Interreg Baltic Sea Region

Co-funded by the European Union

CIRCULAR ECONOMY KISMET

Executive summary

TRUE COST ACCOUNTING

Opening the pathway to the next phase of organic

"A review of scientific papers related to the concept of True Cost Accounting for hidden cost of food and potential positive impact by organic on health, climate and biodiversity"

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BERAS International

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0. Our findings strongly advocate for organic agriculture, food and lifestyle.

The Food and Agriculture Organisation of the United Nations (FAO) and other renown institutions have developed the concept of True Cost Accounting for the hidden cost of food (TCA) and stipulated the monetary cost related to health, climate and biodiversity at global level to be bigger than for example the GDP of the EU.

We have reviewed around 50 scientific papers. Our findings are most promising and suggest a pathway and concrete measures to significantly decrease the hidden cost of food as follows:

- a **dietary pattern** with less refined sugar, fats and oils and meat and more plant rich food will significantly reduce health and environmental costs (Tillman & Clark in Nature 2014)

- **eating organic** is associated with significant less negative health risks such as for overweight and obesity (-23/ 31%), metabolic syndrome (-31%), type II diabetes (-35%) and risk of cancer (-25%) (The French BioNutrinetSanté study with 12 published research papers)

- **organic food** contains less residues of pesticides (Meta studies by Rahman et. al and Jiang et.al)

- **organic/biodynamic farming systems** have up to 60% less emissions of greenhouse gases, enhances soil health and biodiversity (The Swizz based Research Institutes of Organic Agriculture (FiBL) and their 45-year DOK trial)

- It is assumed that **Bio districts have a vital role** in facilitating the inclusive process advocating for and implementing the transformation needed for farming, food, equal rights and lifestyle.

MAIN OBSERVATIONS

The price we as consumers pay for food in the shop does not reflect the true cost. We and the society at large "pay" in addition the negative impact on health, the climate and environment.

We have demonstrated that organic farming and food significantly can reduce the hidden costs. It is our opinion that the price of organic food, all aspects included, is less than food from monoculture agriculture with the use of herbicides, pesticides and mineral fertilizer.

The emerging understanding of the science and logic behind True Cost Accounting for the hidden costs of food will open the pathway to the next phase of organic.

It is assumed that Bio districts have a vital role in facilitating the transformation needed.

In their report published February 2019 "Full Cost Accounting to Transform Agriculture and Food Systems" IFOAM Organics International made this important statement:

"Some people consider it unethical to value everything in monetary terms. In the organic sector, we recognize that the currency of nature is life itself and that many phenomena cannot be expressed through money alone. The value of biodiversity, for example, is more than the value of its ecosystem services, and the value of animal rights and welfare is more than the costs of installing management practices that promote animal health.

Money, however, is universally understood as a way to assign value in societies across the world, it is a 'language' that politicians, businesses and consumers alike understand. Financial incentives and disincentives are powerful ways to influence what people and businesses do and how they do it. Notwithstanding its limitations in accurately reflecting societal costs and benefits, Full Cost Accounting is an important tool for change and offers an alternative to our current, predominantly profit-centric model."

1. Introduction

Sustainable agriculture and food culture

Beras International[1] is a foundation whose purpose is to promote education, information, research and development on holistic thinking on regenerative organic agriculture, sustainable food systems and sustainable food societies/ Bio districts.

Beras has received funding from the Axel and Margaret Ax: son Johnson Foundation for Science for the dissemination of research findings on agriculture and food culture.

The objective of our work is as follows:

- Make a review of scientific research related to the concept of True Cost Accounting for the hidden costs of food and the potential positive contributions from organic on health, climate and biodiversity

- Disseminate these research results through publications, seminars, conferences, exhibitions etc.

The aim is to reach out with a clear message to a broad audience that includes all actors in the food chain from farm to table, authorities, education, research and NGOs.

[1] https://en.berasinternational.se

The work focuses on a number of issues:

- True Cost Accounting for the hidden costs of food (TCA) as an **eye-opener** and motivator for concrete action.

- Is there relevant research describing the benefits of sustainable agriculture and food culture **opening the pathway for the next phase of organic.**

- Are there relevant examples on how to apply the concept of TCA in practice and how can such practice be implemented in Sweden – initiate pilot projects?

- Which messages are marketable to which target groups?

- What initiatives and channels should be used to disseminate and invite concrete action and within this a particular focus on the role of Bio districts (Organic districts)

2. Studies

We have reviewed around 50 scientific papers, 13 of which were on True Cost Accounting for the hidden cost of food (TCA) and the rest on impacts and opportunities in health, climate and biodiversity and with a focus on the need to change dietary patterns and the potential role of organics.

The outcome of selected studies within the TCA estimates hidden costs of food at USD 12 - 19 trillion in addition to global food expenditure.

- Broken down by country, the bulk, 75%, of the costs originate from high and upper middle-income countries. Low-income countries account for only 3% and lower-middle-income countries for the remaining 22% according to the FAO.

- Hidden costs of food are growing strongly, mainly driven by increased health related problems from unhealthy diets.

- The environmental (climate and biodiversity) hidden costs of food are ultimately even greater given the transformation of nature and the costs of managing and mitigating impacts such as wildfires, floods, storms, extreme heat, etc.

Opportunities related to positive health and environmental impacts have been studied by several researchers:

- Tillman & Clark demonstrates the environmental and health benefits of Mediterranean, pescetarian and vegetarian diets.

- The BioNutrinetSanté study shows a correlation between organic diets and health benefits, with significant positive effects on overweight and obesity, coronary heart decease, diabetes type 2 and some type of cancers.

- Two meta-studies by Rahman and Jiang show positive health effects of organic food.

