

Criticisms and Frequent Misconceptions about Organic Agriculture:

The Counter-Arguments



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Part A: “Organic foods are not healthier than non-organic foods/Organic foods are unhealthy”



Misconception Number 1: Pesticide residues in conventional foods are always within safe levels.

Summary of Counter-Arguments

- A significant percentage of conventional food products contain pesticide residues in excess of legally-defined, maximum, authorized residue limits in Europe and the US.
- As a result, most people carry pesticide residues in their bodies (100% of the people tested in the US), but the level can be drastically reduced by the adoption of an organic diet.
- Legally defined “maximum residue limits” are by no means a guarantee of zero health risk.
- In developing countries, pesticide residues in food are uncontrolled by the government most of the time.

Details of Counter-Arguments

- In industrialized countries, the great majority of conventional food products admittedly exhibit pesticide residues below the legally-defined, maximum authorized residue limits. However, **there is always a small percentage of conventional food produce that exceeds these levels.** For instance, the 2002 through 2004 annual and quarterly reports of the Pesticides Residues Committee of the UK consistently show that approximately one percent of conventional food samples contain pesticide residues above the maximum permitted levels.¹ The annual pesticides monitoring reports of the Food and Veterinary Office of the European Commission also report elevated levels of pesticide residues. Specifically, the 2001, 2002, and 2003 reports (corresponding to a total of approximately 46,000 food samples) show that 3.6, 5.2, and 5.1 percent, respectively, contained pesticide residues above the maximum residue limit (MRL). Similarly, in the US, the 2001 through 2003 annual reports of the Pesticide Program Residue Monitoring of the U.S. Food and Drug Administration (FDA) shows an overall “violative” level of pesticide residues between one and two percent for domestic food samples and between four and six percent for imported food samples.

¹ See <http://www.pesticides.gov.uk/prc.asp?id=824>.

- **Legally defined “maximum residue limits” (MRL) are not a guarantee of “zero health risk.” First, MRLs set by governments are not always set on the basis of health criteria.** For instance, in the EU, MRLs (expressed in mg/kg) are based on Good Agricultural Practice (GAP) data. Therefore, foods derived from commodities that comply with the respective MRLs are **INTENDED** to be toxicologically acceptable. In this case, MRLs are just indicators of the violation or non-violation of Good Agricultural Practices, not an indication of health risk. In Canada, the regulation establishes 0.1 ppm as the “General Maximum Residue Limit.” This limit was based on the analytical capabilities of pesticide residue detection at the time the regulation was established. In practice, this means that the authorized concentration of pesticide residues is mainly the concentration level that our methods are capable of measuring, rather than the concentration above which human health is jeopardized!
- The direct consequence of this lack of connection between the MRLs and real human health impacts has been revealed by a report released by Pesticide Action Network North America (PANNA). This report shows that **many US residents carry toxic pesticides in their bodies above government assessed "acceptable" levels.** Analyzing pesticide-related data collected by the US Centers for Disease Control and Prevention (CDC) on levels of chemicals in 9,282 people nationwide, PANNA reports that **100 percent of the people tested had pesticides in their body** and that the average person in this group carried a toxic cocktail of 13 of the 23 pesticides analyzed.² Bioaccumulation is a serious problem as toxic substances tend to be stored in fat and concentrate in important organs such as the brain, kidneys, and liver, as well as in breast milk. However, a recent study has shown that an organic diet provides a dramatic and immediate protective effect against organophosphate insecticides (the riskiest class of insecticides), which was demonstrated by detectable decreases in organophosphate insecticides in urine samples of children just five days after switching to an organic diet.³
- Another problem with the pesticide residue analysis is that **we only find what we are looking for.** In any given study, researchers must decide to confine their analysis to a limited number of pesticides. Therefore, residues of all the other pesticides are not measured and could well be above so-called “safe levels.” For instance, for the report of the EU commission in 2003, the samples were tested only for 519 active pesticide ingredients, whereas the pesticide manual for 2005 through 2006⁴ contains 858 active pesticide ingredients.

² Source: *Chemical Trespass: Pesticides in Our Bodies and Corporate Accountability*, Kristin S. Schafer, Margaret Reeves, Skip Spitzer, Susan Kegley, Pesticide Action Network North America, May, 2004.

³ Chensheng Lu, Kathryn Toepel, Rene Irish, Richard A. Fenske, Dana B. Barr, and Roberto Bravo, 2006, *Organic diets significantly lower children's dietary exposure to organophosphorus pesticides*. Environmental Health Perspectives. February 2006. 114(2)260-263.
<http://www.ehponline.org/members/2005/8418/8418.pdf>

⁴ Reference: A world compendium: The e-pesticides Manual Thirteenth Edition, Editor: C D S Tomlin 2005-2006
 Brooks, G.T and Roberts, T.R. (Editors) (1999). Pesticide chemistry and bioscience. The Royal Society of Chemistry, Cambridge.

- When looking at the product level, **there is a large "gray area" between levels that are clearly harmful and far lower levels that are "reasonably certain to cause no harm."** Many legal limits for residues and the doses resulting from exposure to residues in conventional foods fall in this "gray area." They are below the "clearly harmful" level, but higher than the "almost certainly safe" level.⁵ In fact, recent studies show that there might be no such thing as "perfectly safe" levels of pesticides. Yet the whole concept of toxicity thresholds is based on the assumption that chemical products become dangerous only beyond a certain concentration level and are assumed innocuous below that concentration. The more we understand the effect of toxic substances, the more this assumption seems to be wrong. For most toxic substances, **risk exists as soon as there is contact with the first molecule** and continuously increases with increased exposure to the toxic substance.⁶ Therefore, claiming that any officially defined level is "safe" only means that the risk associated with such a level is considered "acceptable" by the scientists, politicians, or public officers deciding on these levels, not that it is non-existent. The risk also varies according to the development stage of the individual. Recently, a conference⁷ attended by 200 scientists of various disciplines called for the need to **shift the focus of toxicology and chemical regulation from the centuries-old paradigm of "the dose makes the poison" to "the timing of exposure makes the poison."** In particular, they called for urgent action to minimize fetal chemical exposure, since at that "timing" (human developmental stage) the risk is higher.
- The above arguments focus on health impacts of isolated pesticides. Equally important is the fact that human beings are permanently exposed to a cocktail of dangerous chemicals. Everyday people absorb pesticide residues through food, breathe polluted air, drink polluted water (which also contains pesticide residues), and use house and personal care products that contain other toxic substances. It is now widely acknowledged that these different toxic substances often have a synergistic effect on human health. In other words, you might be within so-called "safe levels" for each of the chemicals to which you are exposed, yet your **total exposure is much more dangerous than the sum of the individual exposures.** This total exposure undeniably increases our risk for developing serious conditions such as fertility loss, cancer, congenital disorder, asthma, allergies, and others.
- **In developing countries,** official safe levels of pesticide residues often do not exist or are unrealistic, which, in addition to insufficient public resources and technical capacity, results in a **lack of monitoring and control of pesticide residues in food by governments much of the time.** Therefore, there is absolutely no guarantee that they are within safe levels. Moreover, the

⁵ Source:

[http://66.102.9.104/search?q=cache:GEWSCACmg4J:www.consumersunion.org/food/organicq%26a.htm+pesticide+residues+level+WHO+organic&hl=fr&gl=fr&ct=clnk&cd=2\)](http://66.102.9.104/search?q=cache:GEWSCACmg4J:www.consumersunion.org/food/organicq%26a.htm+pesticide+residues+level+WHO+organic&hl=fr&gl=fr&ct=clnk&cd=2)

⁶ See the French article "Peut-on contrôler la pollution?" by Teddy Goldsmith, p. 4-5 in *L'Ecologiste*, n. 18, Mars-April-May 2006, for an excellent overview of this argument applied to toxic chemicals in general. A related discussion from *The Ecologist* can be read on <http://www.edwardgoldsmith.com/page37.html> in English, under the title "Can pollution be controlled?"

⁷ International Conference on Fetal Programming and Developmental Toxicity, Torhavn, Faroe Islands, June 2007.

application of pesticides in developing countries is definitely not done within safe levels. For example, pesticides are applied without the necessary precautions by farmers who due to improper training and entire villages are air-sprayed with pesticides while kids and other people are outside without protection.

Misconception Number 2: There is no consistent evidence of a nutritional difference between organic and non-organic food.

Summary of Counter-Arguments

- Organic produce has been demonstrated to have lower levels of pesticides, veterinary drug residues, and nitrate content.
- Organic plant-based food products generally contain higher amounts of anti-oxidants, vitamins, minerals, and other beneficial substances.
- Organically processed products do not contain hydrogenated fats and other additives whose negative health impacts are widely acknowledged.

Details of Counter-Arguments

- **Recent studies, as well as a large body of literature, clearly show a positive effect of organic production on the nutritional value of food products.**⁸ Existing studies show that organic foods generally contain lower levels of nitrates, antibiotics (for animal products), and pesticide residues (for crop products) and contain more minerals and vitamins and a more balanced protein profile. Organic foods have also been found to be as safe as conventional products when it comes to heavy metals and pathogenic microorganism.
- The Food and Agriculture Organization of the United Nations (FAO) recognized that **“it has been demonstrated that organically produced foods have lower levels of pesticides and veterinary drug residues and, in many cases, lower nitrate content.”**⁹
- There is also consistent evidence that **in general organic plant-based foods contain a higher amount of beneficial, health-promoting secondary plant compounds** than non organic plant-based foods. These are phytochemicals produced by the plants, such as vitamins. For example, phenolic compounds are anti-oxidants for the plant, but also for the human body. Carotenoids (found in yellow, orange, and red plants) are another example of anti-oxidants that are associated with reduced risk of cardiovascular disease and of certain cancers. Studies that have compared phytochemical levels of organic and

⁸ See for instance K Woese, D Lange, C Boess, KW Bogl, A comparison of organically and conventionally grown foods: results of a review of the relevant literature, *Journal of Science, Food and Agriculture*, 74, 281-293, 1997. This study reviewed 150 research projects comparing organic and non-organic food, and concludes that organic foods have a trend towards fewer undesirable components or contaminants and higher desirable components (such as vitamins) compared to non-organic foods.

⁹ United Nations, Food and Agriculture Organization, Food Safety and Quality as Affected by Organic Farming, Report of the 22nd regional conference for Europe, Portugal, 24-28 July 2000.

conventional foods¹⁰ have shown a higher content of phytochemicals in organic than in non-organic food. A recently completed, European Union-funded, four-year study found that organic fruits and vegetables contained as much as 40 percent more antioxidants and had higher levels of beneficial minerals, such as iron and zinc. Levels of antioxidants in milk from organic herds were up to 90 percent higher than in milk from conventional herds. Professor Carlo Leifert, the project coordinator, said the differences were so marked that organic produce would help to increase the nutrient intake of people not eating the recommended five portions a day of fruits and vegetables.¹¹ Concerning the protein content, according to available studies, organic grains seem to have slightly lower protein content, but do contain a more balanced profile in terms of essential amino acids.¹²

- The nutritional differences discussed above can be attributed to several factors. First, **crops under organic production are less “pushed” or “forced” than in conventional agriculture, which means that their growth is generally slower, resulting in higher quality** since the organisms have enough time to synthesize their vital components. A recently completed, long term study¹³ provided evidence of the nutrient “dilution effect” triggered by high levels of nitrogen and rapid plant growth, especially in the absence of pest pressure. Tomatoes grown on fields that have been organically managed for several years exhibit much higher flavonoid concentrations than their conventional counterparts. This also applies for animal products. In certain countries (such as US) animals’ growth under conventional farming can be hastened through inclusion of hormones in animal feed. The effect of these hormones is known to increase the weight of meat produced per calorie of food ingested, primarily through the retention of water in the flesh; therefore, the producer can earn more money because price is based on weight, not calories. For example, if the farmer produces meat that weighs 15 percent more (as a result of water retention due to hormone use) then the farmer can earn 15 percent more for that meat, even though it is water weight. The consumer ends up paying for water, rather than nutrients! The nutritional differences are also linked to the fact that plants under organic management more fully engage their innate defense mechanisms due to higher levels of pest pressure and, in doing so, they produce a vast array of secondary plant compounds. Another possible reason why organic food products tend to have a higher nutritional content could be that many organic farmers select crop varieties or animal breeds not only based on their yield attributes, but also according to their resistance to disease and pests and adaptation to the local conditions. These ancient or local varieties may have a higher nutrient content than high yielding, modern varieties.

¹⁰ See, for example, Magkos, F (2003), Caronaro, M et al. (2001 and 2002), Tintunen, S and Lehtonen, P (2001), Tarozzi, A (2006), Young, JE (2005), Veberic et al (2005), Asami et al. (2003) and Caris Veyrat, C et al. (2004).

¹¹ <http://www.timesonline.co.uk/tol/news/uk/health/article2753446.ece>

¹² Afssa (Agence Française de Sécurité Sanitaire des Aliments) (2003): Evaluation nutritionnelle et sanitaire des aliments issus de l’agriculture biologique, <http://www.afssa.fr>

¹³ “Ten-Year Comparison of the Influences of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes”; Alyson E. Mitchell *et al*, published in the Journal of Food and Agricultural Chemistry, June 2007.

- In summary, there are many factors, other than the organic status, that affect nutritional quality, including crop variety, time of harvest, post-harvest handling, and even soil type and climate, but **overall, organic food is of better nutritional quality and healthier than conventional food.** In addition to the nutritional benefits of organic food, studies have shown that the sensory quality or “enjoyment” of organic food products is higher than for conventional products. This applies to “raw materials” such as fruits and vegetables, but not necessarily to processed products in which many more factors affect the taste than the original composition of the products.
- **When it comes to processed food, organic products also have clear health advantages. Conventional processed foods contain a range of artificial additives, for which negative health impacts have been clearly demonstrated.** Some of the commonly used additives would even be legally banned by several states by now if it were not for the successful lobbying efforts of the food industry. Hydrogenated fats (also known as trans-fats) are the most striking example. These fats are created artificially by a hydrogenation process and are included in many conventional processed foods to make the products more solid and shelf-stable. Consumption of trans-fats has been directly linked to substantially increased rates of heart disease, cancer, and skin disease. Monosodium glutamate, which is added to thousands of food products and referred to by dozen different innocent-sounding ingredient names, disturbs the endocrine system function and is thought to be responsible for the 'Chinese restaurant syndrome' which can involve dizziness, headaches, and perspiration and may also cause asthma attacks. Aspartame, the most widely-used, artificial sweetener in the world has been strongly linked to migraines, seizures, blurred vision, and many other nervous system problems. These and other harmful additives are forbidden in organic foods. Therefore, choosing organic products helps consumers avoid a wide range and large quantity of harmful additives. Organic food is not a luxury; it is how food is supposed to be.

Misconception Number 3: Organic industry groups spread fear of non-organic products in order to increase their market shares and profit.

Summary of Counter-Arguments

- Tactics to scare the public away from organic foods come directly from individuals and companies supporting and profiting from conventional food sales.
- Communication about the benefits of organic food is not done so much by the companies involved in organic business. It is largely left to word-of-mouth, media coverage, and the promotional efforts of organic advocates who do not have financial interests in the sector.
- There are many rational reasons to reject conventional food and it is only fair that these are starting to be shared with and known by the public.

Details of Counter-Arguments

- This argument is coming straight from the “No More Scares” movement in the US, which came up with the report entitled "Organic Industry Groups Spread Fear for Profit" in which they present the idea that the organic message is merely propaganda and manipulation originating from the organic retail lobby. The irony is that the principal figures of the “No More Scares” campaign have a track record of taking part in some of the best examples of manipulation and industrial lobby-supported propaganda. Many of them have been outspoken apologists for the tobacco industry, one of the deadliest consumer products. One of the most active opponents of Organic Agriculture, Dennis T. Avery, is an "adjunct scholar" at the Hudson Institute and a paid propagandist for multinational chemical and agribusiness companies, including genetic engineering front-runners Monsanto, and Zeneca, but also Dupont, Novartis, Syngenta Crop Protection, and McDonalds. He has written several books supporting his cause including, “Saving the Planet with Pesticides & Plastic.” Another strong anti-organic advocate is the so-called Center for Consumer Freedom (CCF) in the US and its founder and chief propagandist, Rick Berman. Given that Coca-Cola, Cargill, Tyson Foods, and Monsanto feature among the major donors of the CCF, one can easily question the “free from influence” positions of the organization.
- Within the food industry, marketing the real benefits of organic food is largely left to word-of-mouth, media coverage, and the promotional efforts of organic advocates. **The specific advantages of organic food go largely unmentioned on product packaging and in mainstream media advertising.** Labels such as "certified organic" are generally left to stand on their own as self-explanatory, assisted only by general terms like "natural." There are no references to the dangers or negative impacts of conventional agriculture on organic product packaging. Therefore, there is little supportive evidence of an aggressive and “fear spreading” marketing strategy stemming from the organic food-industry.
- Today, **a growing proportion of organic products are processed and sold by companies that are not specifically or entirely organic** (e.g., Danone, for food industry companies, or Nike, for clothes made with organic cotton). These companies have no interest in, and in fact do not engage in, criticizing non-organic products because they still get most of their income from these products.
- It is therefore clear that the organic food industry cannot be blamed for spreading wrong information about non-organic food. What is true is that **the organic movement is essentially composed of producers and consumers who strongly believe in Organic Agriculture** as the most sustainable agricultural system to date. They do not hesitate to spread the information about the advantages of the organic system, as well as the real dangers of the conventional agricultural system. These efforts are countered by a much stronger industrial lobby (the one of the agro-chemical industry) whose far-reaching activities are aimed at denying the negative impact of their products. Organic Agriculture, on the contrary, is much more self-reliant (low input) and, therefore, does not have such a strong lobby behind it. Despite this, there is now growing evidence that some practices in the conventional food industry

are harmful and that organic food, on average, is both safer and healthier. So why should people not say what is true?

Misconception Number 4: Organic farming increases the risk of food poisoning: organic food potentially contains more dangerous bacteria (such as *E. coli* because organic farming uses animal manure) and mycotoxins due to the absence of fungicide use.

Summary of Counter-Arguments

- The risks associated with *E. coli* and other dangerous micro-organisms are not higher in organic food stuff.
- Furthermore in many cases, organic standards related to manure and soil management go further than governmental codes of good agricultural practice, thereby, offering additional protection for consumers.

