

Organic foods: Are they viable and is organic foods better for us than non-organic foods?

The Department for the Environment Food and Rural Affairs (DEFRA) definition of Organic foods is: -

Avoiding artificial fertilisers and pesticides

Use crop rotation and other forms of husbandry to maintain soil fertility

Controlling weeds, pesticides and disease using husbandry techniques and where necessary approved materials to control pest and diseases

Use a limited number of approved products and substances where necessary in the processing of organic foods.

(DEFRA, 2016)

This essay will look at the benefits to organic farming, the value and growth of organic farming in United Kingdom (UK), why the consumer chooses organic foods and whether these foods are nutritionally better for them. It will explore how farmers go about becoming an organic farm and when these farms can really be considered completely organic. It will examine the yield of foods grown both organically and non-organically to analyse the sustainability of the food supplies to feed the world and finally it will look at the safety of foods.

When a farm chooses to become organic there is a long process to achieve organic status. The process takes 24 months to be completely organic. The farmers must register their land with one of the 8 Approved United Kingdom (UK) organic control bodies and complete the transition where the land has none of the banned chemicals on it for those 24 months (DEFRA, 2018a). The Department of Agriculture Environment and Rural Affairs (DAERA) describes this transition period saying they cannot be deemed an organic producer until 12 months into the transition to organic and cannot sell produce under the organic umbrella during this time (DAERA, 2018). During the transition period, methods such as crop rotation and the introduction of green manure including crops like clove (high in nitrogen) are implemented to substitute the use of chemical fertilisers and pesticides (DAERA, 2018).

In the UK as of 2016 there was 508,000 hectares of organic land registered with the approved bodies of which 64% is grassland for grazing and 7% is used for the growing of cereal crops leaving the remaining 29% as area for the growth of other vegetables. There are 6,600 organic operators and processors which is up 3.5% on 2016 (DEFRA, 2018b).

One of the reason why farmers change their methods to organic is often the draw of the financial incentives laid down by the European Union (EU) to convert to organic methods (Food and Agriculture Organisation of the United Nations, 2018), the needs to diversify with the changes to the farm payments system (DEFRA, 2018c) and the potential changes to come with the exit of the UK from the EU. With the UK on the brink of leaving the European Union there is an uncertainty as to what will happen to farming, as it is the EU who have withdrawn the use of so many chemical-based fertilisers and demanded change to growing methods in conventional farming (Agriculture and rural development - European Commission, 2018). It is claimed organic farming costs more to execute but the return is higher so offsetting the production costs (Röös *et al.*, 2018). Harvey (2018) implied there would be a continuity of the current subsidy system which is currently supported by the EU to the value of £3 billion per annum and the government are anticipating a better future for British farming. Production of organic food has fluctuated, records from 1999 show the peak of land use was in 2002 with 750,000 hectares either registered or in conversion (DEFRA,2018b), but the peak of production time was in 2008 with £1986 million worth of produce. More research has gone on into the benefits of organic foods since 2008, indicating that maybe this is the reason for the decline the market is experiencing today (Statista, 2018).

Sales and consumption of organic foods are driven by people's perception of organic foods being more healthy (Średnicka-Tober, *et al*, 2016). People buy organic foods both vegetables and meat for various reasons. Many buy organic meat produce as it is considered to be kinder to the animals, they are less stressed, have more grazing space and it is thought to be a healthier choice as regards to fat content (Soil Association, 2018, Dalziel, Kliem & Givens, 2015).

According to research by Janssen (2018), from a sample of 9470 people surveyed those aged over 40 years and were the main wage earner in the household were the ones who purchased and consumed more organic produce. Those who had no children in the home also proved to be high consumers as they are the ones who have the potential to be able to afford the higher priced produce. It was concluded from this research that people are driven to consume organic foods for both natural and healthiness reasons and environmental protection reasons and these were the main drivers. This research contrasts with that of Jones *et al* (2001) would also conclude the connection of cost of products being more affordable for this age group and those who have no children in the home, as they are more affluent and have more disposable income, additionally with no children in the home they have fewer mouths to feed so can

afford to purchase the higher priced organic produce, illustrating that cost was not an issue and in 2001 it was a trend to buy into the organic idea, rather than being driven by an ethical reason. Eisinger-Watzl, *et al* (2015) identified that those who consumed more organic fruit and vegetables were less inclined to have associating chronic diseases such as cancer, but this could not be attribute this just to the organic foods as they also adopted other good lifestyle choices which could improve their health.

