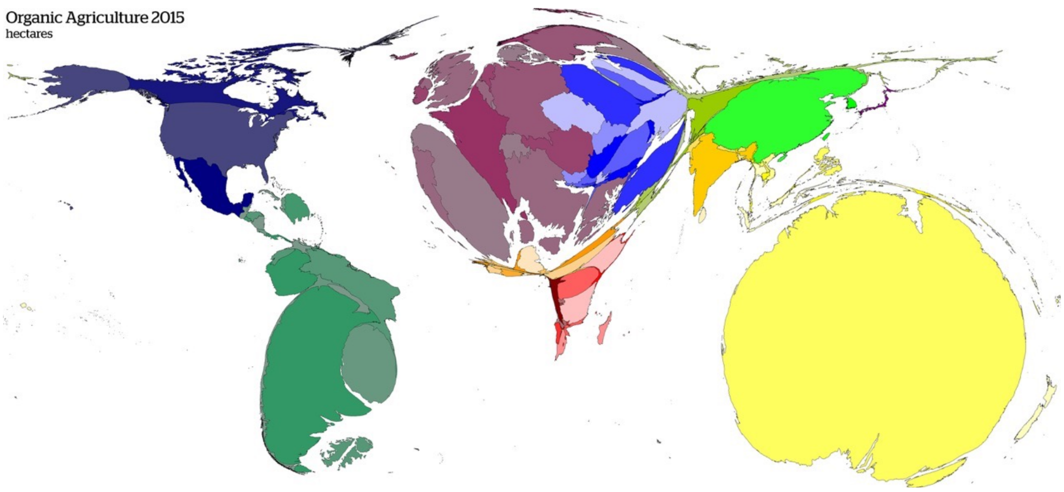

Figure 2. World map of organic agriculture (equal map areas represent equal organic agriculture hectares).

The world map of organic wildculture hectares (Fig.3) accounts for 34,092,862 ha reported from 73 countries (Willer & Lernoud, 2015). The wildculture harvest includes wild berries, wild mushrooms, wild medicinal plants, wild fruits, wild nuts, wild vegetables, palm sugar, honey and seaweed. Finland (9,000,000 organic wildculture ha), accounts for 26.4% of the global total wildculture hectares.

Africa is well represented in the organic wildculture map (Fig.3) and is led by Zambia (6,133,424), Namibia (2,400,000 ha), and Morocco (817,690 ha). India dominates the Asian continent accounting for 5,180,000 organic wildculture hectares. In South America Brazil leads with 1,209,773 ha of organic wildculture. North America and Oceania are skeletally represented and offer great potential for the future uptake and reportage of organic wildculture.

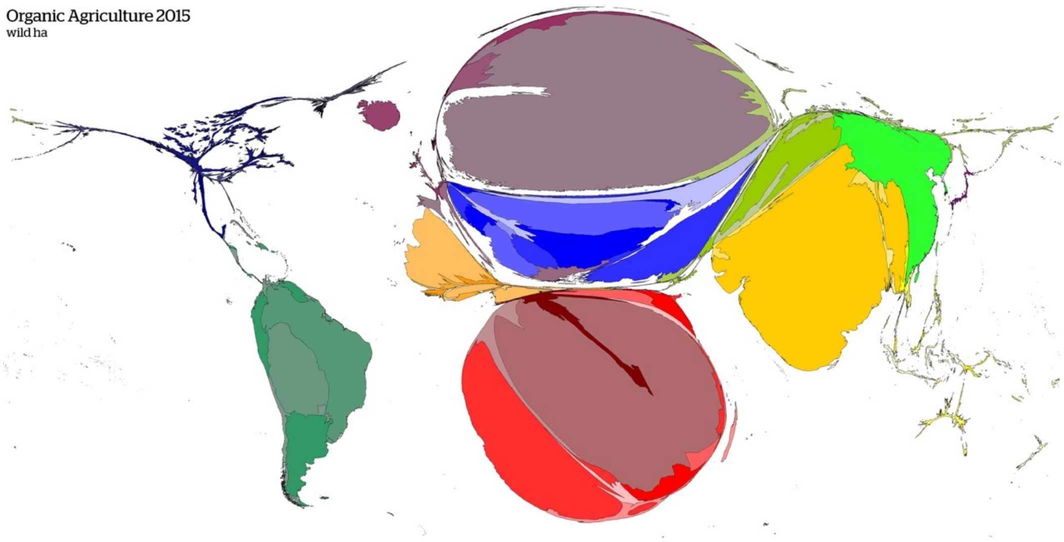

Figure 3. World map of organic wildculture (equal map areas represent equal organic wildculture hectares).