Details of Counter-Arguments

- **Organic food is as safe to consume, if not safer, than any other kind of food.** As cited above, organic products contain significantly lower levels of pesticide residues and other harmful substances than conventional products. The message that organic foods are more dangerous is another argument spread by Dennis T. Avery who claims that “Organic foods have clearly become the deadliest food choice.”¹⁴ These arguments are rather poorly substantiated. For instance, one argument says that “consumers of organic food are also more likely to be attacked by a relatively new, more virulent strain of the infamous salmonella bacteria.” This statement was based on a Consumers Union study in 1998 showing that “premium” chickens had higher levels of salmonella than regular supermarket chickens. But the statement forgets to mention that the premium chickens were not organic. One common argument is the presumed higher risk of *E. coli* poisoning due to the use of cattle manure to fertilize crops in Organic Agriculture. Again, this argument forgets that manure is also used widely in non-organic agriculture. **Conventional farmers commonly apply tons of raw manure as well with no regulation whatsoever.** Organic standards set strict guidelines on manure use in organic farming: either the manure must be first composted, or it must be applied no later than 90 days before harvest (or 120 days in the US organic regulation). The evidence shows that there is not more risk of pathogen contamination of organic food than non-organic food. For instance, a survey conducted by the PHLS¹⁵ of over 3,000 ready-to-eat organic vegetables found no evidence of dangerous microbes that might cause disease in humans, “indicating that overall agricultural, hygiene, harvesting, and production practices were good.”

¹⁴ Avery, Dennis T. 1998c. The Hidden Dangers in Organic Food. American Outlook Magazine 1(3):19-22, Fall.

¹⁵ **Public Health Laboratory Service, *The Microbial Examination of Ready-to-Eat Organic Vegetables from Retail Establishments*, June 2001.**

- In particular, **the risk associated with *E. coli* is not higher in Organic Agriculture**. Indeed, *E. coli* bacteria are found everywhere – in cups of tea, on our hands, in the air, and in our intestines. Most of the *E. coli* strains are harmless, but types of *E. coli* called VTEC (Verocytotoxin-producing *E. coli*) produce potent toxins and can cause severe disease and even death in humans. The most common VTEC strain is O157. It is thought that the misuse of antibiotics in modern agriculture and medicine led to the rapid development during the 1970s and 1980s of more aggressive strains of *E. coli* that are immune to therapeutic drugs. The most common cause of *E. coli* O157 infection for humans is eating contaminated foods, particularly inadequately cooked minced beef (often in the form of beef burgers) and milk. The US Centers for Disease Control (CDC) identify the main source for human infection with *E. coli* as meat contaminated during slaughter. Therefore, application of manure to the fields is not the main cause of contamination.
- Organic food must meet all quality and safety standards that apply to non-organically produced food. But **the standards for manure and soil health in organic farming often go further than the government codes of good agricultural practice**. For instance, according to a United States Department of Agriculture review, grass-fed and hay-fed cattle, which are required in many organic systems, seem less likely to produce the very toxic *E. coli* O157:H7 strain than grain-fed cattle. There are many ways in which Organic Agriculture promotes animal health, thereby reducing the level of pathogens in animal feces. Soils of organic farms exhibit much higher levels of biological activities, which lead to less persistence of harmful organisms due to competition with soil-born micro-organisms.
- The occurrence of mycotoxins in agricultural production depends on many factors, not only on the use versus non-use of fungicides. **The main factors determining the occurrence of mycotoxin producing organisms (weather, site, and storage conditions) influence organic and conventional farming systems in the same way**. Organic farms do not use fungicides, but have other advantages when it comes to preventing mycotoxin contamination (e.g., cereal varieties with longer stems can be used and growth regulators are banned, which leads to a lower infection risk of the ears). More regular mechanical soil cultivation (used for weeding), and more complex crop rotations on organic farms reduce the concentration of inoculum. More stable cell walls in the plant tissue due to the lower fertilization level in organic farms reduce the possibility for infections with toxin producing fungi. The restrictions on importing fodder components reduce the risk of mycotoxin contaminations established under foreign climatic conditions. Moreover, in conventional agriculture, many fungicide applications actually increase mycotoxin levels; in some cases, application of a fungicide only partially controls the target fungal pest, placing the fungus under stress and triggering its normal defense mechanism, including the production of mycotoxins. In other cases, a fungicide may work well on certain species of fungi, but opens an ecological window for other species of fungi that, in turn, may produce dangerous mycotoxins. All in all, organic farming is not more endangered by risk of contamination of products with mycotoxins than other farming systems.¹⁶ This

¹⁶ See H. M. Paulsen and F. Weißmann (2002) and Cummins J (2004).

is also the conclusion of the United Nations Food and Agriculture Organization (FAO) which states that, "studies have not shown that consuming organic products leads to a greater risk of mycotoxin contamination."

Misconception Number 5: Many natural foods contain allergenic substances that have a considerable health impact. Through GMO use, conventional agriculture will be able to turn off the genes responsible for allergic reactions, eventually creating food that is healthier than their organic counterparts.

Summary of Counter-Arguments

- At the moment, food containing GMOs is more likely to cause allergies than non-GMO food.
- Given the current lack of knowledge regarding both allergies and the effects of GMOs on health, it would be highly hazardous to engage in the manufacture of GMO-based, "anti-allergy" food.
- Hence organic food, which is produced without use of GMOs and synthetic pesticides, is and will remain the safest food with regard to allergies.

Details of Counter-Arguments

- Allergies are very specific to each human being. Paul may be allergic to cow milk, Abel to groundnuts, Sarah to hazelnuts, and so on. In that sense, any food potentially contains allergenic substances, as long as one person is allergic to it. Therefore, **organic food, as much as conventional food, can lead to dangerous allergic reactions if an allergic person eats the food to which they are allergic.** That said, organic food is no more allergenic than conventional food.
- Since there are so many different and unpredictable allergies, it would be difficult and probably uneconomical for the food industry to begin producing "allergen-free" products of all types. Moreover, the biotech industry has not yet demonstrated that they are able to produce GMO-based, allergen-free food products. Despite laboratory research on creating allergen-free, GM crops, no such food crops have been successfully developed. Each allergic person will probably have to continue paying attention to which food he/she cannot eat. There does not necessarily need to be allergen-free, GMO groundnuts on the market for a person who is allergic to groundnuts to find a balanced diet. It is probably better this way since **different people could be allergic to different components of the same products** (e.g., Maria is allergic to/intolerant of lactose in milk while Anna is allergic to certain milk proteins), which means that **it is often not possible to remove *the one* gene that gives allergies to everyone.**
- On the contrary, **existing GM crops are more likely to cause allergies than conventional non-GMO or organic foods.** They often produce unexpected allergies. For instance, in 1999 a survey carried out by York Nutritional Laboratory revealed that allergies to soy increased by 50 percent in the previous year. It is worth noting that this period was the first year in which

there was a significant amount of genetically engineered soy sold in the UK. Many studies have shown a direct allergenic effect of GMO food. In 1995, a Brazil nut gene inserted into soy DNA created an allergic reaction in human blood. In 1998, a GM potato caused immune system damage in rats, among other problems. A Bt potato caused abnormal and excessive cell growth in the small intestine of mice. A recent health report claims that Indian farm workers exposed to Bt cotton developed moderate or severe allergic reactions.

- Part of the problem is that GMO plants usually contain genes (and therefore produce proteins) that are “borrowed” from another plant. This will make it more difficult for allergic people to identify where the risk stands and to avoid it. For example, will I get a reaction if I am allergic to wheat and I now eat a GMO sunflower that has been transferred a wheat gene? What if I don’t even know that it has been transferred? People may unknowingly consume the allergen with potentially severe consequences. In addition, some GMOs are created by inserting genes from plants or animals that have never entered the food supply chain before. Therefore, the more genetically modified plants become present on the market, the more people will be consuming proteins new to the human diet, which means that cases of new allergic reactions are likely to arise. **GMO-induced allergies will therefore likely be difficult to identify because they are totally new (doctors won’t have the tests ready) or because they won’t be consistently present in one commodity**, but may be dispersed in several and be sometimes present and sometimes not according to whether the plant is GMO or not and based on the type of genetic modification it has undergone. Studies have also shown cases where subtle, unpredictable differences in the protein structure occurred following gene transfer. Indeed, each cell type expresses a unique repertoire of enzymes capable of modifying protein structure. This means that even if a GMO crop is created by incorporating a gene that is known not to produce allergen proteins in its original organism, the expression of the same gene could cause the production of allergen proteins in the new GMO organism.¹⁷ These differences are so subtle (e.g., differences in glycosylation of the protein) that common gel tests used to test GMOs are not currently able to detect them.
- **Moreover, the process for creating GMOs is itself hazardous in many aspects and can result in higher exposure to allergens.** First, the GM transformation process (insertion and growing cells from tissue culture) can create hundreds of thousands of mutations throughout the genome, as well as altered expressions of perhaps hundreds or thousands of genes. Second, the inserted gene may be mutated or truncated, yielding an unknown protein. Third, GM genes containing bacteria appear to be optimized for gene transfer to gut bacteria, and possibly into human organ DNA, with their own functioning promoter.
- By switching off allergen-creating genes, the scientist may be inadvertently influencing a family of genes, as well as the complex metabolic processes that

¹⁷ See the article Genetically Modified Peas Caused Dangerous Immune Response, by Jeffrey Smith for an example of this effect, and Chapter 6 of the book “Seeds of Deception” by the same author for a more detailed analysis of allergenic risk of GMOs.

use the gene product as an input. Perhaps in the future, when we understand the language of gene expression, we can safely and predictably manipulate single genes. Now, it is a primitive tool from an infant science, being fed to millions, and released into the environment for long-term self-propagating pollution of the gene pool. Allergies are also still a grey area for medicine as doctors are not able to fully explain the reasons why people become allergic (the allergy is in itself an illogical behavior of our immune system). The proportion of allergic people is growing fast without medical scientists being able to explain the causes of this rise. Many people with allergies still do not know exactly what they are allergic to as they haven't undergone tests or have only undergone partial testing. **Given the current lack of knowledge regarding both allergies and the effects of GMOs on health, it is highly hazardous to engage in the manufacture of GMO-based, "anti-allergy" food.** Individual testing and careful eating habits should remain the basis to limit allergy-related risks and more research should be conducted on the causes of the rise of allergy problems in our modern societies.

- Hence, **organic food, which has been produced without the use of GMOs and synthetic pesticides, is in fact the safest food today.**

Misconception Number 6: Some natural pesticides used in organic farming have been proven to have harmful effects on health. For instance, Pyrethrin sprayed on organic fruits is highly toxic and Rotenone, another natural pesticide, is a potent neurotoxin long used to kill fish and recently linked to Parkinson's disease. So there is no reason to trust that organic products are safer.

Summary of Counter-Arguments

- Natural pesticides are quickly degraded and therefore unlikely to leave residues in food stuff.
- Organic Agriculture relies first on preventive measures and, only as a last resort, on natural pesticides.
- Organic standards-setting bodies are responsive to new data on toxicity of natural substances and precautionary measures are applied while alternatives are being sought.

Details of Counter-Arguments

- It is true that natural pesticides used in Organic Agriculture can also have a certain level of toxicity. For instance, the plant-extracted Rotenone is known to be toxic to humans and other mammals in addition to being lethal to insects.¹⁸ However, **most natural pesticides have a very small persistence in the environment and are, therefore, unlikely to leave residues in food.** Rotenone, for instance, breaks down when exposed to sunlight and has a short lifespan (a week or less) in the environment. The botanical pest controls (among which are Rotenone and Pyrethrum) are derived from plants. These

¹⁸ The e-Pesticide Manual, 13th edition (2006) edited by Clive Tomlin.

materials are registered with the US Environmental Protection Agency (EPA) and have undergone safety testing which placed them in the EPA's least toxic category. Botanicals are preferred in organic production to synthetic pesticides because they break down quickly into common natural compounds, while synthetic substances tend to persist in the environment. An important measure of the safety of these plant-derived materials is their known effects based on historical use for the last 3,000 years.

- Most importantly, **Organic Agriculture relies first on preventive measures and only secondly on natural pesticides** to control pests and diseases in crop production. Organic farming relies on prevention rather than cure, and the primary form of pest control is through following cultural methods and best practices. Organic standards are based on the principle that design and management of the whole farming system to achieve health, vitality, and diversity of soil, crops, and the environment are the primary means to ensure that pest and disease problems are minimized. The incidence of pest and disease damage in organic systems is reduced using a number of fundamental practices including use of sustainable crop rotations, maintenance of biodiversity, maintenance of optimum crop health, and the use of resistant varieties. Organic growers are also encouraged to explore the use of biological control agents (predators or parasites of pests which are released into the crop area) instead of natural pesticides for insect problems. **All these techniques reduce the need for organic farmers to use natural pesticides** (for instance Rotenone was used by only eight Soil Association-certified organic farmers in 2005 in the UK). When there is a real pest outbreak despite these preventive measures, organic farmers resort to use of natural pesticides (after permission from their certification body), but do so with caution in order to disturb the natural equilibrium as little as possible.
- Nevertheless, the organic sector does not pretend to be the holder of immutable truths. **New studies can bring interesting data on the effect of natural pesticides and the organic sector is responsive to such information**, open to debating the issues, and will consider putting additional restrictions on the use of the substances if necessary, and may even ban the substances if it is proven that their use in agriculture has a significant adverse effect on health. For instance, the NOSB (National Organic Standards Board) of the US recommends that all agricultural inputs be evaluated as to their long term effect on the environment, not simply on whether they are synthetic or natural. Another example is that in response to a recent study linking Rotenone to Parkinson's Disease, and as an additional safeguard to operators' health, the UK Soil Association introduced further restrictions on the use of Rotenone.

Part B: “Organic agriculture is not better for the environment”



Misconception Number 7: Organic farming uses pesticides that damage the environment: natural pesticides are more dangerous than conventional pesticides because they are less efficient and therefore require the application of huge quantities. This is also true for fungicide (e.g., organic grape producers contaminate the soils with large quantities of copper because they are not allowed to use modern fungicides). In addition, some organic pesticides are as poisonous as synthetic ones (e.g., nicotine and pyrethrum).

Summary of Counter-Arguments

- Organic Agriculture relies first on preventive measures and only as a last resort on natural pesticides. Therefore, pesticide application is not routinely used as in conventional agriculture.
- Use of pure nicotine, as well as nicotine naturally present in tobacco tea, is forbidden by organic regulations of major organic markets including the US, the EU, and Japan.
- Pyrethrins break down quickly and are one of the least poisonous insecticides to mammals.
- Research is being undertaken to find alternatives to copper and, meanwhile, organic standards include restrictions on the quantity of copper salt applied to fields.

Details of Counter-Arguments

- As explained in the answer to misconception number 43, natural molecules (such as those present in natural pesticides) can be very toxic for certain species (e.g., they are used as natural pesticides to kill certain insects), but are not toxic for the environment as a whole because other species can digest them without problem and they do not accumulate in the environment or food chain.
- Pure nicotine is not allowed in Organic Agriculture. Nicotine found in tobacco tea is also forbidden in some organic standards. However, tobacco tea is permitted under other organic standards because it is a plant extract produced on-farm and the concentration of nicotine in tobacco tea is typically low, meaning only minute quantities of nicotine are actually applied. In addition, this nicotine breaks down very rapidly in the environment. The use of tobacco tea or other home-brewed pesticides allows the farmer to be less dependent on

manufacturers and traders of pesticides, which is particularly important in third world countries. Moreover, the toxicity of tobacco tea is considerably lower than the one of nicotine sulphate (the product that is commercialized). Nicotine sulfate is manufactured by combining nicotine from natural tobacco waste with sulfur, resulting in a very toxic and dangerous substance. Homemade tobacco teas do not result in this same toxic substance. While the acute toxicity of nicotine (present in tobacco tea) is still quite high and hence hazardous for the person that comes into direct contact with the spray, the residual period, on the contrary, is short. This means that the farmer has to protect himself well when using the product, but that the product is not hazardous for the consumer. Nevertheless, many organic regulations forbid the use of certain natural pesticides (on-farm produced plant extracts) when their toxicity is controversial. Hence, **pure nicotine, as well as nicotine naturally present in tobacco tea, is forbidden by organic regulations of major organic markets, including those of the US, the EU, and Japan.**

- Pyrethrins are natural insecticides produced by certain species of the chrysanthemum plant. **Pyrethrins are one of the least poisonous insecticides to mammals because they are quickly broken down into inactive forms and pass from the body in urine and feces.**¹⁹ The main environmental problem with pyrethrins is their toxicity to aquatic life, but the likelihood of them reaching and persisting in water bodies is low because they have an extremely low pesticide movement rating since they bind tightly to the soil and they rapidly degrade in sunlight at the soil surface and in water. Hence pyrethrum, like other natural pesticides, appears much less toxic than most synthetic pesticides.
- Mineral inputs used in Organic Agriculture should contain as few heavy metals as possible. Due to the lack of any alternative, and long-standing, traditional use in Organic Agriculture, copper and copper salts are exceptions for the time being. However, the organic sector is aware of the risk of dependence on copper for pest management and control. **Research is underway to find acceptable biological alternatives and disease management strategies to replace the use of copper in the long run.** More research is needed, but already some promising alternatives have emerged, such as potassium bicarbonate, which occurs in nature and is an effective fungicide that is safe for humans and the environment. Research has also shown that milk by-products and milk waste can be very effective in controlling moulds and fungi. Other research is being done on how to bring in beneficial micro-organisms that will attack fungal diseases. In the meantime, **many certifiers put restrictions on the use of copper salts** (often limited to 3kg/ha per year on a rolling average basis) and/or require that, if farmers are using copper, they are required to conduct soil tests to make sure there is no copper toxicity.

¹⁹ Ray, D.E (1991). Pesticides derived from plants and other organisms. In W.J. Hayes, Jr. & E.R. Laws (Eds.), Handbook of Pesticide Toxicology. Vol. 2. (pp.585-593). Toronto: Academic Press.

- In any case, **Organic Agriculture relies first on preventive measures and only as a last resort on natural pesticides** to control pests and diseases in crop production. If there is a pest outbreak despite these preventive measures, organic farmers typically use natural pesticides wisely, so as to disturb natural equilibrium as little as possible.

Misconception Number 8: Organic producers use intensive tillage for soil preparation and weed control. Plowing results in runoff and erosion. It oxidizes soil organic matter and destroys soil aggregates. No-till farming preserves soil organic matter, soil organisms, and improves surface aggregation. However, without herbicides, continuous no-till farming is impossible.

Summary of Counter-Arguments

- Studies have shown that organic farming can build soil organic matter better than conventional no-till farming.
- No-till is not sustainable if it relies on herbicides because they are very toxic to the environment and to people's health.
- There is a large, untapped potential for organic no-till methods.

