

COMMENTARY

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To be or not to be for humankind - organic diets revisited for a sustainable development

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Abstract

Worldwide, traditional diets are being replaced by diets with high proportions of ultra-processed industrial foods, meat products and refined sugars, fats and oils. By contrast, the (slowly) growing consumption of unrefined organic food products and the more and more popular organic-type of diets are associated with lower consumption of these foods. In this comment, we argue that the growth of the organic food chain is already now contributing to the goal of improving public health in global terms as well as to the goal of reducing the environmental impact of agricultural production and food processing. Thus, consumption of organic food contributes to saving lives and enabling future human existence. As such, the organic food system deserves increased attention and stimulation by scientists and public agencies.

Keywords: Organic food, Food pattern, Sustainability, Healthy diet

Plain English summary

Worldwide, traditional eating habits have changed rapidly over the last few decades. People are eating more and more industrially-produced foods, meat products and refined sugars, fats and oils. It is widely recognised that this replacement has problematic consequences, such as an increase in obesity, poor health and low quality-of-life, which have already led to a marked increase in health care costs. Moreover, the continued appetite for ‘fast food’, which is highly processed, and the increasing consumption of animal-derived foods has prevented the development of sustainable agriculture on the global scale. Meat and dairy products have a much higher environmental impact than plant-based foods: their production leads to more greenhouse gases and to stronger pollution, thus hampering the achievement of the Paris climate goals. At the same time, there has been a reverse trend, though on a smaller scale: more and more people are starting to consume “organic” foods produced by paying closer attention to nature, i.e., using

fewer chemicals and antibiotics, resulting in less polluted waterways and more biodiversity. Several European studies show that people who buy organic food also eat fewer animal products, sugar and ultra-processed foods, and more unprocessed foods, including vegetables, fruits and whole grain products. Furthermore, these studies consistently indicate that consumers of organic food choose a more sustainable dietary composition than consumers of typical supermarket foods. In the present commentary, we emphasize the relevance of this type of diet for a sustainable development of global food production. By drawing public attention to the importance of a healthy, more plant-based and unrefined diet, we show that organic food can contribute to the goal of improving health as well as to that of reducing the environmental impact of food production. For the future of mankind, the question is “to be or not to be”; we believe the organic food pattern can strongly contribute to these aims, i.e. to a healthy planet.

Background

Worldwide, as an apparently inherent part of economic development and ‘Westernisation’, traditional diets are rapidly being replaced by diets with high proportions of ultra-processed industrial foods, meat product and

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refined sugars, fats and oils [10, 23]. While the first consequences of this unprecedented dietary revolution for human health are obvious and already now put a heavy and ever-increasing burden on health care costs and quality-of-life (see [4, 15]), the dramatic impact of these tendencies for a sustainable agriculture development at the global scale is only recently receiving due attention [20, 23]. The dimension of the problem becomes even more obvious when one considers, for instance, that global agriculture requires 40% of total earth surface, or that it emits more than $\frac{1}{4}$ of all greenhouse gases (see [3] and references therein). To make a long story short: it will be impossible to feed the still growing world population according to these tendencies without making our planet inhabitable already in the nearby future.

By contrast, the consumption of unrefined organic food products and organic-type of diets has only very gradually increased over the past decades, and is still at a comparatively low level. Organic foods are produced relying on ecological processes, biodiversity and cycles adapted to local conditions, avoiding agricultural inputs with unknown or adverse effects such as genetically modified seeds, synthetic fertilizers and pesticides, preventive veterinary drugs, and during processing avoiding most preservatives, flavour enhancers and other additives and irradiation [21]. Therefore, organic products as such are expected to have a different – more favourable – composition and even positively affect health. In fact, such expectations have already started to be fulfilled [2]. Moreover, several recent studies indicate that regular consumers of organic products generally follow a diet with a different *composition*, namely with less ultra-processed industrial foods [27], meat products, refined cereals and sugar [5, 8, 19, 25]. Such a shift in dietary composition is completely opposite to the still on-going sharp rise in the world-wide consumption of ultra-processed foods.

