

## **Is genetic engineering unnatural? If so, is that an ethical problem?**

This paper is divided into two sections.

The first section is about the concept of nature.<sup>1</sup> The discussion about that concept is related to a discussion about nature as having moral status, and naturalness as a property that contributes to the moral status of an object.

The second section is about ethical problems in the context of naturalness and genetic engineering. I will discuss ethical problems related to the concept of nature (and naturalness) regarding two different examples of genetically engineered crops, i.e. herbicide resistant soybeans and the so-called Golden rice. These crops are not grown in Sweden, where I live, primarily because of the climate. In addition, Sweden has a rather restrictive legislation about GMOs. In this section, I am interested in whether genetic engineering is plausibly described as being unnatural, and whether that is relevant from an ethical point of view. My argument is that irrespective of whether genetic engineering is unnatural or not, that issue is certainly not the largest ethical problem in the context of genetic engineering.

### **Section I**

#### *The concept of nature*

The concept of nature has been, and is still, discussed for a long time, in an abundance of books and articles. I do not aspire to present any general plausible concept of nature here. On the contrary, I lean towards the notion that the concept of nature is extremely context-dependent, and probably in need of more or less constant redefinition. Nevertheless, I will present two versions of one original definition. In environmental ethics, and in other contexts as well, the concept of nature is often defined as "unaffected by humans". Here, I will pay attention to some problems with that definition. Depending of which of the two versions that is used, the problems related to the concept are different.

The first version of the concept of nature is that nature is to be defined as not affected by humans at all. According to this concept, a human affected entity is unnatural, even in cases where the human influence is minimal.

The definition leads to a number of problems. Especially so if we wish to use this definition of the concept as a keystone in a plausible environmental ethic for the preservation of nature. As nature is by definition unaffected by humans, it is questionable whether there is still any nature on earth at all. Hence, there is nothing left to preserve. As chemical molecules of human origin have been found in many different organisms at very different locales, for instance in penguins' at the South Pole and in polar bears' at the North Pole, there is probably no nature on earth that is unaffected by humans. Nowadays, even the climate is affected by humans, so everything on earth that is influenced by climate, is probably indirectly affected by humans.<sup>2</sup> This means that there is no nature left to preserve, and thus the definition is practically meaningless. Hence, as a keystone for an environmental ethic, this concept of nature does not seem useful. For that reason, I will introduce the second

---

<sup>1</sup> I presuppose that nature and naturalness are closely related. In nature, the entities are natural, and so is nature.

<sup>2</sup> See **McKibben, Bill**, *The end of Nature*, Anchor Books, New York, 1990

version of the concept, that is a closely related understanding of the concept, but nevertheless different from the foregoing in one important aspect.

The second version of the concept of nature is that nature, or naturalness, is a matter of degrees. That is, if an entity is only minimally effected by humans, it is still *quite* natural, but not totally unnatural, as it would have been according to the first version of the concept. Human influence on nature does not immediately and totally delete nature, while changing it to something unnatural. There are still traces of nature, so to say, as well as there are traces of "unnature", in humanly affected entities. This acceptance of human influence on nature has advantages over the previous version.

Firstly, this definition makes nature preservation possible. If nature is denaturalised by any kind of human influence, it seems impossible for humans to preserve nature. Humans are incapacitated as preservationists; at least in all other ways than staying far away from the natural object we want to preserve (although even that *may* be seen as a way of affecting nature).

Secondly, this definition allows humans more space. It does not only enable humans to perform natural preservation, it also allows a diversity of human actions affecting nature. According to this definition, there are possibilities for humans to do things in relation to nature, without totally "denaturalising" it.

