THE ETHICAL CONSUMER

A REPORT

THE DANISH COUNCIL ON ETHICS

The Ethical Consumer – Report

Published by the Danish Council on Ethics 2016
Front page illustration by Grafiraf

The publication can be downloaded from the website of the Danish Council on Ethics, www.etiskraad.dk

Contents

Preface

This present report has been prepared by a working group under the Danish Council on Ethics consisting of Mickey Gjerris (Chairman), Christopher Arzrouni (until retiring from the Council in July 2015), Jacob Birkler, Kirsten Halsnæs Lene Kattrup, Steen Vallentin, Signe Wenneberg and Christina Wilson as well as (in the latter part of the work) external expert member Jesper Ryberg, Professor in Philosophy and Theory of Science, Roskilde University.

The report has been considered and adopted by the Council at meetings held in November and December 2015.

The Council and the working group wish to thank a number of people for having contributed to the debate and made their knowledge available fin the process. They are:

Jørgen E. Olesen, Professor at the Department of Agroecology – Climate and Water, Aarhus University;
Jesper Ryberg, Professor in Philosophy and Theory of Science, Roskilde University;
Rikke Bagger Jørgensen, Senior Researcher at DTU, Department of Chemical and Biochemical Engineering;
Hanne Boskov Hansen, Special Adviser in the Danish Veterinary and Food Administration, Chemistry and Food Quality;
Morten Ebbe Juul Nielsen, Associate Professor, Department of Media, Cognition and Communication, University of Copenhagen; Christian Gamborg, Associate Professor, Section for Environment and Natural Resources, University of Copenhagen; Birte Boelt, Senior Researcher, Crop Health, Department of Agroecology, Aarhus University; Helle Tegner Anker, Professor, Consumption, Bioethics and Governance, University of Copenhagen; Søren Flinch Midtgaard, Associate Professor, Department of Political Science, Aarhus University; Henrik Saxe, Director for Global Decision Support Initiative, DTU; Mette Hjorth Mikkelsen, Academic Employee, Danish Centre for Environment and Energy; Julian Kinderlerer, Professor, Chairman of the European Group on Ethics In Science and New Technologies; Jesper Lassen, Professor, Consumption, Bioethics and Governance, University of Copenhagen; Lotte Holm, Professor, Department of Food and Resource Economics, University of Copenhagen; Lars Pram, CEO at the Danish Consumer Council; Martin Merrild, Chairman of the Danish Agriculture & Food Council; Karen Hækkerup, CEO of the Danish Agriculture & Food Council; Helene Regnell, CSR Manager in Dansk Supermarked Group; Bruno Sander Nielsen, Chief Adviser at the Danish Agriculture & Food Council; Thomas Søbirk Pedersen, Professor of Ethics, Roskilde University and member of the Ethical Council for Animals.

At the Council of Ethics' secretariat, Anne Lykkeskov acted as project manager for the work and together with Morten Andreasen and Ulla Hybel prepared the manuscript based on discussions in the working group and the Council.

October 2016

Gorm Greisen	Christa Lundgaard Kjøller
Chairman	Head of Secretariat

Summary

This report discusses the phenomenon of *The Ethical Consumer* – the notion that consumers through their consumption take responsibility for the ethical problems that the production of food may cause: This could be the products' impact on the environment and the climate, excess consumption of scarce resources, a problematic perspective on nature, poor animal welfare, etc. The Council discusses if, in some situations, consumers could be said to have an obligation to take such considerations into account, and if, in some cases, we should impose regulatory instruments such as prohibitions, taxes or labelling instead of leaving the responsibility to the individual consumer.

Ethical consumers are guided by their values, and some values are not shared by everyone – they could be founded in religion, e.g. prescribing that meat and milk should be kept separately. This type of values are probably best suited to guide the individual consumer without committing others to do the same. Other values are more fundamental and common, and the report will discuss such values and when the production of food can be said to have consequences that go against them. One value that is shared by most people is that we are not permitted to commit acts that inflict serious harm to other people. Many would also agree that we are not permitted to cause serious harm to animals or to nature through the production of food. There is, however, no general agreement on which harmful acts are so serious that committing them would be ethically wrong.

Chapter 2 discusses questions such as: Is it even relevant to take ethical concerns into account when we buy food? If so, which considerations should we take? When should the consumer take responsibility that ethically problematic products are not manufactured? And how do we handle it if the values of different people collide?

The subsequent chapter 3 will look closer at the phenomenon that consumer surveys show that 'naturalness' is perceived by many as an important value in food choices. There is, however, no common understanding of what it really means that a food product is natural, given the fact that all food products are, to varying degrees, processed by humans.

In Chapter 4, the Council considers ethical consumption related to two areas that some believe are associated with ethical problems when it comes to food production. These areas are:

Food from animals fed GMO: In Europe, there is persistent consumer opposition to genetically modified crops – a resistance that is unaffected by scientific risk assessments showing that there is no evidence that the use of GMO in itself has caused adverse health and environmental impacts. Some consumers have therefore expressed a wish to extend the labelling of GMO-containing food products to cover also food produced from animals fed GMO.

A majority of the Council members recommend that animals fed GMO crops be labelled, but the members base their recommendations on different types of arguments. The majority does not consider GMO in itself to be any more problematic than other breeding forms, but they favour a labelling system in respect of the the right of sceptical consumers to be able to avoid such foodstuffs. It could, however, be discussed if a separate labelling system is needed or if it suffices to refer consumers wanting to avoid these products to buy food with the official organic label. Some members find that GMOs give rise to ethical problems that do not have to do with risks, and one member distrusts the safety of GMO cultivation altogether. One member does not find that there is any basis for further regulation of GMO.

Climate-damaging food products: Food products account for 19 %–29 % of global anthropogenic greenhouse gas emissions, of which cattle alone account for about 10 % of the emissions. So, there could be major benefits for the climate – and thus all the people who are affected by global warming – if especially the populations in the western countries were to adjust their food purchases to more climate-friendly behaviour. This would especially require a reduction in the consumption of meat from ruminants, which emit large amounts of the greenhouse gas methane. It is presently left entirely to consumers to judge whether they ought to pursue climate-friendly behaviour.

A majority of the Council members recommend putting a tax on beef. The main reason is beef's massive contribution to climate change, which is an ethical problem because it harms other people and constitute a serious threat to the global society's development and to nature. The members realise that the best solution would be to introduce supranational taxes and that ideally any such taxes should be put on all foods according to their degree of climate impact. But supranational measures could take time to roll out, and it is important to initiate measures that will produce short term effects and that send a clear signal to citizens if the development is not to accelerate out of control. Denmark ought therefore to take the lead with taxes, while the government simultaneously work to implement measures to counter the climate impact of food from both consumption and production, both in Denmark and internationally. A minority moreover find that, whether or not a tax can be introduced, consumers should act ethically whenever learning that their behaviour causes harm to others. One member furthermore favours measures at several levels, but is against a tax on beef. One member finds that the choice of pursuing climate-friendly behaviour should be left entirely to the ethical consumer.

1. Should it be left to consumers to save the world with their shopping trolley?

Over the past decades, a trend has emerged – *The Ethical Consumer*. The term covers the phenomenon that some consumers have started buying products based on considerations, which supplement the health-related, social, economic and practical concerns that have to do with the family's immediate wellbeing or with price or quality. Ethical considerations can also be private, but over the past years factors such as the products' impact on the environment and the climate, excessive consumption of scarce resources, perspective on nature, etc. have tended to also influence the food choices of some consumers.[1]

When some consumers take action, it could be seen as their way of demonstrating that they find the political countermeasures for ethical problems linked to some areas of food production to be insufficient. For example, a lot of people find that politicians, for various reasons, appear incapable of effectively addressing long-term, global threats to the environment and the climate. Ethical consumption may in this connection be seen as an initiative towards letting the market solve the problems. The development is to be reversed by increasing demand for sustainable products and conversely reducing demand for non-sustainable ones.

There are a many types of ethical and value based concerns to consider in food production. Some of them, e.g. religiously motivated diets that call for meat and milk to be separated, are probably best left for the individual consumer to decide. They are based on values that are not shared by everyone, and it should therefore be up to each person to decide if it is something he or she wants to live by. Other ethical concerns, however, appear so important and general in nature that it abating by them should not be left to the individual, overstrained consumer. For example, society does not leave it to the free choice of individuals whether or not they want to buy foods that fall short of official health requirements.

This report looks at ethical food consumption and discusses when there is a just cause to leave it up to consumers whether or not to take ethical considerations into account in food choices. Obviously, the individual consumer is al-

[1] See for example Holm, Lotte 2014

ways free to apply ethical considerations, but the decisive factor is whether we should rely on the consumers' ethical judgement or if there are cases where regulatory instruments such as bans, taxes or labelling should be applied. This could be relevant in cases where production has impacts on other people, the surrounding nature or future generations. In other words, in what situations would it be too ineffective to rely on the individual consumer in relation to ethical problems that arise from the production of a given food product, so that he responsibility should be shared through government e.g. imposing taxes or bans on certain foods? The report will discuss two areas that in which food production give rise to ethical problems:

1. **Food from animals fed GMO:** In Europe, there is persistent consumer opposition to genetically modified crops – a resistance which has continued unabated since GMO crops were first introduced in the 1990s. Evidently, opposition remains unaffected by scientific risk assessments showing that there is no evidence suggesting that the use of GMO in itself has caused significant adverse health or environmental effects, neither directly nor unambiguously. Regardless of these risk assessments, 61 % of Europeans reported in 2010 that they were concerned about genetically modified foods, and 57 % stated they found that genetically modified crops benefit some people but put others at risk.[2]

   The resistance has made the EU reluctant to authorise GM crops for cultivation, and the EU has introduced a labelling system for foods consisting, containing or produced from genetically modified organisms. Consumers who find GMOs ethically problematic thus have the possibility of avoiding them in the 'first link' so to speak. Some consumers have, however, expressed a wish to extend the labelling to food from animals fed GMO. In Chapter 4.1, the Council discusses if the present labelling system should be extended to cover food from animals fed GMO crops.

2. **Climate-damaging food products:** These years, there are growing concerns that the production of particular food types is a major cause of anthropogenic climate changes. Food products account for 19 %–29 % of global anthropogenic greenhouse gas emissions,[3] of which the livestock sector accounts for 14.5 %. 41 % of this sector's emissions come from beef production, while dairy cattle account for 20 %,[4] i.e. cattle alone account for about 10 % of human beings' total greenhouse gas emissions. So, major benefits could be achieved for the climate – and thus all the people who are affected by global warming – if especially the populations in the western countries were to adjust their food purchases to more climate friendly behaviour. And especially, if they consumed far less meat from ruminants, which emit large amounts of the powerful greenhouse gas methane.

[2] European Commission 2010a, 18
[3] Vermeulen, Sonja J. et al. 2012, 198. This number includes all stages of food production as well as packaging, transportation, sales links and the consumer's processing as well as waste disposal.
[4] FAO 2013, 15–16

Today, there are no regulatory initiatives aimed at reducing the production of the most climate-damaging foods. Buying products with thought for the climate is considered to be the responsibility of the individual consumer and no one else. In Chapter 4.2, the Council discusses if it should continue to be left to the consumer to consider the climate, or if the extent of the problem calls for the imposition of taxes or other restrictions on food consumption.[5]

1.1 Consumer or societal responsibility?

The assessment of whether it should be left to consumers to take ethical responsibility by avoiding or selecting various foods includes a wide range of considerations. If ethical considerations are based on values acknowledged by most people – e.g. the notion that products should not be manufactured in ways that seriously harm others or involve undemocratic or discriminating acts against people – compliance with the values should perhaps be secured by law so that consumers cannot dismiss those considerations.

It is legitimate to legislate against harm to others, but in reality it may be difficult to determine when somebody causes such serious harm to others that society ought to intervene. There will be no consensus as to what 'others' we should show consideration to. Are we talking about other people, or should we also think of animals and nature? The question of which creatures belong to the ethical community, with a right of ethical consideration, is a topic of much debate. Different positions will be presented and described in Chapter 2.[6]

When it comes to ethical considerations based on philosophies of life or perceptions of the right way of living that do not persuade other people, it could be right to leave the choice to the consumer. For example, some consumers find it important to consider their food products to be natural. But there are probably no foods that can be claimed to be completely natural if that means untouched by human beings. And different people hold different views about *how much* human beings are allowed to alter a food before it is no longer natural. Others yet are just not concerned with whether or not foods are natural. All in all, it would be both difficult and controversial if the state was to introduce rules or taxes to promote 'natural' food products. In Chapter 2, we discuss different approaches to these ethical questions.

So, it is in fact rather difficult to draw a dividing line between ethical concerns that each of us should take for themselves and concerns that should be safe-

[5] The theme of the report is Ethical Consumption, and therefore the main focus is on consumption, even though there could be valid arguments to also target emissions at the production level.

[6] Section 1 of the Act on the Danish Council on Ethics provides that 'Respect for nature and the environment is based on the premise that nature and the environment have value in themselves.' The Council members are, however, divided on the question of whether the nature and the environment can be said to have value in themselves. As mentioned, the question will be discussed from various philosophical angles in Chapter 2.

guarded by common rules to ensure compliance. But if the production of a given food product, in fact, causes major ethical problems, it would be ineffective to leave it to the consumer to stop the manufacture of the product. The reason is that several aspects keep many people from devoting time to learn complex knowledge about production matters and act accordingly. In the climate area, the contributing aspects are:

- The individual's effort *in itself* makes only a very small difference for nature and the climate. It makes many people feel their efforts have no real effect.

- This tendency is intensified by the fact that many become discouraged when they see that others fail to take their share of the responsibility.

- The lack of support could be interpreted as a modern version of the so-called 'tragedy of the commons': The individual may perceive it as their self-interest to consume as much as possible and thus emit as much greenhouse gas as possible into the atmosphere, but when everyone is doing the same, the climate is destroyed to the detriment of all.

- Climate changes are 'far away' in space and time from the act itself (e.g. eating a beef), and the harm done to others is indirect and in the future, which makes it difficult to relate to at the supermarket counter.

- Climate-damaging foods are in reality too cheap since the costs of externalities such as restoration of climate damage are not reflected in the price. The financial incentive that ought to be in place to pursue climate-minded acts simply is non-existent.

Even if the consumer is in fact motivated and willing to go the extra mile and pay more to be an ethical consumer, the task could turn out to be a near mission impossible. Modern food production is extremely complicated, and it may be difficult for the consumer to know what processes the product has gone through before ending up in the supermarket. At best, it would be extremely time-consuming to find out – even if the product is labelled. Add to this that many product groups have no authorised labelling system; there are a number of company and industry specific systems each based on their own standards. This makes it more difficult for consumers to choose products according to their ideals.

1.2 How effective are labelling systems?

In response to the growing consumer interest for sustainable products, a number of labels and brands have been developed for the Danish market. These are labels that inform the consumers about anything from the environment, sustainability, reuse, what the product is made from, how to dispose of it and much more. Over the past years, supermarket chains have launched their own

brands, e.g. Änglamark, Grøn Balance (literally: green balance) and Levevis (literally: way of life). An analysis conducted by the Danish Competition and Consumer Authority and the Danish Environmental Protection Agency shows that consumers often perceive the supermarket chains' own brands as green labels that focus on the environment. The analysis covers 21 labels, including the official ecolabels: the Flower, the Swan and the Ø-label. It shows that the labels generally live up to what they signal, and there is a control system behind the labels. But when it comes to what the labels represent, consumers generally have little knowledge. Only 11 of 40 labels have a level of awareness of 50 %. A few labels have a level of awareness of 2–3 %. Generally, the increasing number of labels means that consumers find it more and more difficult to grasp what they stand for.[7]

An Australian survey shows that consumers often interpret the supermarkets' labels on their products to reflect degrees of animal welfare, implying that some of the products actually meet high animal welfare requirements.[8] But this is not necessarily the case; In Australia, it was left to the egg industry to establish a voluntary labelling system for the welfare of laying hens using three categories: cage eggs, barn eggs, and free-range eggs. The system was, however, criticised for imposing such lenient criteria on 'free-range hens', that these hens really did not have significantly better conditions than cage hens. Thus, the consumers who shopped at these large supermarket chains in Australia, in fact, had no possibility of buying eggs from hens that had more space. For the chains only sold products with the labels of the egg industry because they were cheaper than eggs from the manufacturers with higher animal welfare requirements. If they were to sell the latter products, the price level would increase – a scenario the supermarkets did not want.

So, the consumers who only shopped here could not buy eggs with more than minimal welfare requirements for the laying hens – not even if they bought eggs from free-range hens and probably did so believing that their animal welfare was okay. A number of other organisations introduced their own labelling systems, and some of them adopted higher standards for 'free-range hens' than the system of the egg industry. But these products were still only sold in special stores.

The many different labelling systems together with the shops' limited product range thus made it difficult for Australian consumers to shop according to their values even if they wanted to. Likewise in Denmark, researchers have demonstrated that some companies brand themselves as animal-friendly alternatives to conventional animal products even though their criteria are only marginally stricter in comparison.[9] The Council wants to call attention to the problem inherent in the fact that grocery chains have different labels based on their own criteria instead of labels based on criteria harmonised across all chains.

[7] Konkurrence- og Forbrugerstyrelsen 2013
[8] Parker, Christine 2013, 52
[9] Borkfelt, Sune et al. 2015, 195–200

The volume of labels makes it even more confusing for consumers who want to make ethically responsible food choices.

All in all, there are many factors that speak against leaving it to the consumers to take ethical considerations into account when there are important considerations to be taken. But when are considerations so important that the choice should not be left to consumers? The Council will discuss this and take a position thereon in this report.

2. Ethical consumption: Underlying value discussions

The focus of this report is the question of the extent to which consumers or society in the form of the state in three specific areas can and should avoid certain products based on ethical considerations. To first answer this question, it is necessary to consider if there are in fact important ethical considerations to take into account in the choice of foods. It could be the case if the manufacturing thereof is ethically problematic for other people – and/or animals and/or nature. And if in fact there are ethical considerations to take into account, is it then the responsibility of the individual consumer to show such consideration, or is it rather a shared responsibility requiring political action. The latter would require the state[10] to establish some form of regulation.

In this chapter, we will describe some different philosophical perspectives' on how food products can be said to be ethically problematic, and when we can argue that either individual persons have obligations or common political measures are needed. We will moreover show how different values are rooted in different views on the relationship between individual responsibility and collective responsibility. A criterion accepted by most approaches is that if a person's choice causes harm to others, then common societal measures are needed. State control is in place to ensure that nobody markets foods that are risky to consume. But in other cases, it is more difficult to determine when the risk of harm is big enough to necessitate regulation.

Another central question related to the harm done to others is the question of who it is that we must not harm? Is it limited to other people, implying that we are to avoid products which are for example manufactured by children? Or does it also extend to animals, so that we should avoid buying products such as foie gras, an area where many consider the animal welfare in production to be very low? Or is nature as such included, implying that we should avoid buying products manufactured at the expense of the destruction of important natural reserves? Or should we perceive the consideration for nature even wider to

[10] The essence of the discussion that follows is whether it is the individual person (in capacity as consumers) or the community that has ethical obligations in the choice of food. If this responsibility is shared, it is normally handled by the state, which disposes of the institutions needed to pass laws (the legislative power) and execute them (the executive power). Hereinafter, when we refer to the state, it means the authority that is responsible for the shared obligations vested in the community or society. The state has a monopoly of the execution power (through the police and military). It is therefore important to discuss what it must take to justify that it exercises power over the citizens. This is another important theme here.

include also products we perceive to be unnatural or to violate the natural order?

There is disagreement on what constitutes serious harm as well as on whom we should consider ethically. Also, there will be no consensus on other arguments such as whether foods are unnatural, are strong enough to justify governmental intervention. These differences of opinion reflect different values and therefore cannot be eliminated by obtaining more information or by increasing awareness. We will therefore also be looking at how the state should act in different situations when there is persistent public disagreement in relation to ethical questions.

These disagreements will be unfolded below; we will look at various approaches to the questions of the relationship between the individual and the state, human being and nature, etc., and on how they influence on some of the questions that consumers are likely to ask themselves when choosing dinner in the supermarket.[11] When the individual has simultaneous roles of both a consumer, taking care of his own and his family's preferences, and as a citizen, who is to consider the direction that society's food production and consumption ought to take.

2.1 Should consumers take ethical considerations into account when buying foods?

Why think of ethics when you shop?

Most people are likely to say that what you have for dinner is nobody's business but your own. But ethical questions have to do with the considerations that we ought to take to others, and if we buy food that is produced in a manner that impacts others (humans, animals or nature) in a seriously negative way, then your food purchases are ethically relevant. A severe example could be foods produced under conditions exposing the workers to danger.

In other examples, people are much more divided about whether a food is problematic. For religious reasons, some find that it is wrong to eat pork; others do not embrace this religion and thus have no such concerns. So, in some cases when disagreement is value-based, it would seem reasonable that the consumer acts according to her own values without committing others to do the same.

[11] The views presented appear in the literature, but not all are necessarily represented among the Council members.

How far can we stretch the consumer's responsibility to ensure that ethically problematic products are not produced?

Some totally disagree that consumers ought to take ethical considerations into account when they shop, not even in cases where the vast majority agree that the production of a food is ethically problematic. Their arguments revolve around the individual's responsibility in situations that they have no power to change; We will get to that later.

In the following, we shall use the avoidance of climate-damaging foods as the example of ethical consumption; It will be discussed in detail in Chapter 4.2. Researchers agree that the global production of beef significantly contributes to climate change because ruminants release large volumes of greenhouse gases. The principled reflections in the following are, however, relevant to a number of situations where ethical consumption might come into play: poor work conditions in the production of consumer electronics, poor animal welfare, resource consumption in connection with the manufacturing of clothes, etc.

The individual consumer should not take climate impact into account

The first possible position to be described is that of fundamentally believing that the individual consumer has no responsibility to act based on ethical concerns. An argument supporting this position is that it has no *direct* negative consequences for other people if a person e.g. buys a piece of meat in the supermarket.

The reasoning would be that climate change is not something the individual consumer can do much about. Even if she decides not to buy that piece of beef, and even if she decides never to buy beef again, it will not in itself make a noticeable difference to climate change. Or put differently: Her buying beef is not a sufficient condition for climate change, in fact, it is not even a necessary condition. Therefore, the individual consumer does not have an obligation to avoid products the total production of which adversely impacts others, if that *single one purchase* does not.[12] However, the argument does not dismiss that there may be ethical concerns to take into account in food production; it simply claims that they cannot be the responsibility of the individual consumer.

