

## Does organic production provide for a more healthy food than non-organic?

Report on a Dutch study, with some additional comments.

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### 1. Outline of the paper

In this paper I will mainly report on an extensive desk and expert consultation study made by van Vliet (1998). It was the first report on the delicate issue of health effects of organic food consumption wherein expert workshops involving representatives of institutions were involved at such a scale. The idea was to find out in how much the evidence already available in literature did meet the standards of institutional science, so as to legitimate recommendations to the institutional research and advisory policy.

The report as such is a 29 pages summary of the whole study, which has two lengthy appendixes: 1) a working document on the expert consultations and 2) a thorough discussion of some 2000 references in literature. It was financed by the Science Shop Foundation (SSF) of the Wageningen Agricultural University, in a co-operation of the mentioned Science Shop, the Department of Ecological Agriculture (DEA) and the Dutch Platform for Biological Agriculture and Nutrition (PBAN), co-ordinated by Prof. Goewie, chair of the DEA. Hobbelink (SSF, chairing), Dagnelie from the Epidemiology Department of Maastricht University, Huber from the Dunamis Nutrition Institute in Driebergen and the author (Wageningen Agricultural University) served on the study's supervising committee. Furthermore, 15 experts from various institutions related to nutrition figured in the resonance council of the study; 6 of them were familiar with organic agriculture. My paper will first provide for an English summary of the mentioned Dutch report (here referred to as Van Vliet 1998). As the Van Vliet (1998) report itself has no summary, I made a summary for this paper (2-6). In the second and last part thereof I will present some personal points of view of a hypothetical nature (7).

### 2. Introduction

Among the main reasons for consumers to buy food from organic production are the perceptions of its health, its taste, its respect for animal welfare and for a fair economy. Health primarily in the sense that eating organic products supports the personal or family health, but then also that the production of organic food does not have negative effects on the environment nor on animal welfare and nature at large (Noordwijk, 2000). As for taste, together with the European top cooks (Haest Vienna, 1990?), many consumers like the overall quality of the organic products as having good organoleptic features (structure, smell and taste), a view shared by the Slow Food Foundation (1999).

However, clear scientific evidence of the health effects in humans of eating food purely or mainly from organic production is not yet available. On the other hand, quite a number of incidental researches, for example on health effects in animal feeding, on quality of fresh products using qualitative research methods and case studies, claim that there are clear indications pointing toward a positive effect on human health. That is why the PBAN asked for a scientific review on the existing literature, preferable leading to an advice for further research.

### 3. Materials and Methods

At first, food, nutrition, health and organic production were defined as follows. *Nutrition* was used to indicate the products the average consumer daily eats, either fresh or somehow processed. *Food* was taken as indicating the composition of the daily meals. *Health* was taken in conformity with the World Health Organisation (WHO) as a situation of full physical, psychological and social welfare, thus indicating more than only the absence of diseases as for instance caused by toxic substances or microbes. *Organic production* was taken as food production complying the EU standards 2091/92. In line with for example the IFOAM standards, the products from organic agriculture were supposed to fully comply to the *food standards of Good Agricultural Practice (Codex Alimentarius)*, to which the *food production* standards of organic production were seen as an additional set of requirements.

Based on these considerations the key question of the desk study was: is there any clear scientific overall evidence that eating organic food instead of non-organic food makes a (positive) difference for the health of the consumers?

The desk study itself was done using the Agralin literature retrieval system, with additional input from an internet discussion platform and consultation from expert networks. The results obtained from literature were then discussed in the committee and, on a lower frequency, in workshops with the resonance council. On specific question the experts of the council were interviewed individually, each according to their expert knowledge.

### 4. Results

To prove health effects of organic food consumption, epidemiological studies would be preferable because, provided their scientific soundness, they would make the point as direct as possible. However, already in an early stage the study, it became clear that results from such studies were not available. Neither comparisons of populations' health, cohort or intervention researches were found. Only some case studies indicating that babies recover from allergies when shifting to organic food. In the context of social relevance, the study recommends case control and cohort studies on the effects of organic food consumption in cases such as food allergy and intolerance in children, chronic-headache and/or chronic-tiredness, digestive problems and cancer. Lengthy discussions were made on the problem of comparing populations eating organic and non-organic food, as the point was made whether in such cases (only) the organic food consumption or (also) a more healthy life style would be compared. Separation of those factors would demand involving very large populations, and thus increase the high costs of such human population studies even more. But then also dietary and cooking issues came up, such as eating more or less meat, more or less vegetables, more or less fresh products, long or short time cooking, deep-freezing and magnetic field heating. Here, the art of balancing single or multiple factor thinking with systems' or holistic thinking came up very clearly, an issue that would penetrate all discussions made in the subsequent workshops of this study.