The world map of organic production hectares (Fig.4) accounts for the aggregated hectares of organic agriculture, organic wildculture, organic aquaculture and organic forestry. In Fig 4, Australia dominates as it did in Fig.2 (organic agriculture), followed by Finland and Zambia, which dominated in Fig.3 (organic wildculture).

Fig 4 accounts for 78,228,918 certified organic production hectares contributed as: 43,091,113 organic agriculture hectares; 34,092,861 organic wildculture ha; 73,117 organic forestry ha; 53,478 organic aquaculture ha; 28,411 organic “grazed non agriculture” ha; and 889,938 “other non-agricultural land” (Willer & Lernoud, 2015, p.55).

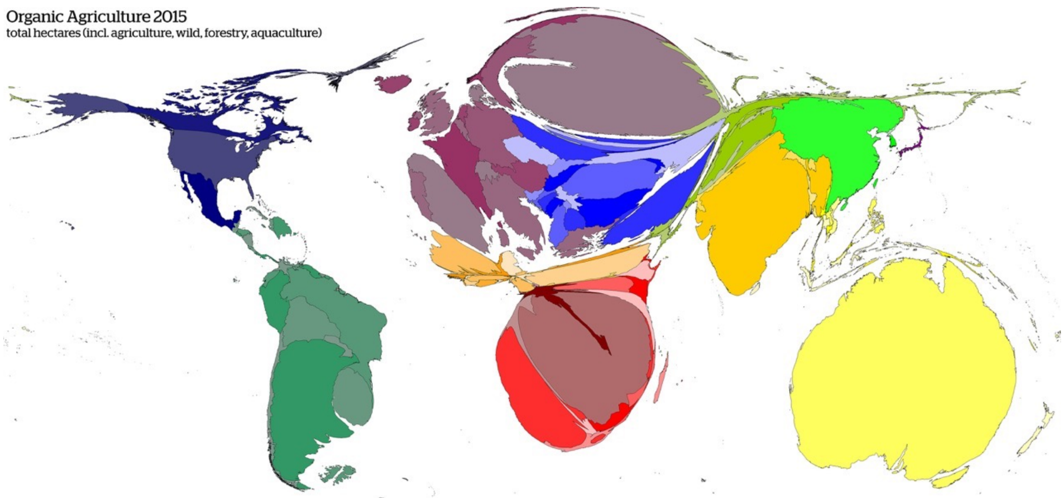

Figure 4. World map of organic production hectares (equal map areas represent equal organic production hectares; organic production includes organic agriculture, wildculture, forestry and aquaculture).

The world map of organic producers (Fig.5) accounts for 1,198,583 producers reported by 148 countries (Willer & Lernoud, 2015, p.280). The organic producers map is dominated by the presence of India (650,000 producers). Mexico dominates the Americas with 169,703 producers. Europe is strongly represented by Italy (45,969 producers). Africa is strongly represented by Uganda (189,610 producers), Tanzania (148,610 producers), and Ethiopia (134,626 producers). North America and Australia are skeletally represented. Data on producers from China were absent in the reported data set (Willer & Lernoud, 2015).