Research by Williams and Hammitt (2001) proposed that the public has limited knowledge of the hazards of pesticides and it did not influence their choices. Whereas in more recent years one of the key reason's society chooses organic food is due to the chemical and mineral residues from pesticides and fertilisers on the food which are then consumed rather than the nutritional benefits (Atkins & Bowler, 2016, Barański, *et al*, 2014). One misconception about organic foods is that the public believe no pesticides are used to grow produce, this is due to clever advertising as not all pesticides are banned (Savage, 2018). Gosden (2015) discussed the use of azadirachtin, (an extract of the Indian Neem tree) as a pesticide in use in the UK which when used in crops which flower and require the assistance of bees for pollination was found to be killing the bees. The Soil Association has since limited the use of this to extreme cases as a last resort with special permission. As a standard the Soil Association (2018) recommend only 20 pesticides, the majority are derived from natural ingredients. An additional product which is permitted that the Soil Association is concerned with is copper, which is used as a fungicide. Savage (2018), recognised that pesticides are still used but in different ways but still enough to be detected in testing. In the United States of America (USA) the Pesticide Data Program tested organic and non-organic samples and detected the incidence of residue on organic food to be lower, the very low levels of chemicals found are quite similar to the low levels detected on conventional samples. The testing also revealed 68 different pesticides, metabolites or growth regulators on organic fruit and vegetables, for 37% of these chemicals the average residue on organic samples was actually higher than the averages on conventional, but still very small (Savage, 2018). This is an indicator of how many residues are deposited in the growth cycle, as the USA has a more stringent approach to pesticide restrictions than the UK, having fewer pesticides available to the farmer than the UK (Soil Association, 2018).

Baranski, *et al* (2014) carried out meta-analyses based on 343 peer-reviewed publications that indicate statistically significant and meaningful differences in composition between organic

and non-organic crops/crop-based foods. They highlighted the increased level of antioxidants such as polyphenolics and flavones within organic produce which are linked to the reduction of neurodegenerative diseases such as Parkinson's or Alzheimer's disease, certain cancers and Cardiovascular diseases. Baranski, *et al* (2014) concluded there was a higher concentration of beneficial antioxidants and fewer potentially toxic mineral residues in organic produce which will be the result of the non-nitrous and phosphorous farming practices.

An additional aspect of organic farming is the methods used to rear organic livestock. There are positives and negatives to organic meat. Srednicka-Tober, *et al*, (2016) conducted a large scale worldwide meta-analysis revealed evidence from 67 studies, that it is nutritionally better with the presence of higher levels of omega-3 fatty acids and slightly lower levels of saturated fatty acids (SFA). The evidence for the SFA base on chicken meat is questionable as is only based on 5 studies, 3 studies from the UK and Italy offered results of no significant difference and the two others from United States of America and Korea reported significantly lower levels of SFA, the fact that the included studies was only 5 from 4 different countries is also relevant to the results as soil nutrient levels of the different countries will differ which could influence outcomes, stock breed and bloodline would sway the results and finally the feed given to the animals in what is referred to as the finishing period (how it is fed before it goes to market) could all potentially change the outcome and the nutritional values. In reference to the growth of cereals and vegetables and the nutritional benefits of organic food there is no current evidence as to organic food being higher in vitamins and minerals (Dangour, *et al*, 2009) although there is a reduction in heavy minerals such as cadmium from the removal of manmade pesticides which would contribute to the reduction of associated diseases (Hurtado-Barroso, *et al* 2017).