Details of Counter-Arguments

- Organic farmers are very concerned about protecting and enhancing soil fertility. Organic agricultural practices are designed to work with and emulate living ecological systems and disturb the natural balance as little as possible. As a result of this focus, organic farmers, since early times (even before the no-till approach started to take roots among conventional farmers), have been interested in reduced-tillage methods. However, **the negative impact of tilling is much less of an issue in organic farming than it is in conventional farming.** Ploughing encourages erosion mainly if the soil remains uncovered for a long period of time and if its organic matter content is low, which decreases its structural stability. Through techniques such as mulching, planting cover crops, and intercropping, organic farmers often succeed in maintaining a soil cover throughout most of the year. In addition, the higher organic content of soils on organic farms (due to use of compost, manure, mulch, and other organic fertilizing inputs) helps limit soil degradation and erosion. **The secondary tillage operations performed for weed control typically have a low disturbance on the vertical structure of the soil as they “break” and “cut” rather than turn the soil.** Organic agriculture farming practices are widely known for their positive effect on soil organic matter, soil organisms, and soil physical structure, and can achieve this result without the use of herbicides, which pollute both the soil and the water. On the contrary, conventional no-till farming may reduce soil erosion compared to tillage-intensive conventional farming, but is often combined with the application of huge quantities of herbicides that are very toxic to the environment and people's health. Research conducted over a nine-year period by the US Department of Agriculture's Agricultural Research Service has shown that **organic farming can build soil organic matter better than conventional no-till farming.** The research showed that organic farming's

addition of organic matter in manure and cover crops more than offset losses from tilling.²⁰

- Moreover, sustained reduced tillage or no-till farming are not incompatible with organic farming. **There are many very promising examples, both on farms and at research stations, that show that zero-ploughing and even no-till organic farming are possible and productive.** In the United States, the Rodale Institute is running a promising research project on no-till organic farming (the No-Till + Project), and has developed a cover-crop roller designed to achieve cover-crop mechanical kill without disturbing soil structure.²¹ Similar and lower-tech (even animal-drawn) implements exist now in many countries, including developing countries. There are many organic farmers who have been successfully running no-till systems for years in the US. In Japan, Fukuoka's farm has been operating an organic no-till system for many decades.²² In France, Joseph Pousset successfully experimented with zero-ploughing and zero-input organic agriculture for more than 13 years.²³ In southern Brazil, there are many examples of successful no-till, organic farming systems, and the introduction of no-till, no-herbicide practices has enabled a net gain of over US\$100/ha.²⁴
- In fact, **Organic Agriculture has the potential to be even more successful using no-till methods** because the secret to achieving effective no-till is applying massive amounts of organic matter to the soil (especially green manure and cover crops).²⁵ No-till systems are particularly sustainable when they rely on cover crops (instead of herbicides) to control weeds in between cropping seasons, which is a practice particularly suitable to Organic Agriculture. Furthermore, these cover crops often also fix nitrogen into the soil which reduces the need for synthetic fertilizers. Other methods can also be combined to control weeds (alone or in conjunction with cover crops), such as crop diversification or grazing livestock. All these organic methods build soil fertility and render tillage less and less necessary as the soil structure improves, whereas merely applying round-up before sowing (as is done most of the time in conventional no-till) does not do any good to the soil.
- In summary, organic farming systems, as currently employed, build healthy soil and limit erosion. That said, organic agriculture would benefit if no-till or low-till technologies were to be widely adopted. Advances in this area are now much further along than many critics acknowledge.²⁶ Organic, no-till farming is not easy, but is promising. The difficulty lies in that farmers need a good understanding of the soil ecosystem in order to be successful and building this

²⁰ Read more in the July 2007 issue of Agricultural Research magazine (www.ars.usda.gov/is/pr/2007/070710.htm)

²¹ See the Internet platform for no-till + of the Rodale Institute at <http://www.newfarm.org/depts/notill/index.shtml>

²² Fukuoka's approach is explained in his famous book "One Straw Revolution" (1978)

²³ See one of Pousset's books: "Engrais verts et fertilité des sols" for more information.

²⁴ Result of the AS-PTA (Assistance and Service for Alternative Agriculture Projects) program.

²⁵ See the impressive experience of Roland Bunch (World Neighbors) in Honduras and many other countries on this topic at http://www.newfarm.org/features/1002/roland_bunch/index.shtml

²⁶ The reader may want to consult the book "Pursuing Conservation Tillage Systems for Organic Crop Production" by George Kuepper, 2001, available online at <http://attra.ncat.org/attra-pub/organicmatters/conservationtillage.html#tillage>

knowledge base is more time-consuming than purchasing and spraying herbicides. However, **the success of no-till methods in organic farming is much more rewarding, less costly, and definitely more sustainable than in conventional agriculture.** As a US weed ecologist said: “You ought to be paying yourself for being a good manager rather than paying someone else to supply you with inputs.”²⁷

Misconception Number 9: Since yields are much lower in organic agriculture, widespread adoption of organic agriculture would require farmers to expand farming into marginal and natural areas to grow the same amount of food, thus destroying more fragile ecosystems and reducing biodiversity.

Summary of Counter-Arguments

- Organic agriculture yields are only slightly lower than conventional yields in developed countries and actually typically much higher than conventional yields in tropical countries where areas with the highest biodiversity are located, so a worldwide adoption of Organic Agriculture would, overall, benefit wild areas.
- Conventional agriculture damages immediate surrounding wild areas as well as ecologically-connected wild areas further away and decreases agro-biodiversity.
- Organic standards forbid clearing of primary ecosystems as a way to extend cultivation areas.

Details of Counter-Arguments

- First of all, global yields in organic agriculture are not much lower than in conventional agriculture. Yields may be around 20 percent less than in conventional agriculture in developed countries, but, in general, are higher than in conventional agriculture in developing countries. Overall, certain models show that a global shift to organic farming could produce enough calories to feed the entire human population and, potentially, up to 75 percent more calories than are now produced on the same area of land. Most of the world’s biodiversity is located in developing countries. Therefore, **if organic agriculture was more widely adopted, the higher yields obtained in these highly biodiverse areas would allow for preservation of more wild land in regions where it matters most.** Furthermore, conventional agriculture leads to a major desertification threat in many regions of the world. This means that conventional agriculture creates marginal areas, from originally fertile and productive agricultural land. This is detrimental to agricultural development AND to the biodiversity in areas affected by desertification. Organic agriculture can help maintain the fertility of these fragile lands, thereby contributing to both maintaining levels of agricultural productivity on agricultural lands and avoiding the loss of biodiversity.
- The other problem with the reasoning in the above misconception is that **the majority of the world’s areas of high biodiversity are located near and**

²⁷ Dr. Adam Davis, quoted in an article from The New Farm on <http://www.newfarm.org/depts/notill/features/2005/0602/msuroller.shtml>

between cultivated lands. Biodiversity cannot be maintained in independent “islands” of protected lands. These highly biodiverse areas need to be connected to other natural areas that are protected in order for animal and seed migrations to maintain the high level of diversity. Therefore, it is important to create zones that are favorable to maintaining this biodiversity in between protected areas. Organically managed farms are such favorable zones. If the lands between protected areas are full of pesticides they cannot be used as wildlife corridors and present a major threat to world biodiversity, especially in the tropics. This is why it is so important to adopt organic agriculture on a widespread scale. Organic farms exhibit higher levels of all sorts of biodiversity (for soil, crops, and wild and domesticated animals). Organic farmers rely on this biodiversity to emulate ecological cycles that help sustain their agricultural productivity.

- **Conventional agriculture damages wild areas.** Its negative effects on our environment and wildlife are now widely acknowledged, sometimes reaching areas far beyond immediate proximity of the agricultural fields. An example of this is the threat of massive fertilizer pollution in the Gulf of Mexico’s Dead Zone south of the Mississippi River Delta. Approximately 5,500 square miles of water in the Dead Zone has so little summer oxygen that it is unable to sustain aquatic life. Federal agencies, nine states, and Native American tribes are now cooperating to reduce nitrogen and phosphorus run-off from agricultural fields that ends up in the Mississippi and the Gulf of Mexico.
- Approximately one-third of the world’s land surface is used for agriculture. **Organic standards and practices ensure this area is sympathetically managed for biodiversity and that primary ecosystems are not cleared to further extend the agricultural frontier.**²⁸

Misconception Number 10: Organic farming leads to significant nutrient losses. Organic farmers rely primarily on compost, animal manure, or green manure crops to supply soil fertility. The nutrients in these organic sources typically do not match crop demands. It is easy to over-apply nutrients, such as phosphorus, while nitrogen needs are just barely met. The nutrient cycles have a leak to the consumers, which are not replenished with fertilizers.

Summary of Counter-Arguments

- In fact, conventional farming leads to more nutrient losses than organic farming due to leaching of synthetic fertilizers, soil erosion, non-recycling of farm resources.
- Organic farming builds soil fertility over the long-run instead of trying to accomplish an instant matching to crop demand of nutrients.
- Leguminous plants can provide enough nitrogen to the following crops of the crop rotation.

²⁸ For more information on the role of Organic Agriculture in protecting biodiversity, read the IFOAM dossier “Organic Agriculture and Biodiversity,” which can be accessed on the IFOAM website.

- Almost all current agricultural systems have a nutrient cycle leak to the consumer, whether organic or conventional. Ultimately, research will have to identify the most sustainable ways to help minimize the rural-urban nutrient cycle leak.

Details of Counter-Arguments

- As shown by several studies, **organic agriculture has the potential to improve soil fertility and help build both nutrient and carbon stocks in the soil.** For example, a farming system trial on soybeans carried out at the Rodale Institute (USA) showed that yields were comparable in conventional and organic cropping systems (less than 1% difference), but a comparison of soil characteristics during a 15-year period found that soil fertility (including nitrogen content and organic matter levels) was enhanced in the organic system, while it decreased considerably in the conventional system. Moreover, the conventional system had the highest environmental impact, where 60 percent more nitrates were leached into the groundwater over a five-year period than in the organic system.²⁹
- Farming is no lab activity: there is no way for farmers to provide inputs (whether natural or synthetic) that exactly match crop demand in the short term (e.g., over a growing season). This is why it is important to build soil fertility and nutrient content over a longer period of time by bring in fertilizing inputs with diversified nutrient composition. In conventional agriculture, farmers tend to focus on the growing season timeframe because soils that have low levels of organic matter cannot easily store nutrients from one season to the other. However, **in organic agriculture, it is much more possible to build up soil nutrient stocks over a longer period of time.** When there is a serious disequilibrium between nutrient inputs and crop demands, soil and plant analysis or observations can help the farmer identify and correct the disequilibrium. This is true for both conventional and organic agriculture. The difference is that conventional farmers generally focus on only three nutrients: N, P and K, while organic farmers bring in organic matter composed of a complex combination of nutrients, less easily quantifiable, but more effective in maintaining soil fertility. An important input provided by organic matter to the soil is humus, which is not a nutrient per se, but is very necessary to the maintenance of good soil structure and to the availability of nutrients for the plants. The risk of creating a major nutrient deficiency is smaller in organic agriculture than in conventional agriculture. However, if it does occur, organic farmers can still correct the deficiency by bringing in natural fertilizers such as rock phosphate (for P), magnesium rock (for Mg deficiency) or mineral potassium (for K deficiency). Moreover, synthetic trace element fertilizers (Fe, B, Mn, Zn, Mo, Cu, F, Co, etc.) are allowed in organic agriculture provided there is a documented deficiency.
- **Green manure does not provide phosphorus, but can provide enough nitrogen to meet crop needs.** While green manure/cover crops do not remove or provide phosphorus (it is absorbed by the plant, but returned to the soil

²⁹ Drinkwater, L.E. et al, (1998) Legume-based cropping systems have reduced carbon and nitrogen losses, Nature, v. 396, 19.

afterwards unless the plant is harvested), they bring in atmospheric nitrogen through biological fixation, a process that accounts for about 70 percent of the total nitrogen fixed in the biosphere. They also have the potential to bring in 75 to 300 kilograms of N per ha,³⁰ which is comparable to the synthetic N fertilizer inputs usually brought in by conventional farmers. For instance, in Pennsylvania clover used as a winter cover crop can provide enough nitrogen for a wheat-maize-soy rotation without additional fertilizers.

- Most current agricultural systems have a nutrient cycle leak to the consumer. This problem is not limited to organic agriculture, but rather results from population growth, as well as from the increasing dissociation between the place where the crops are produced and the place where the consumers eat them (leading to massive rural to urban nutrient flows). The waste of nutrients through soil erosion and through the misuse of animal waste, especially in conventional agriculture, also adds to the problem. These nutrients end up in rivers and ultimately in the sea. To replenish nutrients, agricultural systems rely on natural mineral reserves such as rocks (also used in organic agriculture). Although this solution is the most common to-date, natural reserves are not renewable resources, and can be depleted over the long run. **Ultimately, agricultural systems will need to seek solutions that truly help limit the rural-urban nutrient cycle leaks.** Some examples of potential solutions include recycling human and animal wastes and using sea and lake resources (e.g., algae, fish bones, and nutshells) as agricultural inputs. A pragmatic and radically new approach to sewage management would be needed, but, theoretically, the amount of plant nutrients and organic matter that could be recovered would almost be sufficient to fertilize the crops needed to feed the world's population.³¹

Misconception Number 11: Pig husbandry, whether organic or not, is a burden on the environment since it discharges huge quantities of phosphorus into the environment. Scientists have now succeeded in creating a genetically modified pig breed that can assimilate phosphorus contained in grains, meaning that little or no phosphorus additive is needed in their meal. If such pigs were to be used in large scale farming, conventional pig husbandry would be less harmful to the environment than in organic systems.

Summary of Counter-Arguments

- Pig husbandry is a major environmental problem due to industrial and landless production systems.
- On organic farms, equilibrium between animal and crop production ensures proper nutrient cycles and avoids soil and water pollution.

³⁰ D.H. Hubbell and Gerald Kidder (2003) at <http://edis.ifas.ufl.edu/pdffiles/SS/SS18000.pdf>

³¹ See "Possibilities for Closing the Urban-Rural Nutrient Cycles" in "Global development of organic agriculture" (2006) for a more detailed analysis of this possibility.

Details of Counter-Arguments

- Pigs do not produce phosphorus (P) on their own; they excrete the surplus P that they do not assimilate from their phosphorus-enriched diet. Hence, **if pigs were fed primarily with feed grown on the farm, and their excrement was returned as fertilizer to the soils of the same farm, there would be no excess phosphorus.** The problem occurs when pigs are grown in industrial settings with no connection between crop production and animal production. Organic standards require that organic farms function with appropriate stocking rates to ensure equilibrium between animal and crop production.
- According to the principles of Organic Agriculture, **organic livestock husbandry has to be in harmony with the ecological conditions and natural processes of the environment.** With regard to pig husbandry, this means that pigs must be fed using mainly feed produced on the farm and that the cultivated surface must be sufficient to accommodate manure spreading in a way that respects the soils and the surrounding environment. Organic practices, such as maintaining appropriate stocking rates and herd sizes and adapting rotations according to climate (e.g., rainfall) and other characteristics of the land, help farmers comply with the recommended quantities of phosphorus application per hectare.
- Therefore, there is no need to modify pigs genetically to ensure a sustainable pig production. **Husbandry practices and overall farm management that follow Organic Agriculture principles already provide a solution for environmentally sustainable pig husbandry systems.**

Misconception Number 12: In tropical developing countries, the surplus of organic matter that can be returned to the soil is too small and mineralization of organic matter is too quick to provide sufficient nutrient inputs to the plants. Therefore, the only way to avoid depletion of agricultural soils is to provide them with regular synthetic fertilizer inputs.

Summary of Counter-Arguments

- Organic matter is crucial to soil fertility. Synthetic fertilizers are not substitutes for organic matter.
- Organic agricultural techniques enable farmers to maximize production and use of organic matter.
- The use of various non-chemically processed mineral fertilizers (such as rocks) is allowed in Organic Agriculture if necessary to complement nutrient inputs from organic matter sources.

Details of Counter-Arguments

- The agronomic importance of organic matter cannot be overemphasized and accelerated degradation of soil organic matter in tropical areas is indeed a challenge in the aim of obtaining high productivity, but synthetic fertilizers are no substitute for organic matter. Organic matter contributes substantially to

nutrient supply, cation exchange capacity (CEC), and favorable soil structure. **A loss of soil organic matter due to unsustainable agricultural practices mines the soil fertility in a way for which mineral fertilizers can not compensate.** In soils that are depleted of organic matter, application of single compound mineral fertilizers remains ineffective because the low CEC of the soils and limited availability of other nutrients (e.g., micronutrients) often become the limiting factors.

- In addition, synthetic fertilizer use has not been proven as an economically sustainable way of improving soil fertility and yields in Africa and parts of Asia, partly because it is too expensive and risky to use for poor farmers faced with poor infrastructure and risky rainfall patterns, and partly because relying on synthetic fertilizers might work in the short term, but it depletes the soils in the long term. Therefore, **it is crucial to improve the use of locally available resources and to build soil organic matter content as much as possible.**
- The production of organic matter is generally not a constraint in the semi-humid or humid tropics. In fact, **the humid tropics have more potential for organic matter production than temperate regions due to year-around plant growth.** However, the availability of organic matter resources for agriculture might be reduced by other competing uses such as fuel and house construction. Appropriate technologies, such as solar cookers, are yet to be developed and disseminated to reduce this competition.
- The production of organic matter is mainly a constraint in arid and semi-arid tropics, where the low availability of water limits plant growth. Despite these constraints, farmers in these areas sometime waste organic matter by burning crop residues. They may also not use all available organic matter that could be added to the soils through mulching or other techniques. In many farming systems with livestock, the manure deposited in the night kraals (or in stables in the case of zero grazing) is often not returned to the cultivated fields, but left to decompose in a small area. With improved transportation and targeted application techniques (such as planting pits often promoted in African organic projects), this manure resource could contribute to building soil organic matter. **Organic agriculture, through the emphasis on building soil fertility with organic matter inputs, can help farmers make better use of existing organic matter sources.**
- In the semi-arid Great Plains of Colorado, organic management has enabled increases in the organic matter content of soil and has maintained or increased the stocks of macro and some micro nutrients available to the plants.³² Although there are many examples of such promising results, **more research is needed on organic techniques that can help increase production of organic matter on the farm, especially in dry areas.** Some studies have shown that there are promising leguminous plants that can be cultivated in very dry conditions, for instance during the dry season in semi-arid regions, and produce a substantial amount of organic matter and serve to fix nitrogen. One example of this is the Jack beans (*Canavalia ensiformis*) that will grow where either the climate is so dry or the soils so poor that virtually nothing

³² Long-term Organic Farming Impacts on Soil Fertility, by Jessica G. Davis, Jami Daniel, and Lew Grant, Paper presented at the 18th World Congress of Soil Science July 9-15, 2006 - Philadelphia, Pennsylvania, USA.

else will grow.³³ This plant and other leguminous crops (e.g., *Crotalaria*s and *Mucuna*) provide especially large amounts of biomass that can be used as reliable supplies of organic matter.

