



## Are you in favor or against Genetically Modified Organisms (GMO)?

Recently the Rt Hon Anders Wijkman, Member of the Swedish Royal Academy of Sciences, an accomplished environmental activist who served a decade as member of the European Parliament, asked me the question: "Are you against GMO - all forms of GMO?"

Actually, my inherently positive approach to finding solutions to major challenges that humanity faces always starts by searching for the best ways to achieve a competitive, sustainable, healthy and happy society. While scientists, politicians and business leaders may have found and implemented great social and technological solutions in the past, we can always do better, much better indeed. So, I am not about "for or against", I am about "better".

In our quest to attain a society capable of "responding to basic needs for water, food, health, housing and energy for all", we cannot leave any opportunity unturned, because "we do not like it". We have to look reality in the eye, going beyond what is good and what is bad, going beyond what fits our dogmas and what does not. We have to ask ourselves: "Is there better?" Often we find solutions that seem to be the best at that moment in time, not realizing at the outset the unintended consequences that may be caused by our impatient drive toward quick solutions.

I know this dilemma all too well. Back in the early 90's, I went out of my way to promote biodegradable soaps, outcompeting the market leaders without advertising by distributing an ecological product made in an ecological factory only to realize that this success caused an increase in demand for palm oil, which over the next decade lead to the destruction of 2.5 million hectares of rainforest, including ruining major tracks of the habitat of the orangutan. Was I, responsible for the destruction of the rainforest because I wanted to contribute to the cleaning up of the rivers in Europe? It is only *then* that I realized that biodegradability - even with the best of my intentions - often has nothing to see with sustainability. How could I pretend to clean up the rivers in Europe while undermining the livelihood of the habitat of primates?

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I realized the hard way that we need to look at the whole system and not simply pursue one single objective. Every time we only focus on one problem and find one quick solution, we are likely to cause these unintentional consequences. It takes years, sometimes decades to realize the adverse effects of what we do, and then it is often too late. If we decide to ignore the negative impact and side effects of our hasty actions, and do not dramatically improve, then we cause collateral damage -knowingly causing harm- a strategy condoned by the military. However, it cannot be embraced by civil society.

We need to create the space to look at the hard reality through the eyes of a child, observe all ramifications of the challenges we face without preconceived ideas. We study the options we have, employ scientific knowledge to the best of our abilities and design a model that advances life on earth.

This is how I pursue the soap and detergents business today. I - and the ZERI Foundation - actively promote the extraction of d-Limonene from citrus peels, which is perhaps one of the most effective, competitive and sustainable cleaning products. We convert waste from the orange juice industry into cleaning agents that outcompete palm oil derivatives, using available resources. The waste from the peels after extraction of the active ingredients can serve as an animal feed. Instead of causing damage to the rainforest or simply managing waste, we can generate three revenues and double the number of jobs. This is The Blue Economy.

After pondering over all possible options, I am encouraging companies from Japan to the United States, Brazil to South Africa to embrace this "better" solution. Why would you limit yourself to continue with palm oil-based soaps and detergents when there are now certified sustainable sources? Can someone explain to me how a monoculture can ever be sustainable?

I recognize that the d-Limonene may be the best option today. Improvements, even radical improvements, could emerge anytime. That is the pathway of evolution, building better competitiveness. At least, there is no more need to destroy rain forests.

It is against this background and positive approach that I responded to Anders' question about GMO, drawing from my experience as entrepreneur and innovator, committed to get better results faster, serving this simple purpose: respond to the basic needs of all with what we have, navigating the known and unknown, always prepared to take the risks to do much better than we have been able to do.

Gunter Pauli

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Tokyo, 5th of October 2010

Dear Anders,

First of all, thank you for asking.

Actually, I received that same question a few months ago during a conference on the future of agriculture in Brussels. And just last week, members of the Hungarian Academy of Sciences (at their splendid halls in Budapest) debated this subject with me with remarkable openness and determination.

The question we have to answer is not if we are in favor or against GMO.

The first question we have to answer is: "What is the purpose of GMO?"

If the purpose is to make crops resistant to drought, then the first question is: "Why do you want to plant a crop that needs water in an area that does not have water?"

And, if climate change is the cause of the drought (an easy excuse these days) why don't we switch to crops that can grow under these environmental conditions?

If we only choose to farm only 5 crop varieties, wherever we are in the world, of course GMO is the only option to feed the

Of course, if options for crops are limited options to five varieties (wheat, rice, corn, soy, palm) planted as monocultures, and we have discarded all other 1,000 opportunities that are proven locally ... then we have no option: we must genetically modify these crops to resist drought.

But, what if in this International Year of Biodiversity we search for the best seeds, the result of millions of years of adaptation, then we could embrace "the best option that is readily available and proven to work", without any potential unintended consequences.

We can actually plant these seeds immediately without having to undertake further research, save the money that now is spent on approvals, media campaigns and lobbyists who all try to get this "drought resistant" seed endorsed by policy makers.