When studying the safe rearing organic or conventional animals there has been little evidence to question the risks of food poisoning as there is levels of bacteria within both products (Greger, 2018). But contamination can occur due to the un-checked nature of organic crop growth, with the presence of fungi or other bacterial contaminants and this too can be passed onto the animals via the feeds consumed (Lean, Combet & Barasi, 2017). Salmonella and Campylobacter has been found in both examples of meat products but the chance of being treated successfully by doctors has been increased in the cases of food poisoning in the

organic foods due to the lower levels of multidrug- resistant bacteria found in it (Greger, 2018).

The Soil Association (2018) states: -

Farm Animals must not routinely be given antibiotics. Farm animals now account for almost two-thirds of all antibiotics used in the EU. These are passed to us through the food chain

The Soil Association say this as conventional farming methods often distribute antibiotics via feeds. They do this to reduce the stress of rounding up animals to treat individually adding the medication to the feed (Farm Antibiotics, 2018). The use of antibiotics in humans in the UK is comparable to the rest of Europe whereas in animals it is 60% below the Europe average use (UK One Health Report, 2015). This practice is minimized in the UK even in the non-organic market. It could be questioned whether there is more of a risk to human health as a result of antibiotic resistance in farm animals or from the resistance we cause from using cleaning products in our homes, resistant bacteria are all around us and the more we disinfect the more resistance we create as a species (Farm Antibiotics, 2018). Whether it is organic or non-organic meats there are regulations preventing the use of veterinary antibiotics to soon before slaughter. There is rarely any antibiotics found in the food chain, illustrating that it not necessarily about antibiotics residue but more about the resistance to bacteria (Farm Antibiotics, 2018).

The results of organic farming provide a positive effect on biodiversity to the detriment of yield (Gabriel, *et al*, 2013). Yield varies depending on the type of soil, the crop and the area of the country it is being grown in (Seufert, Ramankutty & Foley, 2012). Yield is said to improve as a result of the different farming methods such as low-till planting where the surface of the soil is said to have minimal disturbance so able to maintain the water volume (Seufert, *et al*, 2012) this could be a disputed effect as these methods are also adopted by conventional farming as it requires less use of machinery therefore less burning of fuel so lower carbon emissions (Staropoli, 2016). Fertilizing the land becomes a challenge to organic farmers in the absence of livestock. Animal manures supply the nitrogen to the soil, so alternatives should be found. Utilizing organic animal manures, introducing microorganisms and fungi in to the soil or growing and then ploughing in green manure vegetation such as clove, rye, buckwheat and perennial legumes will help in nourishing the land in an organic fashion (Dore, 2008, Röö *et al.*, 2018). The growing of the green manure adds time, cost of

seed and fuel to plough the crops back into the land so this is where additional costs start to mount in the growth of organic produce.

The fact that there are additional production costs such as the increase of fuel use in the preparation of ground or the extra growth of green manure leads into an additional argument as to the ethics of organic foods due to carbon footprint. Le Page (2016) proposes that foods flown thousands of miles could have a lower carbon footprint to those grown under organic conditions in this country. The requirement of more land to produce the same amount of yield offsets the ecology of organic methods as it produces more greenhouse gas (GHG) emissions. This is contradicted by the Benbrook, (2018) who suggest that the GHG emissions are not as high as reported due to the fact that the majority of foods produced organically are vegetables and did not emit that much greenhouse gas. They failed to put into the equation the growing organic meat market, with the UK having 2.7% of its cattle being reared under organic conditions (DEFRA, b, 2018). With 53% of the GHG produced by agriculture being methane, produced by the fermentation within a cow's stomach and the decomposition of the manure it could be said the organic market is contributing to this with its growth as compared to the whole market the overall quantity of milk and beef producing cattle has reduced in the UK (DEFRA, 2017). In a study from the Netherlands it was shown that there was a 5-10% GHG emission from the production of 1 unit of milk within the organic dairy facility but the production of arable crops it was 40-50% higher GHG emissions, this was attributed to the field and ground work by machinery required both in preparation for planting and later in weeding (Bose, *et al*, 2014).