- Organic and biodynamic systems in the FiBL - DOK study have up to 63% less emissions of greenhouse gases, 61% better on indicators for biodiversity and 44% better on soil fertility. (The Swizz based Research Institutes of Organic Agriculture (FiBL) and their 45-year DOK trial)

- The Swedish researcher Arthur Granstedt et al. shows that net-zero greenhouse gas emissions can be achieved with ecological recycling agriculture, where greenhouse gas emissions are offset by, among other things, carbon sequestration in the soil.

- The EAT Lancet Commission presents a global framework for creating a sustainable food system, "The Planetary Health Diet".

A. The concept of True Cost Accounting for hidden costs of food

1. Introduction to True Cost Accounting[2] for hidden cost of food.

True cost accounting for hidden costs of food (TCA) is a holistic and systemic way of measuring and valuing the environmental, social, health and economic costs and benefits generated by food systems to facilitate better decisions by policy makers, businesses, farmers, investors and consumers.

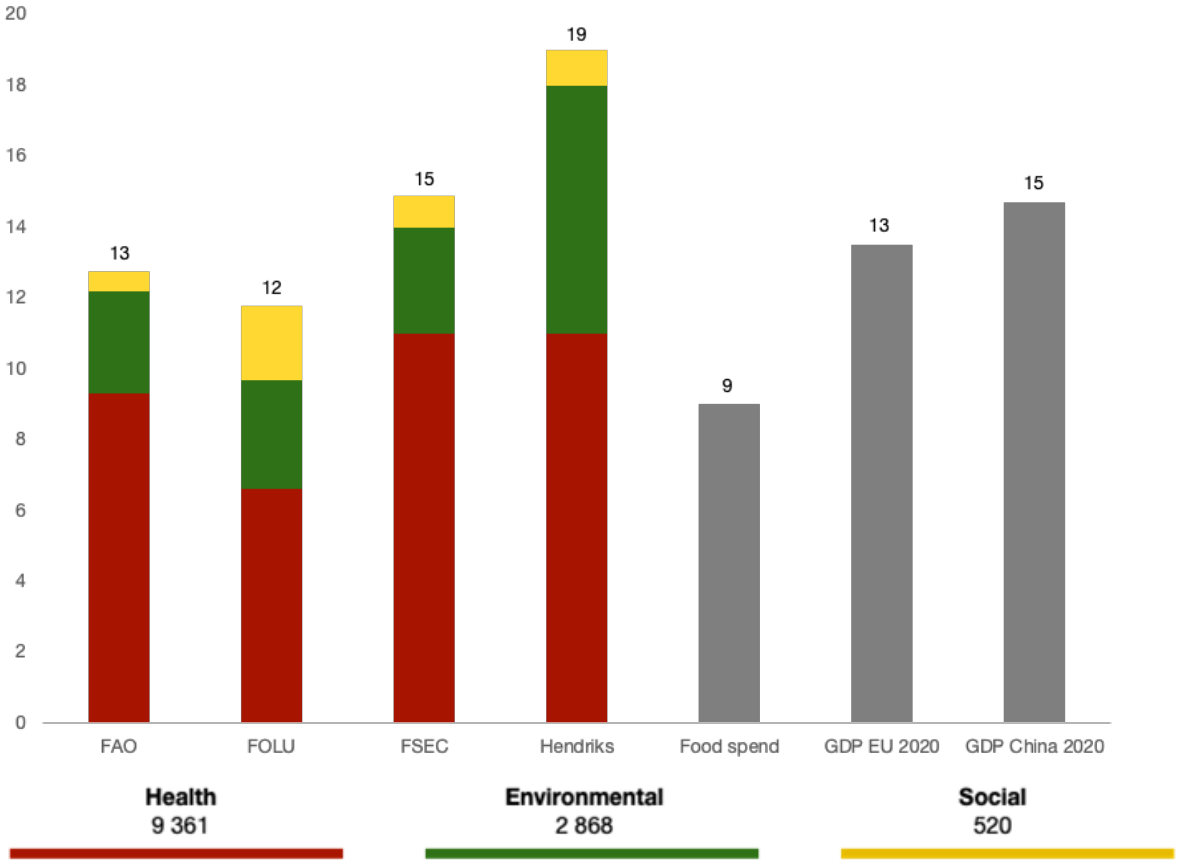
It is a methodology that, in addition to market transactions, measures and values all flows into and out of agricultural systems, including those not captured by market transactions, so-called hidden costs or externalities. Valuation can be either qualitative or quantitative, and in possible cases monetary.

2. Global hidden costs of food - an overview from all scientific papers studied.

The cost is estimated at 12 - 19 thousand billion USD on top of global food expenditure- ***the columns in grey are in comparison global food spend and GDP of EU and China!***

Hidden costs globally (USD thousand billion)

[2] FAO, The State of Food and Agriculture (2023), https://doi.org/10.4060/cc7724en



The graph shows the average and range of four studies; FAO[3], FOLU[4], FSEC[5] and Hendriks[6]. The variation between these is driven by differences in what is included, what year is referred to, how cost impacts are calculated and what models are used. However, the ambition in all cases is to assess total global hidden costs of the food system.

Broken down by country, the bulk, 75%, of the costs originate from high and upper middle-income countries. Low-income countries account for only 3% and lower-middle-income countries for the remaining 22% according to the FAO. Hidden costs are growing strongly, mainly driven by increased health-related problems from unhealthy diets which increased by 14% between 2016-2023 according to the FAO. Global hidden costs in 2050 are estimated to exceed USD 16 trillion according to FOLU.

The environmental hidden costs can be much higher if the tipping point is approached, given the transformation of nature and the costs of managing and mitigating impacts such as floods, storms, temperature, etc.