A quick review of established seed banks confirms that there are hundreds of biota available for any latitude or altitude with proven track records to withstand

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drought. However, the next argument will be that the "traditional product" cannot produce enough to feed the world. Is that true? We are made to believe that only five main crops and only GMO combined with (thanks to GMO reduced) chemical cocktails will save us from famine and starvation. Let me analyze that logic.

If we choose to only give value to 0.1-17% of the biomass of a crop, and throw the rest away, left to rot generating methane, of course GMO is the only option.

If we only consume a fraction of what is produced (0.1% of tea, 0.2% of coffee, or 17% of the sugar cane), and the rest is simply left to rot, generate methane or burn, or plow it back into the soil, then it is true that we will never produce enough. Thus, if we rely on a few monocultures that only extract one ingredient for consumption, then we will have turned poverty and hunger into sustainable phenomena. I doubt if the appetite of the world's growing population would ever be able to have food security for all, even with the introduction of widespread GMO. Maybe the creation of this permanent scarcity is what the suppliers of GMO need in order to justify their argument that they alleviate hunger in the world.

Monocultures, irrigation, seed selection and fertilizers have boosted output of single crops, no doubt. However, this approach has lost sight of the tremendous opportunities beyond wheat and rice. We should cascade our agricultural resources just like ecosystems do. Actually, humans are the only species that wastes waste. No other living system does that. So, instead of facing the permanent risk of famine, using proven integrated farming techniques combined with the best of modern agriculture, we can go beyond the concept of scarcity and plan for sufficiency, and even dream of abundance.

Thus, if we turn agriculture into a "system" of production and consumption that uses all available resources, and for example were to start farming mushrooms on coffee and tea waste as is done in Africa and Latin America, or on rice straw as is the tradition in China, then we will be producing on the plantations that solely focus on export crops 100x more amino acids for human consumption with what is available today. There is not one GMO or irrigation plan that could even come close to this performance that is proven.

In the past, agricultural waste from rice straw was used as a building material in Cairo. When concrete and cement began to be used, Cairo faced intolerable air pollution due to the burning of excesses of rice straw. The "best" option proposed was to genetically modify rice to "short straw varieties". Who could be against reducing respiratory illnesses caused by uncontrolled incineration of agricultural waste?

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When straw is discarded as a building material, and its excesses are now burned into ashes, causing air pollution, why is the solution a short straw rice (a GMO) and not a massive farming of straw mushrooms?

However, in a sprawling megalopolis like Cairo, why was the option of generating more food not retained? The farming of straw mushrooms in an urban area generates jobs, income and converts waste into food, while eliminating air contamination. It is now done in 16 countries. Was the excuse that the Egyptians do not eat mushrooms? They never ate hamburgers either, but cheap hamburgers are recently the rage. So is there a flaw in our economic logic?

The mindset that underpins the drive to GMO is the construct of scarcity. The efficient allocation of scarce resources provides the logic for business. Unfortunately over the past half century, business is reduced to a core business based on a core competence. How often did I hear that one or the other multinational is *not* into mushrooms, and therefore this option of converting agro-waste to food - how laudable and even competitive can be - is not even considered. Actually, Anders, we have to admit, (1) these companies are not capable of taking up this proposal, (2) management simply does not have the skills needed to introduce this simple innovation, and (3) shareholders are capable of understanding it but need to be exposed to the option.

If we are prepared to embrace integrated farming, cascading nutrients in the field or inner cities, instead of focusing on one and discarding the rest, then we can produce food even on dry farm land or in urban concrete jungles. Then we could have 1,000 other sources of vegetable protein known around the world, and 5,000 varieties of edible fungi that combined could one day produce more than we can eat!

If all coffee waste were used to farm mushrooms, we would produce an additional 16 million tons of food - using what we have today! Imagine the impact if we add tea, straw, cobs, and pruning from orchards. It may surpass the 100 million ton mark, bypassing food from fish catch and fish farming.

Anders, while this sets the stage, there is a need to offer you a second example to clarify my approach to finding the best solution, and offer a framework for assessing the potential contribution of GMO to a sustainable, healthy and happy world.

Do you remember, some 15 years ago, the arrival of Golden Rice? This GMO rice was heralded as a definitive solution in the fight against blindness. It was introduced as one of the great contributions of science, and probably one of the key reasons why you asked "if I am against *all* forms of GMO?"

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If the purpose is to protect children from blindness we genetically modify rice to include betacarotene into the rice kernel. How could anyone ever be against this option?

We should not form our opinion on what is good or what is bad, we should choose the best possible option, with the least risks, based on an understanding of all possible unintentional consequences to anyone else with whom we share the planet.

When confronted with such a societal challenge like blindness, we should first ask ourselves why is that blindness on the rise? Quickly we realize that there is a shortage of betacarotene ... obvious! Is that enough of a reason to rush to and genetically modify rice to include betacarotene? I beg everyone to bear with me and think this through.