In this commentary, we discuss the synergies between the effects of the shift in dietary composition that accompanies the consumption of organic products and the advantages of organic products *per se*. We further elaborate on the multiple contributions of the consumption of organic foods to a globally sustainable food and nutrition system, and, in particular, to attaining the Paris climate goals. Briefly, these goals have been agreed on within the United Nations Framework Convention on Climate Change (UNFCCC) and deal with greenhouse-gas-emissions mitigation, adaptation, and finance. The main objectives are to keep the increase in global average temperature below 2 °C above pre-industrial levels, and to limit its increase to 1.5 °C. Achieving these goals would markedly limit the risks and effects of climate change. Per July 2018, 195 UNFCCC member countries have signed the agreement.

Environmental impact of food consumption

There is now wide agreement that in global terms, food consumption has a strong environmental impact, and that accurate and exact life cycle assessment of food products is an essential part of evaluating the sustainability of human behaviour, including its effect on climate change. Factors often considered at present are agriculture, industrial processing, packaging, distribution, retail, use, various transport and waste/loss steps, as well as wastewater treatment [13]. However, the present life cycle assessment of foods and of the global food production as a whole still appears to be incomplete, i.e. not all potentially relevant variables are being considered. This may be partly due to the multitude of factors that determine the environmental sustainability of foods and the overall diet. Additional relevant factors are likely to be identified and considered in the near future. One such factor is the damage to ecosystems by the processes involved in food production, both in agriculture and in processing. An example of such a hitherto neglected phenomenon of high environmental relevance is the rapidly progressing decrease of biodiversity [12]. In Middle Europe, this decrease is well illustrated by the reported dramatic (up to 80%) reduction in the total flying insect biomass in protected areas in Germany over the last 27 years [6]. Since a link between intensification of conventional agricultural – especially the use of pesticides – and the decrease in biodiversity is strongly suspected, it is urgent to incorporate this aspect in environmental impact assessments. An essential question is, whether it is still possible to stop, or even reverse, this threatening trend of on-going genetic losses; in any case, the needed efforts will for sure be laborious and cost-intensive. It is time for us to face reality and to save whatever we can before it is too late.

Organic versus conventional

The various stages of the conventional food production chain – use of synthetic fertilizers and pesticides, preventive veterinary drugs, most preservatives, additives and irradiation – strongly damage the environment. The opposite appears likely in the case of organic food production systems, which are characterised by integration of agriculture in ecological processes, by intentional enhancement of biodiversity and use of cycles adapted to local conditions [21] and, most likely, by a lower degree of processing [27]. The studies performed so far often show that the environmental impact of organic food systems is smaller than the impact of conventional food systems when expressed per area land [11]. There is still debate regarding the question whether this also applies when expressed per kg crop, as the crop yield of organic food systems is usually lower than that of conventional food systems [9, 11] and the context might play an

important role [17]. A very recent meta-analysis of a high number of life cycle assessments revealed that per unit food, organic systems require more land and cause more eutrophication [3]. The same analysis could further show that organic systems use less energy than conventional systems do, at the same time that the production of green gas emissions is similar between the two types of systems. However, it is important to note that, even in this very recent meta-analysis, not all factors relevant for an adequate life cycle assessment were taken into consideration (e.g. biodiversity impact; see above). To date, it remains impossible to comprehensively compare the environmental impact of conventional and organic production systems. Most importantly, among the missing factors there are several which would most likely shift the global lifecycle assessment results in favour of organic systems.

At first glance, it appears logical that the ongoing discussion on the environmental impact of these two types of food production systems is focused on farming and production *per se*. However, once the food products are on the market, they will be bought by consumers, and depending on additional, more or less indirect external factors associated with their consumption, the overall environmental impact can vary widely. One of these external factors or variables is the dietary pattern. Several European surveys and cohort studies indicate that the decision to purchase organic food goes hand-in-hand with lower consumption of animal-derived products, sugar and ultra-processed foods, as well as with higher consumption of unprocessed foods, including vegetables, fruits and whole grain products. In the Netherlands, an analysis of food frequency questionnaire data revealed that consumption of organic food during pregnancy was associated with a food pattern with more soy/vegetarian products, vegetables, cereal products, bread, fruits and legumes, and fewer animal-derived products (milk and meat), sugar and potatoes [19]. A food pattern with more vegetable food and less sweet and alcoholic beverages, processed meat and milk was also seen in France [8]. In addition, the latest German National Nutrition Survey confirmed that individuals following an organic-type of diet consumed more fruits and vegetables, and less meat/sausages and soft drinks [5]. And finally, in Norway, the use of an organic-type of diet during pregnancy was associated with higher consumption of vegetables, fruit and berries, cooking oil and whole grain products, and lower consumption of meat, white bread, cakes and sweets [25].