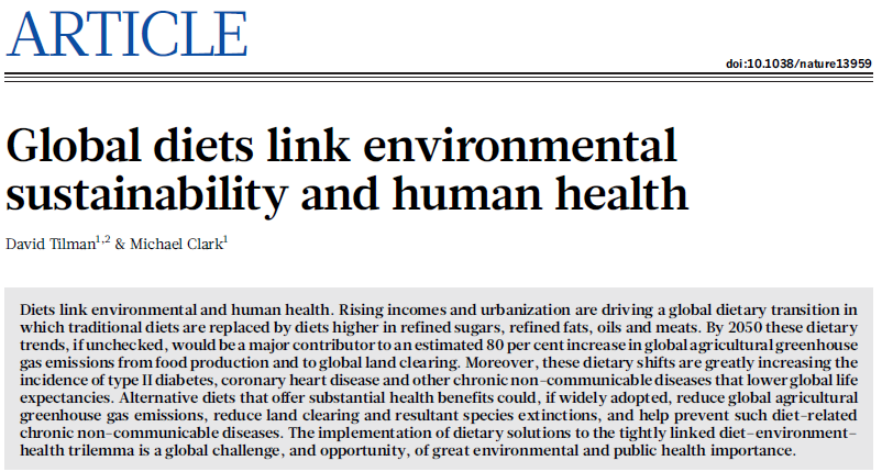
[3] FAO, The State of Food and Agriculture (2023), https://doi.org/10.4060/cc7724en
[4] FOLU, The Global Consultation Report of the Food and Land Use Coalition (2019), Annex
[5] Food System Economics Commission (FSEC), The Economics of the Food System Transformation Global Policy Report (2024)
[6] Sheryl Hendriks et al, The True Cost of Food : A Preliminary Assessment, Science and Innovations for Food Systems Transformation (2023)

Health effects are valued on the basis of GDP lost due to illness and death, so medical costs and a valuation of lives are not included in the studies, except for Hendrik's, which is based on a global average for the loss of human life.

B. Need for a shift in dietary patterns and the potential positive contributions from organic on health, climate and biodiversity

1. Health and environmental effects – Nature 2014, Tilmann & Clark[7]

Tillmann and Clark, Global diets link environmental sustainability and human health, Nature (2014)



ARTICLE

doi:10.1038/nature13959

Global diets link environmental sustainability and human health

David Tilman[1,2] & Michael Clark[1]

Diets link environmental and human health. Rising incomes and urbanization are driving a global dietary transition in which traditional diets are replaced by diets higher in refined sugars, refined fats, oils and meats. By 2050 these dietary trends, if unchecked, would be a major contributor to an estimated 80 per cent increase in global agricultural greenhouse gas emissions from food production and to global land clearing. Moreover, these dietary shifts are greatly increasing the incidence of type II diabetes, coronary heart disease and other chronic non-communicable diseases that lower global life expectancies. Alternative diets that offer substantial health benefits could, if widely adopted, reduce global agricultural greenhouse gas emissions, reduce land clearing and resultant species extinctions, and help prevent such diet-related chronic non-communicable diseases. The implementation of dietary solutions to the tightly linked diet–environment–health trilemma is a global challenge, and opportunity, of great environmental and public health importance.

Diets link the environment and human health. Rising incomes and urbanisation are driving a global dietary shift in which traditional diets are being replaced by diets higher in refined sugar, refined fats, oils and meat.

This study summarises results from ten million man-years of observations across eight cohort studies. For each study, reported health effect after statistical control is used to compare disease incidence in individuals who consumed typical omnivorous diets with those who had diets classified as Mediterranean, pescetarian or vegetarian.

These alternative diets offer significant health benefits and, if widely adopted, could reduce global agriculture's greenhouse gas emissions, reduce deforestation and associated species extinction, and help prevent diet-related chronic non-communicable diseases.

[7] Tillmann and Clark, Global diets link environmental sustainability and human health, Nature (2014)

2. Health and environmental effects - EAT Lancet[8]

Introduction

Food is the single most powerful lever to optimise human health and environmental sustainability on Earth. But food is currently threatening both people and the planet. A huge challenge facing humanity is to provide a growing world population with healthy diets from a sustainable food system.

While global food production of calories has generally kept pace with population growth, more than 820 million people still lack enough food, and many more eat either low-quality diets or too much food. Global food production threatens the climate and ecosystem and is the single biggest driver of environmental degradation and overshooting planetary boundaries.

There is considerable scientific evidence linking diets with human health and environmental sustainability. But the absence of globally agreed scientific targets for healthy diets and sustainable food production has hindered largescale and coordinated efforts to transform the global food system.

To address this critical need, the EAT-Lancet Commission has convened 37 leading scientists from 16 countries across disciplines including human health, agriculture, political science and environmental sustainability to develop global scientific goals for healthy diets and sustainable food production.

EAT Lancet presents a global framework for creating a sustainable food system

How food is produced, what is consumed, and how much is lost or wasted has a major impact on the health of both people and the planet.

[8] EAT-Lancet Commission, Summary report: Food Planet Health (2019)

The EAT-Lancet Commission presents an integrated global framework, providing for the first time quantitative scientific targets for healthy eating and sustainable food production.

The Commission shows that it is both possible and necessary to provide 10 billion people with a healthy diet within safe planetary boundaries of food production by 2050. It also shows that the universal adoption of a planetary health diet would help avoid serious environmental degradation and prevent around 11 million human deaths annually.

But to protect the natural systems and processes on which humanity depends and which ultimately determine the stability of the Earth system will require a major food transformation.

The Commission calls for comprehensive action at multiple levels across several sectors, including a significant global shift towards healthy dietary patterns, major reductions in food waste and spoilage, and major improvements in food production methods. The research and data available are both sufficient and strong enough to justify immediate action.