The individual consumer should take climate impact into account

An argument in support of the idea that individual persons should indeed buy climate-friendly food goes that even if the individual purchase in itself makes no measurable difference to climate change it is not entirely unimportant. When pooled with all other consumer purchases around the world, individual purchases contribute substantially to the causes of climate change since they are the result of many people's combined actions. Some would further argue that the way you behave can influence how others behave, and in buying beef

[12] See for example Sinnott-Armstrong, Walter 2005

you contribute to making it socially acceptable not to consider the climate. And if many people do not consider the climate, it will have measurable negative impacts on climate change.

Another perspective departs from the view that human beings should always strive to do their best in everything they do. If we acknowledge that ethically we should emit less greenhouse gases, we should each do what we can to emit less greenhouse gases in our everyday lives.[13] This argument of course implies that we should take ethical concerns into account in numerous other areas of consumption such as taking hot showers, driving, air travel, etc. despite the fact that energy and transportation legislation does not force us to.

The state is responsible for making food consumption climate-friendly

It should be noted that both of the above arguments acknowledge that when the production of certain goods, say beef, harms other people sufficiently seriously, there is an ethical obligation to reduce such production. The subject of controversy is whether the individual consumer is responsible for it happening even in those situations when the actions are not supported by a politically adopted climate policy.

Whether or not the individual consumer has an obligation to assume responsibility through purchasing behaviour, it is still evident that it is ineffective and insufficient if it is left entirely to individual persons to buy climate-friendly products. Therefore, to ensure effective actions against greenhouse gas emission in certain forms of food production, the problem should above all be solved politically through the state's regulation of production and/or consumption. This could be done through information and encouragement to buy climate-friendly products, through taxes on climate-damaging goods or by prohibiting the marketing of such products. Preferably, it should be underpinned by international agreements since greenhouse gases are blind to national borders. This way, it would be possible to safeguard against the scenario that only a few assume responsibility, while the majority does not. That said, the weakness of international agreements is that a multitude of countries are often only able to agree to lowest common denominator solutions. And if this prevents or inhibits individual countries from pioneering and leading the way, any positive development in the area could be delayed or brought to a standstill.

Why not leave it to the market to ensure food is produced ethically responsibly?

Ethical consumption should work through the market

Traditionally, economic liberalists have considered the market as a place where individuals ought to be free to buy and sell goods with the least possible state intervention. In liberal thinking, consumers can decide to take ethical

[13] Gjerris, Mickey 2015b, 517–532

responsibility through their consumption – or they can decide not to. The individual is free to choose. Ethical consumption is a way of expressing personal preferences. You may buy products that you associate with special values, or you may find other parameters important such as price and/or quality. If a critical mass of consumers assumes ethical responsibility, a signal could be sent through the market with the effect that certain products, perhaps organic vegetables, are promoted at the expense of less green products. Fundamentally, the imposition of state taxes on foods is considered an unnecessary added expense, and voluntariness is preferred. Only in special circumstances, when essential values are at stake, should the state intervene.

Often the market does not function ideally for ethical consumption

Within the framework of a modern, liberal democracy like the Danish system, it is often emphasised that even though freedom is an important value, we cannot leave it to the market mechanisms to handle value questions about common goods like public health, the environment and the climate. This is basically because the market mechanisms not always comply with the economic theory's ideal model. When markets are left to their own devices, it may weaken the freedom of the market players and lead to massive inequalities. In reality markets fail to live up to the ideal in several ways[14], including:

- Often the market players do *not have sufficient information* to make the best choices. Thus, they can end up making choices that are wrong in the sense that they are actually not true to the values of people or those shared by a society. In relation to consumer food choicesthis would be the case if the consumer was not informed that a piece of meat came from an animal fed GMO, and you were, in fact, against GMO fodder and wished not support it. Modern grocery chains are incomprehensible; Often animals are bred in one country, slaughtered in a second one and processed in a third one. Consumers are far away from production and do not know how their foods are produced. So, if they are to practice ethical buying, it may be necessary to introduce labelling systems, giving them the opportunity to act according to their values.

- Sometimes, the free choice of consumers can have significant costs for people not involved in the buying and selling. These costs are called *externalities*. Errors occur in the market's ability to ensure the product is priced correctly when some costs are invisible to the producers and thus to the trading parties. In relation to food production, this occurs when the price of a product does not reflect the costs of restoring the environment and the climate brought about by the production. The price of the product thus becomes too low in relation to the societal costs of production.

[14] Satz, Debra 2007

- It is impossible for the consumer to understand and mitigate against such market errors, so to the extent they exist, the state should intervene and regulate. In much the same way, manufacturers have no financial incentive to consider the environmental impact of his production. The regulation of externalities could, for example, be in the form of taxes on climate-damaging foods such as beef that would reflect the environmental and thus socio-economic costs of production.

2.2 What ethical considerations ought to be taken in to account?

The harm principle

Climate change threatens human beings and nature around the world. The developing countries and poor people are vulnerable, and it is estimated that the burden of climate changes will be a growing concern for future generations. However, people in rich countries also feel the increasing impact of climate changes as we speak. As we have seen, some foods contribute significantly to climate change.

Few would argue that we have a right to inflict serious harm on other people. This follows from the 'no-harm principle' originally formulated by British philosopher, John Stuart Mill:

> *The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others. His own good, either physical or moral, is not a sufficient warrant.*
>
> John Stuart Mill, 1859[15]

The no-harm principle is considered fundamental since basically no approaches would disagree that it marks the limits of personal freedom: If a citizen's free choice inflicts harm to others, it is ethically problematic, and the state should intervene and prevent it through common, politically-based solutions.

The no-harm principle provides people with great liberty of action to live according to their own values. If you are an orthodox Jew, you should be able to buy kosher food to live according to your religious values. But there are limits: You would not be allowed to produce food under unhygienic conditions even if the right to do so is what fits your perception of the good life. Requests implying that serious harm would be inflicted on other people, e.g. in the form of food poisoning, all would agree are so ethically problematic that they should be prevented by the state.

But we soon come to realise that the widespread agreement that the limits of personal freedom is drawn at acts that inflict harm on others, conceals a range

[15] Mill, John Stuart 1859

of specific disagreements.

So, Mill's view is that only harm to others can justify the state to use force against a citizen; Harm is a necessary condition and a sufficient condition for the state to interfere with a citizen's freedom of choice.

Others would disagree, finding that serious harm to others is a sufficient, but not a necessary, condition. The state could also legislate based on values, e.g. by prohibiting the production of GMO because some perceive GMO as harmful. This is where it could become problematic because those who rely on the risk assessments showing no evidence of harm to people caused by GMO production do not agree that GMO production is wrong. If imposing such a ban, the state would be taking sides in a value-based conflict by introducing legislation that parts of society would find entirely unfounded. Problems could emerge as a result, which we will get back to in the section *What to do about disagreement about values?*

But there are also types of harm which, in liberal societies like Denmark, are not considered to be a sufficient condition for the state to intervene in a citizen's free choice. If, for example, a person wants to divorce his or her spouse, who then becomes heartbroken, the one spouse inflicts serious harm on the other. But the nature of the harm is such that the state has no right to intervene and limit the individual's freedom by forcing him or her to stay married. You may still find that harm is a necessary condition for the state to intervene, but that it is not a sufficient condition to justify intervention.

Besides, something else matters here: The one spouse is not requesting divorce with the intention of harming the other. A woman may be asking for divorce because she wants to create a better situation for herself. That the other spouse thereby suffers harm is an unintended consequence of the divorce. Usually, harmful acts are judged more leniently when harm is not the intention, i.e. if the harm is an unintended consequence of another act. However, it does not mean that the state will not intervene in case of indirect, serious harm; Involuntary manslaughter is judged milder than first degree murder. But it is still punishable because a person has been subjected to serious harm.

Despite all these disagreements, it should be noted that the subject for debate is not the principle itself that harm to others legitimises the state to intervene against individuals. Opinion differs when it comes to the types of harm necessary or sufficient to legitimise state intervention, and they need to be discussed separately. But the harm principle is an important principle in that defenders of various ethical approaches agree that the state may legitimately intervene against acts that in relevant ways cause harm to others – whatever 'relevant' means.

There is another principled disagreement in the debate about harm to others –

more precisely who are those 'others' that count ethically and therefore should not be harmed: Is it only other people? Or does harm to animals and to nature count too? We look into this below.

Is it only other people who should not be harmed?

Ethical considerations concern human beings

In a western context, there has been a long tradition of seeing people as having a special moral status or dignity. Until the Age of the Enlightenment, this special dignity was justified in being given by God. Then came more secular reasons that found the moral significance in traits in the human nature. This development corresponds to a shift from talking about natural rights to talking about human rights. The UN's Universal Declaration of Human Rights from 1948 is based on the assumption that humans have a special status and moreover that *all humans have the same ethical status*.

A number of approaches have a narrower perception of whom we owe ethical obligations to. They consider obligations to other people to be different depending on the relationship we have to these people.[16]

In the past decades, the traditional, people-centred ethical basis has been increasingly challenged from several sides.[17] A number of philosophers have argued that animals, or some animals, should be included in the circle of whom we should take into account ethically.

Animals count ethically

In the history of the western world, animals have been considered as dumb creatures to be dominated by man. Right until the Age of the Enlightenment, it was widely believed that animals were incapable of feeling pain because they had no soul. In recent years, this view on animals has been abandoned, among other things, because research has shown that not only do animals feel pain and pleasure, many animal species have complex emotions, and some are even capable of showing empathy. Thus we could say that the basis for the moral segregation we have maintained between ourselves and animals is changing. Obviously, animals can be harmed if kept under conditions that cause pain or offer too little space for their natural behaviour. This makes it difficult to defend that it should be ethically justifiable to subject animals to suffering.

Animals have interests that count ethically

Australian philosopher, Peter Singer, argues that we should show much more ethical consideration to animals than we do today. Singer is a utilitarian and has formulated the principle of equal consideration of interests. All sentient

[16] The different perceptions are discussed in more detail, e.g. in Det Etiske Råd 2012, Kapitel 4

[17] Most importantly by Ruth Harrison's *Factory farming* from 1964 and Peter Singer's *Animal Liberation from 1975*. But thinkers and activists have for centuries discussed the ethical status of animals.

beings with the capacity of subjective experiences – and thus the capacity to feel pleasure and pain – have, according to Singer, an interest in not being subjected to suffering as a minimum.

Even if everyone has the right to equal consideration of interests, it does not mean that everyone should be treated equally. For there is a difference between the interests of humans and animals for example. Thus, it is worse to kill another human being than it is to kill an animal, because human beings – unlike even higher animals – have plans for the future that will be destroyed if they are killed. But causing pain to a human being is not worse than causing pain to an animal; both acts are equally wrong, because the capacity to feel pain is the same in humans and animals. Because animals can feel pain, we should, for example, not engage in animal cloning because the cloning technique is badly developed which means that a very large part of the animals are born with handicaps and live painful, short lives. However, in other areas animals function differently from human beings. By way of example, most animals do not suffer in the same way humans would when held in captivity, provided they are kept under good conditions, and therefore it is not wrong per se to keep domestic animals.[18] Treating the interests of humans and animals differently Singer calls speciesism, corresponding to sexism or racism, where human beings are treated differently, although they are persons with the same qualities in every ethically important area.

Animals have lives that are important to them

Another argument defending that we should give ethical consideration to animals is that have lives that matter to them. This argument is held by American philosopher, Tom Regan. Regan is an advocate of deontological (duty-based) ethics, but criticises this tradition for only emphasising the ability to act rationally when determining who has ethical status. Rationality is important to humans, but it cannot be ignored that it is just as important for other beings to have a life that matters to them. Regan refers to these beings as 'subjects-of-a-life'.

Subjects-of-a-life, according to Regan, have inherent and absolute value, and the welfare of such beings cannot rightfully be undermined by referring to the benefits and welfare of others. Because animals are subjects-of-a-life, they have the right to be treated as ends in themselves and not as a means to the ends of others.

Animals should be able to live good animal lives

A third type of argument that animals have ethical value comes from virtue

[18] As an advocate of utilitarianism, Singer believes we should aim for the best achievable combined welfare. This means that there may be situations in which human beings' pleasure of keeping livestock and eating meat is so big that it outweighs limited suffering in several animals kept under sub-optimal conditions. But Singer does not find that the suffering subjected to thousands of animals in industrialised farming can be outweighed by few people's luxurious pleasure of eating meat.

ethics, which focusses on the moral traits of human beings, meaning that the central element is which character traits – or virtues – you base your actions on. You should ask yourself what kind of human being you want to be, and what character traits should motivate your actions. Compassion, moderation, gentleness, attentiveness and the sense of responsibility are virtues that should characterise our relation to the surroundings.

Traditionally, defenders of virtue ethics have focused on humans, but today philosophers like New Zealand, Rosalind Hursthouse, argue that also animals should have opportunities to unfold their lives within the framework they are essentially adapted to. We ought to take this into account, and it will mean treating many animals far better than we do today – for example those raised in industrialised farming.

Nature has value in itself

Since the 1960s, western-oriented academic philosophy and theology have increasingly defended the view that ***nature has value that matters ethically***. What is meant is that nature *in itself* has value which is to be respected irrespective of whether destroying it causes harm to humans. A distinction is usually made between two main approaches:

Individual animals or plants have value

American philosopher, Paul W. Taylor, reasons that also plants have ethical value. Taylor is also an advocate of the deontological (duty-based) tradition, but applies a broader definition than Regan as to what should count ethically. Taylor argues that the notion that all living organisms can follow their biological purpose – the purpose that is in the DNA of the animal or plant – confers a right to ethical consideration just like human beings. All living beings are purposed to uphold their existence and promote their biological functions, and this is valuable to them just as the lives of human beings are valuable to us. Taylor acknowledges that living beings live by eating each other. Therefore, the problem arises that the vital interests of some will constantly be violated. But here it is important that humans give respect to nature and consider the interests of other living organisms, so that we do not violate them to fulfil our own trivial needs.

Everything in nature has value

In contrast, the so-called ecocentrics argue that not just individual living things but nature as a whole has value; not just living things, and not just individual humans, animals and plants, but also over individual units such as biological species, ecosystems and the planet have value, meaning that they should not be harmed. There are different views on why we should respect and consider all of these things: One is that not only the relations we have to other people but also those to nature and all its elements have ethical value. Norwegian philosopher, Arne Næss, argues that intuitively we can all acknowledge that all things in the biosphere have an equal right to live and that humans can only

realise themselves through identification with the larger organic whole that we are part of. Finally, some virtue ethics would, as mentioned, argue that traits such as care, moderation, gentleness, attentiveness and the sense of responsibility are virtues that should characterise our relationship to nature as a whole as well.

Expanding the circle of ethical beings with animals in addition to humans, would off course lead to many more situations of colliding values. And the problem would simply be intensified if we include plants in this ethical community – even more so if nature as such is to be considered as something that imposes obligations on humans. How to practically navigate in a world that has ethical value in itself is therefore an extremely complex question to which various ethicists hold widely differing answers.

But even if we find that only humans, possibly humans and superior animals, have ethical status, the outcome could well be that we have larger ethical obligations to nature than we normally admit. Because to the extent we consider plants and ecosystems valuable to humans, we should also look out for them. And if we consider all humans to have ethical value, we should look out for the climate too, even if global warming, at first, will only strike humans far away or generations to come.

So, there is disagreement as to when harm to others is ethically problematic and disagreement as to who it is we must not harm. The disagreements are value-based. The next question is therefore what to do in societies where citizens disagree about value questions?

2.3 What to do about value conflicts?

What if citizens disagree about what ethical considerations to take into account?

In liberal democracies such as Denmark there is overall agreement that values such as equality between human beings and freedom are important. But in more complex choices, we often disagree about moral values. For example, there is no agreement as to whether it is morally justifiable to change sex, have an abortion, do research with stem cells, eat meat (or some types of meat), keep livestock, etc. There are various religions and secular philosophies that partially collide when it comes to what they consider have value and what ethical considerations ought to be made.

Politically, this is problematic, because if the state bases its laws on one of the conceptions, those who adhere to other conceptions would find the legislation lacking in legitimacy. If, for example, the state was to ban the production of GMOs, this would be the right thing to do based on some value beliefs, but

groundless for those not sharing these beliefs. The state would be promoting some citizens' conceptions of the right way to live at the cost of other v, which could potentially question its legitimacy and jeopardize the citizens' support for the state.

The American philosopher, John Rawls, has famously described the problem:

> *How is it possible that there may exist over time a stable and just society of free and equal citizens profoundly divided by reasonable though incompatible religious, philosophical, and moral doctrines?*[19]

Rawls' own answer was to distinguish between, on the one side, a set of overall values that only applies to the political level. On the other side are the different comprehensive religious and philosophical perceptions or ideologies that encompasses many more aspects of life, including conceptions of what constitutes *the good life*. Liberal states, ideally, should only legislate based on a limited set of political values: freedom and equality coupled with access to basic necessities.[20] This is because these are the overall values that many ideologies would accept them and thus any legislation based thereon.[21]

The ideologies endorsing the fundamental political values Rawls calls 'reasonable'. The state should, as far as possible, remain neutral towards the pluralism of reasonable moral and religious conceptions of *the good life*.

The state's value neutrality, however, does not mean that people can live in any way they want. As mentioned, overriding values such as equality and freedom cannot be bargained with. These values are essential in order for society to be just.[22] Rawls proposed the division that the state's value neutrality should not be ascribed to questions of *justice*. The just rules for the organisation of society are those that everyone are assumed to endorse in a hypothetical situation in which they were to write the rules not knowing where they would be placed in society when the rules were to enter into force.

As mentioned previously, the state can also intervene if the choices of citizens inflict harm on others because this would not mean the state favouring the values of one citizen over another; It would be society's way of protecting its citizens from injustice. The no-harm principle is based on an ideal of justice, supplementary to the principle that the state ought to remain neutral in value questions, i.e. it should not favour some perceptions of the good life over others.

---

[19] Rawls, John 2005, xviii
[20] Rawls, John 2005, xxxix
[21] Obviously, the case here describes an ideal model for how the state *ought* to legislate in order to ensure stability in a pluralistic, democratic society. This is not to say that reality does not hold examples of laws that are based on values of the good life not shared by everyone.
[22] Rawls provides a theory on how just rules of a society can be derived in *A Theory of Justice* from 1971

One problem is that in reality it is not so simple to draw a clear line between, on the one hand, values that are rooted in perceptions of the good life not to be interfered with by the state, and, on the other, values related to justice that the state can regulate without favouring anyone's perception of the good life. For, ones perception of justice is intertwined with ones perception of life quality in many areas. The value neutrality of a state, obviously, cannot be implemented throughout. Nonetheless, value neutrality is still an overriding ideal in liberal societies in which the state does not take sides in religious questions or prohibits people from having views and expressing those views. Introducing laws in contravention of this idea, many would therefore find controversial, e.g. if the state was to legislate for people to eat healthy food, even if their unhealthy eating habits harm no other than themselves.

The ideal of a value neutral state can, of course, be criticised in several ways. The most extensive criticism goes that fundamentally, the state should not take a neutral stand, but should instead legislate according to the right principles. Another point of criticism is that the state is thought to represent unity and democracy, and that common decisions should be based on an overall balancing of citizen values.

However, as pointed out by Rawls, the problem is that there is no detailed agreement as to what principles are right, nor is there any agreement as to how we can make an overall balancing of values that everyone will be happy with. Some find that when values are perceived differently in different cultures and sub-cultures, it is because there are no values that apply at all times and in all cultures. In other words, there is no one truth when it comes to how much consideration to give to other people, whether to give equal consideration to everyone and how to treat animals. Others disagree and find that values are universal: There is one answer to the above questions that applies always that everyone can endorse under the right conditions.

However, many universalists admit that in practice not all have the same values in all aspects, which is evident by looking at a society like today's Denmark. It makes relativists and universalists alike believe that it is necessary that we live with a limited degree of pluralism which acknowledges that we have different conceptions of the good life and how we ought to live it. People should be free to live according to their own values – provided that these values can be observed without harming others and *their* possibilities of pursuing *their* ideals.

Disagreement exemplified: How to understand personal freedom?

A subject of value-based disagreement that influences the question of ethical consumption concerns how much freedom people in a liberal democracy should be allowed. Is the private sphere and the food you choose to buy nobody's business but your own? From one viewpoint, it is probably best if the

state takes a great responsibility for the citizens' food consumption and prohibits the most unhealthy foods – or imposes taxes (as attempted with the now abolished tax on fat). From another viewpoint, it would be totally unacceptable if the state was to deprive citizens of the choice to take chances and eat unhealthy foods if doing so enhances their quality of life.
The question of how much freedom individuals in a community should be allowed is relevant in every human society. So, the general consensus that citizens should be free to act and form their own lives according to their own ideals obviously covers a wide spectre of interpretations of where exactly to draw the line for the free scope of individuals and for what the state may interfere with.
In one end of the spectre, we find the defenders of extensive freedom for individuals implying that ideally the state's role should be limited to ensuring police protection, national defence and administration of the judicial system. We own ourselves and the produce of our work. Hence, it is morally wrong for the state to collect taxes or otherwise interfere with our lives as long as our acts do not cause harm to others. We should not be hindered in committing acts that only harm ourselves.

In the opposite end of the spectre are various approaches finding that the respect for personal freedom is compatible with us renouncing part of that freedom to the community or the state. The role of the state should not only be to protect its citizens from injustice; The defenders of a more comprehensive state find, to varying degrees, that the freedom of individuals cannot be seen independent of their living conditions. If these conditions are not fundamentally in order, e.g. if you are held down by poverty, illness or lack of education, you can hardly be free to make the choices needed for you to pursue your idea of the good life. The state should be active in establishing the best framework for the lives of its citizens. It should be added that in a world where countries become increasingly dependent on each another, the state could be considered as a necessary and decisive player when it comes to handling environmental issues that impact common goods – locally, nationally and globally.

Disagreement exemplified: What is the value of 'the natural'?

Whereas there is little dispute that freedom is a value – though its interpretation is disputed – the question of what is valuable is much more contested. For example, there are differences of opinion when it comes to the value of *the natural* and the value of natural foods. We will elaborate further in the next chapter because the view plays such a big role in food matters. All surveys of consumer views show that the majority sees naturalness as something valuable. They do so in many areas, but profoundly in the area of food.

The vast majority of respondents in the EU consumer survey thus state that they consider the main problem of foods from GMO is that they are unnatural. In the meantime, determining what natural food really is could be difficult,

considering that almost any food has been processed by humans. Also, people seem to disagree about what it really means that a food is unnatural. To some, this lack of clarity is sufficient ground to dismiss naturalness as having value in itself. Others find that there is a limit to how much humans are allowed to intervene with nature, and that the application of techniques such as genetic engineering crosses a line that ought not be crossed.