As yield is of primary importance to the farmer, the question of whether the produce is “organic” must be a consideration of the shopping public. The organic logo can be applied to a product if produced by a registered producer and if is a processed item it must contain at least 95% organic produce (Gov.UK, 2018). The fact that products have the logo on them does not always mean they are organic due to factors beyond the farmers control such as spray drift from another non-organic farm (Hse.gov.uk, 2018). Spray drift is when a farmer sprays a field with a long boom sprayer and the wind picks up particles of the pesticides or other chemicals, blowing them over adjacent fields. This is fine if the adjacent fields are non-organic, but residues can be spread in this fashion (Hse.gov.uk, 2018). Co-operation is required between farmers ensuring spraying is done on days when the wind is light to minimize drift or leaving strips of land as buffer barriers to protect against contamination (Maynard, Overstreet and Riddle, 2018).

The evidence reviewed comparing the nutritional value for both organic and traditionally farmed vegetables, cereal crops and meat is extensive and inconclusive as to human health. Both have qualities which are attractive to the consumer and likewise negative to the grower. Nutritionally there are positives to the organic foods with a higher level of antioxidants and in some cases lower level of fats produced but this too is questionable with poor quality and conflicting supporting evidence. It could be questioned as to the reliability of the marketing of organic foods and how much is told too the consumer in terms of ideas surrounding subjects such as the GHG emissions and the sustainability of food supplies in the world. In the authors opinion there is a place for organic foods but the authorities responsible for controlling areas such as which fertilisers can be used should be mindful of the restrictions put in place as it may limit the amount of food grown, something which is at the forefront of policy for many countries.

Word count 2863.

References.

Agriculture and rural development - European Commission. (2018). *Agriculture and nitrates - Agriculture and rural development - European Commission*. [online] Available at: https://ec.europa.eu/agriculture/envir/nitrates_en [Accessed 26 Nov. 2018].

Atkins, P. and Bowler, I. (2016). *Food in Society*. Taylor and Francis, pp.194-195.

Barański, M., Średnicka-Tober, D., Volakakis, N., Seal, C., Sanderson, R., Stewart, G., . . .

Leifert, C. (2014). Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: A systematic literature review and meta-analyses. *British Journal of Nutrition*, 112(5), 794-811.

doi:10.1017/S0007114514001366

Benbrook, C. (2018). *The Organic Center: Organic diet linked to lower greenhouse gas emissions*. [online] Organic-center.org. Available at: <https://www.organic-center.org/organic-diet-linked-to-lower-greenhouse-gas-emissions/> [Accessed 12 Nov. 2018].

Bos, J. F.F.P., Haan, J., Wijnand, S., Schils, R.L.M. (2014). Energy use and greenhouse gas emissions in organic and conventional farming systems in the Netherlands. *NJAS - Wageningen Journal of Life Sciences*, 68(C), pp.61–70.

DAERA (2018) Organic Farming- your questions answered. Available online: - <https://www.daera-ni.gov.uk/articles/organic-farming-your-questions-answered#toc-11>

Dalziel, C.J., Kliem, K.E. & Givens, D.I. (2015). Fat and fatty acid composition of cooked meat from UK retail chickens labelled as from organic and non-organic production systems. *Food Chemistry*, 179(C), pp.103–108.

Dangour, A.D., Dodhia, S.K., Hayter, A., Allen, E., Lock, K. & Uauy, R. (2009) Nutritional quality of Organic foods: a systematic review. *American Journal of Clinical Nutrition*: 680-5
doi:10.3945/ajcn.2009.28041

DEFRA (2009) UK food security Assessment: Our approach.
file:///C:/Users/sakab/AppData/Local/Microsoft/Windows/INetCache/IE/I2HC7FDP/food-assess-approach-0908.pdf. Accessed 2/11/2018.