- The degradation of organic matter is determined by the quality of the added material, the soil water content, and the soil temperature. In semi-arid areas degradation is often delayed due to low soil water content. Many organic materials are rather recalcitrant to degradation, including phenol- and tannin-rich, leguminous tree leaves. Moreover, **the use of certain organic techniques can help address the problem of quick mineralization**. For instance, the use of hedgerows can slow down mineralization, due to the lower degradability of leaves and twigs.
- Finally, **the use of various non-chemically processed mineral fertilizers (such as rocks) is allowed in Organic Agriculture**, if they are used with the aim of addressing long-term fertility needs.

Misconception Number 13: In tropical countries, the limiting factor for soil fertility is phosphorus, which cannot be recovered through atmospheric fixation with leguminous plants, as is possible for nitrogen. In areas where there is no natural reserve of phosphorus available, Organic Agriculture cannot work because the only way to maintain soil fertility is to bring in synthetic P fertilizers.

Summary of Counter-Arguments

- Organic farms usually implement a range of practices that increase phosphorus inputs and phosphorus recycling and reduce phosphorus losses at the farm level.
- Synthetic P fertilizers are made from rock phosphates that are chemically modified. Organic Agriculture allows the use rock phosphates (PRs) that are only physically (mechanically) modified. They are less energy intensive, more affordable, better for building the soil's long term fertility and as easily transportable as the chemically modified phosphorus.

Details of Counter-Arguments

- The question of replenishment of phosphorus levels in tropical organic agricultural systems is indeed seen by many agronomists as one of the main challenges for the long-term productivity of organic farms. The problem is assumed to be more serious in Sub-Saharan Africa because the soluble content of phosphorus on bedrock is quite low in many regions. However, many field observations suggest that the **phosphorus “nutrient cycle problem” is not more difficult to solve in Organic Agriculture than in conventional agriculture**.
- **When considering Organic Agriculture at the farm level, there are several possible inflows of phosphorus**. Organic inputs can be brought from outside the farm (e.g., through grazing, collection of wild products, and organic amendments such as peat, guano, and seaweeds). Agro-forestry practices can

³³ <http://www.agroforestry.net/overstory/overstory29.html>.

also increase the nutrient take-up from the subsoil through the deep-penetrating roots of trees (and other perennial crops).

- Organic standards permit the use of clay and rock phosphates (PR), both of which containing phosphorus. **Although the use of rock phosphates is not currently common in tropical countries, and in Africa in particular, there is considerable potential for improvement in extraction methods and also regarding transport and distribution to farmers that would assist countries in Africa and tropical countries outside of Africa in the use of rock phosphates.** There are substantial deposits in various countries across Africa and some of these countries, such as Togo, Senegal, Morocco, and Tunisia, even export to the world market. In addition, many rock phosphate deposits located in the tropics and subtropics are still un-tapped.³⁴ Countries like Mali and Burkina Faso have deposits that they want to develop for local markets, with the intention of increasing the use of rock phosphate and replacing imported fertilizers. Further anticipated developments, including improvements in economies of scale, and logistics, more and more farmers will have access to natural phosphates when needed. Technically, there is no reason why the transportation cost of natural phosphate (per unit of P) should be higher than the transportation cost of synthetic phosphate. Indeed, rock phosphate has a concentration between 32 and 35 percent p205, which is comparable to the concentration of synthetic phosphorus fertilizers (most traded superphosphates average 36 percent p205, while single superphosphate is sold in some markets with a p205 content of around 18 percent).
- Except for some nitrogen-based fertilizers, almost all conventional, chemically processed ‘industrial’ fertilizers are chemically processed rocks. Synthetic P fertilizers are derived from rock phosphates that have been chemically modified. In contrast, agrominerals used in Organic Agriculture are commonly only physically modified, by crushing and grinding.³⁵ **The production of rock phosphate relies on the same raw materials as production of chemically processed P fertilizers, but is less energy intensive.** Superphosphates have high energy cost components and are already too expensive to be affordable in adequate amounts by low output farmers—unless continuous subsidies are provided by taxpayers or donors. The difference is that, in most conditions, phosphorus from rock phosphate is not as immediately available to plants as superphosphate (which is water soluble by treatment with acid); it is broken down into forms available to plants over a longer period (e.g., five years). It is nevertheless possible to use several biological means to increase the availability of P from rock phosphate in the first years (e.g., phospho-composting, inoculation with vesicular-arbuscular mycorrhizal fungi, use of phosphate solubilizing micro-organisms that enhance PR dissolution and P availability to plants). Many leguminous plants (which are commonly used in typical organic rotations) also facilitate the solubilization of rock phosphate. Moreover, by reducing Ca activity in the soil solution, the presence of organic matter (Ca-sink) in the soil helps to quicken the dissolution of PR. Hence, the impact of PR application will be realized more quickly in a well-managed

³⁴ *Use of Phosphate Rocks for Sustainable Agriculture* (FAO, 2004)

<http://www.fao.org/docrep/007/y5053e/y5053e00.htm>

³⁵ The reader may want to check on the excellent book written by Peter van Straaten: *Rocks for crops*, available online at http://www.uoguelph.ca/~geology/rocks_for_crops/

organic field. However, organic is a long term project³⁶. Organic practitioners understand that building healthy and truly fertile soil takes time, which is one of the reasons they employ techniques that work over longer periods of time than the growing season. Bringing readily soluble, synthetic fertilizers to the soil will only provide from one to three nutrients for the current growing season, but will undermine the broader fertility of the soil in the mid to long-term. On the contrary, rock phosphates and other natural mineral fertilizers commonly have long-term residual effects and contribute to recapitalization of nutrients in the soils.

- The current loss of phosphorus observed in Africa, also has a lot to do with the fact that a large percentage of Africa's food producing areas consists of farming characterized by very small family farms that have very little access to any kind of inputs (synthetic and natural P fertilizers alike). This means that alternative ways of improving the nutrient balance have to be developed and implemented, and that reducing nutrient losses on the farm will play a major role. **Organic Agriculture can significantly reduce the outflow of phosphorus from the farm** through recycling of crop residues and animal wastes and because it results in higher organic matter content in the soil, which helps reducing erosion and nutrient run off and increases the soil's cation exchange capacity (CEC). Phosphorus consumed by both humans and animals is rejected through their waste. Too often, nutrients contained in these wastes end up getting flushed into waterways, disturbing their ecosystem and ultimately causing water pollution and insalubrity problems. Recycling animal wastes (including bonemeal, chicken manure and bat droppings) and human wastes through on-farm composting and, perhaps, ecological waste (water and solid) management systems could help significantly reduce the phosphorus losses.
- While studies of soil fertility at the national level in Africa present negative nutrient balances (even under conventional agriculture), the picture is more varied at field and farm levels where households have developed a wide range of management strategies.³⁷ It is often hard to quantify the effect of organic management practices on nutrient cycles because of the fact that **Organic Agriculture isn't about like-for-like input substitution, but rather the overall development of healthy soil**. Unlike synthetic fertilizers, organic fertilizers often have a complex and variable nutrient composition, which makes the collection of data a much more complex enterprise. A related problem is the lack of research on organic and natural mineral fertilizers (e.g., less research tends to be done on rock phosphate than on synthetic P fertilizers since fertilizer manufacturers have an economic interest in selling superphosphates). Agricultural research institutes and extension services are also still convinced that chemically-processed fertilizers are indispensable.
- Let's also not forget that, **although low soil fertility is one cause of Africa's food insecurity, it is certainly not the only cause**. Social and economic determinants are at least as important. There is increasing evidence that it is not only supply factors, such as productivity per hectare, but rather demand factors, such as market opportunities and access, that determine agricultural

³⁶ This is addressed in the IFOAM Basic Standards, which state that "*Mineral fertilizers shall only be used in a program addressing long-term fertility needs..*".

³⁷ Nutrients on the Move: Soil fertility dynamics in African farming systems, Thea Hilhorst and Fred Muchena (2000).

development outcomes in Africa. Organic agriculture, by offering new and rewarding market opportunities for African smallholders, can help rural families find a way out of poverty, and can provide them with the incentive to invest in enhancing the soil fertility of their land holdings.

Misconception Number 14: OA focuses on “not using chemicals.” For example, OA research tries to develop “physical” mechanisms for weed control. However, physical techniques can be even more damaging to the soil ecology than chemical techniques. For example, thermo-weeding “sterilizes” the soil by injecting high pressure vapor, killing not only weed seeds, but also insects, worms, and bacteria of the soil.

Summary of Counter-Arguments

- Apart from mechanical³⁸ techniques, flaming is the only physical technique that is used by a significant number of organic farmers, is mainly used in a targeted way, with very low impact on non-targeted species.
- Soil sterilization is against the principles of Organic Agriculture and should not be used on organic farms.

Details of Counter-Arguments

- Some organic farmers do use techniques such as flame weeding as a non-chemical weed control method. **Flame weeding is generally a targeted technique with low impact on the temperature of the soil itself.** It uses propane gas burners to produce a carefully controlled and directed flame that briefly passes over weeds, searing the leaves and causing the weed to wilt and die after its cell contents—plasma and proteins—are disrupted. It is sufficient to heat parts of the plant especially the leaves up to 100 °C in order to boil the water within the cells and ultimately destroy them. It is also used to kill crops (e.g., potato plants) when they are infected with phytophthora, so as to avoid further spread of such infestations. Flaming is a technique that can also be used for pest control. For example, potato plants up to eight inches (20.3 cm) tall can be flamed to kill Colorado potato beetles, *Leptinotarsa decemlineata*, without causing undue damage to the potato plants. Again, in this case, the technique is used in a targeted way and has very low impact on non-targeted species.
- That said, it is possible that some farmers use these techniques in a manner that is not conducive to the soil’s biological activity. However, **the general principles of Organic Agriculture include sustaining and enhancing the health of all ecosystems, and especially the soil.** As a result, sterilization of soils shouldn’t happen in organic farming. This is made clear in the IFOAM

³⁸ By mechanical techniques we mean techniques, whether manual or mechanized, that have a mechanical effect on the soil or on the plant, for example, ploughing, ridging, hoeing, mowing, and uprooting. In this section we use the term “physical technique” to refer to non-chemical techniques that are also non-mechanical as described here. They typically include radiation such as temperature, UV, or laser treatments.

Basic Standards for Organic Production and Processing, which state that: “Standards shall require that:...physical methods for pest, disease, and weed management are permitted, including the application of heat. Thermal sterilization of soils to combat pests and diseases is restricted.”

- Thermo-weeding is by far the most widespread of all physical techniques used by organic farmers for weed-control. However, it is still much less widespread than mechanical weeding. To date, **other physical methods (UV and laser) are very rarely used on organic farms.**

Misconception Number 15: Because there are many areas of the world where farmers can't grow particular crops organically (e.g., due to substantial pest populations and particularly aggressive weeds), consumers often resort to purchasing imported crops that travel great distances just because they want organic. This becomes even more polluting to the environment than consuming local non-organic products. Consumers should rather focus on seeking local products than organic products.

Summary of Counter-Arguments

- Generally, if local constraints are insurmountable to organic farmers, they are very likely to be also uneconomically viable for conventional farmers and/or extremely negative for the environment due to massive use of pesticides.
- Buying a majority of organic products and buying local whenever possible is the best strategy for a sustainable personal lifestyle.

Details of Counter-Arguments

- Conventional agriculture also has regional constraints. Just because you can use pesticides and herbicides doesn't mean that you can grow anything anywhere easily. A consumer who is eager to purchase food as locally as possible should be aware of the specific production constraints faced by conventional farmers. **Generally, if the local constraints are insurmountable to organic farmers, they are very likely to be also uneconomically viable for conventional farmers and/or extremely negative for the environment due to massive use of pesticides.** In Organic Agriculture, the problems associated with substantial pest populations and aggressive weeds are reduced by the implementation of a more diversified cropping system.
- For animal production, **“local” conventionally raised livestock are often not as local as consumer may think.** A local conventional pig breeder in the US may get feed from Argentina, grown with inputs from Europe, whereas an organic local farmer (e.g., 100 km away) provides his or her animals with home-grown fodder or with fodder from neighboring farms. This is generally a requirement of organic standards. For example, the IFOAM Basic Standards state that “the prevailing part (at least more than 50%) of the feed shall come

from the farm unit itself or be produced in co-operation with other organic farms in the region.”

- It is obviously an environmentally friendly practice to consume local products whenever possible. If one is used to the good taste of local in-season organic fruits and vegetables, there is less incentive to purchase imported off-season produce, as the taste is inferior (even if organic) because this produce is often picked unripe in order to be able to travel un-perished to markets far away.

Part C: “Consumers are paying too much for organic food”



Misconception Number 16: Organic food is too expensive.

Summary of Counter-Arguments

- The overall cost to society of producing food organically is actually lower than the cost of conventional production. The price of conventional food is artificially lowered by production-oriented subsidies. Negative externalities caused by conventional farming are not accounted for in the price of food. Better policies could address this problem.
- For northern consumers, the organic premium is declining due to increasing economies of scale in processing and commercialization of organic products as the sector develops. Nevertheless, it is likely that a premium will remain due to additional certification costs, higher consumer demand, and more demanding production standards.
- In developing countries, uncertified organic food is generally cheaper to produce and sold at the same price as conventional food.

Details of Counter-Arguments

- **Conventional agriculture carries many hidden costs, such as the external environmental and social costs that such production systems create.** These external costs are not included in the cost of production and in the final price because they remain externalities to the farm production system. One example of such an externality is the need for, and cost of, water treatment and environmental protection measures due to pesticide use in conventional farming; pesticide manufacturers pass on the costs of cleaning up pesticides to farmers, who pass it on to water companies, who in turn pass it on to consumers via water bills. In effect the polluter gets a hidden subsidy from anyone who pays a water bill, while the non-polluter – the organic farmer – receives no such subsidy. The yearly total cost of removing pesticides from the water supply in the UK is £120 million. Another example is the BSE (Bovine spongiform encephalopathy) epidemic, which originated from a conventional practice aimed at reducing production costs by feeding cows on rations that included meat and bone meal (that was contaminated), but resulted in a huge collective cost. On the contrary, prices of organic foods include not

only the cost of the food production itself, but also a range of other factors that are not captured in the price of conventional food, such as:

- Environmental enhancement and protection (and avoidance of future expenses to mitigate pollution);
- Higher standards for animal welfare;
- Avoidance of health risks to farmers due to inappropriate handling of pesticides and to consumers due to a healthier food and water supply (and avoidance of future medical expenses); and
- Rural development by generating additional farm employment and assuring a fair and sufficient income to producers.

A study carried out by Professor Jules Pretty calculated that the total hidden or “external” cost to the environment and to human health of organic farming was much lower than for conventional agriculture, probably no more than a third the cost, and that organic farming also has higher positive externalities.³⁹

The World Resources Institute, an environmental policy think tank, also reported that after accounting for all the external costs of soil loss, water contamination, and environmental degradation caused by conventional farming practices, the average farm shows a net loss instead of a net profit, which suggests that the total cost of food production to the society is much higher than current conventional food prices. **If the hidden costs were included in the shelf price, consumers would be paying the real costs of food and organic food would be cheaper than conventional food because these additional costs are much lower.**

- Certified organic food is generally sold at a premium price compared to conventional food, although in some cases, certified products can be cheaper. **This price difference reflects both higher production costs due to alternative production practices (e.g., higher animal welfare standards, restricted use of chemicals, and soil fertility enhancement), and a higher demand from consumers for organic products.** In some cases, the price difference is the result of the specific willingness of consumers to pay higher prices and does not reflect a higher cost of production. This can be the case for instance in community-supported agriculture schemes where consumers agree with the farmer on the price of his or her products beforehand, keeping in mind the objective of establishing a local fair trade system and of encouraging the maintenance of agricultural families in rural areas.
- For non-certified organic food in developing countries, the situation is very different. There are many agricultural systems that fully meet the requirements of organic agriculture, but are not certified organic. The produce of these systems is usually consumed by the farming household or sold locally (e.g., in urban and village markets) at the same price as their conventional counterparts. Although the uncertified produce does not benefit from price premiums, some cases have been documented where non-certified Organic Agriculture increases productivity of the total farm agro-ecosystem and reduces the amount of purchased external inputs, which means that **the production cost of these organic products is actually lower than that of conventional products.**

³⁹ The Real Cost of Modern Farming, Jules Pretty, available at <http://www.resurgence.org/resurgence/issues/pretty205.htm>

- Most importantly, the true cost of a food product is not simply the price for which it is sold. It is widely acknowledged that the price of non-organic food is often influenced by subsidies and other public support schemes. National or regional programs and subsidies are mostly geared towards large-scale, chemically intensive agriculture and artificially lower the price of conventional products. As an example, the European Union pays €40 billion a year towards agricultural subsidies under the Common Agricultural Policy (CAP). Taxes-payers' money is used to subsidize the production of farmers who mainly use non-organic farming practices. The taxpayer gains little in terms of environmental or health benefits. If this support were to be diverted away from production-linked aid towards support that encourages all farmers to adopt more environmentally friendly forms of farming, such as organic, the price of organic food would be comparable to that of conventional products. Unfortunately, the current allocation for rural development program, which embodies some of these objectives, is just five percent of the total CAP budget. **Organic agriculture is still facing unfair competition in the marketplace due to the competition distorting effect of current subsidy schemes.**
- The organic supply chain currently suffers from costs linked to handling small quantities for niche markets. The greater diversity of enterprises in organic production means that economies of scale are less easily achieved. Post-harvest handling of relatively small quantities of organic foods results in higher costs, especially given the mandatory segregation of organic and conventional produce, particularly for processing and transportation. Marketing and the distribution chain for organic products are relatively inefficient and costs are higher because of the relatively small volume. **As demand for organic food and products increases and the sector develops, technological innovations and economies of scale are likely to reduce costs of production, processing, distribution, and marketing for organic produce.** This phenomenon is already perceived by consumers in the main organic markets such as Germany and the US, where some organic products are now being sold through usual marketing channels.
- In conclusion, the price of organic food is not too high – rather, it is the price of conventional food that is too low. Consumers are in fact paying for non-organic food three times over, through the sticker price, taxation (which mainly subsidizes non-organic farming), and payments that remedy damage that conventional farming and food production has inflicted on the environment and human health. **If the production, distribution, and trade systems accounted for the real environmental and social costs, consumers' incentive to buy organic products would be triggered, because they would actually be less expensive than the conventional products.**

Misconception Number 17: People can't afford organic products, so promoting them will reduce fruit and vegetable consumption, which are healthy, but expensive when organic.