3. Health effects - BioNutrinetSanté[9]

These studies show associations between organic diets and positive benefits with all reported health areas such as overweight and obesity, metabolic syndrome, type2 diabetes and cancers.

British Journal of Nutrition (2016), **116**, 700–709
© The Authors 2016

doi:10.1017/S0007114516002427

Typology of eaters based on conventional and organic food consumption: results from the NutriNet-Santé cohort study

Julia Baudry[1]*, Mathilde Touvier[1], Benjamin Allès[1], Sandrine Péneau[1], Caroline Méjean[1], Pilar Galan[1], Serge Hercberg[1,2], Denis Lairon[3] and Emmanuelle Kesse-Guyot[1]

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(example of one of the scientific papers from the BioNutrinetSanté study)

The NutriNet Sante Cohort Study is a web-based prospective study since 2009 of adults with the aim of studying the relationship between nutrition and health

[9] Lairon et al, NutriNet-Santé cohort study (2021)

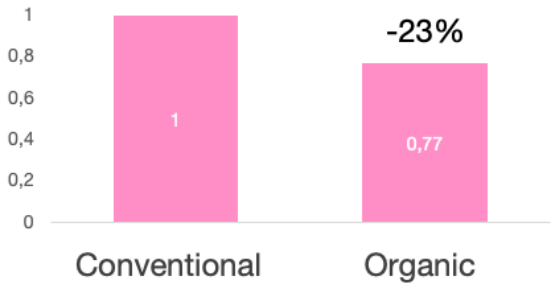
outcomes and examining the relationship with various dietary and nutritional determinants. From 2013 organic food was studied “BioNutrinetSanté”. Up to 2020, the base has amounted to 170 000 persons

A questionnaire surveyed people's habits across 16 food groups and identified organic frequency such as never, sometimes or mostly to make an organic profile which was matched with the prevalence of organic options for 264 food items to estimate the proportion of organic diet in a group. The model was adjusted for sociodemographic characteristics, lifestyle such as smoking and exercise, dietary patterns, BMI, etc.

Regular consumers of organic products show specific socio-demographic characteristics (women, higher level of education, more physical activity, less smoking, fewer low-income earners) healthier dietary patterns (more plant-based), more customised food based on nutritional recommendations

Relationships between nutrition and overweight

Relative risk of overweight

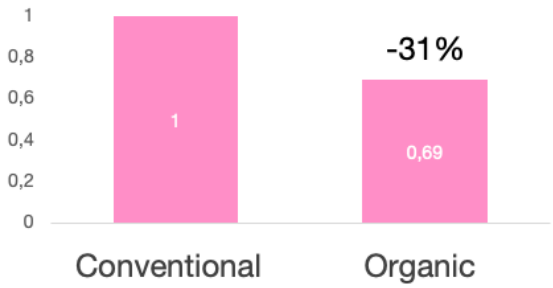


Parameters

- n = 62 200
- 77% women
- 3.1 year mean follow-up
- Organic food consumption refers to a mean of 70 %

Relationships between nutrition and obesity

Relative risk of obesity

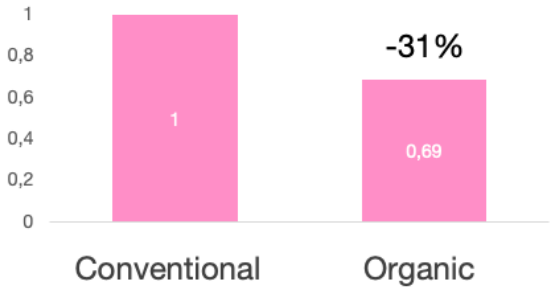


Parameters

- n = 62 200
- 77% women
- 3.1 year mean follow-up
- Organic food consumption refers to a mean of 70 %

Relationships between nutrition and metabolic syndrome

Relative risk of metabolic syndrome

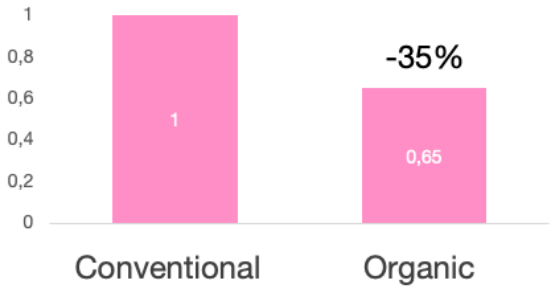


Parameters

- n = 8 174
- Both genders
- 3.1 year mean follow-up
- Organic food consumption refers to a mean of 62%

Relationships between nutrition and Type2 diabetes

Relative risk of Type2 diabetes

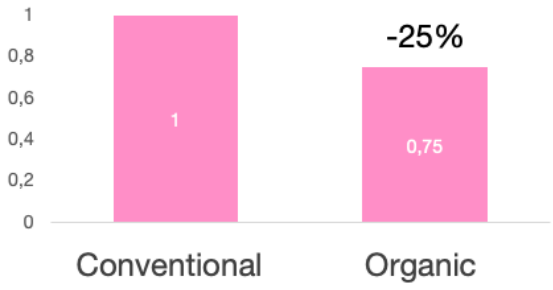


Parameters

- n = 32 800
- 76% women, mean age 53 years
- 4 year mean follow-up
- Organic food consumption refers to a mean of 56 %
- 293 incident cases identified

Relationships between nutrition and cancer (all types)

Relative risk of cancer



Parameters

- n = 70 192
- 78% women, mean age 44 years without known cancer at inclusion
- 4,6 year mean follow-up
- Organic food consumption refers to a mean of 75 %
- Lymphoma (-76%)-(-86%)