Once again, it leaves us with the question of what to do when something has been debated a long time and people are still divided. In regard to GMO, it is disputed what value natural states have and if there is an ethical limit defining how far humans should be allowed go to modify nature. Should the state then be allowed to pass legislation based on values that not everyone shares? Should such questions be left for the individual consumer to decide, or should the state legislate based on such values if shared by sufficiently many? And if the state is to favour the values of some, whose should it be?

2.4 Conclusion

Whether you believe that consumers should take ethical consideration into account in their daily shopping depends on a number of factors.

One factor is whether individuals be said to be responsible for the very small contributions they make through their individual purchases in relation to ethical problems that are caused by the production of specific foods?

Another factor is if there really are any ethical considerations to be taken in food production? Here, many will agree that this could be the case in situations where production causes harm to others. But, there will be no agreement as to which types of harm would justify the state to restrict people's freedom and who *those others* are. Who counts ethically? Is it only people? Only some people? Or do animals count as well? And what about plants and nature as such?

Roughly speaking, we can plot it as choices on a scale: In one end, we have choices that ought to be individual (it could be choices tied to a specific religion which the individual makes for himself without committing those not adhering to the religion, e.g. praying at certain times of the day or treating food in a certain way). In the other, we have choices about foods that are produced in a way that may cause serious harm to other people (e.g. if hygiene standards are not observed). In between are a number of choices characterised by disagreement about whether there are ethical considerations to take into account, and, if so, whether the responsibility lies with the consumer or society, in which case a political framework regulating the individual's behaviours should be established.

3. Reflections on naturalness and foods

Part of the discussion of the value of nature and natural things could be said to be behind consumers' strong preference for natural foods and conversely renunciation of foods perceived as unnatural. Thus unnaturalness was the most frequent reason for suspicion of genetically modified foods in an opinion poll where 70 % of a European participant's considered them unnatural.[23] Some surveys conducted by psychologists show that preference for the nature and natural things is partly founded in instrumental concerns, e.g. that natural foods are perceived as healthier, cleaner and tasting better. But in addition, many also indicate that they would prefer a minimally processed and thus more natural product, even if it was chemically identical to another product that humans had played a great part in producing. It is interpreted such that the state of being natural in itself is considered valuable for consumers.[24]

In the meantime, it seems that underneath this apparent endorsement of an ideal of naturalness hides a wealth of understandings of what 'nature' means and when something is 'natural'. It would be productive to study these underlying disagreements to prevent defenders of opposing views from talking past each other. For we cannot discuss whether the natural has value ethically speaking before knowing what we are talking about when we talk about the natural.

Even though the concept is referred to repeatedly, there is no acknowledged definition of what nature or 'natural' is. Instead, it is often defined by what it is not. Scottish philosopher, David Hume (1711–1776), noted that nature is often seen as a contrast to:

1. The miraculous or supernatural

2. The civilised/anthropogenic

3. The artificial

If nature is to be understood as the opposite of the supernatural and you deny that the supernatural exists, then all things in the world are natural, so this is hardly what most people mean when they talk about natural.

[23] European Commission 2010a
[24] Rozin, Paul et al. 2004, 147–154; Rozin, Paul 2005

If, on the other hand, nature is to be understood as the opposite of that which humans have made, the civilised, then it must be understood as that which humans have not interfered with. But today, this can only be said about a few virgin forests and distant natural reserves, and nothing in Denmark would fall under this definition. Others have attempted to further categorise the different degrees to which things have been interfered with by man:

- The wild understood as uncultivated land, untamed livestock, ungrafted plants,

- The rural as opposed to the urban, includes also agricultural land and cultural landscapes,

- The green understood as the living, the low-technological and the organic; what existed before the industrial revolution. This is also found in cities in the form of parks, pets and potted plants. The category also covers planed timber, leather and cotton, but not more synthetic products such as chip board, napa and acrylic,

- The physical understood as what can be described by natural science as opposed to the subjective, social and cultural. While the human body is included in nature, human thought and science are not.[25]

As these categories show, there is great diversion as to how much human intervention is acceptable before something is no longer considered natural: from no intervention whatsoever to the types of interventions seen until certain historical eras, e.g. until the industrial revolution. But with so many suggestions, how can we arrive at a common understanding of 'natural' that most people would endorse?

Hume suggests to contrast the natural to the artificial, but more precision is needed. O'Neill et al suggest to understand the artificial as anything created by humans with *a specific purpose*:

> *Something is artificial if and only if it is what it is at least partly as the result of a deliberate or intentional act.*[26]

The natural is thus everything that is not the result of such acts. But is this to say that human beings are not natural since they are often the result of human beings having acted deliberately with the purpose of having children? And does that make climate change natural since it is not the result of deliberately human actions, but is the unwanted side effects of other things that humans do?

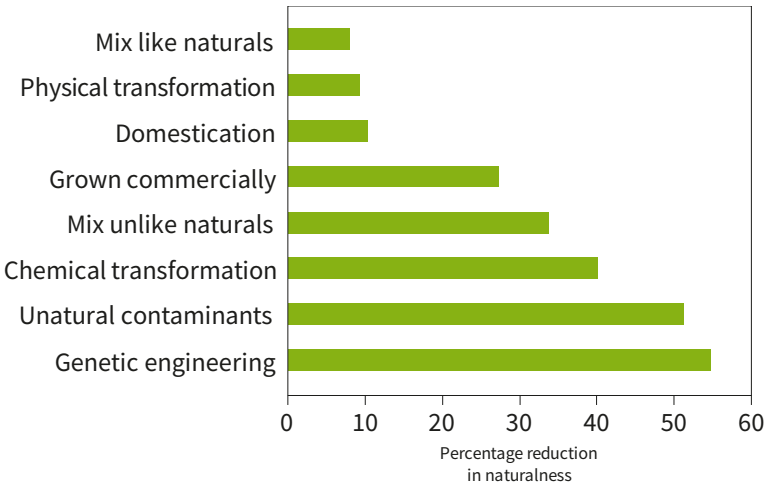
[25] Fink, Hans 2003
[26] O'Neill, John et al. 2008, 129

In reality, it is thus extremely difficult to find a meaning of natural that captures the many ways in which the concept is used. In the food area, it is even more difficult since almost all foods are grown or processed by humans, so according to several of the mentioned definitions no foods are natural.

Different surveys have sought to pin down what consumers really mean when they talk about natural foods. Once again, the tendency is to define natural based on what it is not. A major survey covering five European countries and the USA shows that across the countries, a large majority of consumers associate natural food with food that has not been added any (especially chemical) substances and is not processed.[27]

When something is added to a food, the majority of the survey participants perceived it as 'polluted' and its naturalness as reduced. But, it does matter what is being added. Chemical changes (e.g. preservation) or removal of natural components (e.g. fat) or additives of natural or unnatural substances to a moderate extent (e.g. colouring substances) and – significantly – genetic manipulation, cause the food product to be perceived as markedly less natural than before. By contrast, physical changes (e.g. freezing or blending) to most people have less bearing on their perception of naturalness.

As can be seen from the table, conventional production (domestication) is not significantly perceived as unnatural, despite the fact that, as scientists state, it "is a massive human intrusion, over hundreds of generations, that produces major changes in the genotype and phenotype of a wild species (...) Genetic engineering, in contrast, involves insertion of a single gene, with a minimal change in genotype and phenotype." Still, genetic manipulation reduces the perception of naturalness by 54.1 %, whereas domestication only reduces it by 9.8 %.[28]



Source: Rozin, Paul 2005

[27] Rozin, Paul et al. 2012, 448–455
[28] Rozin, Paul 2005

British philosopher, Anne Chapman, proposes to look at naturalness as something that increases in degrees; the more people try to control nature and distance themselves from the processes in it, the more unnatural that practice is. Based on this definition, cotton is more natural than polyester because polyester is entirely man-made and would not exist without human intervention. Cotton, on the other hand, is a plant that grows in nature. Accordingly, she finds genetically modified plants more unnatural than those grown conventionally.

We shall not venture further into this complex area at this place, suffice it to say that there is no clear-cut definition of when a food is natural and what it takes for it to become unnatural. And therefore, there is also no way of measuring just how natural a given food is. Many factors influence the consumers' perceptions, and different people seem to apply different classifications of naturalness.

So, on the face of it, it seems difficult to determine what it means that foods are natural. But even if we could come to an agreement, the next question is whether something is good or ethically valuable because it is natural? Which leads us to ask if something is bad if it is unnatural?

There seems to be no such thing as a simple analogy: We do not consider natural phenomena like volcanic eruptions and malignant tumours as something good, but most people do consider unnatural things like appendectomies and tooth brushing as good. The fact that something is natural cannot be used as a standard to determine if it is good in itself.

However, 'unnaturalness' may perhaps from a more general view be seen as a common denominator for factors that worry consumers when it comes to knowing if the food they buy is healthy or at least safe to eat. Another perspective could be that 'naturalness' in relation to food products could be a way of 'connecting' to the earth and to nature, from which many find that we have become too detached because of technology. Various food scandals presumably have had a negative impact in relation to the consumers' trust in the industrialised food supply. Many surveys suggest that there is a great coincidence between what consumers perceive as natural and what they perceive as healthy.[29]First of all what they think is good for their health, but some also put weight on what they consider to be "healthy" for the environment.[30]

To the extent that the preference for natural food in this way is a means for instance to obtain good health or safety through the food we eat, naturalness can be said to have instrumental value because it enhances people's wellbeing and quality of life. Obviously, it only does so in those cases where naturalness actually enhances these things; Old, tainted food may well be natural, but is

[29] Devcich, Daniel A. et al. 2007, 333–337; Rozin, Paul et al. 2004; Rozin, Paul 2005; Rozin, Paul et al. 2012
[30] Magnusson, Maria K. et al. 2003, 109–117

neither healthy nor conducive of trust.

The above seems to question if it would be constructive to use naturalness as a standard to measure if something is good for humans. It is notoriously difficult to determine when foods are natural, but even if you take foods that have been minimally interfered with by humans, e.g. old raw milk, they are not necessarily good.

This of course does not mean that we should dismiss the consumers' requests for natural foods as unfounded. The reason that many request products that are minimally processed and produced locally could be seen as a wish to ensure that the product is manufactured under responsible conditions and is not added harmful substances. The food product system is complex, and it is often incomprehensible for consumers to find out which products are healthy and produced with ethical responsibility.

This has made some claim that consumers have a right to information that enables them to make choices according to their preferences. Some have compared this right with the right to informed consent in the health services sector.[31] A labelling system could be seen as a way to accommodate this right. As mentioned, however, there are many factors of importance to different food consumers, and a number of factors which could be declared via a labelling system, e.g.:

1. The ingredients contained in the food

2. Information about the production process and its environmental impact

3. If specifically the food contains any genetically modified substances

4. If there are *known* health risks associated with eating the food

5. If any research evidence points to *possible* risks associated with eating the food[32]

General labelling of all foods to include all these factors would be very comprehensive and costly. It is difficult to see that such vastness of information for each single product would actually enable the consumer to make an autonomous choice in the supermarket.

It could be argued that people have a right to information when important considerations affect a multitude of citizens. For example, the opposition to genetically modified foods is considerable, especially in Europe, and there is persistent disagreement about whether there are risks or ethical problems

[31] Chadwich, Ruth 2000, 193–208
[32] Ibid

associated with the production or intake of GMO. This GMO aversion is unaffected by surveys showing that neither cultivation nor consumption of GMO is associated with any risks. Other considerations, among them naturalness, seem to play a decisive role for these consumers. In a situation of such value based differences of opinions, it could be argued that the state should remain neutral and not favour one perception over others, e.g. by prohibiting GMO in general. But it should be possible for the large group of citizens who find GMO ethically problematic to avoid them.

4. Cases

The ethical consumer is active in several areas and acts according to many different ethical considerations. As mentioned, some of them are motivated by values which the individual consumer finds important for him or her to live a good life, but which are not necessarily shared by others. This type of choice can be said to be well suited for 'the ethical consumer', who thus chooses the products that are true to that person's values.

Other ethical choices are motivated by the concern for others who could be harmed by the production of a given food. But when consumers attempt to shop according to their conscience – studying complex matters such as the climate impact of different foods – they may find it frustrating that their efforts make very little difference because others fail to take their share of responsibility. Here, it would seem more appropriate for the state to make these considerations mandatory through regulation rather than leaving those actions to the consumers and the market.

In the following we will discuss two different cases in which food production has ethical complications: foods from animals fed GMO and climate-damaging foods. The first case concerns foods that are unpopular with the majority of Europeans, and which many would like to see prohibited or at least affixed with an authorised label that would make it possible to avoid them. The fact that the production of some foods put profound pressure on the climate is also something that more and more consumers realise, making them avoid these products. This area, however, is normally not considered one which the state can legitimately interfere in.

Based on facts about the different areas, the Council will put forward its recommendations as to whether these areas should be left to the ethical consumer or whether they should be made a common responsibility with resulting regulation.

4.1 Food from animals fed GMO

The first genetically modified food products entered the American market in 1994. However, consumer suspicion has meant that GMO has never been a great success in foods, especially in Europe. The development contrasts with the drastic increase in cultivation of GMO outside the EU for feeding purposes, etc. GMO feed is imported on a large scale for feed purposes in the EU. So, while many European consumers oppose the cultivation of GMOs, indirectly they are large-scale consumers of GMOs. Nonetheless, while labelling of food

containing GMO is mandatory in the EU, it is not required by law that foods from GMO-fed animals are labelled.

In the meantime, techniques of genetic modification have been developed making it simpler to modify foods in a targeted manner. These years, GMOs are being developed which may help us deal with the challenges of climate change prevention and adaptation, or which may reduce the use of pesticides. In the 20 years of large-scale GMO cultivation, there has been no evidence that the very circumstance that a plant is genetically modified involves specific risks. But many consider it a problem that the technology has largely been used in a way that continues an intensive production form that is based on widespread use of pesticides and monoculture.

In its recommendations, the Council considers if, against this background, it would be appropriate to use a labelling system that would enable consumers to avoid meat even from animals fed GMO – or if, on the other hand, it would be reasonable to prohibit or restrict the use of GMO feed given the adverse impacts the current GMO farming practice have on the nature and the environment. We will first present the current facts of relevance to these considerations.

4.1.1 What is GMO, what types are cultivated, how many animals are fed GMO?

GMO stands for 'genetically modified organism' and thus may refer to genetically modified crops – or the food products or ingredients they are processed into – and other organisms, e.g. microorganisms and animals. We will only be discussing GM crops and foods.

The vast majority of GMOs cultivated worldwide are used as feed. Presumably, it is so because of a strong consumer suspicion to GM food in many parts of the world and the fact that crops are already being used as animal feed. So far, four types of crops (soy beans, maize, cotton and oilseed) and two types of traits (herbicide tolerance and insect resistance – see the box below) have been dominant. Soy beans and maize alone account for 80 % of the total global GMO production.[33]

Example of herbicide resistant crops: RoundupReady soya
Among the first commercially available GMOs – and today the most prevalent GM crop – is RoundupReady (RR) soy, which, by means of genetic modification, has been made resistant to Roundup pesticide (active agent: glyphosate). Roundup normally destroys any type of plant. It simplifies weed control and reduces the need for tillage.

[33] Clive, James 2014

Example of insect resistant crop: Bt cotton
Bt crops carry a gene from a bacteria that makes the plant produce Bt toxin. The agent is toxic to certain pests. It allows farmers to gain better yields and limit the use of pesticides.

Current Danish conventional livestock production is dependent on access to cheap protein feed, so-called concentrates. Previously, farmers could increase the protein content in feed by mixing in slaughterhouse waste from livestock production. The outbreak of mad cow disease, however, banned this practice after reports of rare cases of disease transmission through the feed. This has increased European farmers' dependence on import of protein feed.[34] However, at present there seems to be a growing interest to replace soy and wheat in the feed with high-protein fava beans, which farmers can grow themselves and which fare well in organic production.[35]

Two thirds of the proteins contained in the feed used in Danish farming come from imported soy, mainly from Argentina, Brazil and the USA, of which 60 %–90 % is genetically modified.[36] It is important to note that organic livestock may not be fed GMO.

In round figures (2013), conventional livestock production in Denmark is made up by:[37]

- 1.5 million cattle. Feed contains soy. Milk production accounts for the second-highest protein consumption (565,000 tonnes of crude protein). To this should be added 278,000 beef cattle (76,000 tonnes of crude protein).
- 28 million piglets, of which 19 million are slaughter pigs and 9 million are for export. Soy is the main source of protein. The piglet production accounts for the biggest protein consumption (770,000 tonnes of crude protein).
- 106 million broilers. Soy is the main source of protein (70,000 tonnes of crude protein). To this should be added protein for egg production (18,000 tonnes of crude protein).

So, if consumers buy animal products from conventional production, they indirectly become large-scale consumers of imported GM soy. While Denmark, like most of the EU, has been suspicious of commercial farming of GM crops and its use within the EU, it has been permitted to import GM crops and ingredients

[34] GMO Compass 2006
[35] Jørgensen, Asger N. 2015. The protein in fava beans is, however, not sufficient to replace other protein sources (personal comment added by Birte Boelt)
[36] Bosselmann, Aske Skovmand et al. 2015
[37] To this should be added minks, but they mainly get their protein from fish meal/waste imported from surrounding fishing nations. Ibid.

for use in feed.[38]

4.1.2 Knowledge about risks and benefits of GMO cultivation and of consuming food products from animals fed GMO

There are no documented examples showing that the use of GMO in itself, directly and unequivocally, has caused significant adverse health or environmental effects. Naturally, it could be down to the fact that such examples have not yet been identified despite extensive research. As we will see, is appears that GMOs cultivated globally so far have on average had a significantly positive environmental and economic impact. Note, however, that it is partly because they have replaced conventional production that used several and more toxic pesticides.

A survey conducted by the two acknowledged scientific institutions *Pew Research Institute* and *American Association for the Advancement of Science* in January 2015 showed a widespread agreement comprising 89 % of scientists that genetic modification *in itself* is not harmful.[39]

It is possible that the cultivation of *specific* GM crops is linked to certain advantages and disadvantages, that makes them deviate from the general picture, although the evidence of such effects has been weak so far. Over time, several studies have apparently connected ill health effects to certain GMOs, but these studies have either not been peer reviewed or have been withdrawn or deemed controversial by the scientific establishment.[40] However, among some GMO sceptics there is a considerable amount of distrust in the scientific establishment within GMO risk research. In August 2015, this scepticism culminated when 40 American researchers were asked to publish their ties to 36 companies and organisations.[41]

There is agreement that GMO cultivation is associated with many of the advantages and disadvantages also seen in conventional farming, which depends on the manner in which the crops are cultivated. Monoculture, for example, is associated with a number of well-known disadvantages. In the USA, extensive use of Roundup resistant GM crops has exploded the use of the herbicide with

[38] It is indeed legal to grow GMO in Denmark under certain conditions (see the coexistence requirements below), but the farmer's possibility of growing them requires that GMOs are registered on the so-called species lists. Registration on the species list is subject to a value test that is to ensure the species is better in terms of yield and environment compared to existing species (Birte Boelt, personal comment)

[39] Also see a review of controversial examples showing that GMO is harmful: Entine, Jon og Rebecca Randall 2015: https://www.geneticliteracyproject.org/2015/01/29/pewaaas-study-scientific-consensus-on-gmo-safety-stronger-than-for-global-warming/

[40] The latest example concerns a GM maize variant, allegedly claimed to cause tumours; the study was retracted from the journal, but republished in a new journal, including in Casassus, Barbara 2014: http://www.nature.com/news/paper-claiming-gm-link-with-tumours-republished-1.15463. Various movements maintain that GMO can be harmful, see for example: Walia, Arjun 2014: http://www.collective-evolution.com/2014/04/08/10-scientific-studies-proving-gmos-can-be-harmful-to-human-health/, which is subjected to critical review here: Katiraee, Layla 2015: http://geneticliteracyproject.org/2015/01/26/10-studies-proving-gmos-are-harmful-not-if-science-matters/. Also see: Nicolia, Alessandro et al. 2013

[41] Kloor, Keith 2015

resulting problems of resistant and multiple resistant weed species.[42]

Some find that when GMO does not in itself carry risks, it seems illogical that the EU has chosen to regulate GMO separately, subjecting GMO to particularly stringent authorisation requirements.[43] Some observers find that subjecting the authorisation of GMO to more stringent requirements has had unfortunate consequences, e.g. that only 'major' crops undergo genetic modification; that only large seed companies can afford using the technology; and that generally other breeding technologies are preferred.[44] What is even more striking is the political opposition to GMO, which has resulted in only very few GMOs being authorised for cultivation in the EU. In reality a standstill was in place for 10 years leading, recently, to attempts of being untied in that the individual countries may now decide themselves whether to allow the cultivation of certain GMOs.[45]

Should GMOs be approved if deemed safe?

It is important to note that the outcome of any risk assessment largely depends on the value choices on which the assessment is based. That something is 'risky' means that it is assessed to cause unwanted consequences, but there may be different perceptions of which consequences are unwanted.

So, while critics claim that the so-called Bt crops reduce insect populations in the field and thus the birds' food options, biodiversity, etc., defenders assert that this is exactly what proves the effectiveness and success of the technology.

Another example concerns how some consequences are included in the scientific risk assessment, while others are not. The traditional risk assessment focuses narrowly on whether the use of a given crop is, to a higher degree or in a specific way, harmful to humans and the environment relative to the current practice. A general point of criticism is that the introduction of GMO in agriculture has continued the agricultural sector's dependence on pesticide use. Glyphosate-resistant crops have, for example, been developed by Monsanto, the company producing glyphosate, and the success of selling GM seeds has of course significantly boosted the company's sales of this agent. Although it is often claimed that glyphosate-dependent production leads to a lower toxic

[42] Gillam, Carey 2015
[43] See for example House of Commons, Science and Technology Committee 2015
[44] See for example Nicolia, Alessandro et al. 2013; Clive, James 2014
[45] In practice, it may not necessarily be simple to decide what possibilities the new legislation gives (Helle T. Anker, personal comment). The European Parliament and the Council of the European Union 2015: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:JOL_2015_068_R_0001. Also see: Nature Biotechnology 2015

pressure than the production it replaces, some find that pesticides should be avoided altogether, e.g. by switching to organic production.[46] So, even if one acknowledges that safety-authorised GMOs entail no *new* risks, one may still oppose authorisation because one does not accept the *well-known* adverse impacts that these GMOs (like conventional crops) entail. A prohibition affecting GMO production, but not conventional production despite entailing the same consequences, would be considered unjust.