As a next-best option for clarity, animal feeding experiments were screened, using the animal as a model for human. Although the value of animals to stand for humans can be discussed in principle, the link may still be rather obvious at large, especially when mammals are used, as in pharmacology and medicine. Indeed, results from several experiments on animal feeding were found. They were largely made in the 8ties, and reported on increases of fertility, survival of new-borns, stress resistance,

and growth in cattle, small mammals and chickens when fed on organic food. But these reports were rather small in number and each from them had flaws that, from a strict scientific point of view, made them all fail to convince the expert workshops. Nevertheless the experts agreed that the experiments gave sufficient evidence to legitimate a thorough and large-scale animal feeding experiment, using parameters on several levels (chemistry, biochemistry, physiology and animal behaviour). Though research costs here might be less than those from epidemiology, they still are quite considerable, as they should cover several treatments, parameters and several generations of the animals.

As plant production experiments and analytical research on the products is relatively least expensive, this approach was found in most papers published. The study argued that their results still provide evidence for the question on health effects, in particular when the presence of positive nutrients or the absence of pollutants or toxins was involved. Most papers were found to report on the quality of products, assessed by chemical and biochemical methods, by looking for storage quality (physiological) or biofoton-radiation, or holistic methods as crystallisation and crop-fenotype development. The products analysed were taken from various places in the food chain (sampling in shops, at wholesalers or on farms) or grown in comparative research set-ups. The focus of the researches varied from screening on the presence of toxic substances (negative quality assessment) to screening for positive features such as vitamins, high quality proteins, essential amino acids, micro-nutrients, dry matter content, structure and constitution or vitality.

In many of these cases the products from organic agriculture showed a better quality: less negative and more positive features. However, here again, many details of the researches can be criticised. Variety of the species, sowing and harvesting times (and harvesting phases), soil and climate conditions on the farms, manuring and pre-crop conditions but also storage and transport are among the variables that should be carefully considered. When for example the product are taken from organic and non-organic farms in favourable and unfavourable production sites, and when the non-organic farm produces in an environmentally friendly way, the organic products from the unfavourable area may have less quality than that from the non-organic farm in the favourable area. Like before, here again a key problem is the number of differences that are crucial to contrast the organic versus the non-organic production system, and on the other hand the need for comparability of the results. The first asks for a high number of differences, as organic agriculture is not so much about leaving out or adding any particular treatment: it is a production system in its own right and requires a compatible research approach. In the end it requires a systems understanding in the experts dealing with the research, in experimenting as well as in evaluation. Although here as before, a general statement on positive health effects of organic produce could not yet be made, the expert workshops shared the overall impression that there is ample evidence to legitimate serious interdisciplinary research on the issue.

Now as there were no reports found that as such were completely convincing for all experts, an effort was made to make a meta-analyses of all results from organic products' (bio)-chemical analysis. Although much larger in numbers than experiments on animal feeding, the product analyses experiments reported on varied too much in research questions, experimental set-up and parameters used. They could for

example have different soils, pre-crops or other growing conditions or used different varieties, different harvesting times etc. Moreover, they often had data on too small populations or lacked statistic elaboration of the experimental data.

These findings lead to serious discussions in the expert workshops on the problem of comparing different production systems (organic vs non-organic) and then still having sufficient similarity to allow comparison in the way scientists were used to. Judgements on the acceptable numbers of variants and transparent multi-variant analyses differed among the experts, as well as the choice and acceptance of meta- or sum-parameters as produced by holistic research approaches.

Subsequently an effort was made to find common interpretations of the mentioned results among the experts consulted, to serve as a preliminary conclusion. For some, the results from all reports (case reports, animal feeding and product analyses) were so much in line with one another that, although criticism on each was fairly possible, the mutual support was overwhelming. However, for others precisely flaws of each single report supported their scepticism. As the workshop participants all had their own position between those two extremes, a common opinion on the positive health aspects of organic food could not be reached. What all agreed on was that the issue was very interesting indeed and needed thorough multidisciplinary elaboration, both for scientific and social interest. Some proposals for strategic research could be indicated (6.).