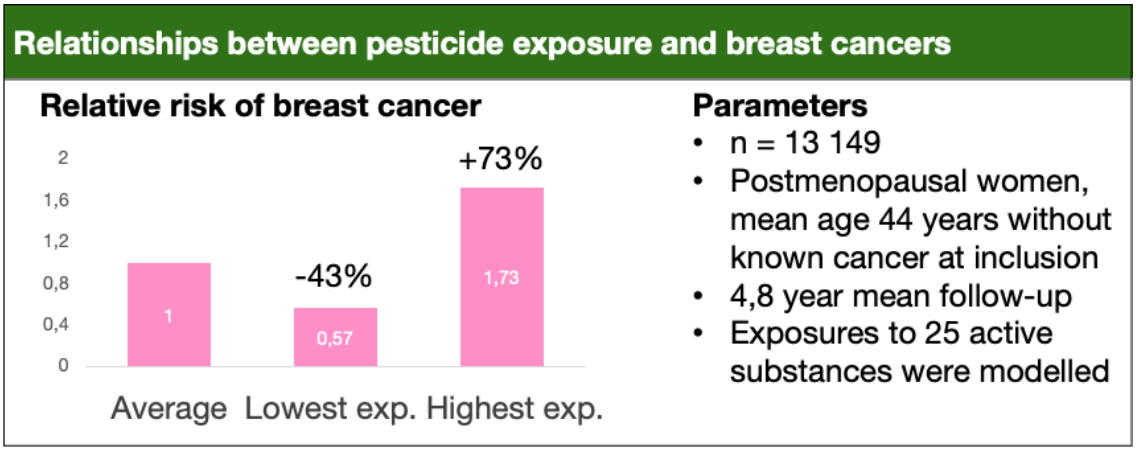
A sub-study shows a link between pesticides and breast cancer

Some pesticides, used in large quantities in current agricultural practices across Europe are suspected to have adverse effects on human reproductive health (breast and prostate cancer), as observed in agricultural settings.

In 2014, participants completed a self-administered semi-quantitative food frequency questionnaire that distinguished conventional and organic foods. Exposures to 25 active substances used in EU plant protection products were

estimated using a database of pesticide residues related to agricultural practices,

The lowest exposure to synthetic pesticide mixtures was associated with 43% reduced risk of breast cancer. Highest exposure to synthetic pesticide mixtures was associated with 73% increased risk of breast cancer, especially in obese women (+413%)



4. Health effects of organic – Meta studies by Rahman et al[10]

Meta-study by Rahman et al "A Comprehensive Analysis of Organic Food" shows positive health effects of organic food for obesity, blood nutrients composition and some forms of cancers.

Various health benefits have been associated with higher consumption of organic foods. This review identified some of these health benefits, including a reduction in obesity and body mass, BMI, improvements in blood nutrient composition, as well as reductions in maternal obesity and pregnancy-related risks of pre-eclampsia. Furthermore, consumption of organic food can reduce the development of non-Hodgkin lymphoma (NHL) and colon cancer.

After reviewing the existing literature regarding the nutritional value of organic foods, it was found that organic food contained higher levels of iron, magnesium and vitamin C.

5. Health effects of organic – Meta studies by Jiang[11]

Meta-study by Jiang et al "The effects of organic food on human health" shows positive health effects of organic food for obesity and other effects related to less pesticide exposure in organic food.

[10] Rahman et al, A Comprehensive Analysis of Organic Food: Evaluating Nutritional Value and Impact on Human Health, Foods (2024), https://doi.org/10.3390/foods13020208

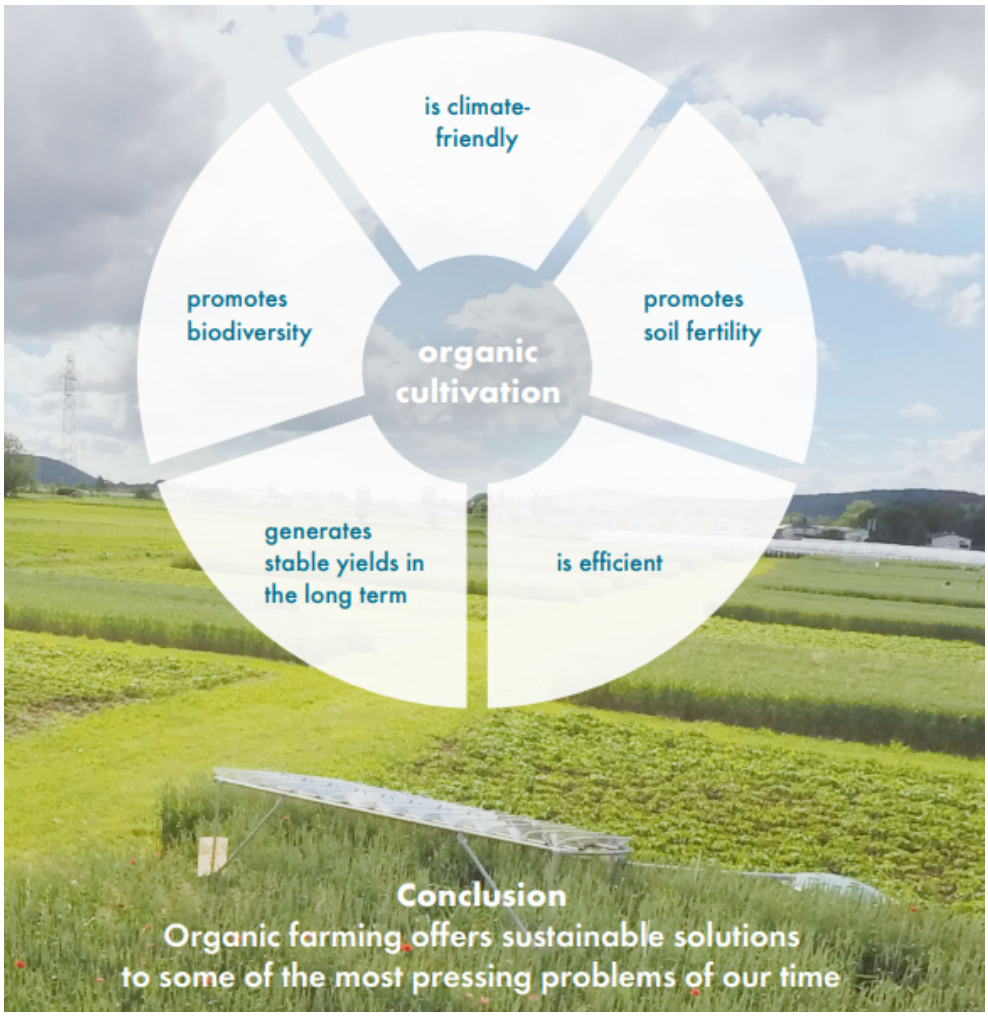
[11] Jiang et al, The effects of organic food on human health: a systematic review and meta-analysis of population-based studies, Nutrition Reviews (2023)