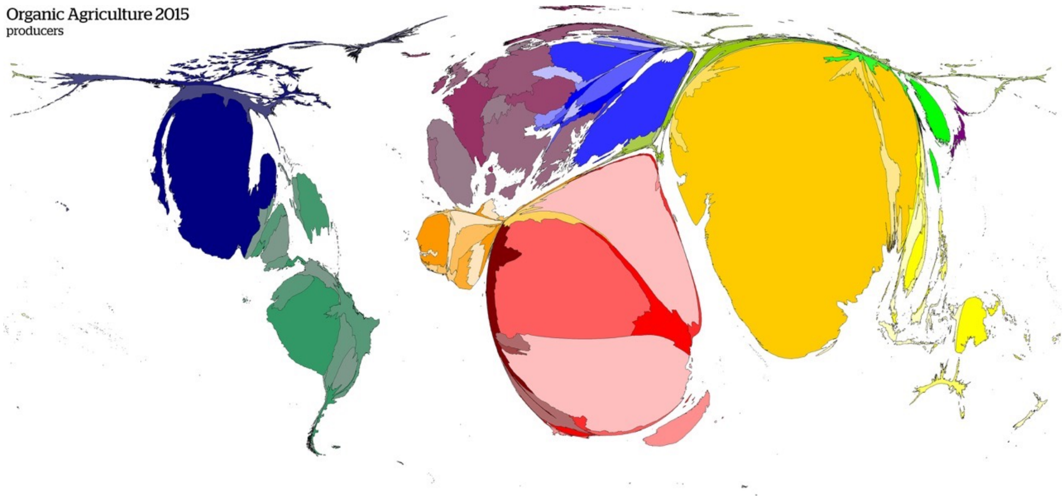

Figure 5. World map of organic producers (equal map areas represent equal numbers of organic producers).

Discussion and conclusion

The four maps of the atlas of organics presented here (Figs 2, 3, 4 & 5) reveal the successful widespread diffusion and uptake of organic production and the organics meme. Some countries dominate for agriculture hectares, others for wildculture, and still others for producer numbers.

The data sets of organics parameters rely on the reportage of third parties who are not necessarily 'at arms length', since, for example, they may be local organic certifiers. Survey respondents may under-report, for example, for reasons of ignorance or confidentiality; they may over-report, for example, to intentionally inflate figures, or because an enterprise that is certified organic may be certified by several certifiers to gain access to different markets and may thereby be counted several times in aggregated data.

The data reported (and here mapped) are for certified organic enterprises, and as such they under-report the global organics movement. Certified organic enterprises are a subset, perhaps a small subset, of the global organics enterprise (Paull, 2013).In a world where practitioners of organic production may be practicing, either: (a) certified organics (i.e. practicing with organic certification); or (b) naked organics, (i.e. practicing without organic certification); these latter practitioners go largely uncounted and disregarded in collected data sets (although they may very well be the majority of practitioners).

Statistics of naked organics are not available, nor are global estimates of naked organics (i.e. non-certified organics) available.

Practising naked organics, rather than certified organics, may be a choice due to: the costs of certification; the intrusion and privacy compromise of certification; the bother of certification; the lack of ready availability of certification; the adherence to anarchistic and/or libertarian values; as well as other reasons.

The diversity of organics advocates and the intended inclusiveness was acknowledged in the foundational document of IFOAM-Organics International where Roland Cheviot referred to “this federation respecting all particularities and individualities” (Chevriot, 1972, p.1) Whatever the reasons, organics certification is not an attractive and/or acceptable option for all organics practitioners, and so statistics for certified organics, of necessity, understate the organics data in the fullness of its diversity.

“The most common use of cartograms is solely for the display and emphasis of a geographic distribution, as a contrast to the usual geographic map” (Tobler, 2004, p.58). The geographic distribution of organics as illustrated in Figures 2,3,,4, & 5 display the broad adoption of certified organic production, as well as the unevenness of the adoption and the further opportunities for adoption.

There is no social licence from consumers for pesticiding the world’s food supply, it is a practice proliferated by industrial and productionist approaches, and one that relies on the lack of transparency in local and global food production practices and labelling, rather than nutritional and well being approaches. The organics pioneers had a big vision for organics that went far beyond the small specialist niche that it presently occupies (Paull, 2014). Organics advocacy has been demonstrated to be effective (Paull, 2015). While there are steady annual increments reported in certified organic hectares, there could be revolutionary changes if, for example, other territories took the example of Sikkim which has declared the goal of being 100% organic and is reporting good progress (Seetharaman, 2016), or of Russia which has declared the gaol of taking a global lead in the production of organic food (Case, 2015).