## 5. Discussion

This state of the art was characterised by some experts as reminding of long-time scientific deadlocks on such hot issues as smoking and cancer, environmental pollution of specific industries, nuclear waste disposal and over-exploitation of natural resources. Also there renowned scientist can take opposing stands on the same issue, facing the same evidence from different points of view, different disciplines, research conventions, and even paradigms and research interests. And it may be clear that the idea or notion that organic production might have a positive effect on the consumers' health has enormous consequences for society, affecting the positions of national health, food quality and agriculture authorities as much as the whole food industry.

Part of the paradigmatic discussion draws on factor thinking versus systems thinking. In the first, nutrition is a physico-chemical process with nutrient uptake as the key issue. Nutrients are molecules or complexes of molecules, which as such are as neutral as they are after chemical analyses, when all reminiscence of the nutrients' origin have been cleared away. Digestion is the process in which the organism makes the nutrients available from the products in which they are contained.

Carbohydrates, proteins, vitamins and micro-nutrients are what we eat, together with some fibres to facilitate transport in the digestive tract. Whether the any of the nutrients come from vegetables, grains, beans, meat, milk, fish or from chemical (petro-)industry, does not matter as long as the (bio)chemical composition is the same. They are the building stones that build the organism.

On the other hand, in systems thinking, for a living organism, no molecule or factor has much meaning in itself. All effects of nutrients depend on the conditions and circumstances. Where, when and how the organism takes the food, and when, where and how the food was grown and treated (transported, processed, cooked, served and eaten).

In the first view the parts determine the whole, in the second view the whole determines the parts. By and large, those two views go along with the opposite ways the non-organic and the organic industry tend to perceive matters relating to food & agriculture.

In the study of Van Vliet (1998), the position is taken that both views can be made to merge when common and interdisciplinary research projects are conceived in close co-operation of dialogue minded representatives of both ways of thinking. As experienced elsewhere (Van Mansvelt and Van der Lubbe, 1999), different concepts and perceptions can be conciliated when a same object is studied together.

## 6. Conclusion and recommendations

The study made by van Vliet (1998) was a first report on the delicate issue of health effects of organic food consumption wherein expert workshops involving representatives of institutions were involved at such a scale. The idea was to find out in how much the evidence already available in literature did meet the standards of institutional science, so as to legitimate recommendations to the institutional research and advisory policy. Screening for epidemiological, animal feeding and product analyses researches, the first were found lacking, the second small in numbers and the last numerous but highly diverse and controversial in their conclusions. However, the positive effects on animal health (reproduction, stress resistance) and the positive findings in product analyses (less negative contents, more valuable nutrients, better storage quality, more anatomical and vital structures) were found to be impressive, although not yet consistent nor scientifically flawless. Based upon these findings, the study could strongly recommend research programs looking for:

- Case studies on effects of organic food consumption in health risk groups such as babies and young children suffering allergies and senior citizens with digestive problems.
- Cohort studies on these risk groups.
- Intervention studies in families with predisposition for allergies (atopic constitution), running from early pregnancy to the baby's first birthday.
- Intervention studies in homes for senior citizens.
- Laboratory experiments on effects of extracts of diets made from organic and non-organic production, using such parameters as cell-growth, tumor promotion, choline esterase depression and anti-oxidant potential.

Moreover, animal feeding experiments, using different stress conditions for the animals and combining chemical and holistic food analyses with animal physiology and animal behaviour, in an interdisciplinary project, would be quite elegant indeed.

## 7. Additional remarks of a preliminary, hypothetical nature

Looking back at the food quality study reported on, it may be striking that when talking of food, in the end it boils down to nutrients and or pollutants of some kind. Here the question may be posed in how much the scientific knowledge on these nutrients complies to the consumers' experiences when enjoying a tasty meal. And also the full function of our digestive activities may be reconsidered, questioning consumption as merely nutrient uptake or more.

- Taste & smell as a reliable tools for food quality assessment.

Usually, the whole question about taste as revealing quality is put down with the argument of subjectivity of human sensorial observation in general, added with taste as a matter of convention (nurture, trends).