This study shows that consumption of organic food was found to reduce pesticide exposure, and the overall effect on diseases and functional changes (BMI and male sperm quality) was noticeable. More long-term studies are needed, especially for single diseases.

6. Environmental impacts - FiBL[12]

The DOK trial - FiBL compares biodynamic, organic and conventional systems since 1978

The Research Institutes of Organic Agriculture (FiBL) are governmental independent social institutions or non-profit organisations operating as foundations or associations in different European countries. In Switzerland alone there are 80 researchers on organic. The DOK trial by FiBL compares biodynamic, organic and conventional (integrated) farming systems since 1978, mimicking real farming practices divided into crop plots. Below overall conclusions from the DOK trial:

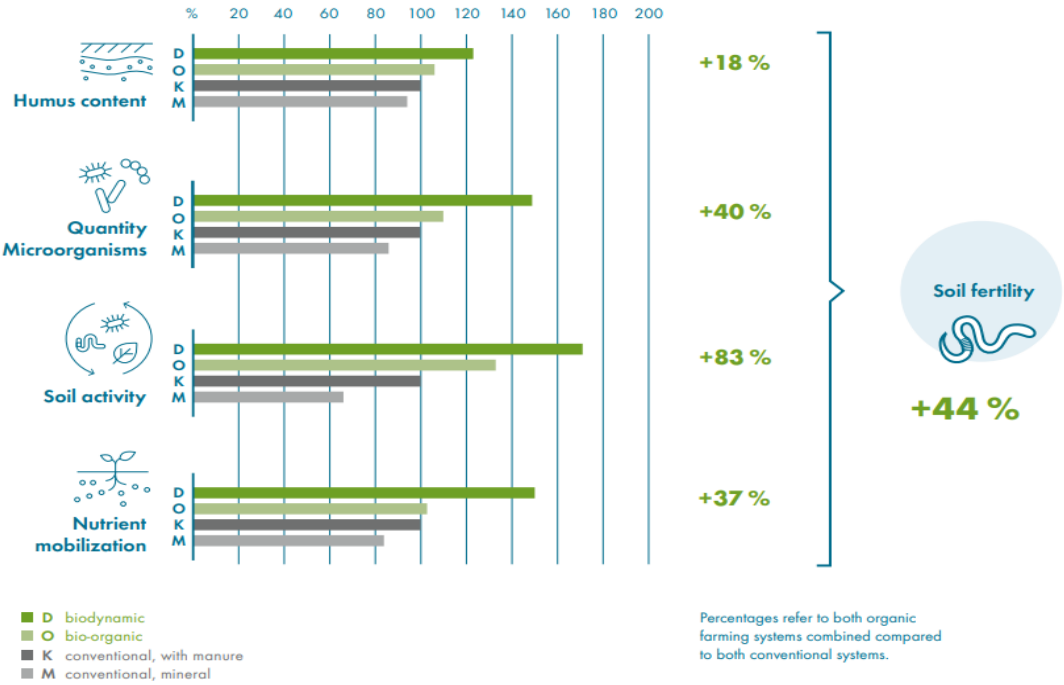


[12] https://www.fibl.org/en/shop-en/1787-dok-factsheet

And here some examples from the FiBL DOK- trial

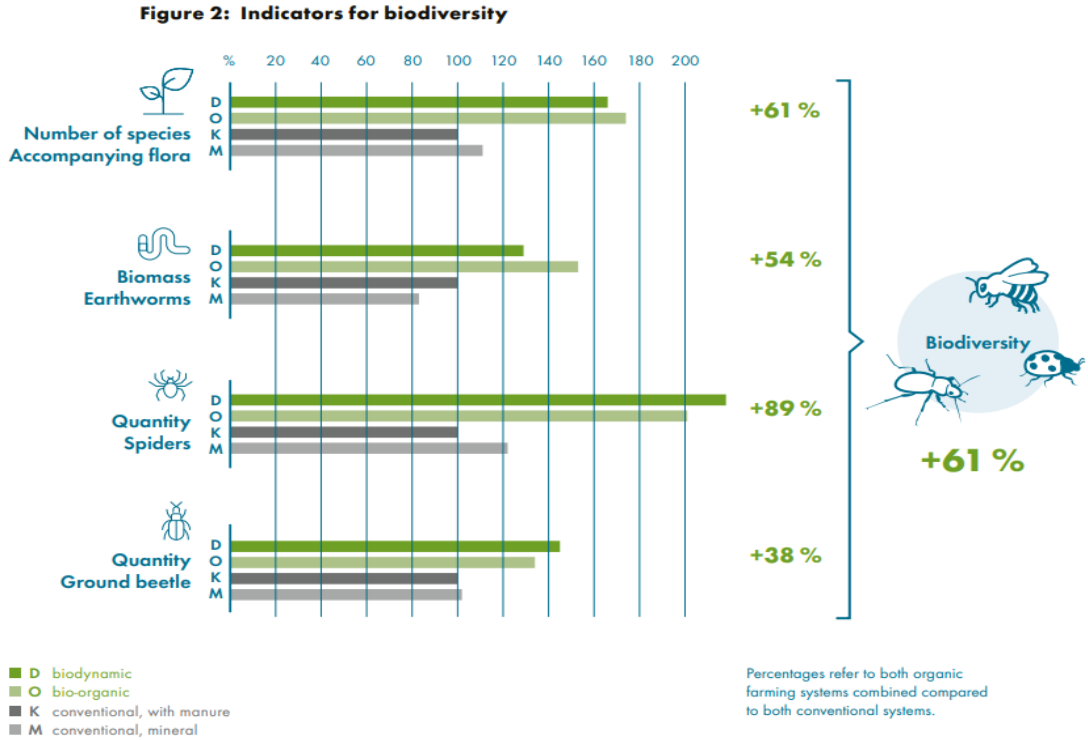
Soil fertility

Figure 4: Indicators for soil fertility



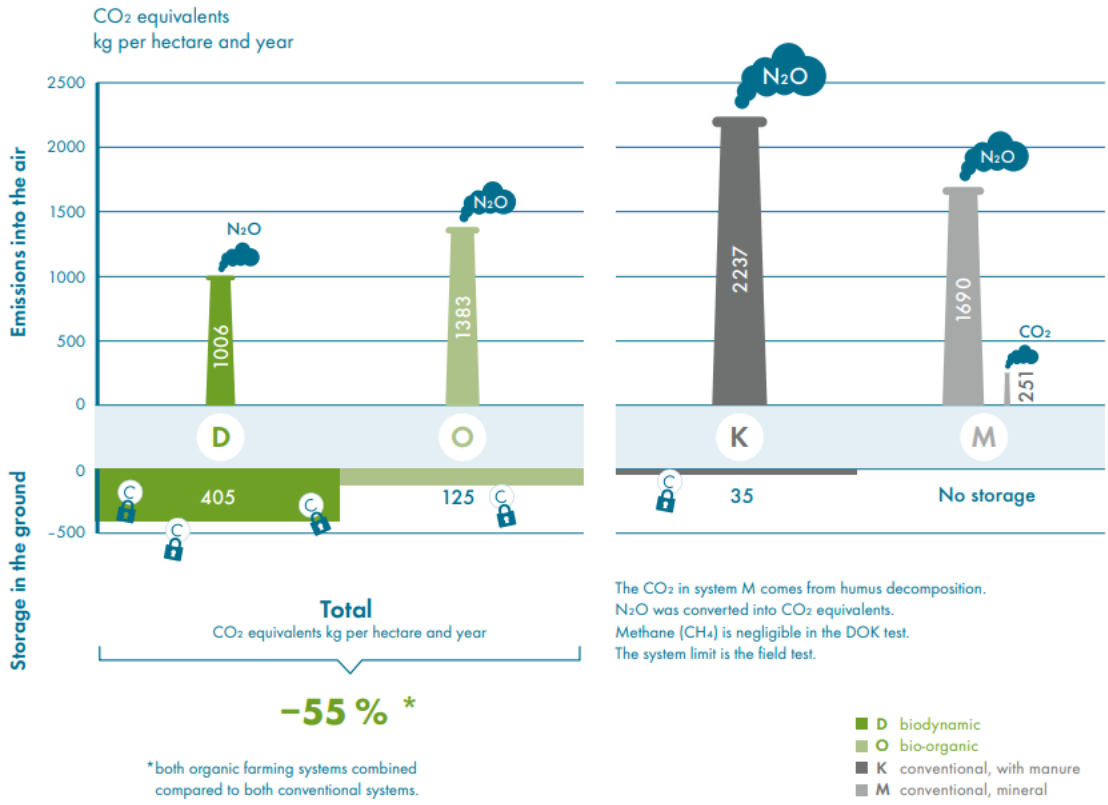
Biodiversity

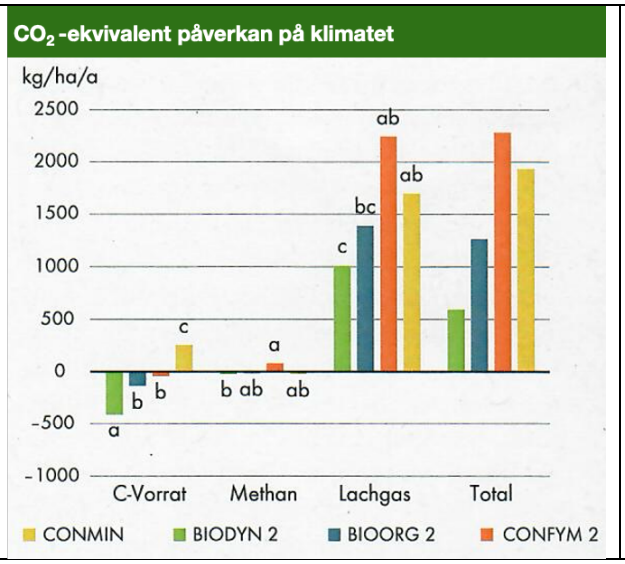
Figure 2: Indicators for biodiversity



Greenhouse gas emissions

Figure 3: Greenhouse gas emissions from the soil in the form of nitrous oxide (N_2O) and CO_2