Thirdly, this definition reduces the difference or conceptual gap between human beings and nature. As humans do not totally denaturalise nature irrespectively of how we act, there seems to be a possibility for a continuing relation between humanity and nature. There is not necessarily an ontological gap between humanity and nature, which is probably good for an environmental ethic that needs instruments for emphasising humans as belonging to nature. It should be helpful to environmental ethic, and to the environmental movement as well, to have instruments for claiming that there is some kind of – ethically relevant – interdependency, or other kinds of relationships, between humanity and nature. These types of themes are highlighted by several environmental ethicists, from a variety of reasons and arguments.

As there are, from my point of view, problems in relation to the first version of the concept, I am sorry to say that the second version does not exactly solve my problems either. At best, it is more useful for my purposes. Sorry to say, I do not have any better candidate; this concept will have to suffice until I have a better idea. The main reasons for my dissatisfaction deal with the picture of humanity implied by this second version of the concept.

Despite what has been said above about the reduced difference between humans and nature, the second concept of nature still leaves many problematic and important questions about humanity's place in nature unanswered. Above all, there is the problem of human beings as something very strange to nature; strange to the extent that humans actions, unlike actions performed by all other (acting) organisms, more or less change nature to unnatural. What does this say about humanity's place in nature? Are humans not natural parts of nature?

According to this version of the concept of nature, humans are still strange, or unfamiliar, to nature as such. It seems difficult to clarify this unfamiliarity, though humans are even more strange to nature according to the first version. There are still questions like: If humanity, *Homo sapiens*, is not a species among species, and a part among parts in the ecosystem, then what is *Homo sapiens*?

*The moral status of nature*

In environmental ethics, and the environmentalist movement as well, nature and natural entities are sometimes said to have moral status, in virtue of their naturalness.<sup>3</sup> Or, at least, nature and natural entities are said to have moral status because of their naturalness as an ethically significant property among others.<sup>4</sup> In both cases, this is a central part of what I find problematic about the concept of nature. Among other issues, I am afraid that the definition of nature as being unaffected by humans, in conjunction with a theory for nature's moral status along the lines just mentioned, is a highway to misanthropy.<sup>5</sup>

To my opinion, ideas about human overpopulation on earth as an environmental problem, ideas that involve a more or less general technophobia, and ideas that involve suspicion against science in general, are all frighteningly close to misanthropy. At the same time, ideas like these are – in my opinion – more common among environmental ethicists and environmentalists than in other contexts. This is not to deny that there are serious problems related to the things mentioned, and there are certainly good reasons for cautiousness.

If environmental ethics claim that nature ought to be defined as being unaffected by human beings, and that nature at the same time has moral status, we have to be aware of misanthropy, I think. We have to bear human welfare in mind, not to forget human needs. If we develop and advocate ethical theories along the lines just outlined, we do need to supplement such ideas with, *at least*, ethical theories which, in some way or another, ascribe moral status to humans.<sup>6</sup> In this context, it is definitely not enough to say that other ethical theories still care for more objects than nature; humans, for instance. When advocating environmental ethic theories about the moral status of nature, it is not enough to add, *en passant*, that we are still morally responsible for those things that all ethical theories have always claimed that we are responsible for. Neither is it enough to say that traditional, already established, ethics are not overridden by the environmental ethic. When that is our, environmental ethicists', answer to the critique, we are not taking the critique seriously enough. The problem here is not that the critique is obviously invalid,<sup>7</sup> the problem is rather that some environmentally friendly people do not always pay enough attention to humans in their ethical judgements.

I will not exaggerate this point. Nothing is new under the sun; everything I have said here has been said before, although there still are some points in need of clarification.

It seems to me that the problems here to a large extent have to do with the environmentalist preference for holistic ethics. From an environmentalist point of view, holistic ethics seem reasonable, compared to individualistic ethics. Environmentalists are often used to regard nature as an ethically relevant whole.

---

<sup>3</sup> See **Sober, Elliott**, Philosophical Problems for Environmentalism, in **Norton, Bryan**, ed., *The preservation of species: the Value of Biological Diversity*, Princeton University Press, Princeton, 1986, 173-195

<sup>4</sup> The idea that nature has moral status does not necessarily exclude that other things have moral status too. Rolston, for instance, advocates the idea of nature having natural value, and he also claims that cultural things have cultural value.