Summary of Counter-Arguments

- The relatively high cost of fruits and vegetables and relatively low cost of oil, fat, and sugar do not reflect the actual price of these items and have been distorted by agricultural policies.
- The evidence shows that organic consumers consume more fruits and vegetables and less unhealthy foodstuff than the general population. Promoting an organic diet will only promote healthier eating habits.

Details of Counter-Arguments

- Past and current agricultural policies have contributed to making healthy foods, such as fruits and vegetables, relatively more expensive than less healthy foods. **Taxpayers' money has been used to subsidize the very parts of the food chain that are causing the obesity epidemic today.**⁴⁰ The over-production of oil, fat, and sugar, largely due to government subsidies to protect farm industry revenues, has contributed over decades to the health crisis we are experiencing today. These policies result in the distortion of the sticker prices that make these less healthy foods seem less expensive – regardless of their organic status.
- The facts show that **organic consumers tend to consume more fruits and vegetables, and less fats and sugar than the general population**, because they are already sensitized about the importance of healthy nutrition. Many organic consumers also buy no meat or less meat and fewer readily-made meals, which are relatively expensive, therefore, enabling themselves to purchase more fruits and vegetables within the same budget. Organic products contain less water and more nutrients, so you can eat less (and buy less quantity) for the same nutritional benefit. Therefore, buying organic food products that are a bit more expensive does not necessarily mean having a higher total food budget.
- Even if organic consumers were to spend a slightly larger share of their income on food (and less on other consumption goods) this wouldn't necessarily be a disaster, given the trend of the past decades. For example, in France the share of food expense in the total household budget has decreased from 45 to 14 percent over the last 40 years.
- **Promoting organics is, therefore, not likely to reduce fruit and vegetable consumption**, but rather it will increase consumers' awareness of sound nutrition in general and lead consumers to change their food habits and/or create incentives for consumers to dedicate a larger share of their total budget to the important goal of improved nutrition. Moreover, organic fruits and vegetables have enhanced health properties compared to non-organic fruits

⁴⁰ Professor Philip James, chair of the International Obesity Task Force (IOTF), during an International Congress on Obesity in Sydney.

and vegetables, so even if consumers eat the same quantities of these organic items, they will enjoy improved health benefits.

Misconception Number 18: The organic movement is exacerbating the growing gap between rich and poor by contributing to a two-tiered national food supply, with healthy food for the rich and unhealthy food for the poor.

Summary of Counter-Arguments

- Organic food is not only for the rich; many organic consumers are from the low-income economic class.
- It is possible to eat organic inexpensively. For example, eating vegetarian, in-season organic items is generally not more expensive and is healthier than the typical conventional diet.

Details of Counter-Arguments

- There are a variety of consumption patterns among people who buy organic food and some organic consumption patterns are not more expensive than the average non-organic food consumption pattern. For example, **a vegetarian, in-season, organic diet is generally not more expensive and is healthier than the typical conventional diet.**
- Furthermore, the price difference between organic and non-organic foods is decreasing as the organic sector develops, which means that the poor are increasingly able to choose organic products if they wish to do so. In reality, **the incentives for people to choose organic food are many and income level is not the only determining factor.** Many low-income households purchase organic products. In the US, a 2006 report by market research consultants The Hartman Group found out that Latino/Hispanic Americans and African Americans are much more likely than Caucasians to be core organic consumers. There is also a widely known correlation between education level and tendency to buy organic food. In addition, there are many cases of young consumers of organic products who have very low-incomes. In fact, there is such a large spectrum in the socio-economic characteristics of organic consumers that there is no such thing as a typical organic consumer profile. Therefore, it is not accurate to conclude that only the rich buy organic.

Misconception Number 19: Organic food does not look very appetizing.

Summary of Counter-Arguments

- Irregularities in fruits and vegetables are natural. A display of perfectly standardized and imperfection-free fruits or vegetables is a sign of chemical use, absence of biodiversity, and waste of food across the food chain.
- Organic fruits and vegetables might not look as perfect and shiny as conventional ones, but they taste the same or even better.

Details of Counter-Arguments

- This argument against organic food can only possibly be applied to unprocessed fruits and vegetables, not to processed and cooked foods, whose visual appearance obviously depends on the skills of the processor or packager, rather than on the method of production. It is true that the visual appearance of organic fruits and vegetables is sometimes different from the ones that we are used to seeing in the conventional supermarkets. Organic apples, for example, may be slightly smaller, of un-standardized size, or may display a few stains or even pest marks. Actors in the organic supply chain, as well as most organic consumers, are more aware of the aberrations generated by over-standardization of natural products on the supermarket shelves, including waste of produce (due to discarding items that are not perfect in appearance) and abuse of pesticide use and other chemicals to improve the appearance of fruits and vegetables. As a consequence, organic consumers are more willing to accept a wider diversity in the appearance of organic produce, and even sometimes value it as a sign of biodiversity and authenticity. However, there are more and more cases, especially in general supermarkets, where organic fruits and vegetables are now required to have a visual appearance equivalent to that of conventional products (which results in wasting of more food). In any case, **visual appearance is not directly linked to taste or nutrient value of a product**. You may think that an organic apple is not appetizing, but when you taste it, you will realize that it was worth trying! In fact, many comparative studies of the organoleptic quality of organic and conventional fresh fruits and vegetables have shown enhanced organoleptic quality in organic produce (i.e., better taste and aroma). Education of consumer on the unnatural and wasteful system of artificially perfect fruits and vegetables will change these standards of appearance and result in less waste.
- In conventional agriculture, a significant number of pesticides and chemicals are used specifically for the purpose of enhancing appearance. **Consumers who are not ready to accept small and natural irregularities in fruits and vegetables should be aware that the perfect visual appearance of these products was rendered possible at the expense of the environment and their own health.**

Misconception Number 20: Organic food is for vegetarians.

Summary of Counter-Arguments

- Organic stores sell a whole range of organic meat products, as well as vegetarian-friendly processed food. Whether or not you are a vegetarian, you can buy and eat organic food.

Details of Counter-Arguments

- There is no reason why organic food should be restricted to vegetarians. The best proof of this is that **any significant organic store sells a variety of meat products**. You can find organic chicken, organic sausage, and organic salami in most organic stores. There is certainly a higher proportion of vegetarians among organic consumers than among the rest of the population, but this is due to their increased awareness of animal welfare and health issues, which also drives them towards consuming organic products. Therefore, organic stores often provide a great variety of seeds and processed foods that contain high quality proteins and are good meat substitutes in a vegetarian diet. In short, if you are vegetarian, it is likely that you would rather go to an organic store to do your weekly shopping, but shopping organic doesn't mean you have to become vegetarian!

Misconception Number 21: Organic producers are too often cheating; reports surface from time to time of fraud and scandals in the organic industry. Organic certification is not reliable, since it is only based on a paper trail.

Summary of Counter-Arguments

- Fraud will never be completely eradicated, but organic certification is currently the best quality insurance system of the whole food market and is continuously adapted to changing conditions.
- Other claims (such as “natural,” “eco-friendly,” or “integrated production”) are not substantiated and can mislead the consumer, while the term “organic” and the organic label truly reflect the application of organic standards.

Details of Counter-Arguments

- Fraud is a phenomenon that can never be completely eliminated in our society. Likewise, **the organic market, which currently has the best quality management system of the entire food market, cannot completely prevent fraud**. However, detection of each case of fraud contributes to the improvement of organic certification because its quality assurance system is adaptive. Moreover, the organic certification procedures are designed to reduce the risk of fraud to the smallest possible level. There are many levels at which those who cheat the organic certification system can and do get caught:

during the farm inspection visit (some of which are unannounced), during review of their written documentation by the certification body, or during the controls often performed by retail and trade quality managers. Major violations (such as the use of pesticides or synthetic fertilizers) lead to the immediate withdrawal of the farmer's certificate and removal of the products from the organic supply chain. Certification bodies are themselves subject to control by accreditation bodies. In fact, many certification bodies have deliberately set standards that are higher than their respective national regulations, demonstrating a true concern for the integrity of organic systems. In addition, the organic sector has a particularly strong history of social control between organic farmers themselves, but also between the farmers and organic consumers (especially in participatory guarantee systems at the local level, but also in other set-ups such as consumer-producer cooperatives and agro-tourism). Organic regulations that are currently in place are legally-binding standards that ensure that anybody having observed a fraudulent use of the organic label can file a judiciary case against the producer or whichever other agent is involved in the fraud.

- Despite these many levels of control, the sector is aware that the organic certification guarantee is never perfect and can always be improved. **Particular attention is given to the fraud topic by many actors within the organic sector** including organic certification bodies under the Certification Body Forum hosted by IFOAM, organic retailers [for example in the US under the National Cooperative Grocers Association⁴¹], consultancies, research institutions, and other supporting organizations as demonstrated by a recent workshop organized on this topic in Switzerland.⁴² These efforts ensure that the organic sector will keep a cutting-edge quality control system in the face of evolving consumer needs and emerging sector-specific challenges.
- The main problem is not the few cases of organic farmers who disregard organic regulations. **The main problem is rather the attempts made by conventional producers and processors to take advantage of organic agriculture's good image by giving the impression that their products are organic.** Usually only the term "organic" (or its translation in other languages) is protected by legislation, but many product packaging attempts to mislead the consumer by displaying vague phrases such as "farm fresh eggs," "produced naturally," "integrated production," "extensive cultivation," "eco-friendly," as well as other terms. These do not guarantee the rigorous methods of organic production. They are just various forms of conventional agriculture and a marketing strategy to surf on the organic wave.

⁴¹ See <http://www.ncga.coop/node/3053> for more information.

⁴² First European Workshop for the Prevention of Fraud, held on October 2nd and 3rd at the Research Institute for Organic Agriculture (FiBL) in Frick, Switzerland, with 60 experts from trading companies, label organizations, certification bodies, authorities, and others attending.

Misconception Number 22: Organic Agriculture is just a marketing scam.

Summary of Counter-Argument

- Organic claims are no marketing scam; they truly reflect the reality of organic production, guaranteed by organic certification systems.

- In Europe, **Organic Agriculture started from pioneer farmers, even before a market demand existed.** For decades it remained a very marginal market niche and many organic farmers were newcomers in agriculture who produced both for their own consumption and for the market. The marketing strategy behind the sale of organic food was very basic and focused on providing explanations to consumers regarding the reality of organic production. The growth of the organic sector was primarily production driven. There was no real economic incentive provided by the market to drive producers into organic farming if they didn't truly believe in it. Today, market demand is strong and organic food has found a place in conventional retailers and supermarkets; therefore, becoming subject to conventional marketing strategies, but there remains a reality for organic production that is more important than any marketing message associated with the products. Organic certification is there to guarantee it.
- **Organic certification is a truly credible assurance system that enables consumers to identify those producers that produce in accordance with the principles of Organic Agriculture,** which are health, ecology, fairness, and care. Certified organic products are those that have been produced, stored, processed, handled, and marketed in accordance with precise technical specifications (standards) and have been certified as "organic" by a certification body. Once a certification body has verified conformity with organic standards, the product can be labeled as organic. This label will differ depending on the certification body, but can be taken as an assurance that the essential elements constituting an "organic" product have been met from the farm to the market. It is important to note that an organic label applies to the production process, ensuring that the product has been produced and processed in an ecologically sound manner. Therefore, the organic label is a production process claim as opposed to a product quality claim.
- Aside from the third party certification system, there are other guarantee systems that can provide equally trustworthy assurances about the organic status of the produce. For example, **participatory guarantee systems provide a reliable organic guarantee for local, and sometimes distant, markets,** with the involvement of farmers and consumers in the verification process.

Misconception Number 23: Consumers don't know or understand certification and labeling, so they can't trust the organic claim.

Summary of Counter-Arguments

- Among all available certification labels for food, the organic label appears to be the most identifiable and credible.
- Consumers in major organic markets know several of the basic organic requirements and understand the most important implications.

Details of Counter-Arguments

- Many different certification schemes are now operating in all production sectors, as an attempt to offer additional guarantees to consumers about the product or the mode of production. **Among the various certification schemes available for food and other agricultural products, the organic certification system is one of the most credible labels.** This is due to the following reasons.
 - While consumers have difficulty understanding the complexity of different and competing standards (such as those guaranteeing a “sustainable production system,” “integrated management,” or simply “certified controlled quality”) the concrete implications of organic standards are the most easily grasped by consumers. **Most consumers in developed countries currently know several of the basic requirements associated with organic certification, at a minimum,** such as chemical use restrictions, animal welfare considerations, or the restriction of GMOs. The objective is not that all consumers know the complete details of organic standards, but that the organic label assures consumers that the products are produced in accordance with a set of standards for which they understand the principles and that these standards cover all the important aspects of production and processing. In comparison, standards of the other certification schemes mentioned above are less clear to consumers. Moreover, private or public organic standards are accessible by anyone, as they are usually posted on the Internet or available upon request.
 - **The term “organic” or its translation in other languages is protected in the world’s largest markets** (to date approximately 70 countries have a national organic regulation). It is a specificity of the organic certification scheme to have such a key word protected in national regulations. “Organic” claims on products are backed up by a law and an enforcement system, whereas other terms (such as “sustainable” or “natural”) can be featured on packaging without the producer having to comply with a specific set of requirements. This gives credibility to the organic label because consumers understand that “organic” is defined by law and enforced by public authorities.
 - Products labeled as organic do not only have to be produced and processed according to national organic regulation requirements, they also have to be certified by a certification body officially accredited

(often by public accreditation authorities). These **multiple layers of control guarantee that inspection and certification of the organic operators are being done in a truly objective way**, by an independent third party.

- Although the organic certification system is one of the most complex for food products, consumers understand the important implications and can and do trust that products sold under this label are subjected to standardized requirements.

Part D. “Organic farming is unkind to animals”



Misconception Number 24: Animals under organic management are denied proper veterinary treatment, such as vaccinations and antibiotics, which leads to unnecessary and prolonged suffering.

Summary of Counter-Arguments

- Organic livestock management practices reduce the risk of diseases.
- Animals under organic management are never denied proper veterinary treatment. If diseases occur, natural treatments are preferred, but veterinary treatments (such as antibiotics and vaccinations) are permitted when absolutely necessary.

Details of Counter-Arguments

- Animals under organic management are never exposed to unnecessary suffering. According to IFOAM Basic Standards, **organic management practices have to promote and maintain the health and well-being of animals** through balanced organic nutrition; stress-free living conditions; and breed selection for resistance to diseases, parasites, and infections. In order to maintain animal health, disease prevention is the first recommended strategy. Preventive practices (such as regular exercise, free access to pasture and/or open-air runs, and adequate grazing rotations) stimulate the natural immunity of the animal and increase tolerance to diseases.
- Routine or preventive use of chemically synthesized medicines and antibiotics is not allowed in organic farming because routine drug treatments weaken the animal’s immune system, can lead to antibiotic resistance, and increase reliance on drugs. When disease occurs, organic farmers are encouraged to use natural and complementary therapies for their animals, including homeopathy, Ayurvedic medicine, and acupuncture. However, if these are not appropriate, then conventional medicines, including antibiotics, can and should be used. The welfare of the animal is paramount. Animal suffering should be avoided at all times. Therefore, if an animal becomes sick or injured despite preventive and alternative measures, that animal shall be treated promptly and adequately, if necessary in isolation and in suitable housing. Veterinary treatment, under the supervision of a veterinarian, is encouraged when it is the only way to

avoid unnecessary suffering of the livestock, even if the use of such medication will cause the animal to lose its organic status.⁴³

- **One reason why vaccinations are restricted under organic standards is that many vaccines are genetically engineered.** When the vaccine is not genetically engineered, vaccination is allowed under specific limitations: when an endemic disease is known or expected to be a problem in the region of the farm and when the disease cannot be controlled by other management techniques or when a vaccination is legally required.

Misconception Number 25: So-called natural living conditions include non-hygienic stables and mud, which are sources of disease and bacteria, exposure to which results in animal suffering.

Summary of Counter-Arguments

- In organic agriculture, access to outdoor areas, appropriate stocking rates, and possibilities to express their natural behaviors promote animal health and reduce stress.
- Organic farmers are particularly attentive to hygiene because they cannot use routine medical treatments to compensate for bad hygiene, as is often done in conventional agriculture.

Details of Counter-Arguments

- As the IFOAM Basic Standards state for animal husbandry, the organic farmer should practice methods of animal management that reduce stress, promote animal health and welfare, prevent disease and parasitism, and avoid the use of chemical allopathic veterinary drugs. Those who are not familiar with organic husbandry sometimes state that, because the circumstances for organic animals are as natural as possible, the stables or barns may be non-hygienic and the outdoor areas are a source for bacteria-infections. However, the hygienic standards of stables on organic farms are at least at the same level as on conventional farms. One cannot find any organic farmer or consultant who will claim that dirt and bad hygiene is expressing good organic practices. On the contrary, **organic farmers are more motivated to keep a good standard of hygiene to prevent diseases, as bad hygiene simply cannot be compensated for by routine medical treatments, as it can be in conventional farming.**
- Nor does the access to outdoor areas mean a higher risk for contagion with dangerous types of bacteria. Of course, just as with animals from conventional farms, it is possible for organic animals to get infected by harmful bacteria. However, the confinement and overpopulation of industrial animal husbandry settings in conventional agriculture poses its own, much more serious, problems. **The possibility of expressing natural behavior has many positive effects on the animals' health.** For example, for chickens, taking a sand bath

⁴³ For more information, read the IFOAM dossier *Organic Agriculture and Animal Health*, available on the IFOAM Bookstore (<http://shop.ifoam.org/bookstore/>).

is not just a ritual; it is a method for getting rid of parasites. Furthermore, natural circumstances with appropriate livestock management help reduce stress. Stress reduces immune function and, hence, enhances disease susceptibility. Exercise and access to sunlight decreases the risk of skeletal disease and fertility problems.⁴⁴ Also, rotating the pastures on which animals graze will allow young animals to develop a natural immunity because they will be gradually exposed to micro-organisms, both harmless ones and pathogens, which promotes their immunity and future health.

- Moreover, **when given access to a natural environment, animals are capable of ‘self-medicating’ many of their diseases** by consuming substances not normally considered nutrient. They modulate their health by consuming certain plants, insects, and even earth for such compounds. For example, sheep infested with nematode parasites in New Zealand were found to select the bitter and astringent Puna Chicory and thereby reduced their parasite load. Free ranging cattle in Venezuela help themselves to clay sub-soils. Clay helps balance stomach acidity and curb diarrhea.⁴⁵
- In conclusion, the greater possibility for organic animals to express their natural behaviors, in particular through a greater access to open-air environments, results in healthier animals with stronger immune systems. **Organic Agriculture standards ensure that animals do not suffer and remain in good health, while being able to express their natural behaviors.**

Misconception Number 26: Animal diseases, such as avian flu, are spread because animals are allowed to be outside. If they were all kept indoors, the disease would not spread to animals in holdings.