Acknowledgements

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References

BFA. (2009). Organic farming in the Falkland Islands. *Organic-Market.Info, Lauterbach, Germany, 3 July*.

Brumby, J. (2007). *Minister’s Forward in Victorian Organic Food Products Directory 2007*. Melbourne, Australia: Regional Development Victoria, Victorian Government.

Case, P. (2015). Putin wants Russia to become world leader in organic food. *Farmers Weekly, 4 December*, 1-2; www.fwi.co.uk.

Charles, D. (2005). Master Mind: The rise and fall of Fritz Haber, the Nobel laureate who launched the age of chemical warfare. New York: Ecco, HarperCollins Publishers.

Chevriot, R. (1972). *Subject: Creation of an international Federation*. Typescript letter, 1 page, undated. Paris: Nature et Progrès.

Gall, J. (1885). Use of cylindrical projections for geographical, astronomical, and scientific purposes. *Scottish Geographical Magazine, 1*(4), 119–123.

Gastner, M. T., & Newman, M. E. J. (2004). Diffusion-based method for producing density equalizing maps. *Proceedings of the National Academy of Sciences (PNAS), 101*(20), 7499-7504.

Haber, F. (1920). The Synthesis of Ammonia from its Elements *Nobel Lectures, Chemistry 1901-1921* (1966 ed., pp. 326-340). Amsterdam, Netherlands: Elsevier Publishing.

Northbourne, Lord. (1940). *Look to the Land*. London: Dent.

OFA. (2011). Organic - The fastest growing agricultural based industry in the world. *OFA Organic Update, August*.

Paull, J. (2013). The organics iceberg and the tyranny of organic certification. *Journal of Organic Systems, 8*(2), 2-5.

Paull, J. (2014). Lord Northbourne, the man who invented organic farming, a biography. *Journal of Organic Systems, 9*(1), 31-53.

Paull, J. (2015). Organic farming: The arrival of the dissident agriculture meme in Australia. *Journal of Organics, 2*(1), 49-64.

Paull, J., & Hennig, B. (2011). A world map of organic agriculture. *European Journal of Social Sciences, 24*(3), 360-368.

Paull, J., & Hennig, B. (2013). The World of Organic Agriculture - Density-equalizing map. In H. Willer, J. Lernoud, & L. Kilcher (Eds.), *The World of Organic Agriculture: Statistics and Emerging Trends 2013* (pp. 129): Frick, Switzerland: Research Institute of Organic Agriculture (FiBL) & Bonn: International Federation of Organic Agriculture Movements (IFOAM).

Paull, J., & Lyons, K. (2008). Nanotechnology: the next challenge for organics. *Journal of Organic Systems, 3*(1), 3-22.

Peters, A. (1983). *Die Neue Kartographie/The New Cartography*. (dual text: in German and English); Klagenfurt, Austria: Carinthia University; New York Friendship Press: Friendship Press.

Pfeiffer, E. (1938). Bio-Dynamic Farming and Gardening: Soil Fertility Renewal and Preservation (F. Heckel, Trans.). New York: Anthroposophic Press.

Seetharaman, G. (2016). How Sikkim could offer lessons to other states in organic farming. *The Economic Times, 7 February*, www.economictimes.indiatimes.com.

Smil, V. (2001). Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production. Cambridge, USA: The MIT Press.

Steiner, R. (1924). *Agriculture Course* ("Printed for private circulation only"; 1929, first English language edition; George Kaufmann Trans ed.). Dornach, Switzerland: Goetheanum.

Tobler, W. (2004). Thirty Five Years of Computer Cartograms. *Annals of the Association of American Geographers, 94*, 58-73.

Willer, H., & Lernoud, J. (Eds.). (2015). *The World of Organic Agriculture: Statistics and Emerging Trends 2015*: Frick, Switzerland: Research Institute of Organic Agriculture (FiBL) & Bonn: IFOAM-Organics International.