<sup>5</sup> Misanthropy perhaps is a reasonable attitude, although I presuppose that it is not.

<sup>6</sup> From considerations of space, I restrict my discussion to humans. More appropriate, perhaps, would have been to talk about all or different kind of individual organisms.

<sup>7</sup> Of course, not all criticism on these lines is fair. Anyhow, the criticism *is* fair often enough to be taken seriously.

Nature's preservation is rather an issue of whole entities, like ecosystems and species, than an issue of individuals. Therefore holistic ethics seem reasonable. However, when talking about humans, the holistic environmental perspective does not seem to be that useful. It is extremely problematic to apply an environmental holistic ethic to human beings, and to human societies.

To sum up, nature and naturalness as being morally relevant in and of themselves, and at the same time being threatened by humans, *as humans*, is a combination that is difficult to handle. This has to do with the misanthropy problem, which is perhaps related to the holistic view on ethics, which in turn relates to well-established environmentally friendly attitudes toward nature. Despite the problems related to holistic ethics, however, I do not think that it is as a good idea to reject the entire approach.

### *More or less natural?*

According to the second version of the concept of nature, humans more or less denaturalise nature. Now, it is time to have a look at that. What does it mean, to more or less denaturalise nature, or to denaturalise nature to some extent? How does more human influence on nature differ from less human influence on nature? On what kind of scale should degrees of naturalness be assessed?

One sketch of an answer is that it is a question about areas. At a first glance, this perhaps seems a plausible idea. It also fits very well with ideas about preservation of wilderness. However, on reflection, I do not think that it is a good answer. To talk about areas rather seems to be a remainder from the first, already rejected, version of the concept of nature. Some areas – maybe all areas on earth – are affected by humans, and are thus unnatural. Other areas are not affected by humans, and are thus still natural. According to this, areas that are affected by humans are unnatural, while unaffected areas are natural. All things considered, the more of the latter type of areas there are, the more of nature there is. This obviously opens for the earlier objection that this makes the concept of nature practically meaningless from a preservationist point of view – either because there is no nature to preserve or because preservationist interventions only serve to decrease the amount of nature left.

Another sketch of an answer is that it is a question about whether the human influence on nature is possible to restore to a natural state, or not. According to this idea, human influence that changes a natural object to the extent that it is impossible to restore it to its original shape results in an unnatural object. In this case what kinds of influence that are considered unnatural will probably change from time to time, and also differ between locales, as the knowledge about natural objects and the restoration of natural objects will change and/or increase. The most important objection to this is that some people would claim that natural restoration is always impossible, as humans are not able to create natural objects.<sup>8</sup>

The third, and probably most reasonable, sketch of an answer is that some kinds of human influence denaturalise nature, while other kinds of human influence do not. For instance, organic farming is natural, at least quite natural, while genetic engineering and genetically modified organisms are quite unnatural.

---

<sup>8</sup> See **Elliot, Robert**, *Faking nature: the ethics of environmental restoration*, Routledge, London, 1997 and Katz, Eric, *The Big Lie: Human restoration of nature*, in Light, Andrew & Rolston III, Holmes, *Environmental Ethics*, Blackwell Publishing, Oxford, 2003

If naturalness and unnaturalness is primarily determined by the kind of human influence considered, I think that genetic engineering is plausible as an example of a human activity that is unnatural, or that serves to denaturalise nature. Typical environmentalist responses to GMOs support this claim. In the next section I will therefore investigate this candidate for a denaturalising human activity more closely.

## Section II

### *Is genetic engineering unnatural?*

There are too many different kinds of genetic engineering to say anything detailed about the naturalness of each of them. For that reason, this is a very brief and sketchy discussion.