Summary of Counter-Arguments

- There is no evidence that keeping birds indoors does anything to stop the spread of avian flu. Wild bird testing and migration route analysis suggest that wild birds are a minor source, if they are a source at all, of virus transmission.
- The highly-pathogenic strains of bird flu are essentially a problem of the transnational poultry industry, which sends the products and waste of factory-farms around the world through a multitude of channels.

Details of Counter-Arguments

- Bird flu is nothing new. It has co-existed rather peacefully with wild birds, small-scale poultry farming and live markets for centuries. But **the highly-pathogenic strains of bird flu, such as the deadly H5N1, are essentially a problem of industrial poultry practices.** H5N1’s epicentre is the factory

⁴⁴ Szymona J., Lopuszynski W., 2004, Organic farming and animal health: protecting livestock, Proceedings of the 3rd SAFO Workshop, Falenty, Poland.

⁴⁵ Soil Association, 2002

farms of China and Southeast Asia and, while wild birds can carry the disease (at least for short distances), its main vector is the highly self-regulated transnational poultry industry, which sends the products and waste of its farms around the world through a multitude of channels.⁴⁶ One of the standard ingredients in industrial chicken feed, and most industrial animal feed, is "poultry litter," a euphemism for whatever is found on the floor of the factory farms, including fecal matter, feathers, and bedding. Chicken meat, under the label "animal by-product meal," also goes into industrial chicken feed. Furthermore, since only five breeding companies supply producers with more than 90 percent of the laying hens world-wide, if one of those breeding companies has an outbreak, the disease is spread quickly to farms worldwide. Reports prepared by the UN's Food and Agriculture Organisation (FAO) and the US Department of Agriculture (USDA) show that **outbreaks in one Asian country after another began in intensive poultry farms**, which had taken day-old chicks directly from Thailand, the regional hub of the poultry business.

- The genetic diversity of poultry on small farms is critical to the long-term survival of poultry farming in general. Bird flu does not evolve to highly pathogenic forms in backyard poultry operations, where low-density and genetic diversity keep the viral load at low levels. When backyard farms are separated from the source of highly pathogenic bird flu, the virus seems to die out or evolve towards a less pathogenic form. The FAO and the World Organisation for Animal Health (OIE) reported that there is "growing evidence that the survival of the virus in smallholder and backyard poultry is dependent on replenishment".⁴⁷ **It is in crowded and confined industrial poultry operations that bird flu, like other diseases, rapidly evolves and amplifies.**
- **There is no evidence that keeping birds indoors does anything to stop the virus,**⁴⁸ and wild bird testing and migration route analysis suggest that wild birds are a minor source, if a source at all, of virus transmission. Instead, it is the link between backyard production and the industrial poultry system that are so problematic. Backyard farms are also often intimately connected to the industrial system, through markets, inputs (such as day-old chicks and feed), and even veterinary services. The opportunity is always there for highly pathogenic bird flu to pass from the industrial system to small-scale poultry farms.
- Backyard producers (geared to local and family needs) do not send their birds and bird waste across borders, maintain high genetic diversity in poultry populations, and do not confine and stress the animals as much as industrial settings. Moreover, avian flu outbreaks in smallholdings tend to burn themselves out. Therefore, the solution to bird flu and other animal epidemics

⁴⁶ Fowl play: The poultry industry's central role in the bird flu crisis, GRAIN, February 2006

⁴⁷ FAO and OIE, in collaboration with WHO, op cit, p 17 and p 22.

⁴⁸ A Stegemen et al., "Avian influenza A virus (H7N7) epidemic in the Netherlands in 2003: Course of the epidemic and effectiveness of control measures," *Journal of Infectious Diseases*, 2004, 190:2088-2095; ME Thomas et al, "Risk factors for the introduction of high pathogenicity Avian Influenza virus into poultry farms during the epidemic in the Netherlands in 2003," *Preventative Veterinary Medicine*, 2005, 69:1-11

seems to be the abolishment (or at least the implementation of much sounder practices and much stricter control) of industrial poultry facilities, not the harassment of small outdoor poultry units. **When it comes to bird flu and other fast-spreading animal diseases, diverse small-scale farming is the solution, not the problem.**

Misconception Number 27: Today, conventional farm animals grow well and provide high milk yields. Industrial farm poultry produce a large numbers of eggs. Therefore, these animals cannot really be suffering.

Summary of Counter-Arguments

- Although animals in conventional industrial farms might be very productive, they have very high rates of sicknesses and suffer mentally and physically throughout their lives.
- Organic standards ensure that animals' health and well-being is given the attention that, unfortunately, is not afforded most of the time in conventional agriculture.

Details of Counter-Arguments

- In the discussion about organic and conventional agriculture, supporters of the conventional system sometimes state that animals cannot be suffering if they grow well and provide high milk yields or produce a large number of eggs. However, even though these animals seem healthy, they are on the verge of disease. **There are plenty of reports that show that the health of intensively-bred animals is not the norm, but rather that these animals live permanently in unhealthy conditions and under medical treatment.** The conventional production system is highly dependent on veterinary drugs. For example, Intervet, one of the three biggest veterinary pharmaceutical companies in the world, offers routine programs with dozens of antibiotic treatments covering the whole lifespan of a dairy cow in order to ensure udder health. Denmark hosts one of the most intensive pig breeding facilities, with 8,500 conventional pig breeders producing 25 million pigs every year. Although the sows are very productive, there is plenty of evidence that the increasing industrialization of production damages the health of the sows and their piglets. The mortality among Danish pigs has more than doubled since 1982 to 4.5 percent in 2005, and the use of antibiotics has increased by 19 percent between 2003 and 2005. Approximately 35 percent of the pigs get critical comments when veterinarians examine them at the slaughterhouse mainly because of signs of suffering in the respiratory passages, a result of lack of fresh air in the stables.⁴⁹ According to a study by the University of Bonn, the performance of dairy cows increased by 30 percent between 1960

⁴⁹ Tind Soerensen J. et al. (2006) *Sundhed og medicinforbrug hos oekologiske og konventionelle slagtesvin.*

and the mid-nineties. At the same time, udder illnesses increased by 600 percent and claw and limb disorders surged by 300 percent.⁵⁰

- Given the conditions of population density and confinement in industrial production facilities, it is not surprising that they are suffering from a range of health problems. **The animal feed provided to them is also affecting their health at the same time that it boosts production.** In conventional farming, animals are mainly fed with concentrates, instead of roughage, to reduce costs and boost production. The Danish Society for Protection of Animals (2004) reports that around half of Danish sows suffer from stomach ulcers due to stress and the unnatural structure of their fodder. Cows suffer dislocation of the fourth stomach due to consumption of concentrated feeds. On the contrary, in Organic Agriculture animals should be provided with a balanced diet to permit them to exhibit their natural feeding and digestive behavior.
- Saying that animals are healthy because they are highly productive is inaccurate. It is as if you were saying that the fattest or tallest kid in school is the healthiest. **The health of an organism is not measured by the productivity of whichever part of the body or reproduction system is useful to human consumption.**
- In Organic Agriculture, we consider health to be not simply the absence of illness, but the maintenance of physical, mental, social, and ecological well-being. **Even when animals have no disease, they can feel mental and physical suffering when they are not allowed to express their natural behaviours, as is too often the case in conventional agriculture.** One example is the condition of sows in industrial pig production. The notion of sows as breeding machines on four legs is underlined by the way the majority of pig sheds are set up. Currently, most conventionally raised sows stand in long rows of stalls, separated from each other by metal bars. The stalls are so small that the sows can only walk one or two steps forwards or backwards. They are not even able to turn around, and have no opportunities (in contrast to the sows in Organic Agriculture) to behave naturally. For example, they cannot walk around, build a nest for her piglets, root, or examine their surroundings. It is obvious that such conditions result in physical and mental suffering. Another example is the hormonal control of reproduction used for cattle, sheep, and pigs in conventional agriculture. It is done to synchronize birthing times and, thus, simplify management. However, long-term damages (such as the state of exhaustion resulting from the lack of recovery time for sows) are not considered when applying such practices, which can be assimilated to “torture-breeding,” where yield, and not health status, is the predominant goal.
- Finally, **high productivity does not prevent animals from undergoing massive temporary suffering due (for example) to routine mutilations and inhumane conditions during transportation and slaughter.** For example, it is routine practice in conventional pig husbandry to clip off the end of the

⁵⁰ H. Sommer: *Intensive Tierproduktion ist unverantwortlich*. In: *Ökologie & Landbau* 24 Jg. (1996), Nr. 4, p.48.

pigs' tails and to either clip off or file off their teeth. This is done because otherwise pigs would bite one another's tails because of the small space in which they are raised and the lack of possibilities for other activities in the stable. Transportation is known to cause massive stress, dehydration, and physical injury to animals before they get slaughtered. Organic standards require that animal stress during transport be minimized through a range of stress-reducing measures.

- **In conclusion, the high productivity of animals in conventional agriculture is not at all a sign of health and well-being.** Highly productive animals indeed suffer a range of health problems associated with their unsound living conditions and over-solicited metabolism. They also suffer physically and mentally throughout their lives and particularly during certain stages, such as during mutilations, transport, and slaughter. All organic agriculture standards contain a substantial part on animal welfare and ensure that animals do not suffer and can express the natural behaviors necessary to their well-being.

Misconception Number 28: Organic animal husbandry standards are not harmonized worldwide, so it would be best if OA did not try to define anything. For instance, how can OA standards allow cows to be shackled inside stables (as is the case in Switzerland)?

Summary of Counter-Arguments

- There are indeed variations in organic animal husbandry standards worldwide, to account for different local agro-ecological, cultural, social, economic, and technical conditions, but all standards are based on the universal principles of Organic Agriculture.
- Organic Agriculture is indisputably better able to guarantee high animal welfare than conventional agriculture.

Details of Counter-Arguments

- As is the case for other elements of Organic Agriculture, there are indeed differences between country regulations and the various private standards when it comes to animal husbandry standards. Nevertheless, all the standards have much in common and are based on the principles of Organic Agriculture, which are universal. **Differences in standards reflect differences in local conditions such as climate and culture, as well as the processes of development of the standards themselves.** Realities and expectations about the degree of animal welfare vary from one country to the other, as do the incidence and impact of diseases affecting farm animals. According to the IFOAM Basic Standards, all animals shall have access to pasture or an open-air exercise area or run, whenever the physiological condition of the animal, the weather, and the state of the ground permit. Taking into account both animal welfare and ecosystem pasture management, animals may be temporarily confined because of inclement weather or absence of pasture due

to temporary or seasonal conditions. They also may be fed with carried fresh fodder where this is a more sustainable way to use land resources than grazing.

- **Religion and cultural aspects have also to be taken into account.** For example, during slaughter each animal should be stunned before being bled to death. However, in countries where this process assumes a religious and/or traditional meaning, organic standards might allow exceptions for cultural reasons.
- Another example of variability in animal husbandry standards is the maximum percentage of non-organic feed that is allowed under organic production. In regions of the world where the organic sector is well developed, it makes sense for organic standards to require 100 percent organic feed for organic livestock. **However, in regions where appropriate organic feed is not available and where Organic Agriculture is in early stages of development, standards that require 100 percent organic feed would hamper development of the organic sector in these regions.**
- In conclusion, it is not because there is a certain level of variability in animal welfare standards that these standards are worthless. No organic standard can pretend to be the best universal framework for animal welfare, nor is it easy to assess animal welfare outcomes in a truly measurable way, but **there is clearly a big difference between living conditions of organically-managed animals and animals in conventional industrial settings** and animal welfare standards make Organic Agriculture indisputably distinguishable in this regard.

Part E: “Organic farming cannot feed the world”



Misconception Number 29: Organic farming yields are too low to feed the world’s growing population.

Summary of Counter-Arguments

- Studies have shown that in northern countries, organic farms can be almost as productive as conventional farms. In developing countries, they are often even more productive. Overall, organic yields could feed the world.
- Given the (very limited) current level of public support and research for Organic Agriculture, there is considerable potential to increase its performance with appropriate allocation of resources for research and extension.
- Global food production is more than enough to feed even a growing global population; the problem is getting food to the people who need it. Hunger is more due to social, economic, and political conditions than it is to problems regarding agricultural productive capacity.
- Six million ha of productive land are lost each year around the world through desertification. Organic Agriculture can reverse this process and help safeguard the world’s production potential.
- Organic Agriculture is actually the most efficient, cost-effective, sustainable, and fair way to feed the world.

Details of Counter-Arguments

- Organic Agriculture is based on a sophisticated combination of traditional knowledge, modern science, and innovation. Therefore, **adopting Organic Agriculture today doesn’t mean going back to the pre-industrial yields** of our great-grand parents.
- The old adage that yields in Organic Agriculture can only be one third or half of those of conventional yields is often based on incomplete data. For example, the widely quoted statistical reference according to which a transition to organic farming in the whole of the United States could only produce one fourth of the food currently produced is based on a study by the USDA showing that all the manure produced in the US could only cover one fourth of the national fertilizer needs. The above conclusion derived from this

study would be acceptable if Organic Agriculture only relied on manure as a source of fertilizer, but this is far from the reality. In fact, worldwide, much more nitrogen is provided in organic agriculture as green manure than animal manure.

- Many studies carried out in several parts of the world actually show that **organic farms can be almost as productive as conventional farms (in developed countries) and sometimes even more productive (especially in developing countries)**. A 21-year long study carried out in Switzerland by the FiBL (*Forschungsinstitut für biologischen Landbau*) Institute showed that the yields in organic farming are only 20 percent less than in conventional farming. Reviewing more than 200 studies carried out in the US and Europe, Per Pinstrup Andersen (professor at Cornell University and winner of the World Food Prize) and his colleagues reached the conclusion that yields in Organic Agriculture are around 80 percent of conventional yields. Another study reviewing a global dataset of 293 examples found that in developed countries organic systems, on average, produce 92 percent of the yields produced by conventional agriculture.⁵¹ Other studies show organic yields even closer to conventional yields (94 percent for maize, 97 percent for wheat, 94 percent for soy, and approximately that same yield for tomatoes according to a study carried out by Bill Liebhardt from the University of California-Davis⁵²). A more recent US study even showed an increase in yields through organic farming in a grain-based cropping system.⁵³ Growers who go through the three-year transition period from conventional to organic management usually experience an initial decrease in yields, until soil microbes are re-established and nutrient cycling is in place, at which point yields can return to previous levels.
- More importantly, **in developing countries, where most food shortage problems occur, Organic Agriculture is found to be more productive than conventional agriculture**, with yields that are often double or triple those of conventional agriculture according to a study by Jules Pretty and Rachael Hine from the University of Essex that reviewed more than 200 projects in 52 countries, covering approximately nine million farms of over 30 millions hectares total. This confirms the results of the University of Michigan study cited above. The increase in yields resulting from Organic Agriculture in tropical countries can be attributed to the increased organic matter in the soil that helps increase the soil's water retention capacity.
- The team from the University of Michigan, co-directed by Catherine Badgley, developed a model to calculate the overall effect of a world-wide transition to Organic Agriculture, using their aforementioned observation that Organic Agriculture yields slightly less in developed countries, but more in developing countries, compared to conventional agriculture. The results given by the model show that a **global shift to organic farming could produce enough**

⁵¹ Badgley, Catherine; Jeremy Moghtader; Eileen Quintero; Emily Zakem; M. Jahi Chappell; Katia Aviles-Vazques; Andrea Samulon; and Ivette Perfecto. 2007. Organic Agriculture and the Global Food Supply. *Renewable Agriculture and Food Systems*, 22:86-108 Cambridge University Press. <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=1091304>

⁵² See Liebhardt, B. Get the facts straight: organic agriculture yields are good. OFRF Information Bulletin #10, Summer

⁵³ <http://www.leopold.iastate.edu/pubs/nwl/2007/2007-2-leoletter/ltar.htm>

calories to feed the entire human population and potentially 75 percent more calories than are produced now, on the same area of land (which means that Organic Agriculture could in this case sustain a much bigger population than the one currently sustained by cultivated land). Another study, directed by Niels Halberg from the Danish Institute of Agricultural Sciences, using a model developed by IFPRI, reached conclusions that were similar to those of the Michigan team. An FAO 2002 report also notes that organic agricultural systems can allow farmers to double or triple productivity compared to traditional systems, but recognizes that yield comparisons are often misleading because of the fact that many farmers adopt organic techniques in order to save water and money and to reduce the yields variability in extreme conditions rather than to increase production. Studies have found that in periods of exceptional drought, both in northern and southern countries, organic yields are far higher than conventional yields.⁵⁴

- **The production performance of Organic Agriculture is particularly promising in light of the limited support it has received in terms of research funds directed towards optimizing organic farming practices.** The current yields of Organic Agriculture have been achieved through organic farming methods that have been developed and refined by years of grower experience, mostly independent of the billions of dollars of support provided to the agrichemical industries in terms of research and development. If governments would increase the small proportion of its research funds currently directed toward optimizing organic farming practices, Organic Agriculture has the potential for yields that equal or surpass those of conventional agriculture, even in northern countries.
- Nevertheless, given the current situation (food production surplus with simultaneous famine on the worldwide scale), the **right question is “can we feed the world,” rather than “can Organic Agriculture feed the world.”** The major constraints to achieving universal food security are found in social, economic, and political conditions--more than in constraints regarding agricultural productivity capacity. One of the most important factors for poverty alleviation is rural development. Organic Agriculture, based on the Principles of Health, Ecology, Fairness, and Care, is the most advanced tool for rural development. The answer to wide-spread hunger lies more in political and institutional changes than technical innovation. Global food production is more than enough to feed the global population; the problem is getting food to the people who need it. As the Nobel Prize winning economist Amartya Sen (1982) notes "Starvation is the characteristic of some people not having enough food to eat. It is not the characteristic of there not being enough food to eat." Therefore, famine is fundamentally a problem of democracy, poverty, and food distribution. In fact, as pointed out by many farmers' associations (including Via Campesina), the current practice of northern, developed countries dumping agricultural products on markets in the southern, developing countries at artificially low rates enabled by agricultural subsidies is a major cause of starvation among rural populations in these southern countries. This dumping should stop. This would enable many people in the

⁵⁴ Organic Agriculture, environment and food security, FAO, 2002.

developing world to depend on fair, stable prices when they sell their own produce and would ultimately improve food security in these regions.