A third example – which will be elaborated on below as it has been made relevant by findings in the spring of 2014 of glyphosate in urine of cows – deals with how extensive evidence needs to be before we can conclude that certain activities are "suffiently safe ".[47] Some may find that society should be "cautious" and only accept products that have been thoroughly tested, thereby reducing the risk of unwanted adverse consequences to a minimum, in which case it would be a fair assumption that it would reduce the pace of technological development all things being equal. Others would perhaps prefer society to take a more "progressive" approach and run greater risks in return for faster development, new environmental methods and greater manoeuvring room for manufacturers. Both choices express perceptions that, based on certain sets of values, could be considered reasonable. In contrast, under no circumstances would it seem fair without a due cause to treat certain products (e.g. GMO) more or less cautiously than other products in areas where the plants are not relevantly different. Read more thereon in the section about the 'The precautionary principle'.

So on the one hand, it is not possible to immediately conclude that GMOs, even if scientific risk assessments class them as "harmless", are desirable in the eyes of everyone. On the other, it would be fair to ask if the current counter-arguments can justify regulation that makes GMO different than other production forms.

In the following a number of results in relation to the consequences of using GM crops compared to non-GM crops will be described with special focus on the use of GM soya.

[46] Denmark recently rejected the renewal of the import authorisation of four already authorised types of GM cotton because they contain antibiotic resistance genes that can be transferred to disease bacteria. The specific resistance genes are, however, already found in nature, which is why any potential transfer is without significance. Nonetheless, there is political interest to maintain a no to the use of antibiotic resistance genes in GM plants. See: Albrechtsen, Rikke 2015: http://www.altinget.dk/foedevarer/artikel/danmark-vil-sige-nej-til-gmo-bomuld?ref=newsletter&refid=17009&SNSubscribed=true&utm_source=Nyhedsbrev&utm_medium=e-mail&utm_campaign=foedevarer.

[47] Read an elaborate discussion about the benefit-value relationship in Andersen, Hanne et al. 2010

4.1.2.1 Health effects

GMO in general

In a survey of data from 28 years of animal production from before and after the introduction of GMO, covering more than 100 billion animals, the authors conclude that health effects in animals were neither positive nor negative.[48] In a review of 24 studies of the long-term effects of using GMO-containing feed, the authors conclude that there is no difference for those consuming animals fed GMO and fed other diets: Nor are there measurable health risks in the animals.[49] However, surveys on the use of GM cotton in China show that the switch to GM has reduced the number of intoxication injuries because Bt crops reduce the use of insecticides.

Numerous studies have investigated if GMO, directly or indirectly, could be harmful to health if inserted genes are transferred; For example, it has been studied if genes are transferred to bacteria in the environment or in human or animal intestines, or if specific genes may potentially render the crop more allergenic than "natural" genes. Although genes in some cases may be transferred, the studies give no cause to fear GMO any more than variants grown by other means.[50]

Soya

Since GM soya is the most prevalent GM crop worldwide, the said results suggest indirectly that there are hardly any dramatic health risks associated with consuming the crop compared to its non-GM variant.

While Roundup/glyphosate, like other pesticides, are toxic, they have traditionally been considered in the range of less toxic agents.[51] But in the spring of 2014, two Danish farmers reported that their animals' health had gotten better after abandoning the use of a soy type genetically engineered to be resistant to the Roundup herbicide (RR soy) in the feed. Glyphosate residuals in urine and low mineral levels were furthermore observed in cows fed RR soya. Against this background, the Danish Veterinary and Food Administration ordered a report from the Aarhus University on the possible health effects of using feed containing RR soy compared to conventional soy.[52]

In their review, the researchers conclude that it certainly cannot be ruled out that glyphosate may affect the mineral uptake and change the intestinal flora in animals. Persistent feeding of animals with glyphosate residual food may in

[48] Eennaam, Alison Van og Amy Young 2014

[49] Snell, Chelsea et al. 2012. Please note that a number of the studies under review have methodological challenges, see tables 2 and 3 in the article.

[50] Nicolia, Alessandro et al. 2013

[51] In March 2015, an expert panel under the WHO stated that glyphosate is "probably" carcinogenic. See Cressey, Daniel 2015: http://www.nature.com/news/widely-used-herbicide-linked-to-cancer-1.17181. In November 2015, EFSA (European Food Safety Authority) concluded from a peer review that there were no grounds to classify glyphosate as carcinogenic. However, it is well-known that glyphosate is toxic and that it is found in Danish groundwater from time to time. EFSA has now set a threshold for acceptable daily intake among other things.

[52] Sørensen, Martin Tang et al. 2014

the long term and particularly in the vulnerable stages of animal lives cause adverse health effects. At the same time, researchers claim that previous studies (that found no evidence of health effects, cf. the above) hold little knowledge about these particular effects. Nor do the risk assessments, based on which the glyphosate threshold values are authorised, apparently hold such assessments despite the fact that researchers consider them obviously based on basic knowledge about the properties of glyphosate. But notably the researchers find it unlikely that the observed health effects are the result of genetic modification as such. Glyphosate residual is not only present in GM feed; The herbicide is commonly used to spray conventional fields before harvesting. So, the problem cannot necessarily be solved merely by avoiding the use of GM feed.

4.1.2.2 Impacts on the environment and on nature

In a considerable review of 147 studies of the impacts of GM crop, the authors conclude that on average, GMO farming has reduced pesticide use by 37 %.[53] If herbicide-tolerant crops such as RR soy is used correctly, fields are sprayed less times and later than in traditional farming. But, as we will see, one cannot necessarily expect that spraying is done correctly and that the mentioned effect is achieved.

Provided GM crops are planted correctly, it is possible to reduce the impact on the surrounding nature e.g. from seepage into the ground, drift to field boundaries and ditches with the wind or leaching by rain into watercourses (relative to conventional production). In Denmark, field surroundings make up a significant area of what is officially listed as natural areas. At the same time, GM crops are often tied to a switch to less toxic substances. There is also specific evidence that a switch to GMO has caused greater biodiversity, which is also beneficial to agriculture as it is dependent on pollinators like bees.[54]

Again, experience from the USA suggests that the use of pesticides is not always decreasing. In some cases, consumption has actually increased. The prevalent and one-sided use of e.g. Roundup has made some weed species resistant and has necessitated the concurrent use of several types of pesticides to control the growth of weed. A number of GMOs that are resistant to two or more herbicides are furthermore in the pipeline. The result will be that spraying with several substances is necessary to achieve the same effect. The most comprehensive study of the environmental impacts of GM crop cultivation in USA shows that the problems associated with herbicide resistant weeds have now reached such proportions, that more herbicide is used in GM soy fields than in conventional soy fields.[55]

Several studies furthermore show that there may be a long way to the benefit that may ideally be reaped from GMO cultivation to seeing it actually prac-

[53] Klümper, Wilhelm og Matin Qaim 2014
[54] Lu, Yanhui et al. 2012
[55] Perry, Edward D. et al. 2016

ticed. In support of these claims, a Danish interview study with farmers revealed that they would not be inclined to depart from their traditional assessment of when it is necessary to spray the fields. They tend to see the 'clean field' as a sign of the production's profitability.[56]

Thorough studies have been conducted of the risk that genes are transferred to weed species, thus making them more resilient either in the fields ('superweeds') or in nature, which has given rise to concerns that so-called *invasive species* could emerge and spread at the cost of local species. The invasion of new species could be a result of changed living conditions in nature. For example, it is well known that nettles have been able to spread in the Danish nature due to the nutrients that spread in connection with the agricultural sector's manure spreading on fields. Insect resistance is a good example of a trait that we may imagine can increase the competitiveness of wild plants, making it easier for them to spread. There is no evidence that invasive species as a result of GMO production have so far had any adverse consequences.[57] But there are examples that inserted genes via pollen drift may flow to and spread in populations of wild relatives, which could perhaps change their competitiveness in the long term.[58] It therefore cannot be dismissed that in step with the engineering of GMOs with traits that may increase competitiveness, a problem of invasive species could arise. But it should be noted that a much more probable causes of such problems are climate changes and the transfer of seeds and plants across regions (a well-known historic example is giant hogweed).

GM soya

The environmental problems connected to the cultivation of soy, including RR soy, are increasing. Soy cultivation is expansive and one-sided (monocropping), which creates favourable conditions for pests and glyphosate-tolerant weeds. And to counter this development, increasing amounts of several fungicides, insecticides and herbicides are used.[59] Of course, these problems were known well before the introduction of GM soy and can be expected to arise in any expansive use of monoculture.[60] Again, the consequences are not directly linked to GMOs, but rather to a one-sided cultivation practice. As mentioned above, in USA the situation now is that more herbicide is used in GM soy fields than in conventional soy fields.

According to the WWF, the increase in soya production has had various adverse impacts on nature and the environment. From 2000 to 2010, 20 million hectares of land were obtained for cultivation in an area stretching from Brazil across Bolivia and Paraguay to Argentina. Pressure is thus put on a number of valuable natural areas, including Amazonas. In the USA, still more prairie is taken up for the cultivation of soy and maize.

[56] Lassen, Jesper et al. 2007
[57] Nicolia, Alessandro et al. 2013
[58] Zapiola, María L. og Carol A. Mallory-Smith 2012
[59] Verdensnaturfonden 2014; Plantedirektoratet 2010
[60] Barfoot, Peter og Graham Brookes 2014

In addition, deforestation contributes to CO_2 emission, and soy cultivation leads to the release of nutrients that threaten watercourses, etc.

4.1.2.3 Socio-economic consequences

In a review comprising 147 studies, the authors conclude that on average, GM cultivation has increased yields by 22 % and increased profits by 68 %, and that especially smallholder farmers in developing countries benefit from adopting GM.[61] One further benefit of switching to glyphosate-tolerant crops is that they ease the requirements for tillage. Tillage increases erosion, which in some places significantly deteriorates the quality of the soil, leads to desertification and increases CO^2 emission.

But GM adoption cannot always be assumed to be an obvious choice. For instance, many developing countries would be able to improve productivity through traditional processing alone, and the infrastructure and regulation required by GM cultivation are not always in place. A report from the Food and Agriculture Organization of the United Nations (FAO) concludes that organic agriculture has a number of benefits for farmers in developing countries.[62] Furthermore, the United States Department of Agriculture concludes, on the basis of 15 years of GMO use in the USA, that the yield cannot unambiguously be said to be clearly higher in GMO production.[63]

GMO cultivation has significantly impacted on the agricultural market structure. It is due to GM varieties being patented, while Europe has had no tradition of patenting new varieties. A patent gives the inventor exclusive rights for 20 years. In return, the applicant must disclose how the invention was made in the patent application. The underlying rational is that if inventions were kept secret, society would not be able to take advantage of the knowledge held by the invention and "build on top of it". In other words, researchers are allowed to do further research on a patented GM crop (or the genes inserted in it). But for as long as the patent is in force, they are not permitted to breed further on the crop, e.g. to refine it further or grow seeds for the next sowing season; Instead the seeds must be bought from the manufacturer. This stands in contrast to the traditional practice, the guidelines of which are established in the so-called UPOV Convention.[64] Under the convention, an inventor of a particular variety is entitled to royalty every time it is cultivated, regardless of whether the seeds are bought or bred by the farmer. The decisive difference between patenting and the UPOV rules is thus that non-patented varieties can be developed into a new variety to be patented, whereas other developers are not permitted to redevelop the variety if patented.[65] The first GMO patents are expiring these years, which thus makes the GM varieties available for sale without royalty and for reprocessing.[66]

[61] Klümper, Wilhelm og Matin Qaim 2014
[62] OA and FAO 2007
[63] Fernandez-Cornejo, Jorge et al. 2014
[64] See http://www.upov.int/overview/en/index.html
[65] Birte Boelt, personal comment
[66] Regalado, Antonio 2015

There is also a problem with keeping GMO production separate from conventional and organic productions known as the so-called coexistence problem. If the crops are mixed together, organic farmers can no longer sell their harvest as organic and thus suffer a considerable financial loss. But keeping different productions apart could be challenging. Grain residue in a harvester after reaping a GMO field could still be present when the harvester is used on a conventional field. Or pollen drifting from a GM maize field could fertilise the maize of adjacent organic maize fields. It has proven quite demanding to maintain a requirement of avoiding coexistence altogether, and for this reason a 'technically unavoidable' coexistence threshold has been set in relation to labelling and thus the marketability of the products:

> *The rules are to ensure that the cultivation of genetically modified (GMO), conventional and organic crops can take place side by side without subjecting neighbouring farmers to economic loss caused by GMO mixed in their crops. Organic crops must contain no more than 0.9 % GMO, and it must be declared on the label of the harvest from conventional farming if the GMO content exceeds 0.9 %*.[67]

It is up to the individual EU Member States to establish rules on buffer zones. In Denmark, there must be 150 m between a field with GM maize and fields with conventional or organic maize. Denmark was one of the first countries in the world to establish rules on coexistence. According to the rules, a farmer can furthermore be compensated if the threshold of 0.9 % is exceeded.

In the USA, GM variants of crops such as sugar beet, cotton, maize and soy account for 90 % of the harvest, but demand for organic crops has grown remarkably at the same time. The lack of coexistence regulation has spurred conflicts between organic and GM producers that have not yet been solved.[68]

GM soya

A study estimates that global GM soy production has increased profits by 4 % on average compared to non-GM production, of which two thirds are attributable to savings and one third to a higher yield.[69] If we are to believe the aforementioned studies showing that GMO cultivation has generated an average increase in profits of 68 %, soy is by no means a top performer.

The change has caused an intensification of the production with the accompanying socio-economic consequences, which historically has been seen in other places as well: Small-scale farms are replaced by bigger farms, and foreign investors buy land where it is cheapest, e.g. in South America where land is bought for cultivating soy in Bolivia.[70]

[67] NaturErhvervsstyrelsen 2015
[68] Bjerga, Alan 2014
[69] Barfoot, Peter og Graham Brookes 2014
[70] Verdensnaturfonden 2014

Next generation of GMO

In summary, it seems that the GMOs grown so far and of which the majority is used for animal feed, carry relative benefits and that the risks are associated with the way the GMOs are cultivated, rather than genetic modification in itself. There are no signs that eating GMO is unhealthy in itself.

Furthermore, as mentioned, these experiences are related to a narrow spectrum of GMO variants that have so far been dominant. Obviously, the situation is quite different in other contexts such as in GMOs produced for the manufacture of medical substances ('pharming'), which is governed by entirely different rules and is outside the scope of this report. Relevant to food and feed, though, is 'second generation' of GMO variants which is currently being approved for commercial cultivation. Examples are:[71]

- Climate-adapted foods: drought-tolerant variants of soy, maize, rasp, rice, sugar cane, etc., that produce a higher yield during droughts, are now cultivated around the world.

- Healthier foods: a potato with a lower content of acrylamide, a potentially cancerous substance, was authorised for cultivation in the USA in 2014.

- Nutritionally enhanced foods: "Golden rice", a rice variant enhanced with vitamin A is being risk-assessed at present. Vitamin A deficiency is common in many less developed countries, and the GMO has been developed with a humanitarian aim.

- Pest-resistant crops: Oranges engineered using a gene from the spinach plant to control pests, which are currently threatening the global production of orange juice, were approved for large-scale testing in open fields in May 2015.

It cannot be dismissed that some of these crops enjoy increased support among the Danish people in that the utility, they create, not only benefits the manufacturers (see more about the public's view on GMO below). This e.g. applies to the orange, which is furthermore characterised by the fact that previous efforts to grow resistant orange trees without the use of genetic engineering have failed.[72]

At the same time, we cannot dismiss the possibility that new GMOs with new traits can have other effects on health and on nature than we have seen so far – especially in those cases that involve genetic engineering of constituent substances. As mentioned, if inserting a new gene changes competitiveness, the result may be growing problems with weed control and invasive species.

[71] Clive, James 2014; Waltz, Emily 2014; Satran, Joe 2015
[72] Voosen, Paul 2014

The opposition to GMO use in Europe and other places has meant that alternative molecular methods, involving no genetic engineering, are gaining ground and are perhaps to some degree superseding GM technology, some find. Also gaining ground is a new and far more accurate and effective method for genetic modification, the so-called CRISPR technology, which defenders claim is an extremely promising technique, not least if environmental efforts are to be promoted. With this technique, Chinese scientists have been able to remove the gene in wheat that makes it possible for the hazardous mildew fungus to attach to it. It is also possible to reintroduce traits in utility plants that were lost during plant breeding, making them stronger. Such modifications may reduce the need for spraying with pesticides.[73] Modifications of this kind can turn out to make quicker progress than traditional GMO technology, because the insertion of new genes is fiercely regulated in a number of countries.

4.1.3 What themes are discussed?

It may seem surprising that there is such strong opposition to GMO technology, considering that no risks seem to be associated with eating or growing GMO as such. Compared to many other uses of bio and gene technology, it is peculiar that GMO in food production has gained such limited public support. In Denmark, the public support for GMO has been a steady 32 %, but more than half of the respondents are outright suspicious. The opposition to GMO is not an expression of general doubts about technology. Nor is there a general scepticism to bio and gene technology in the public.[74]

One reason might be that the citizens reasons for considering GMO as problematic diverges from those analysed as part of a scientific risk assessments. In scientific risk assessments, risk is described as the product of the *severity* of a given risk multiplied by the *probability* of it happening. So, a GMO risk assessment only attaches importance to the risks related to health and the environment. But surveys have shown that lay persons attach importance to other matters. Katrine Hauge Madsen and Peter Sandøe conclude from an interview study that, in addition to the questions answered by scientific risk assessments, consumers are interested in questions such as: ”If something goes really wrong, how bad will it be? Are the negative effects natural or man-made? Have we accepted the risk ourselves or have others on our behalf? Are there benefits that outweigh the risks? Who will enjoy the benefits and who will suffer the risks?”[75]

With this in mind, it is not surprising that citizens have doubts about the use of GM crops even if the crops have been assessed as harmless based on a scientific assessment. Considerations about responsibility and unfairness, etc. are important, and the public may also not be sure how much they can trust scientific judgment. Several surveys of the public's preferences and perceptions show that growing numbers prefer alternative production forms such as organ-

[73] Palmgren, Michael G. et al. 2015
[74] European Commission 2010a
[75] Madsen, Kathrine Hauge og Peter Sandøe 2003, 47–51

ic production rather than conventional production. The intensified consumer interest in organic standards has especially been linked to a number of food 'scandals', including some connected to the introduction of GMO.[76]

Risk, on the other hand, does not always seem to play a decisive role for GMO endorsement. A survey of Europeans' views on GMO thus showed that among *both* the strongest defenders and opponents, many perceived GMO as a risky technology.[77] Interview studies furthermore show that many, despite their GMO suspicion, are not afraid to eat them.[78]

Against this background, it may rightfully be asked under what conditions citizens would support food technologies like GMO? One suggestion from 1998, which today still seems to be valid goes:

> *"… First, utility is a precondition of support; second, people seem prepared to accept some risk as long as there is a perception of utility and no moral concern; but third and crucially, moral doubts act as a veto irrespective of people's views on utility and risk".*[79]

This assessment indicates, *on the one hand,* that citizens in return for a perceived risk of GMO demand that the technology will provide utility. Surveys of the citizens' perceptions of utility show that beneficial effect in the form of improved manufacturer profits is not considered enough by many. But utility may relate to both individual values (e.g. healthier food) and shared values (e.g. combat of environmental and poverty problems). Finally, it could play a role whether the same benefits can be achieved in alternative ways. *On the other hand*, it is assessed that this reasoning is only valid within certain 'moral' limits. Surveys show that the Danish people's moral concerns relative to GMO revolve around factors such as power, democracy, unnaturalness and animal welfare of which unnaturalness seems to play an important role.[80]

Views of nature and GMO

It appears from Chapter 3 that GMO is one of the food technologies that Europeans consider the most "unnatural" of all. A survey of the Danish people's use of the concept of naturalness in connection with GMO shows a perception that GMO:[81]

- is a product of human interference
- creates imbalances in nature

[76] Padel, Susanne og Carolyn Foster 2005, 606–625
[77] Gaskell, George et al. 2006, 64–68
[78] Lassen, Jesper 2002
[79] Wagner, Wolfgang et al. 1997; Lassen, Jesper 2002
[80] Lassen, Jesper 2002
[81] Mielby, Henrik et al. 2013, 471–480

- is a product of processes that are unable to happen in nature; transferring genes between distantly related species (trans-genetic modification) is viewed as more controversial than transferral between species, that would be able to reproduce without technical interference (cis-genetic modification)

- possess features different from their unmodified relatives; features that occur naturally are more acceptable

- are not well known; natural species are well known

As described earlier, the consumers' choice of the 'natural' in the form of organic products may be seen as a reaction to the *risks* considered to be entailed in modern food production. Thus, there is a certain linkage between the perception that something is unnatural and the perception that it is risky. But if we look into what citizens mean when they criticise GMO for being unnatural, it is evident that risk is not considered the only problem (cf. the statements above): GMO is also considered to be a threat to what we could call nature's integrity in the sense that there should be limits to human interference with nature.[82] GMOs are considered problematic because they are an expression of a fundamental form of power over or "interference" with the course of nature, and because GMO specifically is a threat to natural order because they cross species barriers, for example.

As described elsewhere in the report, many people think that it is a problem by definition when foods in their view are "unnatural". But even so, there seems to be no agreed definition of the concept of naturalness, in fact, the concept seems to encompass a multitude of perceptions. Many associate processing and additives with unnaturalness when it comes to food, but the concept is used inconsistently. For example, well-established processing techniques are considered more natural than GMO, although the techniques have clearly altered our food products significantly (the naturalness argument is covered in more detail in Chapter 3). So it could be rather difficult to determine what ethical importance to attach to the naturalness argument.

The mentioned surveys also do not reveal what ethical importance citizens give to the naturalness argument compared to other arguments for and against certain GMOs and versus conventional or organic alternatives – although, as mentioned, the naturalness argument can act as a 'veto' to reject it altogether in some cases.

The precautionary principle

The citizens' reservations to GMO can be seen in the context of a broader scepticism toward conventional food production as well as the emergence of organic products. A stronger awareness seems to have grown out of a number

[82] The Danish Council on Ethics has expressed similar views in Det Etiske Råd 2006

of food scandals which have shown that with lower food prices through intensification of food production follow certain risks. In spite of researchers' persistent and thorough risk assessments, consumers have become acquainted with a number of adverse effects that seem to be directly linked to our production methods, and therefore may seem unnecessary, e.g. heavy metals, pesticides, additives and food infections.