DEFRA (2016) Guidance on Organic farming: How to get certification and apply for funding: Available online at: - www.gov.uk/guidance/organic-farming-how-to-get-certification-and-apply-for-funding#what-counts-as-organic-farming

DEFRA (2017) Agricultural Statistics and Climate Change: available online at: -
file:///C:/Users/sakab/AppData/Local/Microsoft/Windows/INetCache/IE/I2HC7FDP/agriclim
ate-8edition-8dec17.pdf

DEFRA (2018a) Organic Certification: list of UK approved organic control bodies: available
online at:- [https://www.gov.uk/government/publications/organic-certification-list-of-uk-
approved-organic-control-bodies/approved-uk-organic-control-bodies](https://www.gov.uk/government/publications/organic-certification-list-of-uk-approved-organic-control-bodies/approved-uk-organic-control-bodies); Accessed 2/11/2018

DEFRA (2018b) Organic Farming statistics 2017: *National Statistics*: Available online at:-
file:///C:/Users/sakab/AppData/Local/Microsoft/Windows/INetCache/IE/IXJUCKNH/organic
s-statsnotice-17may18.pdf Accessed 2/11/2018.

DEFRA (2018c) Basic Payment Scheme: All the information you need to know about the
main rural payment for farmers in the EU. Available on line at: -
www.gov.uk/government/collections/basic-payment-scheme#bps-2015 Accessed 9/11/18

Eisinger-Watzl M, Wittig F, Heuer T, Hoffmann I. (2015) Customers purchasing organic
food - do they live healthier? Results of the German National Nutrition Survey II. *Eur J Nutr
Food Saf.* ;5(1):59–71

Farm Antibiotics. (2018). *Farm antibiotics myth-buster gives you facts about antibiotic use
on-farm*. [online] Available at: [https://www.farmantibiotics.org/science-facts/farm-
antibiotics-myth-buster/](https://www.farmantibiotics.org/science-facts/farm-antibiotics-myth-buster/) [Accessed 26 Nov. 2018].

Food and Agriculture Organisation of the United Nations (2018) Organic Agriculture.
Frequently asked Questions: available online at: - www.fao.org/organicag/oa-faq/oa-faq1/en/
Accessed 9/11/18

Gabriel, D., Sait, S., Kunin, W., & Benton, T. (2013). Food production vs. biodiversity:
Comparing organic and conventional agriculture. *The Journal of Applied Ecology*, 50(2),
355-364.

Gosden, E. (2018). *Soil Association approved use of unauthorised pesticide on organic crops*.
[online] Telegraph.co.uk. Available at:
[https://www.telegraph.co.uk/news/earth/environment/11679681/Soil-Association-approved-
use-of-unauthorised-pesticide-on-organic-crops.html](https://www.telegraph.co.uk/news/earth/environment/11679681/Soil-Association-approved-use-of-unauthorised-pesticide-on-organic-crops.html) [Accessed 23 Nov. 2018].

GOV.UK. (2018). *Food labelling and packaging*. [online] Available at:
<https://www.gov.uk/food-labelling-and-packaging/organic-food> [Accessed 22 Nov. 2018].

Greger, M. (2018). *The Food Safety Risk of Organic versus Conventional* | *NutritionFacts.org*. [online] NutritionFacts.org. Available at: <https://nutritionfacts.org/2017/04/18/the-food-safety-risk-of-organic-versus-conventional/> [Accessed 16 Nov. 2018].

Harvey, F. (2018). *Government promises profitable farming post-Brexit*. [online] the Guardian. Available at: <https://www.theguardian.com/environment/2018/jun/06/government-promises-profitable-farming-post-brexite> [Accessed 12 Nov. 2018].

Hse.gov.uk. (2018). *Reducing Spray Drift*. [online] Available at: <http://www.hse.gov.uk/pesticides/topics/using-pesticides/spray-drift.htm> [Accessed 23 Nov. 2018].

Hurtado-Barroso, S., Tresserra-Rimbau, A., Vallverdú-Queralt, A., Lamuela-Raventós, R.M. (2017) Organic food and the impact on human health. *Critical Reviews in Food Science and Nutrition* 0:0, pages 1-11.

Janssen, M. (2018) Determinants of Organic Food Purchases: Evidence from household panel data: *Quality Preferences*; Vol 68 p19-28

Jones, P., Clarke-Hill, C., Shears, P. and Hillier, D., 2001. Case study: Retailing organic foods. *British Food Journal*, **103**(5), pp. 358-365.

Lean, M., Combet, E., & Barasi, M. (2017). *Barasi's human nutrition: A health perspective* (Third ed.).