On the other hand, the food industry involved in such products as wine, beer, tobacco, tea, coffee and perfume, heavily relies on experts knowing how to use taste & smell quite consistently. And the top cooks providing for "Haute Cuisine" should be included here. My point is that apparently these sensorial capacities apparently can be trained to meet quite objective standards, just like other capacities can be trained in a way open for appropriate objective judgement (playing violin, photography or handling amino-acid extraction and analyses). In all these cases a feasible combination of the person's constitution (nature), education (nurture) and motivation is required to make him or her fit for the job. So: organoleptic capacities can be trained, perhaps in a way similar to the adjustment of instruments used for chemical analyses.

And like voltage meters must be adjusted to the scale of the presumed voltage to be measures, so must taste and smell be adjusted to the refined-ness of the taste to be expected. When used to fast food, taste adjustment to haute cuisine standards may take a while.

Moreover, some argue that "listening to the stomach" is a way to keep the doctor away: following the need to eat more or less of this or that kind of products can contribute to peoples' quality of life. Although this notion is definitely not (yet) scientifically assessed, it nevertheless means a lot for those who comply to this notion. I presume that here once again experimental learning would increase the knowledge on the issue.

- Digestion as a way of relating to what we are eating

A next set of questions arises when considering whether appropriate nutrient uptake is all we need for our health, or whether the process of digesting the food we eat has a function for our nourishment. One point of view is that the digestive process is there to break down the food to set the nutrients free from their complex bindings. Over-stressing this point one could say that nature failed to make nutrients ready for human use; liquid nutrient solutions would be the ultimate goal of food industry, just as hydroponics to some are the ultimate solution for sophisticated plant production. Another position would be to perceive the effort made in digesting as part of the experience made in eating. Just as the scientist can learn about the food in making analyses, so the body could learn from breaking down the food in the digestive process. Lets us consider for a moment how well balanced jogging and other physical training makes those trained stronger instead of weaker. Where we might think they loose energy, the experience is that they gain energy by working out. Similarly, within appropriate scales, could it be presumed that the effort of digestion strengthens the organism instead of only using its energy in a wasteful way. In my opinion, part of the philosophy of whole-food consumption is that it offers the nutrients in a "original" context, demanding quite some effort for its digestion whereby that effort exerted on the food is valued as a positive contribution to the consumer' health.

- Food as matter in an information-loaded context: eating as meeting

As third notion to be considered draws on the fact that wines, whiskeys and many other products can reveal their origin, year of production as well as house of

production (Region, Terroir, Chateau or Brand). A similar but less elaborated realm of products is that of cheeses, teas, coffees, tobaccos and other food and fancy products. The challenge of analysing such background information by (bio)chemical means has to my knowledge not yet been taken.

However, the awareness of some kind of meaning related to the production site has increased considerable over the last decade, with discussions on the legitimate regional labels emerging.

Presuming we could imagine that place (site), time (year, season) and management (craftsmanship, attention, professional dedication) would be imprinted in the food's structure, fixed in its nutrient's (molecular) composition. Would we then not somehow read that compressed information when analysing the food while using our digestive tract, from selling and tasting down to the so called food-breakdown?

Hard as it is to indicate scientifically accepted methods to assess such information, it seems hard as well to definitely deny that the plants and animals we use for food products did live under environmental conditions that influenced their way of being. Whether their life was stressed or relaxed, healthy or chronically in need of medication viz. pest control, their whole body, and all their organs, and cells witnessed the life they lived. Who ever visited farms, orchards, vegetable gardens etc. can tell how the atmospheres of different production sites can differ, and change over time for better or worse.

And although it is hard to imagine how that interactive complex of features: region, season and person, influences the products we eat, it seems hard as well to explain ourselves that they do not make any difference at all.

I think that, long before science has found transparent access to such questions, many consumers will have gathered their personal experiences by getting aware of how they feel after consuming products from different origins and production systems. And as organic agriculture, as a system, particularly values and cares for the optimal interaction of site, season and individual dedication to the healthy development of soils, crops and husbandry, it may well be that the consumers learn to appreciate its qualities long before science does.

I presume that the food industry can contribute to the consumers' awareness by communicating the message they stand for, while on the other hand giving incentives to science to do relevant research. If those leading managers of food industry present would sit together and phrase their needs for research and the share of research costs they would be willing to spend, in four years time, considerable clarity on the qualities of organic food could be presented.

Do not wait for science: speed it up.

## References:

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