- **Organic Agriculture not only has the potential to increase the global average food productivity per ha, but also has huge potential when it comes to reversing the current degradation of agricultural soils.** Indeed, about six million ha of productive land are lost each year around the world, mainly in poor countries. This desertification process due to unsustainable agricultural practices can be stopped and reversed through Organic Agriculture, which helps build soil fertility, reduces erosion, and increases soil water retention and biodiversity. Maintaining the fertility potential of vulnerable lands across the globe is another important way in which Organic Agriculture helps sustain food production to feed the world.
- While most food production models are based on single-crop yields, organic farms have proved to be more effective in combining different crops on the farm and even within one field, therefore, enhancing the total productivity per unit of land. Finally, the implicit assumption is often made that we need to maintain the current patterns of crops. However, organic farming, with its emphasis on farm-produced feed for livestock, is likely to result in significant reductions in the total quantities of cereals and other crops used to feed livestock, emphasizing instead forages produced as part of maintaining soil fertility or produced in areas not suited to crop production. Consumer demand patterns may also change to favor diets with less meat as awareness of the environmental, animal welfare, and health costs of intensive livestock production systems increases. Hence, **along with a massive shift towards organic, future cultivation patterns may well change in favor of more sustainable, efficient, and productive production systems** that will make it even easier to produce enough quality food for all.
- In conclusion, a worldwide adoption of organic agriculture will not undermine the capacity of the world to produce enough food for all because often organic systems are more sustainable and can be as productive as conventional systems. This is not uniform at the moment because many organic growers are not yet producing their highest potential productivity level, which is not surprising given the small amount of resources dedicated to organic research and extension. Education on the best practices in Organic Agriculture is a cost-effective approach and will have to be scaled up substantially as soon as possible because **Organic Agriculture is the most efficient, most cost-effective, more sustainable, and fairest way to feed the world.** Nevertheless, whether all people have access to enough food is beyond the sole influence of Organic Agriculture as this depends highly on social, economic, and political issues.

Misconception Number 30: To feed the world, organic farming will have to plow under more wilderness areas.

See paragraph no 9.

Misconception Number 31: There are not enough cows in the world to provide enough nutrients in terms of cow manure for today's food crops.

Summary of Counter-Arguments

- Cow manure is not the only source of nutrients for organic farming; other sources of nutrients include, but are not limited to, green manure (leguminous plants), compost, mulch, and seaweed.
- Green manure actually has the potential to provide much more than the quantity of nitrogen provided currently by synthetic fertilizers worldwide.

Details of Counter-Arguments

- **Cattle and other farm animals are not the only sources of nutrients for organic farmers to maintain soil fertility.** First of all, cows and other animals do not themselves produce nutrients. They basically concentrate nutrients in a form that is easier to spread in the field (e.g., they collect nutrients from pasture lands through grazing, which they then process, assimilate, and concentrate the undigested parts in feces, defecate in the barn at night where the farmers can easily collect the manure to be spread on their crop fields. Hence, these animals allow nutrient transfer within the farm, which facilitates maintenance of nutrient/mineral soil fertility. In addition, the animals provide organic matter that increases biological fertility of the soil and stabilizes its physical structure (something that synthetic fertilizers used in conventional agriculture cannot achieve). There are several other methods that are used by organic farmers to recycle and redistribute nutrients within the farm, as well as to increase the organic matter content of their soils. Applying compost and mulch with crop and other vegetal residues from the farm also commonly contribute to soil fertility and structure on organic farms. Furthermore, in developing countries, small organic farmers use a range of creative practices, such as collecting alga from farm ponds to spread on crop fields.
- In addition to the nutrient sources available on-farm, **organic farmers can use several methods to bring in nutrients into the farming system, which helps compensate for soil nutrient losses caused by harvest.**
 - Green manure refers to the use of leguminous crops such as clover, alfalfa, beans, peas, groundnuts, and other such plants to increase nitrogen content of the soil. These plants, through a symbiotic association with bacteria, capture the nitrogen in the air and fix it in their own cells, but also directly release some of it in the soil. It is now widely recognized that planting green manure plants between growing seasons provides enough nitrogen to the soil, organically, without synthetic fertilizers. In fact, scientists have recently demonstrated that

some agrichemicals significantly disrupt symbiotic nitrogen fixation.⁵⁵ Therefore, green manure plants have even more potential under organic management.

- Mineral fertilizers are natural fertilizers such as natural phosphates, mineral potassium, and calcareous and magnesium amendments that are allowed in Organic Agriculture.
- There are other fertilizing inputs that organic farmers can use (e.g., guano, seaweed, biodegradable byproducts of food, feed, oilseed, or textile processing, wood and forestry products, and peat).

The needs and uses of nitrogen vary depending on the region of the world, but overall, much more nitrogen comes from green manure than from animal manure.⁵⁶ Analyzing 77 studies conducted in temperate and tropical countries, scientists from the University of Michigan concluded that **an increased use of leguminous plants could provide 58 million tons more nitrogen than the current quantity of synthetic nitrogen used every year for agricultural production.** Research at the Rodale Institute in Pennsylvania showed that red clover used as a winter cover in an oat/wheat–corn–soy rotation, with no additional fertilizer inputs, achieved yields comparable to those in conventional control fields. Even in arid and semi-arid tropical regions such as East Africa, where water availability is limited between periods of crop production, drought-resistant green manure plants, such as pigeon peas or groundnuts, could be used to fix nitrogen.

Misconception Number 32: Animals grow more slowly under organic production.

Summary of Counter-Arguments

- Growth rate is not the only characteristic desired by organic breeders and farmers; they also consider animal longevity, health, and adaptability.
- Organic farmers do not sacrifice animals' welfare and consumers' health at the expense of productivity. Hence, animals may grow more slowly under organic management, but it is a worthwhile investment.

Details of Counter-Arguments

- **Organic Agriculture requires that the growth capacity of animals not be the only aspect considered when breeding, selecting, and managing farm animals.** For example, it is necessary to consider whether specific breeds are well-adapted to local and organic conditions. Until now organic farmers have depended, to a high degree, on species that are adapted to the demands of

⁵⁵ Proceedings of the National Academy of Sciences (June 12, 2007, vol, 104, no. 24, 10282-10287).

⁵⁶ Can Organic Farming Feed Us All? World Watch, Volume 19, Number 3, May/June 2006.

conventional agriculture. Breeders typically focus narrowly on a high productivity at the lowest possible price. Meanwhile, organic farmers need to consider the breeds' robustness and the ability to resist diseases. Thus, growth rate has to be considered together with animal longevity, health, and adaptability. Lower susceptibility to diseases means less management and fewer medical costs; adaptability results in more efficient and specific use of the land.

- **Conventional agriculture relies on certain practices that do increase growth rates, but at the expense of consumer health and animal welfare.** Animal growth under conventional farming can be forced through the routine use of antibiotics and, in certain countries, hormones in the animals' feed with obvious negative effects on human health. To decrease the animals' energy expenditures, and thereby increase their food intake to body weight growth ratio, conventional farmers often restrict farm animals' to almost no movement at all, ignoring their most basic physiological and behavioral needs. The animal feed concentrates provided to conventional animals to boost their productivity are often maladapted to their physiological needs and result in digestive and other health problems.
- Often (in contrast to the short productive life that characterizes conventional livestock), organic systems allow animals to grow and live longer, with improved welfare and constant and satisfactory productivity. Hence, **organically-managed cows, hens, and sows may take longer to reach their adult size, but this is a worthwhile investment because their productive life will typically be longer.**
- **Finally, it is not always the case that organic practices reduce the growth rate of animals.** For example, a Dutch pilot study⁵⁷ showed that suckling calves show increased growth, as well as better health, compared to bucket-fed calves, and later develop into bigger, heavier animals with increased milk production.

Misonception Number 33: Organic Agriculture uses the primeval forest as the reference for good agro-ecosystem management for food crops, especially advocating for multi-cropping and biodiversity. However, all our important old world cereals (rice, wheat, sorghum, and millet), which constitute the staple foods for most people, are wind-pollinated cereals that have immediate wild relatives growing in vast monodominant natural grasslands and have very little to do with primeval forest conditions. Applying the primeval forest model to these major crops, when the reality of these crops is the exact opposite, is an assurance of poor yields and subsequent starvation.

⁵⁷ Langhout J. (2006) Suckling systems at organic dairy farms in The Netherlands. Proceedings QLIF International Training and Exchange workshop 20-22 February 2006, Driebergen, The Netherlands

Summary of Counter-Arguments

- The primeval forest is a highly stable ecosystem that is particularly relevant to humid tropical areas and indeed a very good reference for organic systems in these regions, but it doesn't have to be applied everywhere. Organic Agriculture must adapt to local conditions.

Details of Counter-Arguments

- Organic Agriculture does not recommend using the primeval forest ecosystem as a reference for all crops and all regions of the world. Clearly, the primeval forest is a highly stable ecosystem that is particularly relevant to humid tropical areas. In such areas, building agro-ecosystems that are inspired by the primeval forest ecosystem is a very good way to ensure soil fertility and stability and, therefore, sustained production. Traditional systems including intercropping and agroforestry are generally recognized as best practices in these regions. Local cultures have already realized this and have developed staple foods that are not cereals, but instead more locally adapted crops such as bananas and tubers. However, **Organic Agriculture does not imply that all farmers have to manage their cropping system as if they were located in humid tropical areas.** No organic farmer in Europe manages his cereal-animal based production system as a tropical forest! Organic Agriculture standards, instead, state that organic farming benefits from the quality of ecosystems and is adapted to its local environment. Organic farmers are requested to protect biodiversity and nature conservation, but this does not mean planting a range of trees every five meters in their wheat plot! It means that on the farm, there should be some areas that can act as wildlife habitat, such as areas that are not under cultivation and are not heavily manured (e.g., extensive grassland, copses, extensive orchards, and bushes).
- **Conventional farmers, by applying large amounts of pesticides, herbicides, and fertilizers on their cereal plots, are not imitating the natural ecosystems of the wild relatives of these species.** Agriculture is by definition a human-induced modification of the ecosystem, geared towards producing more food than the purely natural ecosystem would produce. However, it is all a matter of balance and of limiting the negative impacts of our agricultural activities on the environment. Organic Agriculture is working towards achieving this balance by ensuring sufficient overall productivity of the agro-ecosystem while guaranteeing the maintenance of its production potential in the mid-term and long-term, and respecting and valorizing the environment and its natural cycles.

Part F: “Organic agriculture is not more socially just”



Misconception Number 34: Buying organic does not help maintain small family farms since most of the organic food available in the market actually comes from a few large-scale organic farms, often located far from the point of sale.

Summary of Counter-Arguments

- Buying organic does help maintain family farms, improve smallholders' livelihoods, and maintain diverse landscapes. However, organic certification does not guarantee a “small farm” and local sourcing. If consumers are interested in these features, they must proactively seek the corresponding products.

Details of Counter-Arguments

- It all depends on what we call big! In North America, the average size of an organic farm is around 180 ha, including pastures and non-cultivated areas. In France, the average size of an organic farm is about 50 ha. Clearly, depending on the locality and the production system, a minimum size is required to be viable, but this minimum is often smaller in organic than in conventional agriculture. **The majority of organic farms are family farms employing primarily family members.** Organic certification does not guarantee that the product is coming from a “small,” local family farm. **If consumers want to be sure to help maintain small, family farms, they should look for additional buying criteria other than organic certification.** For instance, they can buy organic food through a local Participatory Guarantee System in which small, local farms participate, or they could buy directly from the small-scale, local organic farmer.
- **Many organic products imported from developing countries (e.g., coffee, cacao, cotton, sesame, and groundnuts) are actually grown by very small producers.** Buying these products organic helps to sustain the livelihoods of these farmers through premium prices and promotion of sustainable production practices. Group certification systems that are used to certify these smallholders collectively include quality management systems that, when they are managed by the producer organizations themselves, contribute to empowerment, capacity building, and community development.

Misconception number 35: Organic Agriculture is more concerned about nature than people.

Summary of Counter-Arguments

- Organic Agriculture cares about both nature and people. It sees the well-being of the soil, plants, animals, humans, and the planet as one and indivisible. It is obvious that the well-being of humans depends on the quality of their environment.

Details of Counter-Arguments

- Organic Agriculture is concerned about both people and nature. Out of the four Principles of Organic Agriculture (Health, Ecology, Fairness, and Care), at least three of them are intimately linked to the welfare of human beings. Organic Agriculture is a **holistic production system that does not separate people from their environment**. Organic Agriculture cares and helps sustain the well-being of the soil, plants, animals, humans, and the planet as one and indivisible. It is common sense that the life and welfare of human beings depends heavily on the quality of our environment, the sustained availability of natural resources, and the capacity of ecosystems to continue providing ecological services, such as clean water.
- What is true is that Organic Agriculture is more concerned about nature than conventional agriculture. Therefore, Organic Agriculture cares more for future generations than conventional agriculture. **The human species is subject to the same general rules as all other living beings: its maintenance and development depends on the availability of natural resources and the relative stability of its general living environment.** Although human beings have developed unlike any other living species on earth, they remain vulnerable in many ways. For instance, while bacteria and insects have proven to be capable of quickly adapting to toxicological threats (such as antibiotics or insecticides) due to their small size and very short reproduction cycles, the capacity of human beings to adapt to ever-increasing chemical exposure is much lower. The rate of invention of new pesticides and other chemicals is accelerating, while our generation time is relatively long (a couple of decades) compared to that of bacteria (a few hours) and increasing (on average humans have children at a later age than in the past). Therefore, there is little chance that the human species will ever “adapt” to the pollution in the environment. The consequence of this is the inevitable increase in certain diseases, such as cancer (e.g., cancer incidence increased by 25 percent in the UK between 1975 and 2004; cancer-related deaths increased by 16 percent in France between 1980 and 2000), allergies, asthma, and congenital disorders (which irreparably affect the genetic capital of the human species). Hence, there is no doubt that considering both nature and people is the best way to safeguard people’s welfare now and in the future. Recent environmental crises (e.g., global warming, desertification, and water pollution) have been unquestionable demonstrations that the disruption of natural cycles directly and strongly affects people’s well-being and survival.

- In addition to considering how the condition of our environment affects people, **Organic Agriculture is concerned about the social well-being of people within their human communities.** Organic agriculture builds on relationships that ensure fairness, equity, respect, and justice between the different actors of the food chain. Most Organic Agriculture standards contain specific social standards to ensure that issues such as child labor and worker and human rights are given due attention. Organic farmers and farm workers are not poisoned by pesticides as is the case for three millions of their conventional counterparts every year. Consumers derive a range of health benefits from consuming organic products (as addressed in Misconception number 2). Therefore, when you buy organic food, you not only contribute to protecting nature, you also contribute to a healthier, safer, fairer, and better world for you, your children, and other people.

Misconception Number 36: The organic food sector is becoming a big business, attracting supermarket multinationals that are gaining more and more of the share of organic sales to consumers. These companies put increased pressure on suppliers and eventually farmers (whether organic or not) to reduce prices and increase standardization of produce. Hence, the organic industry, by selling out to big businesses, is losing its fundamental values. There is no point in buying organic food in supermarkets.

Summary of Counter-Arguments

- Supermarkets are indeed gaining a larger and larger share of food supply, a trend that is true for both organic and conventional foods.
- This seems to help bring consumer prices down, and increase the volume of the organic market, without necessarily driving producer prices down.
- Standardization doesn't necessarily translate into lowering organic standards. Supermarkets are often even more demanding and risk-averse when it comes to complying with organic standards.
- There are still many alternatives to buying organic food in supermarkets, including cooperative organic shops, on-farm sale, farmers' markets, fair trade, and organic shops.

Details of Counter-Arguments

- Increased supermarket penetration is indeed the current trend of the food supply chain, whether organic or conventional. As the organic sector develops and becomes more mainstream, organic products naturally find increasing space on supermarket shelves. Increased standardization is also largely due to consumers' expectation. **Should we blame the organic sector for being demand-driven?** After all, the entire voluntary certification system is based on satisfying specific consumer expectations. Supermarkets are fairly efficient in their distribution and do have the potential to spread organic produce to the broad population at a lower price due to bulk purchase and sales and other economies of scales.

- A recent study of the organic market in the EU showed how little correlation there is between consumer and producer prices for organic food in the EU. Low prices in supermarkets seem to be mainly due to more efficient logistics. It is, therefore, reasonable to assume that **the large scale introduction of organic products into supermarkets do help bring consumer prices down and, thereby, increase the volume of the organic market, without necessarily driving producer prices down.**
- **Standardization does not necessarily mean lowered organic standards.** The fear that supermarkets are driving down organic standards is hard to substantiate. On the contrary, countries with the highest supermarket penetration are also the countries where supermarkets insist producers follow private standards that go beyond the regulatory minimum. Supermarket chains are also particularly risk-averse when it comes to the risk of fraud among their organic suppliers, as a fraud scandal would have huge financial consequences. They often organize their own additional controls to decrease this risk.
- Organic certification is mainly about guaranteeing that a certain production system has been used to produce and process the products that consumers buy. Where consumers chose to do their shopping and which kind of actors take part in the supply chain is beyond the scope of organic certification. Of course **there are always some organic producers and consumers who refuse to use mainstream market channels, choosing instead to conduct business in the context of local markets, cooperative organic shops, online sales, and many other alternative marketing channels.** This is useful and should be encouraged, but the organic food sold in supermarkets is still organic, and the bigger the choice of organic foods offered by supermarkets, the more consumers will turn to organic food.

Misconception Number 37: Organic agriculture is labor intensive, which means that an increased burden is placed on families affected by HIV/AIDS or war in developing countries when they practice organic agriculture.

Summary of Counter-Arguments

- In most poor countries, land and capital (rather than labor) are the limiting factors.
- Organic Agriculture may require more labor, but it generates increased income through premium prices and reduction of other input costs.
- There are a range of very efficient labor saving technologies and methods that can be applied in Organic Agriculture in developing countries.
- Organic Agriculture provides better nutrition and a safer environment, which are very important for HIV-affected populations.

Details of Counter-Arguments

- It is true that Organic Agriculture is often more labor intensive than conventional agriculture. For instance, Organic Agriculture encourages the maintenance of soil fertility through methods (such as compost and manure

application and anti-soil erosion landscaping) that are labor intensive. In developing countries, these practices are generally performed by hand or with limited technologies, which imply the availability of an adequate workforce. However, **in many areas of the world, land and capital (rather than labor) are the limiting factors** (except in the peak labor periods of the seasons, but these generally correspond to periods of ploughing and harvesting, which require labor regardless of whether the crops are conventional or organic). In most developing countries labor tends to be cheaper than chemical inputs (such as fertilizers and pesticides), which is one reason why a switch to organic farming in developing countries is typically a profitable option. A labor intensive agricultural system, when it creates surplus income, which is the case for Organic Agriculture, helps generate both employment and income opportunities for rural populations and help control massive emigration towards urban centers. Increased income helps AIDS-affected populations purchase medicine and, thereby, improve their health condition.