Le Page, M. (2016). Care about Earth? Ditch organic food. *New Scientist*, 232(3102), 21.

Seufert, V., Ramankutty, N. & Foley, J., (2012) Comparing the yields of organic and conventional agriculture. *Nature*, 485(7397), pp.229–32.

Maynard, E., Overstreet, B. and Riddle, J. (2018). *Watch out for: Pesticide drift and Organic Production*. [e-book] Purdue Extension, Purdue University. Available at: <http://file:///C:/Users/sakab/AppData/Local/Microsoft/Windows/INetCache/IE/DEMOEC5H/dw-1-w.pdf> [Accessed 23 Nov. 2018].

Röös, E., Mie, A., Wivstad, M., Salomon, E., Johansson, B., Gunnarsson, S., Wallenbeck, A., Hoffmann, R., Nilsson, U., Sundberg, C. and Watson, C. (2018). *Risks and opportunities of increasing yields in organic farming. A review*.

Savage, S. (2018). *Buying organic food to avoid pesticides? You may want to reconsider* | *Genetic Literacy Project*. [online] Genetic Literacy Project. Available at: <https://geneticliteracyproject.org/2017/03/10/buying-organic-food-to-avoid-pesticides-you-may-want-to-reconsider/> [Accessed 23 Nov. 2018].

Średnicka-Tober, D., Barański, M., Seal, C.J., Sanderson, R., Benbrook, C., Steinshamn, H., Gromadzka-Ostrowska, J., Rembiałkowska, E., Skwarło-Sońta, K., Eyre, M., Cozzi, G., Larsen, M.K., Jordon, T., Niggli, U., Sakowski, T., Calder, P.C., Burdge, G.C., Sotiraki, S., Stefanakis, A., Stergiadis, S., Yolcu, H., Chatzidimitriou, E., Butler, G., Stewart, G., Leifert, C. (2016) Higher PUFA and n-3 PUFA, conjugated linoleic acid, α -tocopherol and iron, but lower iodine and selenium concentrations in organic milk: a systematic literature review and meta- and redundancy analyses. *British Journal of Nutrition*: ;115(6):1043-60. doi: 10.1017/S0007114516000349

Średnicka-Tober, D., Barański, M., Seal, C., Sanderson, R., Benbrook, C., Steinshamn, H., Gromadzka-Ostrowska, J., Rembiałkowska, E., Skwarło-Sońta, K., Eyre, M., Cozzi, G., Krogh Larsen, M., Jordon, T., Niggli, U., Sakowski, T., Calder, P. C., Burdge, G. C., Sotiraki, S., Stefanakis, A., Yolcu, H., Stergiadis, S., Chatzidimitriou, E., Butler, G., Stewart, G., Leifert, C. (2016). Composition differences between organic and conventional meat: a systematic literature review and meta-analysis. *The British journal of nutrition*, 115(6), 994-1011.

Staropoli, N. (2016) No-till agriculture offers vast sustainability benefits. So why do so many organic farmers reject it? Genetic Literacy Project: Available online at: - geneticliteracyproject.org/2016/06/02/no-till-agriculture-offers-vast-sustainability-benefits-so-why-do-organic-farmers-reject-it/ Accessed 15/11/2018.

Statista. (2018). *Organic food sales revenue in the UK 1999-2016* | *Statistic*. [online] Available at: <https://www.statista.com/statistics/282379/organic-food-and-drink-sales-in-the-united-kingdom-uk-since-1999/> [Accessed 16 Nov. 2018].

UK One Health Report. (2015). *Joint report on human and animal antibiotic use, sales and resistance, 2013*. [online] Available at: http://file:///C:/Users/sakab/AppData/Local/Microsoft/Windows/INetCache/IE/I2HC7FDP/One_Health_Report_July2015.pdf [Accessed 26 Nov. 2018].

Williams, P.R.D. & Hammitt, J.K. (2001) Perceived Risks of Conventional and Organic Produce: Pesticides, Pathogens and Natural Toxins: Risk Analysis, Vol 21, No. 2.