Of the different farming systems, it was mainly the biodynamic system (BIODYN 2) with normal fertilisation intensity (Swiss standards) that stored organic carbon in the soil

7. Environmental impacts - Artur Granstedt et al[13]

At farm level, net-zero greenhouse gases can be achieved with ecological recycling Agriculture

The study is based on 30 Swedish organic recycling farms distributed across the country with different climates, soil conditions, sizes and production orientations. The farms have:

- Crop rotations with high proportion (≥ 50%) of legume-grass swards (2-4 years); fixing nitrogen for subsequent crops and sequestering carbon in the soil, at least 400 kg C/ha and year (~1500 kg CO2e)
- Integration with livestock (mostly ruminants) and manure recirculation.
- Low purchases of inputs, most are largely self-sufficient in feed and fertilizer (some exceptions exist that purchase more than 20% fertilizer or feed)

The results should be interpreted with caution, but the scenarios with adapted diets that can be produced by the example farms show that it would be possible to achieve a 90% reduction in the greenhouse impact of staple food consumption (calculated at the production stage of cereal products, meat, dairy products, potatoes, horticultural products and eggs) in Sweden - and this without importing either staple foods or agricultural inputs. However, the recirculation of plant nutrients within the country would need to be improved. The food chain up to the consumer is not studied in the report, but was done in the BERAS study.

A food supply based on ecological recycling agriculture with current policy regulations would cost a little more to produce, but with the proposed changes in policy instruments and a reorganised diet, the shift could take place without increased costs for the consumer. The cost increases that arise for individual products are offset by the fact that plant products are cheaper than animal products when the diet is changed.

[13] Granstedt et al, Framtidssäkrat jordbruk (2023)

C. The role of Bio districts (Organic districts) in facilitating the inclusive process advocating for and implementing the transformation needed for farming, food and lifestyle.

The EU Commission has defined a Bio district as follows:

"A 'Bio district' is a geographical area where farmers, the public, tourist operators, associations and public authorities enter into an agreement for the sustainable management of local resources, based on organic principles and practices. The aim is to maximise the economic and sociocultural potential of the territory. Each Bio district' includes lifestyle, nutrition, human relations and nature considerations. This results in local agricultural production that is appreciated by consumers and hence has a higher market value."

Ref "Action Plan for the Development of Organic Production" https://eur-lex.europa.eu/legal-content/EN/TXT/DOC/?uri=CELEX:52021DC0141

Presently there are 60 Bio districts in Europe and a growing number globally https://gaod.online/ The first Bio districts was established in Cilento, Italy in 2004. The network incudes organisations such as IFOAM Organics International, IFOAM EU, IFOAM Asia, Asian Local Governments for Organic Farming "ALGOA", IN.N.E.R., Regeneration International, the UN Core initiative Organic Food System Programme "OFSP", LOAMC – PH from the Philippines and Baltic Foundation.
Network of Ecoregions "IN.N.E.R." provides support to the start-up and management of Bio districts, examples on work groups, guiding documents and a Monitoring Tool for the performance of the districts https://gaod.online/wp-content/uploads/2023/05/Organic_Districts_Introduction_Tool_Kit.pdf

A number of research articles has been published related to Bio districts. There are yearly conferences and every 5 year a World Congress. Below an extract from the Declaration from the 2nd Organic Districts World Congress in July 2024 in Idanha- a- Nova, Portugal.

RECLAIMING HUMAN DIGNITY - FOCUS AREAS OF ORGANIC DISTRICTS

Sustainable food production and consumption are key to increasing both human and ecological capacities to cope with major challenges such as for our health, food and nutrition security, climate change and loss of biodiversity. Our network can offer significant positive contributions for all of these challenges.

Guided by the principles of Health, Ecology, Fairness and Care organic invites us to take steps even beyond being a production method, consumption and diets and a food system perspective. Together with likeminded initiatives organic should also take the lead for a lifestyle respecting human rights, social inclusiveness, reducing inequality, the health and right of nature on its own on a pathway reclaiming human dignity. Within this realm of

bringing all the pieces together lays the unique capacity and future potential of Organic Districts.

- *to encourage the development of new Organic Districts and with the Guidelines, Tool Kit and Monitoring Tools of IN.N.E.R., assisting in the start -up and management of the districts.*

- *strengthening the knowledge sharing and cooperation in our partnership related to organic production and consumption/healthy diets with common programs for education/academies for farmers and people engaged in the food value chain.*

- *communication directed to consumers and advocacy initiatives for governments and policy makers. An example is True Cost Accounting for the hidden costs of food and the positive contributions from organic.*

- *facilitate the dialogue between the local actors in the food value chain in order to strengthen business models on the principles of ecological economy for fair and equal sharing of revenues, enhancing all aspects of sustainability from farm to table.*

- *engage in the work for a healthy lifestyle respectful of ecological, social and economic long-term sustainability "Reclaiming Human Dignity".*

- *Develop common approaches, tools and guidelines for organic school meal programs "Leave no child behind".*

- *building relations between rural and urban areas in order to strengthen the recognition and respect of our farmers for the important and necessary work they are doing producing our food in caring for animals and nature. To this end also promote the active engagement women in the food system transition.*

- *attract youth in agriculture and in the food value chain. To this end acknowledging that the new generation may have different expectations, needs and desires connected to the work environment and social relations compared to the present structures and that they are given the space necessary to elaborate on this.*

- *Promote the development of sustainable tourism.*

In view of available resources flowing from strategies from the EU Commission, the global network, R&D and proof of concepts, we assume that Bio districts have a vital role in facilitating the inclusive process advocating for and implementing the transformation needed for farming, food, equal rights and lifestyle.