The formulation of the so-called *precautionary principle* we may see as a response to this problem. The fact that GMO is regulated separately and more restrictively could also be an expression of a more cautious approach, which acknowledges that our knowledge about what harm GMOs may cause basically was limited.

The precautionary principle has been defined in various ways. The definition from the UN's environmental conference in 1992, which also formed the basis of the later protocol on biosafety (including GMO), says:

> *"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".*[83]

The fundamental idea of the precautionary principle is that it should be possible to restrict technologies *even without fully knowing if* the danger is acute or real. Whereas the principle applied previously, namely that a technology was always innocent until proven otherwise (making uncertainty an advantage to manufacturers), companies must now increasingly prove that their product is not dangerous. In other words, people and nature must be given the benefit of the doubt much more than the case was before. By way of illustration, all GMOs must be subjected to thorough tests and experimental cultivation intended to evaluate if they behave in unforeseen ways. The quote stresses that it is the way in which we act on *lack of full scientific certainty* that must be changed: Uncertainty should not be used as a means not to limit technology, quite the opposite.

Others have argued that it is too imprecise to describe the problem in terms of uncertainty. In a review of a number of cases where "early warnings" have been neglected, a number of researchers establish that unforeseen events in many cases do not happen as a result of scientific uncertainty, i.e. because it is an unlikely, but foreseen consequence. The unforeseen events were some which, at that time, were impossible to foresee, so it was rather a case of scientific *ignorance*, i.e. lack of knowledge about which consequences to consider on the whole:

[83] EU 2000

To be alert to – and humble about – the potential gaps in those bodies or knowledge that are included in our decision-making is fundamental (...) By their nature, complex, cumulative, synergistic or indirect effects in particular have traditionally been inadequately addressed in regulatory appraisal.[84]

But if the precautionary principle is used to reject technologies for fear of them having adverse effects that we cannot even imagine today, it can easily be used widely to slow down any development since any activity could potentially have unforeseen negative impacts. For this reason, criteria have been established to determine when the precautionary principle may be legitimately applied. Any technology could have unpredictable consequences, so how should the principle be applied? Within EU law this has been allowed for by stating that the application should be proportionate and non-discriminatory and should furthermore be based on an assessment of the consequences of acting versus not acting. It cannot be based on a purely hypothetical risk.

In other words, there will often be a price to pay – the more precautionary, the higher the price. It can be said of the precautionary principle that it changes the distribution of the benefits and risks of a technology. In 2000, the European Commission adopted an announcement on the use of the principle (although without defining it):

(...) decision-makers are constantly faced with the dilemma of balancing the freedom and rights of individuals, industry and organisations with the need to reduce the risk of adverse effects to the environment, human, animal or plant health.[85]

Again, it is illustrated how both risk assessments and the precautionary principle are by their nature value-based. To the extent that the public opposition to GMO is interpreted as a wish for greater caution, it can be seen as an expression of a wish for attaching more importance to showing consideration for human beings and to nature than done in the past: The risk that follows from science's notoriously limited knowledge is, in this area, only acceptable on certain conditions. These conditions could be the above mentioned: A GMO must, for example, have a direct value for consumers or society.

In continuation thereof, it would be relevant to consider if 20 years of experience with GMO cultivation have changed the view that the technology's consequences are 'unknown' – and implicitly the legitimacy of applying the precautionary principle to GMOs. On the one hand, new GMOs may not necessarily behave as the ones that have already been tested. On the other, it could be held that the technology as such is well-known today; As long as animal production solely uses 'well-known' GMOs, it could be argued that the precautionary principle should not be applied. If we insist on applying the precaution-

[84] Harremoës, Poul et al. 2002
[85] EU 2000

ary principle to GMO technology as such, we should equally consider whether such approach would not cause unwanted restrictive effects on many and especially newer technologies.

4.1.4 Legislative regulation of food from animals fed GMO

Regulation of GMO feed[86]

The entire GMO area is extensively harmonised at EU level. In Denmark, GM crops for feed are not cultivated commercially, and GM feed is instead imported from countries from outside the EU primarily. Like cultivation, the marketing in the EU of GMOs and the use of GMO-manufactured products in the food and feed chains are subject to EU authorisation. Once the EU has authorised a crop for human consumption or feed, it can be sold in all EU Member States. This means that an individual Member State cannot prohibit the sale of EU-authorised feed in its territory. Today, 58 GMOs are authorised for human consumption and feed in the EU.[87]

Genetically modified food and feed must be risk assessed and authorised according to *Regulation No 1829/2003 on genetically modified food and feed*.

The requirements imposed on genetically modified foods or feed are:

- It must not have negative effects on human or animal health or the environment,
- It must not mislead the consumer or the farmer, and
- it must not have a lower nutritional value than a corresponding non-GM food or feed.

The principle applied in risk assessment is a comparison of the genetically modified food or the genetically modified feed to corresponding non-GM food or feed.[88]

It is only permitted to market genetically modified feed if it is scientifically established that it is just as safe and healthy for the animals to consume as corresponding, traditionally produced feed. If the feed consists of fertile organisms, it must furthermore be proven that it does not harm the environment. The European Food Safety Authority (EFSA) is responsible for the scientific risk assessment. The authorisations are registered in the EU's register of authorised genetically modified food and feed.

Genetically modified food must be labelled so that it is clear to the user that it

[86] This chapter covers legislation adopted prior to September 2015
[87] See the European Commission – Fact sheet: Questions and Answers on EU's policies on GMOs
[88] Fødevarestyrelsen 2015: http://www.foedevarestyrelsen.dk/Leksikon/Sider/Risikovurdering-og-godkendelse-af-GMO.aspx.

is genetically modified. If the feed has been contaminated with less than 0.9 % genetically modified material and such contamination is unintentional or is technically unavoidable, it should, however, not appear from the label. EU legislation does not prohibit the use of "GMO free" labelling.

Regulation No 1830/2003 on the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms should also be mentioned.

According to *Regulation No 834/2007 on organic production and labelling of organic products,* GMO and products produced from GMO must not be used in organic food. For example, feed for organic animals must not contain or originate from GMO. The same applies to additives and processing aids for organic foods. However, medicines for organic animals can be made from GMO.

Meat, milk and eggs from animals given genetically modified feed are not covered by the GMO food regulations.[89] These products may therefore be sold without satisfying the extensive EU requirements pertaining to GMO-containing food. The products must follow the general rules on marketing, labelling, etc. for food.

Regulation of food from animals fed GMO

Apart from the EU's *general food regulation* (178/2002), which contains general principles and requirements, we particularly call attention to *Regulation No 1169/2011 on food information to consumers*.

This regulation lays down general requirements that apply to any food destined for final consumers. Labelling, presentation meetings as well as advertising of foodstuffs must not

- mislead the consumer in particular as to the characteristics of the food, food effects or properties

- attribute to any food the property of preventing, treating or curing a human disease.

Food information must be accurate, clear and easy to understand for the consumer.

The regulation also establishes some requirements for mandatory food information. If such information is declared on a product, the general principle is that the Member States cannot prohibit the sale thereof.

The regulation furthermore includes provisions about voluntary food infor-

[89] This report does therefore not provide further description of the EU regulatory rules that govern GMO-added food.

mation. Food information provided voluntarily must satisfy the following requirements.

- It must not mislead the consumer.
- It must not be ambiguous or confusing for the consumer.
- It must, where appropriate, be based on the relevant scientific data.

Pursuant to Article 39, Member States may impose demand for additional information, justified on grounds of, for example, public health or the protection of consumers.

We also refer to *Regulation No 1924/2006 on nutrition and health claims made on foods*. Nutrition and health claims are voluntary information given in connection with the marketing of foods. Claims that concern special nutrition and health properties of foods are regulated by the health claims regulation. Whether a claim falls under the regulation thus depends on whether it is covered by the definition of either a 'nutrition claim' or a 'health claim'.

- A nutrition claim means any claim which states or implies that a food has particular beneficial nutritional properties due to its content of energy, nutrients or other substances.
- A health claim means any claim that states or suggests that a relationship exists between a food or one of its constituents and health.

The Regulation on nutrition and health claims made on foods thoroughly regulates the application of nutrition claims and health claims in the EU and supplements the general provisions in Regulation No 1169/2011 on food information to consumers. In relation to labelling and marketing of food, only the authorised nutrition and health claims may be applied, and under the Regulation on nutrition and health claims made on foods , new claims can be adopted or rejected.

The Danish Food Act (*no. 467 of 15 May 2004*) lays down rules on marketing and labelling of food in Part V. Statutory Order *no. 234 of 6 March 2015 on labelling of foods* has been established in pursuance of this act. The executive order supplements and implements the EU provisions on labelling of food.

New initiatives

In April 2015, the European Commission proposed to give the national governments greater influence on the application of EU-authorised GMOs for feed or food by giving the Member States greater leeway to restrict or prohibit the use thereof in their own territory. If adopted this would make it possible for each Member State to prohibit the use of feed containing genetically modified crops in their own territory. Under the proposal, no changes would be made to the current authorisation system, which is based on science and labelling pro-

visions which ensure that consumers have choice. The novel element is that once a GMO has been authorised for use as food or feed in Europe, the EU Member States will have the possibility to decide not to authorise the concerned GMO for use in their consumption chain ('opt-out').

Member States would have to justify that their opt-out measures are compatible with EU law, including the internal market principles and the EU's international obligations (including the EU's obligations in WTO). Opt-out measures must therefore be based on other legitimate concerns than those assessed at EU level (i.e. risk to human and animal health and the environment).

The European Commission's legislative proposal was treated by the European Parliament in October 2015, which dismissed the proposal because ”members are concerned that the law might prove unworkable or that it could lead to the reintroduction of border checks between pro- and anti-GMO countries”.[90]
The proposal is to be re-examined by the Commission.

4.1.5 The Danish Council on Ethics' recommendations on the use of food from animals fed GMO

The Danish animal production is largely based on imports of GM feed, soy in particular, which through genetic engineering has been made resistant to the Roundup herbicide. Thus, Danish consumers are indirectly large-scale consumers of GMOs.

GMOs have been cultivated for more than 20 years and are now grown in very large areas in the USA, South America and Asia for feed purposes in particular. This has provided a certain experience with and knowledge about the consequences of cultivation and application of GM feed crops. The following picture appears:

- There have been no indications that the use of gene technology *as such* makes it risky for animals to eat GM feed or for humans to eat such animals despite extensive studies.
- The prime incentive to cultivate GMO is that the cultivation, in average terms, saves time and money and provides a slightly higher yield.

- The current application of GMO feed usually involves the use of pesticides. An average reduction in the use of pesticides relative to conventional production has been recorded, which, however, is diminished by widespread problems of resistance in recent years.

- The production of soy (GMO/non-GMO) is putting pressure on nature and the environment, e.g. as a result of the conversion of natural areas to farmland.

[90] See European Parliament 2015: http://www.europarl.europa.eu/news/en/news-room/20151022IPR98805/Parliament-rejects-national-GMO-bans-proposal.

- Even though no evidence suggests that GMO production or consumption thereof involves risks, more than half of the Danish population remain suspicious to GMO.

The members present the following recommendations to the labelling of food from animals fed GMO:

The choice of buying food from animals fed GMO should be left to the ethical consumer through a labelling system

A majority of members acknowledge that the increasing numbers of conducted studies do not suggest that it is harmful for human beings to consume food from animals fed GMO. Even so, these members find a labelling system relevant for these food products because it gives the consumer a possibility to avoid them. The members base their recommendation of a labelling system on different reasons: Some members do not consider GMO in itself to be more problematic than other processing forms, but they want a labelling system to respect the liberty of choice for consumers who are sceptical about GMO. Some members find that GMOs give rise to ethical problems other than risks, and one member distrusts the safety of GMO cultivation altogether.

Respect for other people's right to choose not to buy GMO

The majority (Jørgen Carlsen, Gorm Greisen, Kirsten Halsnæs, Thomas Ploug, Lise von Seelen, Christian Borrisholt Steen, Karen Stæhr, Steen Vallentin, Signild Vallgårda and Christina Wilson) are convinced by the research showing that GMO is not harmful in itself, even though certain applications thereof can be. These members acknowledge, however, that this is an area where a vast amount of consumers are persistently sceptical. These consumers should be able to make choices for themselves based on their own values, without committing others to do the same. For them to avoid food from animals fed GMO, a labelling system is needed, which is why labelling these products is recommendable. It could be discussed if a separate labelling system is needed or if it suffices to refer consumers wishing to avoid these products to buy Ø-labelled products (organic label). The most important thing, according to these members, is that those consumers who find the use of GMO wrong in general ought to have a way of avoiding GMO-containing foods.

These members disagree that genetic manipulation is more problematic than traditional farming, which also causes radical changes to plants and animals. They warn against making GMO the scapegoat of problems that originate from a culture with intensive production that causes problems for the environment and animal welfare. It could be suspected that part of the criticism has emerged because GMO is linked to these production forms as most of the known GMOs have been developed to enhance efficiency in farming, which is already highly efficient. But there are also examples of GMOs that are developed to counter real problems, as described in the report.

These members encourage the development of GMOs that can be used to e.g. ensure the nutrition of poor people, to be grown in climate-challenged territories, to feed the world's growing population, ensure adequate vitamin intake in the poorest, save species at risk of extinction, etc. They warn against the establishment of GMO authorisation rules that are so restrictive that they impede the development of useful GMOs. Ideally, all new plants, non-GMOs included, should be assessed based on their potential risks and potential benefits; Criteria that we know from the GMO authorisation procedure in Norwegian gene technology law. In contrast to the legislation of most other countries, Norwegian law provides criteria of sustainability and societal benefit that must be met to authorise the manufacture and use of GMO.[91]

Wrong perspective on nature

Other members (Jacob Birkler, Lillian Bondo, Mickey Gjerris and Signe Wenneberg) find that genetic manipulation fundamentally expresses a wrong perspective on nature whereby human beings' relationship to nature is gradually becoming less harmonic and we distance ourselves from the earth and nature that we are a part of. Genetic manipulation therefore crosses a limit of how far human beings are allowed to go in their manipulation of nature. Obviously, it is hard to say exactly where to draw this line, given that all food can be said to be unnatural to varying degrees, but the members find that genetic engineering to a much higher degree than other breeding technologies expresses nothing but an instrumental relationship to nature. In genetic engineering, changes are made that are unparalleled in nature. Genetic engineering expresses such profound disrespect for nature and its balances that it should only be applied if there are no other alternatives. In order to give people who share this perspective on nature a real possibility to avoid products based on this form of biotechnology, a labelling system is recommended.

Distrust to safety

One member (Anders Raahauge) finds that food from animals fed GMO should be labelled because the modification of plants through genetic manipulation in itself is problematic even if it has not been established that the cultivation or feed is harmful to humans or the nature. This member finds that consumers should have the possibility to avoid GMO based on any distrust to the existing risk assessments. The member finds that especially in this area, there is particular reason to distrust research, the greed of manufacturers, the eagerness of researchers to find new knowledge and people's ability to predict the long-term consequences of adopting techniques that fundamentally change plants and animals. The member acknowledges that distrust that goes unsupported by specific studies does not sufficiently warrant a ban on GMO feed, but he finds that the consumers who have such heartfelt distrust should be given a possibility to avoid the products, in which case a labelling system is needed.

[91] About the Norwegian model, see Det Etiske Råd 2006, 47ff

Food from animals fed GMO should not be regulated

One member (Poul Jaszczak) does not find that there is a basis to regulate GMO further. GMO-containing food is already required to bear labelling information despite the fact that it has not been verified that GMO makes more harm than any other form of agricultural production. It would seem unreasoned to tighten the requirements to include also food from animals fed GMO.

The member argues that the demonstrated harm inflicted on animals fed GMO soy resistant to the Roundup herbicide is not a result of genetic modification as such, but was caused by the plants having been sprayed with glyphosate-containing Roundup. But Roundup is also commonly used to spray conventionally cultivated plants, so the problem cannot be solved by avoiding the use of GMO feed. Instead, the focus should be on the spraying with glyphosate and other toxic substances. Ideally, these should be avoided in conventional production even if the crops are not GMO. Alternatively, we should label all food that contains residue of toxic substances.

The member points out that future GMOs could have the potential of promoting a sustainable agricultural sector – and could perhaps even be of great use in certain climate-destroyed areas. One should not entirely give up the idea of modifying crops genetically because some applications of the technology appear problematic if other applications may solve real problems e.g. in relation to climate change. Instead of prohibition or labelling, this member encourage the development of GMOs that can be used to ensure the nutrition of poor people, e.g. by being capable of growing in climate-challenged areas, feed the world's growing population, ensure adequate vitamin intake in the poorest, save species at risk of extinction, etc.

Minority statement

GMO is the wrong way to go

One member, Lene Kattrup, assesses that GMO is unwanted in Denmark because of the risks associated with the use of GMO, including the greater risk of promoting monocultures, the trend of increased dependency on concentrated import from large conglomerates in other countries, reduced biodiversity in nature, risk of resistant weed species, potential harm to animals and humans (due to increased/expansive use of pesticides), transfer to other crops – including organic fields – of GMO material, etc. Reference is generally made to the factual chapter of this report. It makes a difference that Denmark is a small country. Instead, this member would recommend that the EU and Denmark support the freedom of choice for individual Member States not wanting GMO crops.

The member finds it wrong that we are currently importing large volumes of GMO concentrates as it could mean that we contribute to increased an unnecessary impacts on the environment and the climate and possibly land grabbing and increased inequality in the world. We should grow our own feed. On top of that it makes our agricultural sector too dependent on imports (e.g. of pesticides and

GMO feed). Instead, the member recommends to implement national measures to gradually implement much stricter spraying regulations coupled with a continued ban on GMO, which would additionally give Denmark a competitive advantage. The long-term goal, in the member's opinion, should be enhanced sustainability, the aim being to keep nature and the environment as clean as possible with a circular, good conversion of nutrients and preservation of the soil's fertility. In other words, a healthy Danish future-proof agricultural sector. We should aim to become independent and self-sufficient in relation to food, for safety reasons as well, and make for increasing exports. In this context, GMO seems to be the wrong way to go.

4.2 Climate-damaging foods

In the later years there is a growing acknowledgement that the production of certain food types is a major contributor to anthropogenic climate changes. Food products alone account for 19 %–29 % of global anthropogenic greenhouse gas emissions[92], of which the livestock sector accounts for 14.5 %. 41 % of this sector's emissions come from beef production, while dairy cattle account for 20 %.[93] This means that cattle alone account for about 10 % of the total anthropogenic greenhouse gas emissions. So, major benefits could be achieved for the climate – and thus for all the people who are affected by global warming – if especially the populations in the western countries were to convert their food purchases to more climate-friendly behaviour. Principally, if they consumed far less meat from especially ruminants, which emit large amounts of the powerful greenhouse gas methane. This acknowledgement has only just started to spread within recent years. Politically, the focus has been on the burning of fossil fuels, and the food area is left entirely to the ethical consumer today. The question is if it is an individual responsibility to move food consumption in a climate-friendly direction, and if such a strategy has any chance of success.

We may describe the climate as a common public good that is freely available to every human being on earth. It implies that a country investing in the reduction of greenhouse gas emissions to mitigate dangerous climate changes will have to share the benefit with all other countries. Since most countries separately are sources of greenhouse gas emissions, it may seem a Sisyphean task to act alone to reduce them, which is also why the UN's Climate Change Convention of 1992 was adopted as the framework for joint international action. Common goods are often linked to the problem known as *the tragedy of the commons*; Farmers who share a common grazing land, each has a rational self-interest in putting their animals out to pasture, the result being that the commens are overgrazed if they fail to collaborate on how to manage it. If collaboration is not secured, the act of one party may appear loss-generating or use-

[92] Vermeulen, Sonja J. et al. 2012, 198. The figure includes all stages of food production as well as packaging, transportation, sales links and the consumer's processing as well as waste disposal.
[93] FAO 2013, 15–16

less. In many ways, this description calls to mind the international climate negotiations: Most countries want to reduce greenhouse gas emissions to avoid the extensive consequences of continued warming, but they prefer other countries lifting a large part of the burden.

And while the parties are negotiating, global warming is increasing. This has made a small number of consumers take responsibility by taking climate-friendly action through their food consumption, but their efforts are inhibited by the fact that it is difficult to figure out which foods are most climate-friendly. On top of that, the individual's choice makes no real difference, as only joint efforts will yield measurable effects when it comes to slowing down climate change. Some refer to this as choosing to turn a blind eye to the consequences of our acts because it would be costly for the individual consumer to change behaviour.[94] Probably, we would feel deprived at first if we had to stop eating climate-damaging foods that we have grown accustomed to. Most likely, it is factors like these that may explain why it is still only a rather small group of consumers who think of the climate in food choices.

In the following, we will review current knowledge about the extent of anthropogenic climate change, including the perspectives for the living conditions on earth if greenhouse gas emissions are not reduced. As mentioned, food products contribute to emissions by 19–29 %, and we look at the possibilities of reducing these emissions through changes in food consumption.

The Council will here consider the ethical consumer's responsibility to tackle the serious problem created by climate changes. Should each and every consumer assume responsibility to switch to a more climate-friendly diet, given the obstacles of learning a complex area and given the fact that the individual's contribution alone results in no immediate measurable effect in the big climate picture? Or are the ethical problems of global warming of such magnitude that the state should take initiatives to make the Danish population choose more climate-friendly food alternatives?

4.2.1 Global warming

In the scientific society a remarkably strong agreement now prevails that humans are rapidly changing the global climate through the emission of greenhouse gasses.

In the IPCC's Fifth Assessment Report, it is thus concluded in the Summary for Policymakers by Working Group I on the Climate System that:

> *Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This*

[94] See Gjerris, Mickey 2015b, 517–532

> *evidence for human influence has grown since AR4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20thcentury.*[95]

In addition, it was established by a review of 11,944 papers on global warming, published in scientific journals between 1991–2011, that there is a 97.2 % consensus among scientists that human influence is what causes cause global warming. The authors note that *Our analysis indicates that the number of papers rejecting the consensus on AGW (anthropogenic global warming) is a vanishingly small proportion of the published research.*[96] Therefore, it is agreed that it is necessary to take measures against the problem within a short time frame before the consequences become unmanageable for future generations and for human beings and ecosystems. It is believed that vulnerable areas will be affected first, but in Denmark we have already seen an increase in, for example, extreme weather phenomena.