Organic-type of Western diet and sustainability

Different foods have very different environmental impacts (see [3] and references therein). Ruminant meat (beef, goat and lamb/mutton) have maximal impacts

than are 20–100 times higher than those of plants do. At the same time, milk, eggs, pork, poultry, and seafood have impacts 2–25 times higher than plants per kilocalorie of food produced. This means that dietary pattern changes leading to higher consumption of plant-derived products (and lower consumption of animal-derived products) will have a markedly favourable environmental impact. Therefore, the above different studies performed across Europe consistently indicate that the consumption of an organic-type of diet is clustered with an overall more sustainable dietary composition. Based on these studies, we suggest in this comment to use the term “organic-type of diet” to describe a type of diet that typically combines the use of organic foods with high consumption of unprocessed plant-derived foods such as whole grain cereals, legumes, vegetables and fruits, and low consumption of ultra-processed foods and animal-derived foods. There is a considerable overlap between the food pattern of the organic-type of diet and the New Nordic Diet, which constitutes one of the first top-down attempts to decrease the intake of meat and processed foods, and to increase the consumption of legumes, vegetables, fruit, whole grains, (artic) seafood, nuts and herbs, preferentially of organic production (see [7] and references therein). Interestingly, and at least in the Dutch cohort-study, not only consumers of high amounts organic foods, but also moderate consumers of organic foods exhibited an overall dietary pattern that differed from the standard diet [19]. This means that ca. 30% of the participants in this cohort-study had a diet with at least some characteristics of an organic-type of diet. The relevance of this type of diet – that is being freely chosen by an increasing number of European consumers – for a sustainable development of global food production must be emphasised: this bottom-up tendency might be crucial for humankind!

When characterising the global dietary tendencies over the last 50 years, one can observe marked increases in the consumption of food products whose production releases high amounts of greenhouse gases [23]. Obvious exponents of this trend are meat products and refined sugars, fats and oils. It has been calculated that, if this tendency does not change strongly during the next years, by 2050, the corresponding greenhouse gas production will have increased by 80% relative to the present value [23]. This development creates a serious threat to the Paris agreement of setting out a worldwide action plan to avoid dangerous climate changes by limiting global warming to well below 2°C. Some hope derives from model analyses indicating that this ongoing development could be stopped if the world population would adopt a diet with characteristics from Mediterranean, pescetarian or vegetarian diets [23]. In this case, by 2050, the greenhouse gases derived from food production would stay at

the present values despite the calculated increase of the world population. This may also apply to the New Nordic Diet, which has been shown to be associated with emissions of greenhouse gases comparable to those of the Mediterranean diet [26]. The food pattern associated with an organic-type of diet has several characteristics of the Mediterranean, the pescetarian and vegetarian diet. Therefore, it may be expected that if the world adheres to the organic-type of diet, this will also have a stabilising effect on greenhouse gas emissions, unless the production of organic food would have markedly higher emissions.

For a healthy, sustainable, organic Western diet

The present trend in Western diets to increase the consumption of meat products, refined sugars, fats and oils, ultra-processed and fast foods has led to a worldwide explosion in type 2 diabetes, coronary heart disease, other chronic non-communicable diseases and some types of cancer that lower global life expectancies [23]. Because they offer alternatives to the consumption of these products, Mediterranean, pescetarian and vegetarian diets can attenuate these negative effects on human health, and similar advantages can be expected from the New Nordic Diet and from a diet according to the recent Brazilian dietary guidelines from 2014 [14]. Of these, the New Nordic Diet has incorporated organic production as an explicit inherent part of this food pattern. In the case of the Mediterranean, pescetarian and vegetarian diets, foods may be from conventional production and their advantages for human health and environmental impact only derive from the associated food patterns. However, the similarities between these food patterns and the organic-type of diet let us expect comparable positive effects from the organic-type of diet.