- **There are a range of labor saving technologies and methods that can be applied in Organic Agriculture in developing countries.** These include the use of cover crops to control weeds and protect against soil erosion, the use of direct mulching with crop residues, and reduced tillage. For example, if properly managed, green manure/cover crops can produce from 50 to 140 T/Ha (green weight) of organic matter with limited work (i.e., no transporting of material and no layering or turning over of compost heaps). In fact, in some cases, the green manure/cover crops' success in controlling weeds results in a decrease in net labor costs. In addition, the above mentioned practices often represent an investment in the land that leads to higher productivity in subsequent years. This means that higher yields can be obtained as a result of these practices and the improved incomes can be used to compensate the additional labor by helping the family pay farm workers.
- **Finally, Organic Agriculture has several attributes that benefit HIV/AIDS-affected populations.** Nutrition is key to strengthening and maintaining a healthy human immune system in the face of infection with HIV to delay the onset of AIDS, provide the adequate foundation for any pharmaceutical treatment and reduce its negative side-effects, and generally enable maintenance of an active life. Organic farming is specifically designed to produce quality foodstuffs and diversified organic farming systems are the best basis for balanced nutrition. Organic foods contain more nutritious properties and fewer health-damaging properties than conventional food (see counter-arguments to misconception number 2). Organic Agriculture also preserves water resources from nutrient leaching. In conventional agriculture, pesticides, fertilizers, and maladapted soil and nutrient management practices are main factors that contribute to drinking water contamination, which, in turn, is a major cause of infection and disease (to which immunodeficient people are particularly vulnerable. The misuse of antibiotics in livestock rearing in conventional agriculture is another problem, as it leads to increased antibiotic resistance in humans, which reduces the effectiveness of antibiotics used to treat infectious diseases. Organic Agriculture prevents agricultural workers from handling pesticide and also prevents subsequent pesticides exposure and poisoning that exacerbate the already weakened immune systems of farm workers who are living with HIV or AIDS.

Misconception Number 38: Organic farmers can only survive because they get subsidies; the system is not fit for economic competitiveness. The organic sector is eating tax-payers money and it goes into the pockets of a few manipulative individuals.

Summary of Counter-Arguments

- Organic farmers are far from being the only ones who get subsidies. These days, in northern countries, most conventional farmers can only survive because they get subsidies!
- Subsidies for organic farmers are aimed at encouraging positive externalities (such as environmental services) provided by this type of farming to the society at large.
- The impressive growth of the organic sector in developing countries, where farmers receive no subsidies at all, is proof of its economic viability.

Details of Counter-Arguments

- First, **organic farmers are not the only ones who receive subsidies.** In the US, most organic farmers and those transitioning to organic farming get no subsidies at all, or very few, while huge chemical-intensive corporate farms (10 percent of US farms) get the lion's share (80 percent) of the nation's \$20 billion in crop subsidies every year. In France, an organic farmer receives, on average, 20 to 40 percent fewer subsidies than a conventional farmer. In 2003, the EU support for Organic Agriculture was 635 million euros, whereas the total Common Agricultural Policy budget amounted to 50 billion. This means that Organic Agriculture received 1.3 percent of the agricultural support, yet, at the time it represented 3.9 percent of the total EU agricultural area.
- Second, there are many "externalities" (whether positive or negative) attached to a given mode of production. "Externalities" refer to all the impacts that the mode of production has on the society at large, beyond the production system itself. For instance, if a farmer pollutes the river with nitrates, this is a negative externality. The farmer himself will not be directly financially affected by the problem, so he does not integrate the negative impact of his activities into his decision of whether or not to spread fertilizers. Yet, the cost of "cleaning up" the water and de-polluting the environment will have to be paid by society at large, which means that tax-payers will end up paying for de-polluting one way or the other. This is a case of a negative externality of the production system. On the other hand, when a farmer decides to adopt production methods that will improve the visual appearance of the landscape (e.g., planting hedges and trees or maintaining small running streams on the farm) people around him will benefit, some of them even financially (e.g., through tourism in the region). Therefore, something that can have no significant financial benefit for the farmer himself can be valuable at the society level. This is a case of a positive externality. Logically, **to attain the best possible societal outcome, the state or local administration has to provide incentives to encourage positive externalities and to discourage negative externalities. This is the essence of many subsidies that organic farmers receive.** For instance, organic farmers can receive a subsidy for protecting

biodiversity on their farm through the application of specific production methods (e.g., cutting grass late enough in the season to allow reproduction of endangered grass species or maintaining hedges to provide habitat for birds and other animals). In addition to subsidies that are bound to the implementation of specific measures, organic farmers sometimes receive general financial support from their government because it is now widely acknowledged that organic agriculture, as a holistic production system, brings many positive externalities to society and avoids many negative impacts, such as water pollution and depletion of soil fertility. **Governments have therefore started to realize that by spending a bit of extra money on organic farmers, they will avoid many other costs** (e.g., pollution-related costs) and will help rural development by keeping farmers on the land and keeping the rural landscape attractive to everyone.

- Other forms of financial support granted to organic producers are distributed similarly to other public support schemes (i.e., based on criteria established by the competent authority). The accusation that the organic sector is controlled by a handful of manipulative people who gather enough power to influence authorities and ultimately put tax-payers' money in their own pockets is unsubstantiated. The organic sector is one of the most egalitarian sectors within agriculture. The organic movement started through grassroots initiatives and gradually obtained official recognition. The private organic sector at the international level and at national levels is essentially organized on the democratic principle of one organization (or farm, depending on the level of organization) = one vote. Organic Agriculture is also regulated at the public level in most countries where it is significantly developed, and the democratically elected representatives of these countries are typically the ones deciding on such public regulations and programs, ideally with consultation with private organic sector representatives.
- The impressive growth of the organic production sector in developing countries, where there is virtually no public support for Organic Agriculture, is proof of the economic viability of the system in these regions. Conversion to organic farming in such areas is driven by market forces, with demand for organic products experiencing sustained growth globally.

Misconception Number 39: Seasonal workers in Organic Agriculture are not treated any better than in conventional agriculture.

Summary of Counter-Arguments

- Organic standards do not generally distinguish between seasonal and permanent workers, but the condition of workers of all types is usually better and safer on organic farms than on conventional farms.

Details of Counter-Arguments

- It is true that organic standards do not generally distinguish between seasonal and permanent workers, resulting in little deliberate effort made specifically

on behalf of seasonal workers compared to other workers on organic farms. However, the condition of workers of all types (including seasonal workers) is often better on organic farms than on conventional farms, especially in developing countries. This is ensured through certification schemes, which refer to organic standards containing specific sections on social aspects and workers' rights. For instance, organic farms must: comply with all ILO (International Labour Organization) conventions relating to labor welfare, should not discriminate or mistreat employees, and should not hire child labor. Moreover, the organic inspection exposes the farm to the judgment of an outsider and this control in itself provides an incentive for the farmer to provide decent working conditions to its farm workers, including seasonal workers who are usually suffering from the worst conditions. **Hence, the situation for seasonal workers on organic farms is generally significantly better than that of their conventional counterparts.**

- In addition to social and legal considerations, **workers on organic farms benefit from safer and more pleasant working conditions (e.g., by not being exposed to pesticides and enjoying more diversified activities)**. In the conventional farming sector, three million farm workers worldwide suffer from pesticide poisoning every year.

Misconception Number 40: Organic certification is another protectionist measure designed to maintain the dominance in global markets of producers from developed countries by hampering access by small developing country producer to developed markets. Certification costs are a significant financial burden on producers in developing countries and create barriers to participation in the organic sector. Certification forces these farmers to conform to developed world standards of business that do not take into consideration the current capacities and infrastructure of most developing countries.

Summary of Counter-Arguments

- Organic standards are not stricter for imports than they are for domestic products, so they are no disguised protectionist measure.
- Developing countries have several comparative advantages when it comes to organic production, among which are cheap labor and traditional agrosystems that align more closely with organic standards.
- Organic certification costs for smallholders in developing countries are reduced thanks to the group certification scheme, a regulatory exemption accepted by all major northern importers.
- The growing number of developing country producers that enter the organic global market is proof that certification costs and standard requirements do not represent insurmountable barriers to trade for smallholders in these regions.

Details of Counter-Arguments

- It is true that there are already many standards and requirements to which agricultural products must comply in order to enter northern markets. Some are compulsory (i.e., they apply to any food product entering the market) while others are voluntary (i.e., the farmers and the buyers decide for themselves whether to comply or require compliance with these standards). Examples of these voluntary standards include Fair Trade, EurepGAP, and Utz Certified (for coffee). These standards do not treat imports differently than domestically grown products. They ensure that consumers have similar guarantees for imported and domestically grown food. While on one hand this may pose a problem to developing country farmers who may have less capacity to comply with the rules than European or US farmers, **when it comes to meeting organic standards, developing country farmers often have a comparative advantage**, due to the following reasons.
 - Organic agriculture is more labor intensive and less capital intensive compared to conventional agriculture. Therefore, in developing countries, where labor is relatively cheap and capital relatively expensive, farmers are in better position to produce organic food at a lower cost.
 - Many traditional agricultural systems in developing countries are already closely aligned with organic production standards. For example, many of these farmers rely mainly on ecosystem management, crop diversity, and crop rotations to ensure the stability of their agricultural production. Furthermore, these farmers often have limited or no access to synthetic fertilizers and pesticides. Therefore, it is relatively easy for developing country farmers to meet organic standards because they are already in compliance with many of the standards in practice.
- **There exists a scheme to reduce the cost of organic certification for smallholders in developing countries.** This scheme, called group certification, is actually currently only allowed for farmers in developing countries. The scheme uses Internal Control Systems as a tool to reduce the cost of third party certification. For example, in India, the group certification scheme reduces certification costs to one-tenth of individual certification costs. Most organically-certified smallholders in developing countries worldwide are certified through the group certification scheme, which makes organic certification affordable and allows these farmers to be competitive in the international organic market. Moreover, there are a number of cases where the exporting company (rather than smallholders) is covering the organic certification costs, as well as some other initial investments associated with a transition to Organic Agriculture.
- Organic production standards focus on production practices rather than on organizational management. In this way, organic standards are easier for small farmers in developing countries to implement than many other voluntary or compulsory standards, such as those on food safety. Many of the specific organic requirements (e.g., not using synthetic inputs, improving soil fertility, and promoting biodiversity on the farm) are not difficult to comply with for

developing country farmers, even those with limited infrastructure or capacity. In addition, **many organic standards recognize that there are local variations and take them into account.** For instance, organic standards normally require that organically certified seeds are used for organic crop production, but mention that conventional seeds can be used in cases where organic seeds are not available (which is often the case in Africa). Other possible local adaptations for developing countries are currently under discussion. For example, the issue of animal feed sources is being considered in the revisions of EU organic regulations.

- One aspect of the current organic regulations is their lack of harmonization, which can hinder trade and make it complicated for producers who want to export their produce to several other markets (e.g., exporting to both the EU market and the US market). **The lack of harmonization is a problem for all producers, not just for those from developing country.** IFOAM is working on this issue with governmental and intergovernmental agencies through the International Task Force on Harmonization and Equivalence in Organic Agriculture.
- Finally, the facts speak for themselves: organic production is growing at a much faster rate in the developing world than in industrialized countries. The area of organic farmland has experienced triple digit growth in Africa, Asia and Latin America since 2000, compared to double-digit growth in other regions.⁵⁸ Most of the organic produce grown in developing countries is exported to Europe, the US, and Japan. **The fast growth in the number of producers in developing countries that enter the organic global market is proof that certification costs and standard requirements do not represent insurmountable barriers to trade for smallholders.**

Misconception Number 41: Organic farming is not easy. Organic farmers are alienated by hours of work and work-related stress due to pest invasion and diseases that endanger their crops and income. Most organic vegetable growers end-up with irreversible back problems due to hand weeding and other manual operations. In this sense, organic farming is not healthier for farmers than non-organic farming.

Summary of Counter-Arguments

- Very few farmers revert back to conventional farming after having converted to organic farming; this demonstrates that, overall, it makes them happier and results in an improved lifestyle.
- Organic Agriculture is also knowledge-intensive. When well-practiced, it reduces the amount of work spent on the agricultural practices themselves, as the farmer spends more time inquiring about and understanding how to best manage his agroecosystem.

⁵⁸ The World of Organic Agriculture, Statistics and Emerging Trends 2007.

Details of Counter-Arguments

- It is true that converting to organic farming will not instantly solve all your problems as a farmer. However, **there are very few farmers who revert back to conventional farming after having converted to organic farming**, yet the transition would be far easier in this direction (organic to conventional) than it was from conventional to organic because of conversion period requirements. This demonstrates that, overall, organic farmers are happy with their situation, that they can make a living from it, and that they find the advantages it brings more important than the disadvantages (otherwise they would revert to conventional farming). While it is true that in several cases organic farming requires additional manual work on the farm, the advantages include the following:
 - **Meaningfulness of the everyday work** as the farmers feels confident that he is producing good, healthy food without compromising the environment.
 - **Reduced exposure to pesticides** and other chemicals (in developing countries this is particularly important since there are approximately three million cases of pesticide poisoning every year).
 - **A more appealing and diversified farm/work environment**, which also enables many organic farmers (in the north) to diversify even further their activities through eco-tourism or educational activities.
 - **An improved and secured income** through premium prices and reduced dependency on credit and other financial “ties.” Using their increased income, farmers can address the problem of workload by recruiting more people to work on the farm.
- Organic farming also does not necessarily mean spending hours on hand weeding. In developed countries, hand weeding is used mainly by vegetable growers, while for most other production systems (such as those for livestock, cereals, trees and other major crops) weeding is mechanized so there is no increased physical burden on farmers due to organic practices. In fact, well-practiced, organic farming reduces the overall amount of time spent on the agricultural practices themselves; Organic Agriculture labor requirements can be greatly reduced through improved knowledge. This means that **the best organic farmer is not the one who spends the longest hours doing mechanical or hand weeding, but rather the one who takes the time to inquire about and understand how he can best manage his agroecosystem so as to reduce the amount of agricultural work**. Even for vegetable growing, there are several techniques that can be used to reduce the need for hand-weeding and other hard work substantially (year-round mulching is a typical example). These techniques are also applicable in backyard gardens,⁵⁹ where many people farm organically with ease and pleasure.

⁵⁹ See “Gardening without Work for the Aging,” from Ruth Stout for more details.

Part G: “The core idea behind the Organic Agriculture philosophy (“natural is good; synthetic is bad”) is overly simplistic”



Misconception Number 42: Organic farmers can use toxic natural pesticides based on the argument that substances produced by living organisms are not really chemical, but rather organic constituents of nature. In reality, the distinction between lab-created products and products created by living organisms does not make sense scientifically, since every biological process is fundamentally a chemical process.

Summary of Counter-Arguments

- Organic Agriculture relies primarily on ecological processes, biodiversity, and cycles adapted to local conditions. Chemical substances (even if natural) are used as a last resort.
- Naturally occurring pesticide molecules have two advantages over synthetic chemicals not present in nature: (1) ecology has evolved to deal with naturally occurring chemicals and (2) they have much shorter half-life, meaning pesticide residues on organic products are much lower.
- The synthetic versus natural criterion is not the only criterion used for allowable chemicals in Organic Agriculture. There are additional criteria related to consumer expectations, sustainability of production, human health and environmental protection.

Details of Counter-Arguments

- To prevent unacceptable losses from pests, diseases, and weeds, Organic Agriculture relies primarily on ecological processes, biodiversity, and cycles adapted to local conditions. It also uses living organisms and cultivation methods to control pests and weeds. **Chemical substances (even if natural) are used as a last resort.** Hence the decision process for use of chemical substances for pest and weed control is different in organic farming than in typical conventional agriculture, where the use of pest and weed control chemical substances is routine.
- It is possible to artificially create (i.e., in a laboratory) molecules that already exist in the “natural” world in such a way that there is no detectable difference in the end-product. Such **synthetic products (that are identical to those existing naturally) may be allowed in organic agriculture, provided they**

are not available in sufficient quantities and qualities in their natural form, and provided that all other criteria (see below) are satisfied.

- It is also true that some natural pesticides (even those used in Organic Agriculture) can have harmful effects on human health if they end up in our food. However, **every year the agro-chemical industry creates new active substances composed of molecules that do not exist in living ecosystems and for which the negative human health effects are unknown**. The most relevant difference between “natural” and “artificial” pesticides is the length of time they persist in the environment (i.e., half-life). Because “natural” pesticides use molecules that are already present in the environment (e.g., such molecules may be part of a specific plant), biological mechanisms have evolved to deal to these molecules and there are frequently organisms that are capable of quickly “digesting” such molecules (e.g., bacteria and fungi). While natural pesticides normally degrade in a matter of a few days, synthetic pesticides often persist for several months to tens of years (e.g., Toxaphene/Camphachlor has a half-life between 70 days and 12 years depending on climate and soil conditions). If the natural pesticide is applied with sufficient time prior to harvest, there is very little chance that it will end up in our food. Organic products have consistently shown insignificant pesticide residues as compared to conventional products.
- For the reasons presented above, naturally occurring plants, animals, fungi, bacteria, and other organisms are generally allowed as inputs in organic agriculture. Natural substances that undergo physical transformations, either by mechanical processing or biological methods (e.g., composting, fermentation, and enzymatic digestion) are also generally allowed, since these processes can occur in nature and are therefore unlikely to create unnatural variations of these molecules. On the contrary, substances that are modified by chemical reaction are considered synthetic and, therefore, generally not allowed, except for certain products that are considered identical to those in nature, as mentioned above. Hence, yes, **every natural/biological process is fundamentally a chemical process, but every chemical process does not necessarily occur in nature, which is why the organic movement is so cautious about synthetic inputs**.
- **The natural versus synthetic criterion is indeed a too simplistic to define organic inputs and is NOT the only criterion used by Organic Agriculture. Inputs accepted under organic production meet the following criteria, at a minimum:**
 - *Necessity and alternatives:* Any input used is necessary for sustainable production, is essential to maintain the quantity and quality of the product, and is the best available technology.
 - *Source and manufacturing process:* Organic production is based on the use of natural, biological, and renewable resources.
 - *Environment:* Organic production and processing is sustainable for the environment.
 - *Human health:* Organic techniques promote human health and food safety.

- **Quality:** Organic methods improve or maintain product quality.
- **Social, economic, and ethical:** Inputs used in organic production meet consumer perceptions and expectations without resistance or opposition. Organic production is socially just and economically sustainable, and organic methods respect cultural diversity and protect animal welfare.
- Finally, Organic Agriculture minimizes the use of external inputs and encourages self-reliance of farms. Hence, plant extracts and other natural pesticides that can be produced on the farm are preferred to inputs purchased from manufacturers.