As is well known, decades of international political negotiations to reach binding agreements to reduce the emission of greenhouse gasses have failed to alleviate the problem. Negotiations have taken place under the UN since 1987, in which period the emission of greenhouse gasses has done nothing but increase. In December 2015, 195 countries adopted the Paris Agreement during the UN's Climate Conference. The main objective is to limit the increase in the global temperature to below 2 °C in this century. As the UN puts it on its website, what is needed now is for the countries to live up to their part of the agreement.[97]

The latest report from *the Intergovernmental Panel of Climate Change* (IPCC) states:

> *Global warming is more likely than not to exceed 4°C above pre-industrial levels by 2100. The risks associated with temperatures at or above 4°C include substantial species extinction, global and regional food insecurity, consequential constraints on common human activities and limited potential for adaptation in some cases (high confidence). Some risks of climate change, such as risks to unique and threatened systems and risks associated with extreme weather events, are moderate to high at temperatures 1°C to 2°C above pre-industrial levels.*[98]

The EU's heads of state or government have, in light of the IPCC's work in 2009, agreed to a target of reducing greenhouse gas emissions by 80–95 % by 2050 compared to 1990 levels. Various measures have been deployed; For one thing, an internal EU carbon market has existed since 2005, setting a cap on

[95] IPCC 2013, afsnit D3 . Please note that '*extremely likely*' means less than 5% uncertainty. The scientists' assessment has been accepted by all governments in the world in agreement.
[96] Cook, John et al. 2013
[97] See FN 2015: http://un.dk/news-and-media/historic-paris-agreement-on-climate-change
[98] IPCC 2014, 18

the emission of the most energy-driven industrial undertakings; For another, the so-called Climate and Energy Package from 2008 lays down targets for the non-ETS (emissions trading system) sectors, including the agricultural sector. The targets were specified in 2014 so that by 2030, greenhouse gas emissions must be 40 % lower than the level in 1990. The target is to be achieved through a 43 % reduction in emissions by ETS sectors and through a 30 % reduction by other sectors.[99] The targets have yet to be divided between the individual EU Member States.

Moreover, the EU has, by virtue of its participation in the Climate Convention's Kyoto Protocol, had joint emission reduction targets distributed between Member States, which also take into account the agricultural sector's emissions. There are several reasons why the agricultural sector has not yet been a direct target of EU regulation. The focus has chiefly been on the largest and most concentrated sources and those where reductions were easiest and cheapest to achieve. Also, there has been opposition to regulation of the agricultural sector due to arguments about competitive conditions of international trading. So, food consumption has tended to "fly under the radar" of the eyes of the political system; There are neither taxes nor regulation in this area, so any initiatives to cut greenhouse gas emissions from food are left entirely to consumers.

4.2.2 Food production's impact on the climate and the environment

Despite this, foods contribute considerably to the anthropogenic global warming, accounting for 19–29 % of global anthropogenic greenhouse gas emissions.[100] Against this background, discussions have started that taxes on foods based on the individual product's climate-impact might put consumption on a climate-friendly course, thus being a cost-efficient way to cut anthropogenic greenhouse gas emissions.[101]

Furthermore, food production is central to several of the other major crises that mankind finds itself in today. Thus, the agricultural system is a significant factor not only in climate changes, but also in the loss of biodiversity and degrading of land and water.[102] All things being equal, the problems will grow to critical levels as the world's population grows from 7.2 billion in 2013 to 11.2 billion in 2100. Especially the 48 least developed countries, of which 27 are African, will see a high population growth. The population in Africa will almost increase fourfold from 1,186 million in 2015 to 4,387 million in 2100.[103] The IPPC moreover highlights population growth as one of the most significant

[99] The reduction of 30% is, however, based on 2005 emission levels.
[100] Vermeulen, Sonja J. et al. 2012, 198. The figure includes all stages of food production as well as packaging, transportation, sales links and the consumer's processing as well as waste disposal.
[101] See for example Wirsenius, Stefan et al. 2010, 160. Here, it is argued that the most cost-efficient measure would be to regulate at the source, i.e. in agricultural production. This would, however, require a cost-heavy monitoring system, which is why a tax on consumption would be preferred. Also, the advantage would be that a tax would affect locally produced and imported meat equally.
[102] Foley, Jonathan A. et al. 2011
[103] UN 2015, 1 og 4

drivers of greenhouse gas emissions.[104] FAO estimates that food production must grow by 70 % by 2050,[105] because improved welfare in many poor countries coupled with population growth will generate higher demand for foods with a higher resource impact – meat especially.

To meet future demand, food production must grow considerably. At the same time it is necessary that the agricultural sector's imprint on the environment and the climate is reduced substantially compared to current levels. And this challenge is only made greater by the fact that it is not possible to significantly increase food production by obtaining new agricultural land globally. The reason is that the majority of the planet's non-cultivated land is either unsuited for agriculture or is, in 29 % of cases, forest land, which – if cleared – would contribute highly to the climate changes by emitting the CO_2 tied up in the plants.[106]

In order to increase food production in step with growing demand, efforts are needed on several fronts; We must increase yields of existing agriculture (there is specific potential in Africa, Latin America and Eastern Europe), ensure better exploitation of existing resources as well as take measures against waste in both the production chain and the consumption chain as this is estimated to amount to 25 % of calories produced globally.[107,108] Finally, experts point to the fact that the target can hardly be reached without dietary changes involving less meat.[109] In the period 1961–2011, the production of animal products was responsible for 65 % of the conversion of agricultural fields. Population growth has been the dominant driver, but dietary changes involving more meat in particular is a significant driver that is increasing in force.[110]

Use of agricultural land

So, the first challenge for agriculture is to be able to feed the world's population. To do this without causing climate change it is important that it is done without clearing natural forests or cultivating grazing land to increase the agricultural area. Forest clearing and subsequent sowing of grass have major adverse effects on the climate due to the CO_2 that is held in the soil and vegetation and released through cultivation. At the same time, the loss of the old vegetations ability to uptake CO_2 is not compensated fully by the plantation of crops, which often cannot uptake the same amount of CO_2 as the vegetation that was cleared.[111]

It is therefore important to produce more food in the same land area, and in order to do this a lot can be achieved by reducing meat consumption. Feeding

[104] IPCC 2014, 5
[105] FAO 2009
[106] FAO 2009
[107] Foley, Jonathan 2014
[108] If including plant-based protein used in the conversion to animal protein, the waste is higher than 50%. See for example Barilla Center for Food & Nutrition 2012
[109] Olesen, Jørgen E. 2015
[110] Alexander, Peter et al. 2015, 138–147
[111] Plutzar, Christoph et al. 2015

crops to livestock and eating the animals later constitute an inefficient way of producing food.[112] Surveys show that it is possible to reduce the need for agricultural land by up to 50 % through a vegetarian diet and by up to 60 % through a vegan diet. But, much can still be achieved by reducing the consumption of beef; For example the need for land would fall by 40 % if replacing 75 % of beef with pork or chicken.[113] This is because ruminants have a much lower biological productivity and exploitation of feed compared to monogastric animals like pigs and chickens.[114]

The climate impact of foods

As mentioned, food products alone account for 19 %–29 % of global anthropogenic greenhouse gas emissions when including all stages in production, transport, packaging, marketing, etc.[115] In Europe, the corresponding figure is 22–31 %.[116]

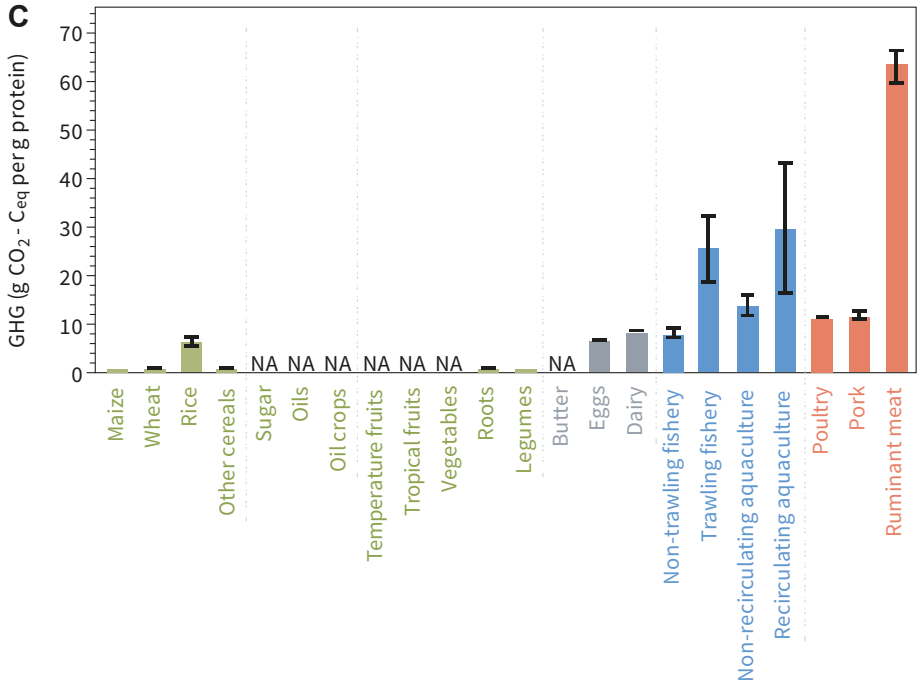
Livestock alone accounted for 14.5 % of total global greenhouse gas emissions in 2005.[117] The livestock sector can be divided into beef production, which accounted for 41 % of the food sector's global emissions, while dairy cattle accounted for 20 %. Pig production accounted for 9 %, and poultry and eggs for 8 % of the sector's emissions.[118,119] These differences originate in different foods having highly differing climate impact.

In the EU, 4–12 % of greenhouse gases come from the production of meat and meat products.[120] Noticeably this does not include emissions originating from the production of milk and dairy products.
By comparison, the agricultural sector alone accounted for 19 % of the Danish emission of greenhouse gas in 2012[121] based on a calculation of direct emissions from production at the farms that does not include all stages in the food production and consumption as done in the reports referred to above. The figure also includes the emission linked to agricultural exports, whereas the impact originating from the import of feed, chemical fertilisers, etc. is not included.[122]

[112] Excluding the relatively few areas, where natural conditions only allow grass or trees to grow, making the areas best suited for grazing of cattle, sheep or goats.
[113] Hallström, Elinor et al. 2015
[114] Wirsenius, Stefan et al. 2010, 621–638
[115] Vermeulen, Sonja J. et al. 2012, 198.
[116] Tukker, Arnold et al. 2006, 108
[117] FAO 2013, 15–16. The model includes all significant emission sources in livestock breeding (supply chains), feed production, non-feed production, livestock production, post-farmgate (refrigeration, transport, slaughtering and processing, packaging and manufacture) p 7
[118] FAO 2013, 15–16
[119] The calculation by FAO of 14.5% is criticised for being too low by Goodland and Anhang. According to their calculations, livestock account for at least 51% of anthropogenic greenhouse gas emissions (see Goodland, Robert og Jeff Anhang 2009), but their calculation methods are criticised by Herrero, Mario et al. 2011
[120] Tukker, Arnold et al. 2006, 15
[121] Nielsen, Ole-Kenneth et al. 2014, 376
[122] Olesen, Jørgen E. 2010

We see the same tendency in international surveys,[123] namely that the production of plant-based food products emits considerably fewer greenhouse gases (GHG) compared to meat.

Lifecycle greenhouse gas emissions (CO_2-C_{eq}) for 22 different food types



Source: Tilman et al. 2014

Differences can be large, and the biggest difference is between meat from ruminants (cows and sheep) and vegetables, of which the first emits 250 times more greenhouse gases per gram of protein[124] than the latter.[125,126] A factor here is how the animals are raised – intensive farming typically results in fewer greenhouse gas emissions per kilogram meat than more extensive types of farming.[127] In intensive production, animals are usually confined in barns, which mean they take up no grazing land. They move around less and therefore grow faster, so they can be slaughtered sooner. They therefore emit fewer greenhouse gases in their life time. In other words, when increasing productivity, land and greenhouse gas emissions are reduced simultaneously per unit produced. But intensive farming is not unproblematic; High-efficiency farming often has problems with greater local pollution of soil, air and water and with poorer animal welfare.[128]

[123] Tilman, David og Michael Clark 2014, 518–522
[124] Be aware that the choice of functional unit, may result in deviations in the results of dietary change. The functional unit here and in the figure is protein – but the most commonly used functional unit is environmental impact per KG of a product.
[125] Ibid, 3
[126] In addition to the general emission of CO_2 , ruminantsemit methane through their digestion. Methane is a greenhouse gas that is 20 times stronger than CO_2.
[127] Tilman, David og Michael Clark 2014
[128] Garnett, Tara 2011, 26, please also see Gjerris, Mickey 2015a

Egg, dairy production and fish, not caught by trawling (which use a lot of energy for the cutter), take second place in terms of emissions, but have considerably lower emissions per gram than beef production.[129] Once again, it is important to consider the problem of biodiversity. Entire fish populations are extinguished by modern fishing.

Whereas the total environmental costs of producing one calorie of dairy product, poultry, pig and egg, respectively, are comparable, beef production requires 28 times more agricultural land and 11 times more water than these animal products. Also, beef production is five times more climate-damaging in comparison.[130]

A factor making it complicated to be an ethical consumer is that the way a specific food item is produced can further impact its degree of climate friendliness or sustainability. A tomato grown in a greenhouse in Denmark could be worse in terms of climate gas emissions than one that is transported by truck from Southern Europe, but grown in open air. Transport (except by air) is usually not nearly as important as how the product is produced and what type of food it is,[131] but regardless of production form, neither tomatoes nor any other vegetable will ever be among the heavyweights measured by climate impact. In all surveys, meat – especially from ruminants – is in a category very far from other foods. In overall terms, it is first of all the primary production of a food product that adversely impacts the climate and the environment; Transportation and production forms are secondary.[132]

Several studies have sought to investigate if organic farming is more climate-friendly than conventional farming. As shown by the below figure, it does not seem to be the case. Greenhouse gas emissions of different agricultural products do not seem to vary much between conventional and organic farming. But it is worth noting that research in the area is limited, and the results of any comparison depend on the figures selected for comparison – which is also evident from the below figure. The International Centre for Research in Organic Food Systems (ICROFS) has compared organic and conventional farming with regard to greenhouse gas emission and a number of societal impacts such as local environment, biodiversity and occupation.[133,134] The greenhouse gas emissions by organic and conventional farming, respectively, according to ICROFS are shown below. The result is based on a lifecycle analysis where all raw materials and other contributors to the final production of a given product are included in the result.

[129] Tilman, David og Michael Clark 2014. Again, the production method has an impact, because netting, whereby a net is dragged across the seabed, uses so much fossil fuel that it accounts for three times higher emissions per gram of protein than fish caught without bottom trawl.
[130] Eshel, Gidon et al. 2014
[131] Gjerris, Mickey et al. 2015
[132] See Saxe 2014
[133] Jespersen, Lizzie Melby et al. 2015
[134] Note: The effects of imported feed, fertilisers and other processing aids are included in the calculation

Productivity and greenhouse gas emission of common food products, from farm

Production	System	Production		Emission of greenhouse gas, kg CO_2 equiv.		Share from DK, %		Source
		Unit	Amount	Per unit produced	Per hectare	CO2 equiv.	Cultiv. area	
Milk [1)]	Org.	kg ECM per year cow	7,175	1.27	5,359	98	95	Kristensen et al., 2011
	Con.		8,201	1.20	6,742	87	70	
Beef	Org.	kg increase per year animal	260	16.60	9,595	99	95	Mogensen et al., 2015
	Con.		451	8.90	8,641	82	70	
Pork	Org.	kg increase per year sow	1,991	3.16	2,685	92	95	Dourmad et al., 2014
	Con.		2,929	2.92	5,467	74	80	
Egg	Org.	kg egg		1.80				Williams et al., 2009 [2)]
	Con.			1.50				
Plant culti-vation	Org.	kg dry matter per ha	4,100	0.440	1,757	100	100	Knudsen et al., 2014
	Con.		5,750	0.425	2,396	70	100	
Soya beans (China – from feed DK)	Org.	Kg per ha	2,788	0.429	1,196	6	0	Knudsen et al., 2010
	Con.		3,083	0.536	1,652	5	0	

1) Emission per kg of milk is before allocation between milk and beef

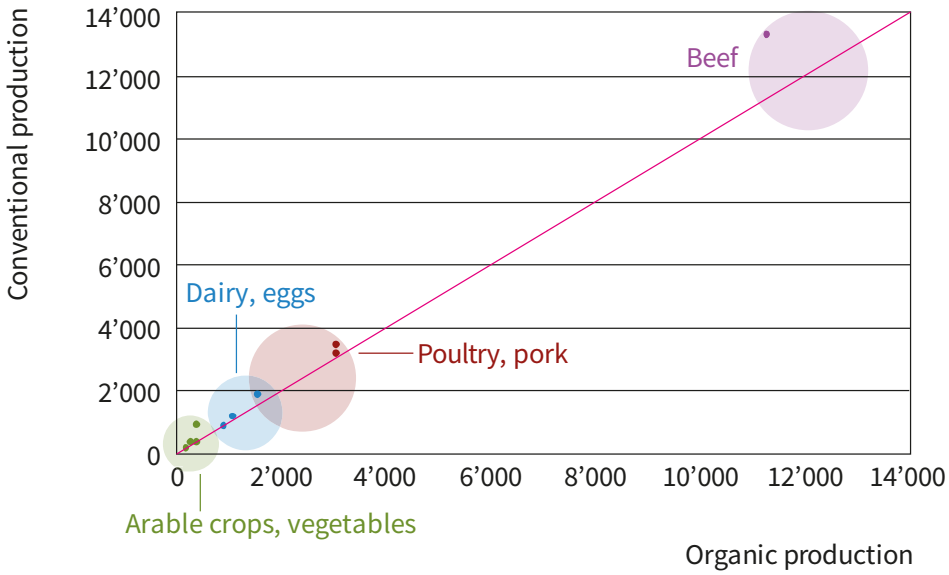
2) Quoted from Nielsen et al, 2013

Source: Jespersen, Lizzie Melby et al. 2015 (own translation)

The table shows that per kilogram of product of animal foods, the greenhouse gas emission from organic production is generally higher than conventional production, whereas organic plant production is on the same level as conventional production. In relation to the land area used for production, the emission in organic production is well below conventional production, primarily because organic production uses less fertilisers. Beef is an exception since it even in terms of land area has higher emissions in organic production. This is a result of beef production (using bull calves) making use of grazing of permanent grassland, leading to higher emissions per surface area unit due to a low feed yield per hectare.

A meta study shows the same trend:

Greenhouse gas emissions (g CO_2 equivalent per kilogram) for agricultural products



The largest reduction of emissions could be reached by reducing meat consumption. In human diets the differences between organic and conventional production are of minor relevance (above the red line: organic perform better, below the line conventional performs better)
Source: Niggli, Urs et al. 2008

It also implies that even if a conversion of a large share of the agricultural *land* to organic production would reduce greenhouse gas emissions from agriculture, the production would in fact also become smaller. Production of the same *amount* of food products through organic production would result in a higher emission of greenhouse gasses compared to producing the same amount conventionally. Nonetheless, organic *consumption* could in practice have a lower greenhouse gas emission than conventional consumption since a consumption analysis suggests that organic buyers predominantly compose their diet with little meat.[135]
The ICROFS conclude that:

> *In summary, although there is not much documentation on the difference in greenhouse gas emission between organic production and conventional production, it seems that greenhouse gas emission from organic production tends to be on the same level or higher than conventional production when measured by unit produced, but that it is well below the level of conventional production when measured by hectare.*[136,]

When organic production is compared to conventional production, it is im-

[135] Denver, Sigrid et al. 2007
[136] Jespersen, Lizzie Melby et al. 2015, p 189

portant to bear in mind that in contrast to greenhouse gas emission, organic farming has a number of environmental and animal welfare benefits compared to conventional farming, for example in regard to the aquatic environment, pesticides and biodiversity.

Meat consumption is generally high in industrialised countries like Denmark – so high that it has evidently reached an almost stagnant level and no longer increases noticeably. It is at a constant level, but some industrialised countries have shown signs of a moderate drop in recent years.[137] But global meat consumption is increasing heavily as a result of population growth combined with improved welfare in the new growth countries, causing a higher calorie intake and consumption of meat products in large segments of populations (India is an exception, due to the country's tradition for vegetarian food). Most growth countries are closing in on the western world's meat consumption.

Whereas improved welfare is obviously good, it is problematic if it results in increased consumption of meat (or other climate-damaging consumer goods). Rather, it should be the rich countries that should reduce their (meat) consumption. A study shows that if the current trend continues unabated, global greenhouse gas emissions from agriculture will have increased by 63 % before 2055 (compared to 1995 emission levels). Supposing that the preference for animal products will continue to rise, the increase will instead be 75 % in the same period.[138]

However, it would be possible to instead *reduce* the agricultural sector's emissions. A study shows that if everyone converted to a vegan or vegetarian diet, populations in rich countries could already reduce greenhouse gas emissions from their diets by 20–55 %. It is, of course, probably unrealistic to think that everyone in the western world would stop eating meat overnight, but even substituting pork and chicken for beef could reduce greenhouse gas emissions by 20–35 %.[139] Some may argue that if the development towards increased meat consumption in the developing countries continues, it will reduce the effect derived from consumption decreases in the western world.

Finally, the effect of following one of the healthy diets that has been developed would in many cases reduce the climate impact of a Dane's diet by up to 35 %. The decisive element is here how much meat from ruminants is included in the healthy diet in question. If it contains large quantities of meat, the reduction in greenhouse gas emissions is only about 10 %.[140] In some cases, a large share of organic products may actually reduce the climate benefits.[141]

[137] According to USDA, US consumption of beef fell by approx. one third since peaking in 1976, whereas the consumption of chicken has doubled in the same period, see ERS 2015: http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/summary-findings.aspx
[138] Popp, Alexander et al. 2010, 451–462
[139] Hallström, Elinor et al. 2015
[140] Ibid
[141] Saxe, Henrik et al. 2013, 249–262 and Saxe 2014

Most of the many healthy diets such as the Harvard Healthy Eating Plate have been developed by dietitians. But, dietary recommendations are revised regularly, and many are disputed. Take the example of the now popular Paleo diet (or stone-age diet); Its defenders consider it healthy and many as sustainable. The idea is to eat what people are assumed to have eaten in the Stone Age[142]: meat, fish, shellfish, vegetables, eggs, fruit, berries and nuts, *avoiding* dairy products, grains, legumes, sugar and processed food. Meat from freely grazing cattle is often a main ingredient, and if many people were to have this as their main ingredient in their diet, it would obviously be a problem out of regard to land usage and climate friendliness.