Genetic engineering has not yet been practised for a very long time. Our experiences from the techniques are brief. However, intentional breeding of crops, cattle and other domestic animals has been used for a very long time in human history. By practise, humans have learned how to use the evolutionary pressure to our own advantage. The results from this practise are enormous and extremely varied. The wheat and carrots that are nowadays grown yield much better harvests than did their forerunners. The cows yield more milk. Our pets do not look or behave like their wild ancestors.

One can of course say that traditional breeding and cultivation is also unnatural. Nevertheless, it seems to me that the people who claim that would also say that genetic engineering is *more* unnatural than the traditional techniques. Otherwise, they probably think that all human interference with nature denaturalises nature. In that case the differences between, e.g. traditional breeding and genetic engineering are obviously not crucial. The differences between the techniques, though, is not a matter of human interference and intentions. Genetic engineering is humanly caused *per se*, and so is traditional breeding for farming purposes.

Unnatural or not, genetic engineering has things in common with evolution. Mutations and crossbreeding sometimes result in organisms that are adaptive to their environment. In nature, there are also cases where genetic materials are moved from one organism to another, also at the trans-species level. (This is sometimes done by bacteria.) There are risks, not only in the case of genetic engineering, but also in the case of natural evolution. Many mutants never grow up, for instance.

Even if trans-species changes of genetic material happen in nature, without human interference, most of the genetically engineered trans-species organisms would in fact never appear through nonhuman forces. An example is a kind of genetically engineered poplar, which has had a gene sequence from a species of flounder, that lives in the Arctic Ocean, inserted into its genome in order to increase the poplar's cold hardiness. It seems most unlikely that such a tree would have appeared without genetic engineering.

Neither does it seem probable that a cow like the Belgian blue would have appeared without well planned breeding. These cattle have double the muscle mass compared to regular cows, and are so heavy that they can barely move. They are also unable to give birth, because of their extremely big calves, and therefore need Caesarean sections.

From these examples, it seems reasonable to say that traditional breeding and genetic engineering are both quite unnatural. That is, the results of these practises are often dependent on humans and are at the same time designed by humans, for

human purposes. Nevertheless, one can also argue that bred and cultivated cattle and crops, as well as genetically engineered cattle and crops, are all good means for the preservation of nature. By this modern and more effective farming, it may be possible to save larger areas as nature reserves. Modern farming leaves room for wilderness, so to say. Other GMOs may be designed to produce effects (e.g. regarding the flow of water and air, the temperature of these elements, the extent to which they contain pollutants etc.) that are directly beneficial for the preservation of nature.

To answer my headline question I have to say, though I wish I had not, that if we accept the idea that nature is more natural the less it is affected by humans, genetic engineering is probably quite unnatural. There are of course other engineered things that are unnatural too. One can construe examples of comparisons ad infinitum. Are cars more or less unnatural than GMOs, is New York more or less natural than a laboratory, and so on. I do not want to do that. I would rather say that genetically modified organisms, seem to me unnatural, taken as organisms, apart from their degree of naturalness or unnaturalness compared to something else.

### *Is genetic engineering unethical?*

So, on the basis of what has been said so far, given that GMOs are indeed paradigmatic cases of denaturalising types of human influence on nature, does this imply that there is anything wrong with them? I will try to answer this question by using genetically modified soybeans and the so-called Golden rice, as my examples. In both cases, I am aware that there is much more to say than I do here. The problems are much more complicated in reality, than they seem to be in my brief overview.

The soybean Roundup Ready is genetically modified in a way that protects it from Roundup, a common herbicide. There are genetic materials from some micro organisms incorporated into the soybean plant. The intended result is that when spraying the acres with Roundup, the weeds are killed, but the soybeans are not. In this case, the gene modification has made weed control easier. When cultivating traditional crops that are not herbicide resistant, the farmer cannot spray Roundup during the season when the soybeans grow. Roundup is a herbicide, and toxic, although there are many older herbicides that are much more dangerous to the farmers' health, and more dangerous to the environment as well.