In addition to the health-promoting organic-type of dietary pattern, consumption of organic food might be associated with favourable impact on health. Firstly, there are some differences in the biochemical and chemical composition of organic and conventional foods [2]. Organic foods usually contain lower concentrations of pesticide residues and nitrate than do conventionally produced foods, whereas the levels of some minerals, vitamins and anti-oxidants may be higher [2]. Clearly, existing results from epidemiological studies do not allow conclusions about causality. Nevertheless, and often after correcting for several co-variables, studies show that consumption of organic food may have favourable impacts on some diseases and disorders. One group of such disorders includes atopic sensitization, allergies and eczemas (reviewed in [2]; see also [16, 22]). Additional possible effects on health comprise lower prevalence of pre-eclampsia [24], and of hypospadias [1]. Finally, favourable effects of organic food consumption on

body weight [18] and other risk factors for cardiovascular diseases have been reported [2], including on favourable plasma fatty acid composition [19].

Consumers of organic food are choosing food patterns with fewer items of animal origin as consumers of conventional do (see above). By drawing public attention to the importance of a healthy, more plant-based and unrefined diet, we argue that organic food is already now contributing to improving public health in global terms as well as to reducing the environmental impact of agricultural production and food processing. Only rapid and fundamental changes in high-impact agriculture, energy supply and food consumption will be able to turn the tide, and prevent even more dramatic catastrophes over the next decades than envisioned today. Organic diets can be seen as a bottom-up experiment of the fundamental dietary changes which are urgently needed to save our planet. Therefore, more time and money should be invested in finding out how we can motivate a bigger proportion of the world population to adopt an organic-type of diet that is both healthy and sustainable.

Conclusions

The evidence for health-promoting effects of organic diets is starting to accumulate. On the one hand, the biochemical composition of organic products is in some cases superior to that of conventional products and epidemiological studies indicate some favourable health-related effects. On the other hand, at least in Europe, data from the Netherlands, France, Germany and Norway consistently shows that the consumption of organic foods is associated with a healthier and more sustainable food pattern.

In addition to classical diet characteristics such as main food groups, macronutrients and micronutrients, future nutritional research should consider the type of production systems involved (conventional or organic), as well as the associated food pattern (including degree of food products' processing), and include an assessment of food production impacts on the environment.

Next to the traditional Mediterranean diet, the New Nordic Diet, or the diet aimed at by the recent Brazilian dietary guidelines, the organic-type of diet can already now serve as an example on how to develop a new food system and cuisine based on low processed organic food with favourable health effects and low environmental impact. For these reasons, the organic food system deserves increased attention and stimulation by scientists and public agencies. If the organic-type of diet prevails, humankind may still have a chance to turn the tide of current catastrophic health and environmental developments and may still have a chance to continue "to be".