4.2.3 Risks: consequences of climate changes, environmental harm, etc.

As introduced by the initial quote from IPCC, climate changes pose a number of risks. While nature and the environment are hit first, there are secondary risks for the living conditions and health of humans.

Among the risks to humans, the IPCC's Working Group II, which has looked at future risks up until the second half of the 21st century, highlights:

- Risk of death, injury, ill-health, or disrupted livelihoods in low-lying coastal zones and small island developing states and other small islands, due to storm surges, coastal flooding, and sea level rise.

- Risk of severe ill-health and disrupted livelihoods for large urban populations due to inland flooding in some regions.

- Systemic risks due to extreme weather events leading to breakdown of infrastructure networks and critical services such as electricity, water supply, and health and emergency services.

- Risk of mortality and morbidity during periods of extreme heat, particularly for vulnerable urban populations and those working outdoors in urban or rural areas.

- Risk of food insecurity and the breakdown of food systems linked to warming, drought, flooding, and precipitation variability and extremes, particularly for poorer populations in urban and rural settings.

- Risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions.

[142] Assumed, because researchers suggest that the diet in the Stone Age was entirely different, see for example Ebbesen, Klaus 2015: http://www.kristeligt-dagblad.dk/kronik/stenalderkost-foer-og-nu: "Stone-age diet as it is described today in modern cookbooks, does not have much to do the conditions of the Stone Age. It is pure imagination ..."

- Risk of loss of marine and coastal ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide for coastal livelihoods, especially for fishing communities in the tropics and the Arctic.

- Risk of loss of terrestrial and inland water ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide for livelihoods.[143]

Residents in exposed areas of the world feel these changes already, and the poorest are those who are exposed the most, even though they have contributed the least to climate changes given their very low consumption. However, researchers indicate that even the populations in the richest countries will be affected as extreme weather events become more frequent with effects on the environmental and social basis of public health: food and water supplies, natural limitation of communicable diseases, natural barriers to environmental catastrophes and ultimately the coherence and stability of societies. Some outcomes of climate changes are noticeable already.[144]

About climate-damaging food and market failures

Many argue that within certain environmental areas, like the area of climate change, the market fails to factor in adverse effects of production inflicted on the environment and natural resources.[145] It happens, for example, when the production of a food impacts the environment and the climate without the price of the product reflecting the costs of restoration which the production in question is responsible for. These costs of restoration are thus pushed on to other people and future generations who will be affected by effects such as climate change. Such costs are called 'externalities', and it is a case of market failure because the market does not reflect the real price of the product when we take into account the production's impact on the entire society.

To some, this is valid reason to say that the state should correct the fact that the products do not reflect the price of production, making them way too cheap. It could, for example, be achieved by putting a tax on climate-impacting goods – possibly a tax earmarked for restoration of the environment and the climate, e.g. based on scientific studies of the costs of climate changes.[146] Others believe that it will be problematic for officials to find the “right” price of a product and then determine the size of the taxes to reach that price. We could risk heading for a type of planned economy as in reality it is impossible to calculate what a product should cost at the supermarket if environmental costs are to be covered.

It is also important to note that various stakeholders may either win or lose from climate changes, etc. And this may influence how problems are described

[143] IPCC 2014, 1–32
[144] For example, see this presentation of President Obama's Clean Power Plan. https://www.youtube.com/watch?t=2&v=uYXyYFzP4Lc
[145] See for example United Nations secretary-General’s high-level panel on Global sustainability 2012, 5ff
[146] For a discussion thereof, please see Halsnæs, Kirsten 2014

and perceived. With climate policy, for example, comes a decline in revenue for energy intensive industries or those linked to fossil energy. Likewise, the regulation of food products could have distributional effects for the agricultural sector and the consumers, which could also be reflected in value-based arguments.

4.2.4 Legislative regulation of climate-damaging food

Regulation of food products, beef in particular

In addition to the general food regulations,[147] including the general labelling rules, we refer to *Regulation (EU) No 1760/2000 of 17 July 2000* establishing a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products. The regulation was introduced with the aim of rebuilding consumer trust in beef after the 1990s' mad cow disease.

The regulation established a principle of obligatory labelling of beef. Each and every piece of meat, whether fresh or frozen, must be traceable from the cold counter back to the slaughterhouse, herd and animal/group of animals from which the meat originates. It is to ensure that the meat in the event of health or safety issues can be traced and recalled.

Regulation No 1760 was amended by Regulation No 653/2014. The previous voluntary labelling system was changed by this regulation, and a new article 15a was inserted, establishing that voluntary labelling must be objective, verifiable by the authorities and comprehensible for consumers. In addition the information must comply with the general provisions on labelling and misrepresentation (Regulation No 1169/2011 in particular). Any labelling details for beef that are not obligatory fall under the voluntary beef labelling system as well as the provisions on general labelling and misrepresentation, e.g. additional labelling on the packages or consumer information on shop signs. Information given in e.g. advertisements, magazines or advert leaflets are covered by the general labelling and misrepresentation provisions.

The Danish Statutory Order on Traceability and Origin labelling, etc. for Beef[148] has been issued under the Danish Food Act.

Special notes on taxes, etc.

Generally, it is possible for the individual Member States to impose taxes on certain products. That said, it is not permitted under EU law to impose taxes that have a discriminating effect on products from other EU Member States or protect internally produced products (TFEU article 110). Even though a tax is basically imposed on both domestic and imported products, the tax may still be prohibited by the Treaty if the revenue from such tax is partly compensating the domestically produced products for the tax. The Treaty is thus to en-

[147] See section 4.1.4. on foods from animals fed GMO
[148] Statutory Order no. 1281 of 5 December 2014

sure that internal taxes have entirely neutral effect in relation to the competing domestic and imported products.

Any tax restricting the trade between Member States will be prohibited by article 34 of TFEU, but may be legitimised by article 36. Any such measure, must not exceed what is necessary to fulfil the purpose (principle of proportionality).[149]
The tax structure has been harmonised in relation to the most important excise duties on tobacco products, alcoholic beverages and mineral oils. Furthermore, a harmonisation of rates for both VAT and excises has been implemented.

New initiatives
In October 2015, the European Parliament voted in favour of putting a ceiling on the emission of various air pollutants in the EU, methane included.

However, the European Parliament adopted an amendment in parallel, which means that the reduction targets are not to apply to the methane originating from the digestive process of ruminants.

The next steps are negotiations on the air requirements with the EU's Ministers of the Environment.

4.2.5 The Danish Council on Ethics' recommendation on climate-damaging foods

Climate-damaging foods are in an area of great consensus in regard to the evidence:

- According to the IPCC, anthropogenic activities are with 95 % certainty the predominant cause of the global warming observed since the middle of the 20th century.

- Climate changes will decisively change the living conditions on the planet, e.g. bringing progressive incidents of extreme weather phenomena, drought, sea level rises, loss of ecosystems and biodiversity including species, climate refugees and a higher degree of threats to human living conditions.

- Food accounts for a large share of anthropogenic climate changes, 19–29 % of global anthropogenic greenhouse gas emissions.[150]

- From this, the livestock sector alone accounts for 14.5 % of human greenhouse gas emissions, of which beef production accounts for 41 % of the sector's emissions, while dairy cattle accounts for 20 %.[151]

[149] About articles 34 and 36, see the general appendix about Food and EU law.
[150] Vermeulen, Sonja J. et al. 2012, 198

- Dietary changes towards less consumption of meat from ruminants in countries like Denmark could reduce greenhouse gas emissions from food by 20–35 %.[152]

As mentioned the food sector accounts for 19–29 % of the current global greenhouse gas emissions, and since there are great differences between the climate impact of various foods, consumers can reduce this figure considerably by converting to a more climate-friendly diet. The Council therefore considers if the Danes, either as individual consumers or in solidarity through the establishment of a regulation system, should take responsibility to reduce the consumption of climate-damaging food.

One instrument to secure a joint effort could be regulatory measures that would reduce demand for climate-damaging foods. Such regulation could be engineered in different ways and introduced in either the production chain or the consumption chain. Since the topic of this report is 'The Ethical Consumer', the Council has primarily discussed the possibilities of regulation on the level of consumption. The most optimal solution would probably be to introduce an incremental tax, according to which foods are taxed based on their degree of climate impact. However, the Council acknowledges that such a tax would be administratively difficult to introduce because of local variations in climate impact within each group of foods. To introduce such a system would therefore not be realistic in the short term. In consequence, the Council has discussed a solution that should be feasible to implement and which should be able to produce noticeable effects in the short term. Since meat from ruminants – in Denmark predominantly cattle – is in a category of high climate impact that is very far from the other food categories, a tax on this type of meat would be the right place to start according to a majority of members. Research suggests that a reduction in the consumption of beef alone would produce considerable effects, and such a tax could moreover send a signal to the Danish society that it ought to give very high priority to reducing the climate impact of foods.

The Council members who suggest using a tax as a means to reduce the climate impact of foods are indeed aware that their task is to identify ethical problems that need to be addressed, but they acknowledge that the authorities would be best suited to work out the details of any taxes, including taking Danish and EU law into account.

On the question of whether climate-damaging foods should be left to the ethical consumer or made a joint responsibility, the members have differing opinions:

---

[151] FAO 2013, 15–16
[152] Hallström et al. 2015, 2ff

Climate-damaging foods should be regulated by means of taxes

A majority of 14 members (Jacob Birkler, Lillian Bondo, Jørgen Carlsen, Mickey Gjerris, Gorm Greisen, Poul Jaszczak, Thomas Ploug, Lise von Seelen, Christian Borrisholt Steen, Karen Stæhr, Steen Vallentin, Signild Vallgårda, Signe Wenneberg and Christina Wilson) find that the consumers have an ethical obligation to consider the climate through their eating habits. This obligation motivates taxes on climate-damaging foods in the consumption chain or the production chain because it could have a positive effect on greenhouse gas emissions as pricing is known to be a decisive factor in consumer choices.

The imposition of taxes would signal that the moral responsibility to reduce greenhouse gas emission should be shouldered by the consumers in solidarity. The individual consumer has no possibility of curbing climate change by changing the way he or she eats. It is not the specific piece of meat that the consumer is buying that causes the damage; Its impact is microscopic and only has damaging impact together with all the other consumers' contributions. If a person is not confident that other consumers will take responsibility to buy climate-friendly products, it would not be rational for him or her to do it. But given the problems that certain foods are described to cause, everyone has an obligation to contribute to the implementation of effective, collective measures to make overall food consumption less damaging to the climate.

Taxes should moreover be considered justifiable since climate-damaging foods are currently priced too low when taking into account the societal costs they entail. There are externalities, in the form of costs to reduce the consequences for those who are affected by climate change, which are not included in the price of the product. It is unfair that these costs are not paid by those who consume the products but by those who are harmed by the climate changes. With this in mind, taxes could be seen as a form of price correction. Politicians should decide to earmark the revenues from the taxes for climate initiatives that either prevent or restore the harmful effects of global warming.

The main reason why climate change is an ethical problem is because it harms other people and nature. It therefore poses a serious threat to both the development of the global society and to nature. We are already feeling the consequences of climate change in the form of extreme weather phenomena that inflicts major costs on human beings and on ecosystems.

Finally, the impact of greenhouse gas emissions will be even stronger in the long term, and the effects will strike unevenly and unfairly. Those with the lowest emissions – namely the world's poorest who have a very low consumption – will be hit the hardest. Next in line are the future generations, who have neither contributed to the emissions. Especially we, living today in the richest part of the world, are passing the bill on to people in the poorest parts of the world and to future generations.

Responsibility should be supranational

All 14 members agree that joint international initiatives should be pursued to reduce greenhouse gas emission from food, because it is a supranational concern, and emissions are blind to national borders. Effective efforts should therefore be international, and the members encourage the Danish government to work for such agreements in order to reduce the climate impact of food.

– *but the Danes should lead the way*

These 14 members, however, worry that supranational efforts in this area would take too long to put in place. Denmark should therefore lead the way by imposing taxes, since initiatives that will work in the short term are critical to prevent developments from spinning out of control.

One way of doing this would be to put a tax on beef in the consumption chain because it would elucidate the problems to the consumers as well as effectively curb consumption. It could also help raise awareness in the area and in the long term make it possible to introduce other or additional climate-friendly measures related to food consumption and food production. Ideally, taxes should be imposed on any food based on its degree of climate impact, but in the short term, putting a tax on the most climate-damaging food, meat from ruminants, would probably be the most feasible solution. A further argument in support of this strategy is that it is unproblematic to consume a healthy and nutritional diet without beef.

A tax on consumption, the focus of this report, has the advantage of striking all beef equally, whether imported or produced in Denmark. That way, the tax can be imposed in Denmark without distorting competition, which would otherwise be the case if the tax was imposed in the chain of production.[153]

Every consumer has an ethical responsibility for his consumption

Some of these members (Jacob Birkler, Mickey Gjerris, Gorm Greisen, Lise von Seelen, Signild Vallgårda and Signe Wenneberg) find that whether or not a tax is implementable, individuals should take action if they become aware that their behaviour is causing harm to others. They believe that regardless of the many aspects that make it difficult for the individual to pursue responsible consumerism, the consumer has a responsibility to eat as climate-friendly as possible. Human beings should always strive to do their best in everything they do. If we acknowledge that ethically we should emit less greenhouse gases, we should do what we can to emit less greenhouse gases in our everyday lives.

Also, the consumption choices of individual persons play a part in forming an everyday culture, especially because the signal you send by eating climate-damaging food is that this behaviour is socially acceptable, which could con-

[153] The latter tax would, if implemented in Denmark exclusively, make Danish products more expensive while imported, climate-damaging products would be exempt from the climate tax and thus would be too cheap compared to their degree of climate impact. Some consumers would choose these climate-damaging products over Danish climate-friendly products because of the price. About this, see Säll, Sarah et al. 2015, 42

tribute to the persistence of a problematic consumption pattern.

Finally, these members also find that the political will to impose taxes could grow stronger through pressure from the citizens – and that this pressure arises when the individual citizen starts acting on his or her conviction.

Other measures

All 14 members emphasise that their recommendations are intended to send a signal to the politicians that effective measures are needed in the area. Many different measures will be needed to curb climate change, and the taxes proposed should not be the only measure. The Council has discussed various possibilities without taking specific positions thereon:

- Taxes on climate-damaging foods could be combined with subsidies on the least climate-damaging foods to further promote climate-friendly eating habits.

- Measures against food waste could also be considered; Here taxes have an added benefit by discouraging excessive buying.

- Public authorities could make it mandatory for their institutions to introduce meat-free days or offer very little meat from ruminants.

- Conversion subsidies could be offered to farmers wanting to convert to a more climate-friendly production, possibly financed fully or partly by climate tax revenues.

The climate impact of foods should be reduced markedly through common regulation, targeting consumption and production in Denmark and internationally

One member (Kirsten Halsnæs) finds that the reduction of the global climate changes to not exceed 2 °C, as intended by the climate agreement in Paris, would require major efforts in all sectors, including agriculture and food, to reduce greenhouse gas emissions. Here, both national and international efforts as well as a joint EU strategy are needed. While the consumers' food choices are important, the efforts and the responsibility of ethical consumers should be seen also in the light of the overall reduction measures in the agricultural sector. Effective efforts to reduce greenhouse gas emissions would imply that they are reduced in the production of foods directly, and that consumers additionally choose climate-friendly diets with a larger share of vegetables. Such reduction of greenhouse gas emissions can be promoted through a line of instruments, including incremental taxes based on greenhouse gas emission, which ought to be directed at all sources in the food production. Isolated taxes on meat are not recommendable. Nor would a tax on beef alone seem economically viable or suitable for the environment. If, for example, a tax on meat was imposed, demand for pork could increase as a result, potentially causing other environmental problems. It is important to encourage collective solu-

tions to greenhouse gas emissions, and it could be unproductive for these collective solutions to put special emphasis on an individual, moral consumer responsibility that could end up shading the extremely challenging efforts required to develop climate-friendly foods.

The choice of climate-damaging foods should be left entirely to the ethical consumer

One member (Anders Raahauge) does not find that there is sufficient evidence in support of measures against the consumer's choice of food. The member draws attention to the matter that there is uncertainty about whether the observed climate changes are anthropogenic – a view expressed by a minority of climate researchers, oceanographers, geologists and astrophysicists. The member finds that when there is dissenting opinion among scientists in a field – also when researchers' opinions are extremely asymmetric – we should be cautious when we express ethical positions. Minorities have drawn the longest straw before, and all serious researchers indeed agree that uncertainty is known to affect climate models.

If humans are not unequivocally the cause of climate changes, then they should not be imposed a special consumption pattern, the member claims, adding that the choice of what to eat has traditionally been left to the individual citizen. Neither the state nor anyone else should interfere with how people choose to live their lives.

Nor should a labelling system be introduced, as it would be costly and the costs would affect all consumers. Consumers who wish to buy climate-friendly products should gather their own information about which products are considered harmful to the climate.

Minority statement

Disclaimer: *One member, Lene Kattrup, has decided not to be part of the report's chapter/case about climate-damaging foods since it contains some fundamental premises, assumptions and perspectives as well as conclusions that the member does not support. The Council is aware that questions of animal welfare generally fall outside the mandate of the Danish Council on Ethics, and that questions about ecology are outside the scope of the working group's terms of reference. The statement therefore expresses the member's own views.*

The member makes the following three recommendations on climate-damaging foods.

Recommendation to put a tax on meat and promotion of organic production
Lene Kattrup supports a tax on meat[154], but wants to exempt organic meat based on a view that we ought to strengthen long-term sustainability with a focus on the environment and on nature, vegetation and wildlife, biodiversity, water resources and groundwater protection, etc.[155]

In some areas, organic farming has climate benefits compared to conventional farming. There is a higher share of grassland, successive crops and green manure crops that increase carbon deposits, a better soil structure reduces the emission of nitrous oxide, and there is no use of pesticides and chemical fertilisers, which both require energy to produce.[156]

There are many indications that there is a better balance in the nitrogen conversion, preservation of the soil's fertility and health and furthermore that there is no or little import of concentrates, e.g. soy, from South America or Asia.

In these areas, the member finds that organic farming must be assessed as more sustainable than conventional farming and to be a more right way to go. For these and other reasons, organic farming as such should not (nor should meat production) be weighed down by extra burdens, but should be promoted instead, the member finds.

There are already a number of negative externalities[157] and environmental impacts, which especially are not included in the price of conventionally produced foods, which means that organic food products – not least meat – are considerably more expensive than they need to be if the market regulations were working optimally and were economically viable – and ethically viable – in the long term. If we put a tax on organic meat, we run the risk that organic farming will be facing even fiercer market terms than today and will even be repressed.

[154] The tax should be allocated to the restoration of the environment, improved animal welfare in conventional livestock production as well as research in the development of new and more sustainable production methods in livestock farming.

[155] About long-term sustainability, see UNCTAD Trade and Environment 2013: 'Wake up before it is too late, make agriculture truly sustainable now for food security in a changing climate'. Full report. Quote from press release on 18 September 2013: 'The report stresses that governments must find ways to factor in and reward farmers for currently unpaid public goods they provide — such as clean water, soil an landscape preservation, protection of biodiversity and recreation', 'The Trade and environment Report 2013 recommends a rapid and significant shift away from conventional, monocultural-based Industrial production of food that depends heavily on external inputs such as fertilizers, agro-chemicals, and concentrate feed'. Information (Newspaper), commenting on the report on 10 September 2014: "The UN finds that in the long-term global perspective, conversion to organic farming is the only sustainable way for the earth." Also see pp. 102-103 in http://www.etiskraad.dk/~/media/Etisk-Raad/en/Publications/Report-on-bioenergy-food-production-and-ethics-in-a-globalised-world-2012.pdf

[156] *Det Svære Valg [The difficult choice]* , Danish Council on Ethics, 2015, Chapter 'Fødevarernes klima og miljøbelastning' [The climate and environmental impact of foods] by Jørgen E. Olesen specially p. 46

[157] About externalities, see *Det Svære Valg* [The difficult choice], 2015, Chapter 'Markedet behøver hjælp, hvis etikken skal med' [The market needs help, but ethics should come along] by Kirsten Halsnæs

It should be taken into account that several surveys have shown that organic consumers already consume and eat less meat, but more vegetables, than other consumers. The consumption pattern of the individual consumer is important and ultimately decisive for the size of production. It seems there are no great differences between greenhouse gas emissions of organic and conventional production, but the consumption pattern of the organic consumer is more climate-friendly.[158]

If you reduce your meat consumption by one third, eat more vegetables, throw out less food and buy more local products, you can help reduce the environmental and climate impact of food by up to 25–50 %.[159]

As mentioned by some researchers, the relationship between intensive and conventional production versus organic livestock production is not clear when it comes to climate impact. The greenhouse gas emissions from livestock depend on the type of species and the way the animals are kept. If ruminants, which as far as we know have the highest impact on the climate, pasture on well-kept and permanent grassland like they do in organic farming, these areas may deposit such large amounts of carbon that in some cases it compensates for the methane emitted by the animals. In case of dairy cows, the climate impact will be less than the production of meat from the animals. Grassland and multiannual crops generally produce less nitrogen leaching, which is good for the climate and the environment.

Some find that the climate impact of foods will generally diminish through intensification. The member does not always find this to be the case. An increase in the productivity of livestock production will often be a threat to animal welfare as well as negatively impact on the climate and the environment in many different ways, e.g. through the use of pesticides, chemical fertilisers and imports of protein-heavy soya with forest clearing in the third world to obtain cultivation areas, which is highly damaging to nature, the environment and the climate. And if increased intensification does nothing but provide cheaper products and increased consumption, then we are back to square one.

Lene Kattrup points out that in her opinion, animal welfare is usually better protected in organic farming, which is another argument in favour of strengthening organic alternatives. How we treat the animals in our care reflects the development stage of our civilisation. It will also rebound on us as human beings if we accept and promote the keeping of animals under disgraceful and

[158] *Klima og Etik [Climate and ethics]* by Jesper Ryberg et. al. 2011 Roskilde Universitetsforlag, Chapter 'Kød og klima - bør vi blive vegetarer for at modvirke den globale opvarmning, eller er det godt nok at spise økologisk?' [Meat and climate – should we become vegetarians to mitigate global warming, or is it sufficient to eat organic food?] by Peter Sandøe, Jørgen E. Olesen et. al. pp. 111-113.

[159] Department of Food and Resource Economic (IFRO) and Research Center OPUS, University of Copenhagen, by Henrik Saxe 'Madens klima- og miljøbelastning kan mindskes med en tredjedel' [The climate and environmental impact of food can be reduced by one third]http://ifro.ku.dk/aktuelt/madogklima/ *og Am J Clin Nutr May 2014* side 7 http://ajcn.nutrition.org/content/99/5/1117

poor animal conditions in order to achieve high effectiveness and an unnaturally high yield.