The main reasons for this kind of gene modification and cultivation are of course economic.

The disadvantages in this case are several.

We do not know very much about the long-term effects to the environment. That is true about gene modification in general, and a herbicide resistant soybean is probably not an exception.

One risk that is often mentioned, is that the manipulated crop, soybean in our case, interbreed with its natural congeners. A problem with that is that the result could possibly be a herbicide resistant natural variety. The possibility fires the imagination: the herbicide resistant super weeds are taking control!

Anyhow, the herbicide resistance is only a competitive advantage if the plants are sprayed with Roundup. You do not generally spray plants. Additionally, the soybean only interbreeds with congeners. If there are no congeners in the neighbourhood, the

scenario above could not happen. For that sake, there are rules about security distances between genetically modified crops and natural landscapes.

Another risk, that is also mentioned frequently, is the economic risk to traditional farming, especially in the third world. If the new varieties of crops are more expensive, and at the same time more dependent of commercial herbicides, than the traditional varieties, this is probably not good to the local economies, although it is probably good to the multinational companies.

The third risk has to do with extinction. When spraying Roundup, or other herbicides, regularly throughout the season, further extinctions will take place. These acres are extreme examples of monocultures. All other kinds of plants are killed by the spraying, so there are not many insects, and thus fewer birds, and so on.

My second example is Golden rice.

Golden rice is a variety of rice, into which beta-carotene producing gene sequences have been inserted. Human bodies make A-vitamin of beta-carotene. The rice is golden because of the beta-carotene; the same substance that causes the colour of carrots.

In rice-based societies, a low level of beta-carotene in the daily food has consequences in a marked incidence of blindness and premature death in children.

Thus far, it seems extremely good that it has been possible to cultivate this kind of rice.

Despite that positive side of it, there is of course a lot of criticism.

The marked incidence of blindness is mainly a problem for poor families. The problem is not, according to the criticism, that these families' daily food is rice-based; the problem is that they cannot afford a balanced diet. That problem is not solved by a new commercial variety of rice, according to the criticism.

Apart from risks in terms of conformity, extinction of traditionally farmed crops and the dependency to various companies, I do not know if there are any known environmental risks related to Golden rice. Nevertheless, as we do not know much about the long-term effects of genetic engineering, we cannot say that it is without any risk. On the other side, neither it is without risk to stop cultivation of the beta-carotene enriched rice. Stop cultivation results in more blind children.

So, what are my conclusions?

Honestly, I do not know what to say about genetic engineering. As has hopefully been clear from my examples, I think that it is highly problematic. In some cases there are fantastic possibilities, in other cases the risks are extremely disturbing. From my knowledge of today, I think that I would say that Golden rice is a rather good thing. The Roundup Ready soybean, in contrast, seems to have too few advantages and too serious risks. We would do better to stop growing it.

What is most important from my point of view, however, is that absolutely nothing of this has to do with naturalness. Neither the naturalness – or lack thereof – of the beans or the rice, nor the naturalness of the consequences of the genetically modified crops. The important questions have to do with advantages and disadvantages of the engineered crops, as far as we know them. As we do not know much, especially about their long-term effects on the environment, it seems necessary to apply a high level of cautiousness to the issue.

I do not think that all genetic engineering is unethical, so I do not reject genetic engineering in general. However, there are probably some kinds of genetic

engineering that are unethical. In the unethical cases of genetic engineering, the ethical problems have nothing to do with naturalness or some kind of violation of *natural* entities. The ethical problems have primarily to do with unacceptable risks and unjustified exploiting of people and environments.

As I regard genetic engineering as rather unnatural, though not necessarily unethical, I do not relate ethic and naturalness to each other at all. There are good natural things as well as bad. Naturalness is, in my opinion, not a property that contributes to moral status. The reasons are mentioned above and the case of GMOs lends further support to them. In fact, nature is neither ethically good or bad, as nature is not a moral agent. Rather, nature is amoral.