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References

- Brantsaeter AL, Torjusen H, Meltzer HM, Papadopoulou E, Hoppin JA, Alexander J, et al. Organic food consumption during pregnancy and hypospadias and cryptorchidism at birth: the Norwegian mother and child cohort study (MoBa). *Environ Health Perspect*. 2016;124(3):357–64.
- Brantsaeter AL, Ydersbond TA, Hoppin JA, Haugen M, Meltzer HM. Organic food in the diet: exposure and health implications. *Annu Rev Public Health*. 2017;38:295–313.
- Clark M, Tilman D. Comparative analysis of environmental impacts of agricultural production systems, agricultural input efficiency, and food choice. *Environ Res Lett*. 2017;12:064016.
- Drewnowski A, Popkin BM. The nutrition transition: new trends in the global diet. *Nutr Rev*. 1997;55(2):31–43.
- Eisinger-Watzl M, Wittig F, Heuer T, Hoffmann I. Customers purchasing organic food - do they live healthier? Results of the German National Nutrition Survey II. *Eur J Nutr Food Saf*. 2015;5(1):2347–5641.
- Hallmann CA, Sorg M, Jongejans E, Siepel H, Hofland N, Schwan H, et al. More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PLoS One*. 2017;12(10):e0185809.
- Jensen JD, Saxe H, Denver S. Cost-effectiveness of a new Nordic diet as a strategy for health promotion. *Int J Environ Res Public Health*. 2015;12(7):7370–91.
- Kesse-Guyot E, Peneau S, Mejean C, Szabo de Edelenyi F, Galan P, Hercberg S, et al. Profiles of organic food consumers in a large sample of French adults: results from the Nutrinet-Sante cohort study. *PLoS One*. 2013;8(10):e76998.
- Lee KS, Choe YC, Park SH. Measuring the environmental effects of organic farming: a meta-analysis of structural variables in empirical research. *J Environ Manag*. 2015;162:263–74.
- Martinez Steele E, Popkin BM, Swinburn B, Monteiro CA. The share of ultra-processed foods and the overall nutritional quality of diets in the US: evidence from a nationally representative cross-sectional study. *Popul Health Metrics*. 2017;15(1):6.
- Meier MS, Stoessel F, Jungbluth N, Juraske R, Schader C, Stolze M. Environmental impacts of organic and conventional agricultural products--are the differences captured by life cycle assessment? *J Environ Manag*. 2015;149:193–208.
- Newbold T, Hudson LN, Hill SL, Contu S, Lysenko I, Senior RA, et al. Global effects of land use on local terrestrial biodiversity. *Nature*. 2015;520(7545):45–50.
- Notarnicola B, Tassielli G, Renzulli PA, Castellani V, Sala S. Environmental impacts of food consumption in Europe. *J Clean Prod*. 2017;140:753–65.
- Oliveira MSO, Amparo-Santos L. Food-based dietary guidelines: a comparative analysis between the dietary guidelines for the Brazilian population 2006 and 2014. *Public Health Nutr*. 2018;21(1):210–7.
- Pan A, Sun Q, Bernstein AM, Schulze MB, Manson JE, Stampfer MJ, et al. Red meat consumption and mortality: results from 2 prospective cohort studies. *Arch Intern Med*. 2012;172(7):555–63.
- Rist L, Mueller A, Barthel C, Snijders B, Jansen M, Simões-Wüst AP, et al. Influence of organic diet on the amount of conjugated linoleic acids in breast milk of lactating women in the Netherlands. *Br J Nutr*. 2007;97(4):735–43.
- Seufert V, Ramankutty N. Many shades of gray—the context-dependent performance of organic agriculture. *Sci Adv*. 2017;3(3):e1602638.
- Simões-Wüst AP, Molto-Puigmarti C, Jansen EH, van Dongen MC, Dagnelie PC, Thijs C. Organic food consumption during pregnancy and its association with health-related characteristics: the KOALA birth cohort study. *Public Health Nutr*. 2017;20(12):2145–56.
- Simões-Wüst AP, Molto-Puigmarti C, van Dongen MC, Dagnelie PC, Thijs C. Organic food consumption during pregnancy is associated with different consumer profiles, food patterns and intake: the KOALA birth cohort study. *Public Health Nutr*. 2017;20(12):2134–44.
- Springmann M, Clark M, Mason-D'Croz D, Wiebe K, Bodirsky BL, Lassaletta L, et al. Options for keeping the food system within environmental limits. *Nature*. 2018;562(7728):519–25.
- Strassner C, Cavoski I, Di Cagno R, Kahl J, Kesse-Guyot E, Lairon D, et al. How the organic food system supports sustainable diets and translates these into practice. *Front Nutr*. 2015;2:19.
- Thijs C, Müller A, Rist L, Kummeling I, Snijders BE, Huber M, et al. Fatty acids in breast milk and development of atopic eczema and allergic sensitisation in infancy. *Allergy*. 2011;66(1):58–67.
- Tilman D, Clark M. Global diets link environmental sustainability and human health. *Nature*. 2014;515(7528):518–22.
- Torjusen H, Brantsaeter AL, Haugen M, Alexander J, Bakketeig LS, Lieblein G, et al. Reduced risk of pre-eclampsia with organic vegetable consumption: results from the prospective Norwegian mother and child cohort study. *BMJ Open*. 2014;4(9):e006143.
- Torjusen H, Lieblein G, Naes T, Haugen M, Meltzer HM, Brantsaeter AL. Food patterns and dietary quality associated with organic food consumption during pregnancy; data from a large cohort of pregnant women in Norway. *BMC Public Health*. 2012;12:612.
- Ulaszewska MM, Luzzani G, Pignatelli S, Capri E. Assessment of diet-related GHG emissions using the environmental hourglass approach for the Mediterranean and new Nordic diets. *Sci Total Environ*. 2017;574:829–36.
- van de Vijver LP, van Vliet ME. Health effects of an organic diet—consumer experiences in the Netherlands. *J Sci Food Agric*. 2012;92(14):2923–7.

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