Finally, some studies indicate that there may be health benefits associated with eating organic foods, e.g. due to a lower content of pesticides and heavy metals and a higher content of antioxidants. Other studies have not been able to establish differences. The member recommends to promote research in this area, as a lot of knowledge is missing.[160]

Recommendation to reduce food waste and avoid excessive consumption and limit packaging

Lene Kattrup recommends government initiatives to reduce food waste throughout the supply chain, a strongly intensified focus on avoiding excessive food consumption as well as reduce the use of food packaging and reduce greenhouse gas emission from production, processing and transport of food, e.g. through initiatives to promote increased use of locally produced food.

Overpopulation/birth rate restriction

Lene Kattrup recommends the government to pursue initiatives for a more viable population development, i.e. birth rate restriction. Today, the world's population is 7.3 billion people, estimated to reach 9.7 billion in 2050. In Africa alone, 28 countries are estimated to double their populations by 2050. The IPCC and others point to the population growth as one of the causes of global climate problems.[161] The member finds that aid to developing countries should be given in return for birth rate restrictions in the recipient country.

[160] Baranski M et al *BR J Nutr* Sept 2014**, '**Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses' http://www.ncbi.nlm.nih.gov/pubmed/24968103
http://www.ncl.ac.uk/press.office/press.release/item/new-study-finds-significant-differences-between-organic-and-non-organic-food

[161] IPPS' status from 2014 commented by Information (Newspaper) on 29 July 2015 http://www.information.dk/telegram/540632 and http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf 'Climate Change 2014 Synthesis Report Summary for Policymakers'

Literature

Chapter 1

Borkfelt, Sune et al. 2015. Closer to Nature? A Critical Discussion of the Marketing of '«Ethical»' Animal Products. *Journal of Agricultural and Environmental Ethics* Volume 28 (6): 1053–73.

European Commission. 2010. *Biotechnology*. *Special Eurobarometer 341*. http://ec.europa.eu/COMMFrontOffice/PublicOpinion/index.cfm/ResultDoc/download/DocumentKy/55674.

FAO. 2013. *Tackling climate change through livestock*.

Gaskell, George et al. 2010. *Europeans and biotechnology in 2010 - Winds of change? A report to the European Commission's Directorate-General for Research*.

Holm, Lotte. 2014. Klimavenlig kost - hvordan? – et forbrugssociologisk perspektiv. I *Vores mad og det globale klima – Etik til en varmere klode*. Det Etiske Råd.

Konkurrence- og Forbrugerstyrelsen. 2013. *Analyse af 21 "grønne" mærker*. http://www.kfst.dk/Indhold-KFST/Publikationer/Dansk/2013/20131219-Analyse-af-groenne-maerker?tc=E538038EB1E04A96B9964BE4C0F85F46.

Parker, Christine. 2013. Voting with your fork? Industrial free-range eggs and the regulatory construction of consumer choice. *The annals of the American academy of political and social science* Volume 649.

Vermeulen, Sonja J. et al. 2012. Climate Change and Food Systems. *Annual Review of Environment and Resources* Volume 37: 195–222.

Chapter 2

Det Etiske Råd. 2012. *Bioenergi, fødevarer og etik i en globaliseret verden*. http://www.etiskraad.dk/~/media/Etisk-Raad/Etiske-Temaer/Natur-klima-og-foedevarer/Publikationer/Bioenergi-foedevarer-og-etik-i-en-globaliseret-verden.pdf.

Gjerris, Mickey. 2015. Willed Blindness: A Discussion of Our Moral Shortcomings in Relation to Animals. *Journal of Agricultural and Environmental Ethics* Volume 28 (3): 517–32.

Mill, John Stuart. 1859. *On liberty*. Redigeret af Simon og Brown. 2012. udg.

Rawls, John. 2005. *Political Liberalism*. Columbia classics in philosophy.

Satz, Debra. 2007. Liberalism, economic freedom, and the limits of markets. I *Liberalism: old and new*, redigeret af Paul et al. Cambridge University Press.

Sinnott-Armstrong, Walter. 2005. It's not my fault: Global warming and individual moral obligations. I *Perspectives on climate change: Science, economics, politics, ethics*, redigeret af W. Sinnott-Armstrong et al. Elsevier JAI.

Chapter 3

Chadwich, Ruth. 2000. Novel, Natural, Nutritious: Towards A Philosophy Of Food. *Proceedings of the Aristotelian Society. New Series* Volume 100: 193–208.

Devcich, Daniel A. et al. 2007. You eat what you are: Modern health worries and the acceptance of natural and synthetic additives in functional foods. *Appetite* Volume 48 (3): 333–37.

European Commission. 2010. *Biotechnology*. *Special Eurobarometer 341*. http://ec.europa.eu/COMMFrontOffice/PublicOpinion/index.cfm/ResultDoc/download/DocumentKy/55674.

Fink, Hans. 2003. Et mangfoldigt naturbegreb. I *Naturens værdi. Vinkler på danskernes forhold til naturen*, redigeret af Peter Agger et al. København: Gads forlag.

Magnusson, Maria K. et al. 2003. Choice of organic foods is related to perceived consequences for human health and to environmentally friendly behavior. *Appetite* Volume 40 (2): 109–17.

O'Neill, John et al. 2008. *Environmental values*. Routledge introductions to Environment Series.

Rozin, Paul et al. 2004. Preference for natural: instrumental and ideational/moral moti-vations, and the contrast between foods and medicines. *Appetite* Volume 43 (2): 147–54.

———. 2005. The Meaning of '«Natural»', Process More Important Than Content. *American Psychological Society* Volume 16 (8).

———. 2012. European and American perspectives on the meaning of natural. *Appetite* Volume 59 (2): 448–55.

Chapter 4

Albrechtsen, Rikke. 2015. *Danmark vil sige nej til GMO-bomuld*. *Altinget*. http://www.altinget.dk/foedevarer/artikel/danmark-vil-sige-nej-til-gmo-bomuld?ref=newsletter&refid=17009&SNSubscribed=true&utm_source=Nyhedsbrev&utm_medium=e-mail&utm_campaign=foedevarer.

Alexander, Peter et al. 2015. Drivers for global agricultural land use change: The nexus of diet, population, yield and bioenergy. *Global Environmental Change* Volume 35: 138–47.

Andersen, Hanne et al. 2010. Hvad er farligt? Forholdet mellem værdier og kendsgerninger. Kapitel 11. I *Videnskabsteori for de biologiske fag*. Biofolia.

Barfoot, Peter og Graham Brookes. 2014. Key global environmental impacts of genetically modified (GM) crop use 1996–2012. *GM Crops & Food: Biotechnology in Agriculture and the Food Chain* Volume 5 (2): 149–60. doi:10.4161/gmcr.28449.

Barilla Center for Food & Nutrition. 2012. *Food waste: causes, impacts and proposals*. http://www.barillacfn.com/wp-content/uploads/2012/11/WEB_ENG.pdf.

Bjerga, Alan. 2014. *Oregon Seeds Sow Worries as GMO, Organic Crops Coexist*. *Bloomberg*. http://www.bloomberg.com/news/articles/2014-02-19/oregon-seeds-sow-worries-as-gmo-organic-crops-coexist.

Bosselmann, Aske Skovmand et al. 2015. Proteinforbrug i danske konventionelle og økologiske husdyr-produktioner. *Ifro Udredning*, nr. 2.

Casassus, Barbara. 2014. *Paper claiming GM link with tumours republished*. *Nature*. http://www.nature.com/news/paper-claiming-gm-link-with-tumours-republished-1.15463.

Clive, James. 2014. *Global status of commercialized Biotech/GM Crops*. *ISAAA Brief 49-2014: Executive summary*. NY.

Cook, John et al. 2013. Quantifying the consensus on anthropogenic global warming in the scientific literature. *Environmental research letters* Volume 8 (2).

Cressey, Daniel. 2015. *Widely used herbicide linked to cancer*. *Nature*. http://www.nature.com/news/widely-used-herbicide-linked-to-cancer-1.17181.

Denver, Sigrid et al. 2007. Får økologiske forbrugere oftere 6 om dagen? *Tidsskrift for Landøkonomi* Volume 2: 109–18.

Det Etiske Råd. 2006. *Nytte, etik og tro i sammenhæng med udsætning af genmodificerede planter*. http://etiskraad.dk/upload/publikationer/foedevarer-og-klima/nytte-etik-og-tro/kap11.htm.

Ebbesen, Klaus. 2015. Stenalderkost har intet med stenalderen at gøre. *Kristeligt Dagblad*, Marts 23. http://www.kristeligt-dagblad.dk/kronik/stenalderkost-foer-og-nu.

Eennaam, Alison Van og Amy Young. 2014. Prevalence and impats of genetically engineered feedstuffs on livestock populations. *Journal of Animal Science*, nr. 92: 4255–78.

Entine, Jon og Rebecca Randall. 2015. *Scientific consensus on GMO safety stronger than for global warming*. *Genetic Literacy Project*. https://www.geneticliteracyproject.org/2015/01/29/pewaaas-study-scientific-consensus-on-gmo-safety-stronger-than-for-global-warming/.

ERS. 2015. *Food Availability (Per Capita) Data System. Summary Findings*. *USDA's Economic Research Service United States Department of Agriculture. Economic Research Service*. http://www.ers.usda.gov/data-products/food-availability-%28per-capita%29-data-system/summary-findings.aspx.

Eshel, Gidon et al. 2014. Land, irrigation water, greenhouse gas, and reactive nitrogen burdens of meat, eggs, and dairy production in the United States. *PNAS* Volume 111 (33). doi:10.1073/pnas.1402183111.

EU. 2000. *Meddelelse fra Kommissionen om Forsigtighedsprincippet*. http://eur-lex.europa.eu/legal-content/DA/TXT/?uri=celex:52000DC0001.

European Commission. 2010a. *Biotechnology*. *Special Eurobarometer 341*. http://ec.europa.eu/COMMFrontOffice/PublicOpinion/index.cfm/ResultDoc/download/DocumentKy/55674.

———. 2010b. *Food-related risks*. *Special Eurobarometer 354*. http://ec.europa.eu/public_opinion/archives/ebs/ebs_354_en.pdf.

European Parliament. 2015. *Parliament rejects national GMO bans proposal. Press release 28-10-2015*. http://www.europarl.europa.eu/news/en/news-room/20151022IPR98805/Parliament-rejects-national-GMO-bans-proposal.

FAO. 2009. *How to Feed the World in 2050*.

———. 2013. *Tackling climate change through livestock*.

Fernandez-Cornejo, Jorge et al. 2014. *Genetically Engineered Crops in the United States*. USDA.

FN. 2015. *Historisk Paris-aftale vedtaget til COP21*. *UN City Copenhagen*. un.dk/da/uncategorized-da/historisk-paris-aftale-vedtaget-til-cop21+&cd=1&hl=da&ct=clnk&gl=dk.

Foley, Jonathan. 2014. A Five-Step Plan to Feed the World. *National Geographics*, nr. Special issue on The Future of Food.

Foley, Jonathan A. et al. 2011. Solutions for a cultivated plane. *Nature* Volume 478: 337–42. doi:10.1038/nature10452.

Fødevarestyrelsen. 2015. *Risikovurdering og godkendelse af GMO*. http://www.foedevarestyrelsen.dk/Leksikon/Sider/Risikovurdering-og-godkendelse-af-GMO.aspx.

Garnett, Tara. 2011. Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)? *Food Policy* Volume 36: 23–32. doi:10.1016/j.foodpol.2010.10.010.

Gaskell, George et al. 2006. *Europeans and Biotechnology in 2005: Patterns and Trends*.

———. 2010. *Europeans and biotechnology in 2010 - Winds of change? A report to the European Commission's Directorate-General for Research*.

Gillam, Carey. 2015. *EPA will require weed-resistance restrictions on glyphosate herbicide*. *Reuters*. http://www.reuters.com/article/2015/03/31/us-monsanto-herbicide-weeds-idUSKBN0MR2JT20150331.

Gjerris, Mickey. 2015a. *Kan oksekød skåne klimaet? Food of Life*. http://foodoflife.ku.dk/debat/kan-oksekoed-skaane-klimaet/.

———. 2015. What to buy? On the complexity of being a political consumer. *Journal of Agricultural and Environmetal Ethics*. doi:10.1007/s10806-015-9591-6.

———. 2015b. Willed Blindness: A Discussion of Our Moral Shortcomings in Relation to Animals. *Journal of Agricultural and Environmental Ethics* Volume 28 (3): 517–32.

GMO Compass. 2006. *Genetic Enginering: Feeding the EU's Livestock*. http://www.gmo-compass.org/eng/grocery_shopping/processed_foods/153.animal_feed_genetic_engineering.html.

Goodland, Robert og Jeff Anhang. 2009. Livestock and Climate Change. *World Watch* Volume 22 (6).

Hallström, Elinor et al. 2015. Environmental impact of dietary change: a systematic review. *Journal of Cleaner Production* Volume 91. San Francisco, USA: 1–11. doi:10.1016/j.jclepro.2014.12.008.

Halsnæs, Kirsten. 2014. Markedet behøver hjælp, hvis etikken skal være med. I *Det svære valg -Udfordringer for den etiske forbruger. Udfordringer for den etiske forbruger*. København: Det Etiske Råd.

Harremoës, Poul et al. 2002. Twelve late lessons. Kapitel 16. I *The precautionary principle in the 20th century. Late Lessons from early warnings*, redigeret af European Environment Agency. Earthscan Publications.

Herrero, Mario et al. 2011. Livestock and greenhouse gas emissions: The importance of getting the numbers right. *Animal Feed Science and Technology* Volume 166–167 (Special issue). doi:10.1016/j.anifeedsci.2011.04.083.

House of Commons, Science and Technology Committee 2015. 2015. *Advanced genetic techniques for crop improvement: Regulation, risk and precaution*. http://www.publications.parliament.uk/pa/cm201415/cmselect/cmsctech/328/328.pdf.

IPCC. 2013. Summary for Policymakers. I *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, redigeret af T.F. Stocker et al. Cambridge: Cambridge University Press. http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf.

———. 2014. Summary for Policymakers. I *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, redigeret af C.B. Field et al. Cambridge: Cambridge University Press. https://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-PartA_FINAL.pdf.

Jespersen, Lizzie Melby et al. 2015. *Økologiens bidrag til samfundsgoder. Vidensyntese 2015*. http://icrofs.dk/fileadmin/icrofs/Diverse_materialer_til_download/web_OKvidensyntesen_okt_2015.pdf.

Jørgensen, Asger N. 2015. *Hestebønner skubber soja ud af staldene*. *Politiken*. http://www.dr.dk/nyheder/regionale/nordjylland/hesteboenner-skubber-soja-ud-af-staldene.

Katiraee, Layla. 2015. *10 studies proving GMOs are harmful? Not if science matters*. *Genetic Literacy Project*. https://www.geneticliteracyproject.org/2015/11/13/10-studies-proving-gmos-are-harmful-not-if-science-matters/.

Kloor, Keith. 2015. *GM-crop opponents expand probe into ties between scientists and industry. Activist group compels records from 40 researchers at US public universities*. *Nature News*. http://www.nature.com/news/gm-crop-opponents-expand-probe-into-ties-between-scientists-and-industry-1.18146.

Klümper, Wilhelm og Matin Qaim. 2014. A meta-analysis of the impacts of genetically modified crops. *Plos One* Volume 9(11). doi:10.1371.

Lassen, Jesper. 2002. Ethics and genetic engineering – lessons to be learned from GM food, 2002. *Bioprocess and Biosystems Engineering* Volume 24 (5): 263–71.

———. 2007. Miljøvenlige genmodificerede afgrøder? Vil landmændene have dem, og vil de blive brugt til gavn for naturen? *Bekæmpelsesmiddelforskning fra Miljøstyrelsen*, nr. 112.

Lu, Yanhui et al. 2012. Widespread adoption of Bt cotton and insecticide decrease promotes biocontrol services. *Nature*, nr. 487: 362–65.

Madsen, Kathrine Hauge og Peter Sandøe. 2003. Nye veje til risikovurdering af genmodificerede afgrøder. *Vedrørende bioteknologi og offentligheden, Center for Bioetik og risikovurdering*.

McMichael, Anthony J. et al. 2007. Food, livestock production, energy, climate change, and health. *Lancet* Volume 370 (9594).

Mielby, Henrik et al. 2013. Multiple aspects of unnaturalness: are cisgenic crops perceived as being more natural and more acceptable than transgenic crops? *Agriculture and human values* Volume 30 (3): 471–80.

Nature Biotechnology. 2015. Kicking the can. *Nature Biotechnology* Volume 33 (111). http://www.nature.com/nbt/journal/v33/n2/full/nbt.3148.html.

NaturErhvervsstyrelsen. 2015. *Sameksistens*. http://naturerhverv.dk/tvaergaaende/gmo/dyrkning/sameksistens/.

Nicolia, Alessandro et al. 2013. An overview of the last 10 years of genetically engineered crop safety research. *Biotechnology* Volume 34.

Nielsen, Ole-Kenneth et al. 2014. *DENMARK'S NATIONAL INVENTORY REPORT 2014. Emission Inventories 1990-2012 - Submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol*. http://dce2.au.dk/pub/SR101.pdf.

Niggli, Urs et al. 2008. *Organic farming and climate Change*.

OA and FAO. 2007. *International Conference on Organic Agriculture and Food Security*. Organic Agriculture and Food Security. ftp://ftp.fao.org/docrep/fao/meeting/012/ah952e.pdf.

Olesen, Jørgen E. 2010. Fødevarernes andel af klimabelastningen. I *Vores mad og det globale klima - etik til en varmere klode*. Det Etiske Råd.

———. 2015. Fødevarernes klima- og miljøbelastning. I *Det svære valg - Udfordringer for den etiske forbruger*. Det Etiske Råd.

Padel, Susanne og Carolyn Foster. 2005. Exploring the gap between attitudes and behaviour – understanding why consumers buy or do not buy organic food. *British Food Journal* Volume 8 (107).

Palmgren, Michael G. et al. 2015. Are we ready for back-to-nature crop breeding? *Trends in Plant Science* Volume 20 (3). doi:http://dx.doi.org/10.1016/j.tplants.2014.11.003.

Perry, Edward D. et al. 2016. Genetically engineered crops and pesticide use in U.S. maize and soybeans. Science Advances Vol 2, No. 8. http://advances.sciencemag.org/content/advances/2/8/e1600850.full.pdf

Plantedirektoratet. 2010. *Undersøgelse af pesticider, mykotoksiner, bly og cadmium I sydamerikanske sojaprodukter til foder*.

Plutzar, Christoph et al. 2015. Changes in the spatial patterns of human appropriation of net primary production (HANPP) in Europe 1990–2006. *Regional Environmental Change*, 1–14. doi:10.1007/s10113-015-0820-3.

Popp, Alexander et al. 2010. Food Consumption, Diet Shifts and Associated Non-CO2 Greenhouse Gases from Agricultural Production. *Global Environmental Change* Volume 20 (3): 451–62.

Regalado, Antonio. 2015. *As patents expire, farmers plant generic GMOs*. *MIT Technology Review*. www.technologyreview.com/news/539746/as-patents-expire-farmers-plant-generic-gmos/.

Satran, Joe. 2015. Greening-Resistant GMO Oranges Come One Step Closer To Market. Here's Why You Should Care. *Huffington Post*.

Saxe, Henrik et al. 2013. The global warming potential of two healthy nordic diets compared with the average Danish diet. *Climatic Change* Volume 116 (2): 249–62.

Saxe H. 2014. The New Nordic Diet is an effective tool in environmental protection: it reduces the associated socioeconomic cost of diets. American Journal of Clinical Nutrition 99: 1117-1125.

Snell, Chelsea et al. 2012. Assessment of the health impact of GM plant diets in long-term and multigenerational animal feeding trials: A literature review. *Food and Chemical Toxicology* Volume 50 (3-4).

Säll, Sarah og Ing-Marie Gren. 2015. Effects of an environmental tax on meat and dairy consumption in Sweden. *Food Policy* Volume 55: 41–53.

Sørensen, Martin Tang et al. 2014. *Notat vedr. "Fodring af husdyr med produkter fra genmodificeret soja"*. *Nationalt Center for Fødevarer og Jordbrug, Aarhus Universitet*.

The European Parliament and the Council of the European Union. 2015. *Directive (EU) 2015/412 of the European Parliament and of the Council*. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:JOL_2015_068_R_0001.

Tilman, David og Michael Clark. 2014. Global diets link environmental sustainability and human health. *Nature* Volume 515 (7428).

Tukker, Arnold et al. 2006. *Environmental Impact of Products (EIPRO). Analysis of the life cycle environmental impacts related to the final consumption of the EU-25*. http://ec.europa.eu/environment/ipp/pdf/eipro_report.pdf.

UN. 2015. *World Population Prospects. The 2015 revision*.

United Nations Secretary-General's High-level Panel on Global Sustainability. 2012. *Resilient People, Resilient Planet: A future worth choosing*. New York. http://www.ipu.org/splz-e/rio+20/rpt-panel.pdf.

Verdensnaturfonden. 2014. *The Growth of Soy – Impacts and solutions.*

Vermeulen, Sonja J. et al. 2012. Climate Change and Food Systems. *Annual Review of Environment and Resources* Volume 37: 195–222.

Voosen, Paul. 2014. *Can genetic engineering save the Florida orange? National Geographic*. http://news.nationalgeographic.com/news/2014/09/140914-florida-orange-citrus-greening-gmo-environment-science/.

Wagner, Wolfgang et al. 1997. Europe ambivalent on biotechnology. *Nature*

Volume 387 (26): 845–47.

Walia, Arjun. 2014. *10 Scientific Studies Proving GMOs Can Be Harmful To Human Health*. *Collective Evolution*. http://www.collective-evolution.com/2014/04/08/10-scientific-studies-proving-gmos-can-be-harmful-to-human-health/.

Waltz, Emily. 2014. Table 1: Transgenic drought tolerant crops in commercial development and on the market. *Beating the weat. Nature Biotechnology* Volume 32.

Wirsenius, Stefan et al. 2010. How much land is needed for global food production under scenarios of dietary changes and livestock productivity increases in 2030. *Agricultural Systems* Volume 103 (9): 621–38.

Zapiola, María L. og Carol A. Mallory-Smith. 2012. Crossing the divide: gene flow produces in-tergeneric hybrid in feral transgenic creeping bentgrass population. *Molecular Ecology* Volume 21.