Monocultures created a shortage of betacarotene, increasing the risk of blindness. Why is red rice (a GMO) is the preferred solution, instead of generating more food and more betacarotene with available resources?

We should ask ourselves the question: "Why is there is a shortage of betacarotene in the food supply chain around rice paddies?" Studying ecosystems we realize that micro-algae, including the blue green algae are just about always around. This is one of the first forms of life that emerged on earth. These have been in existence for

over a billion of years, and weathered all calamities. Micro-algae are known producers of betacarotene and many other nutrients. So what happened to them around the rice paddies?

We realize that there used to be a scum growing on the irrigated paddies. This scum has been removed due to the chemicals used in rice farming to boost output. That scum ... is rich in micro-algae, and very rich in betacarotene.

In earlier times, Chinese, Vietnamese, Laotian, Cambodian farmers used to put shrimps and even carps in the rice paddies. These organisms devoured betacarotene-rich algae and secured it into the food chain so that people had enough of it, naturally using all available resources. That cultivation system is not as high *in rice productivity* as a monoculture, but this traditional system of cultivation generates more nutrients, providing food security, and even secures the necessary defenses against modern illnesses such as blindness. This farming system provides more disposable income, since all basic needs can be covered locally. This puts more money in the pocket to pay for school. Export crops are notorious for generating more output, and an income that fluctuates with the world market prices.

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Our "modern" farming system of rice that focuses on maximizing rice eliminated betacarotene (and much more) from the supply chain! In our drive to increase the output of one component - rice - we decreased the natural cultivation of all the essential amino acids and micro-nutrients that rice alone cannot supply. How can we accept that the solution to blindness is genetic manipulation?

If we really want to fight blindness, and if that is our genuine purpose, then we farm rice, let the scum form on the water, feed it to the ducks, crustaceans and fish. Then we have a balanced intake of protein, and at the same time, we have a good supply (again) of betacarotene, while naturally fertilizing the ponds with manure. As our research demonstrates, *this system* integrated farming system produces more nutrients than intensive rice farming could ever achieve. We are not substituting blindness for famine as some proponents of GMO want us to believe.

Golden Rice does not solve any issue beyond blindness at a premium. Rather, GMOs perpetuate unsustainability in farming, both on the production side (too many inputs depleting top soil) and on the side of consumption (too much of the wrong food).

How is it possible that the Swiss company that controls Golden Rice has an exclusive patent (until 2012), exploiting the sale of the "anti-blindness" rice for a profit? If the purpose is to earn money and maximize return to shareholders, then this should be spelled out when waging the campaign to halt blindness.

*GMO is not bad - however there is a much better way! So why settle for the expensive, profit-driven, risk-laden, and approval-loaded solution, while proven integrated farming systems can evolve our present model of scarcity to one of abundance?*

I am not saying that business is bad. We have to ask ourselves constantly "Is there a better way"? And the conclusion in this case is that "There is indeed a much better way!". This "better way" addresses our shortcomings without leaving the world in hunger. Time has come to stop patching up

the problems with quick fixes, and start implementing lasting solutions that can always evolve to better ways over time.

In Brazil, we calculated that the amount of betacarotene that can be naturally produced per hectare per year by the ecosystem that made rice so competitive is 40 times higher than what could ever be genetically engineered into the rice. This can be achieved at a lower cost.

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So it is not that I am *against* Golden Rice or GMO, I am always challenged to ask "What is best to achieve a goal?" If the goal is to fight blindness due to a shortage of betacarotene, then Golden Rice is a poor option. Worse, it is an expensive option and a rather ineffective compared to the integrated farming techniques that have been proven to function.

We should ask the next question: Do the farmers earn more money by stamping out blindness? Or, does this rice seed cost more, solely increasing the supplier's profit?

The company that developed Golden Rice requested early on support from the United Nations, and asked governments to grant an exclusive license to operate. Is ethical for a company to use an exclusive patent to profit from stamping out blindness, especially if the company applies for grants and tax breaks to guarantee a minimum return?

If the UN pays or governments make up for the difference, then it is tax money that foots the bill! I am fundamentally against the diversion of citizens' earnings to guarantee a profit margin, or to subsidize research programs that are not solving problems, but only placing patches on the challenges of our time.

Until today every case that has been posed to me justifying GMO, I have found much better solutions that provide (1) higher output for the whole (not on one crop), (2) contributes to the health and livelihood of all, and (3) stamp out hunger once and for all. And guess what, these are more competitive solutions as well.

Hope this helps!

gunter

Gunter Pauli is the designer of "The Blue Economy" and the author of the book with the same title. Each week, he publishes one innovative business model that has been benchmarked somewhere in the world. He has competed successfully on the market as an entrepreneur, and the 50+ projects his foundation has been involved demonstrate the commercial viability of these innovations. For more information <[www.zeri.org](http://www.zeri.org)> and <[www.TheBlueEconomy.org](http://www.TheBlueEconomy.org)>.

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