

Reflections on Feeding the World: The Moral Imperative of Biotechnology and the Study-Document of the Pontifical Academy of Sciences on GMOs

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The conference "Feeding the World; The Moral Imperative of Biotechnology" (September 24, 2004) at the Gregorian University in Rome was co-sponsored by the US Embassy to the Vatican and the Pontifical Academy of Science. Sadly, the event did not encourage dialogue on this crucially important question of how to banish hunger from our contemporary world: all the speakers were staunch promoters of biotech crops.

The US Ambassador to the Holy See, James Nicholson, opened the conference by stating that feeding the 1.5 billion people who are suffering from hunger and malnutrition is as much a key element of US foreign policy as waging the war on terrorism. He stated that the way to do this is to make GE crops available to farmers around the world, but especially in Africa. The ambassador chided environmental groups and even European governments who criticised the US government's decision to donate GE food to African countries. The fact is, however, that the European Union gives three times more food aid to Africa than the US. The EU also provides money and resources for poor countries to source as much food-aid locally as possible. This approach supports local farmers who, once the drought is over, can return to being more productive and thus avoid the need for foreign food aid. The US, on the other hand, ships in its own food, thus subsidizing US agribusiness. This response to hunger and famine often undermines the livelihood of local farmers so that the country becomes dependent on imported food.

At one stage during the morning sessions I pointed out that the main problem facing agriculture in the next few decades is global warming. It is causing glaciers to melt in the Andes and the Himalayas. The Ganges, Bramaputra, Mekong and Yangtze all depend on the Himalayan glaciers. One third of humanity depends on these rivers for their food production. A rise of one metre-and-a-half will submerge much of Bangladesh. Yet the U.S. government has not signed the Kyoto Protocol on greenhouse gas emissions, even though its population, just 6% of the human race, is responsible for 25% of global greenhouse gas emissions.

The Food and Agriculture Organisation (FAO) has chosen 'Biodiversity for Food Security' as the theme of this year's World Food Day. Sustainable agriculture depends on the continuation of vibrant biodiversity all around the world. However, we are now experiencing the sixth largest extinction of species in the 3.8 billion years of life on earth. The Church must now use all its moral authority to stem the present mass extinction that threatens to wipe out one-third to a half of all the species in the world in the next 40 years. The bio-geographer Chris Park, of Lancaster University, estimates that there are possibly 75,000 edible plants in the world. Many of these are highly nutritious and could be added to the larder of a much greater proportion of humankind with a minimum amount of research and funding. The Convention on Biodiversity is attempting to protect biodiversity globally. One hundred and sixty eight countries have signed this Convention but the U. S. has yet to sign it, possibly because many agribusiness and pharmaceutical companies are involved in what is now called biopiracy in various countries, especially in the tropics. Under the Convention on Biodiversity they would have to disclose where they found a particular plant, organism or genetic material.

All the speakers at the Conference were at pains to emphasise that biotech crops pose no threat to human health or the environment, despite the fact that other scientists dispute these conclusions. The Cartagena Protocol on Biosafety, which attempts to regulate biotechnology, has been signed by 103 countries, not including the U.S.

The next speaker, Dr. C.S. Prakash, is a promoter of GE crops on behalf of the U.S. government. Aaron deGrassi a researcher at the Institute of Development Studies at the University of Sussex, has provided examples of some of the claims made for biotech crops by Prakash. In his report 'Genetically Modified Crops and Sustainable Poverty Alleviation in Sub-Saharan Africa', deGrassi notes, 'another example of advocacy trumping facts is C.S. Prakash's repeated claims that GM sweet potatoes (in Kenya) are a positive example of the benefits of GM for African countries. (Yet) he has confessed of having no knowledge of the results of scientific trials in Kenya¹.' In April 2002 the Washington Post broke the news that the scientific journal Nature, in an unprecedented move, had disowned the research of the UC Berkeley scientists Ignacio Chapela and David Quist, which it had published earlier. The research had demonstrated the contamination of traditional maize landraces in a remote part of Mexico by GM maize. Prakash has admitted that AgBioWorld, of which he is a Director, 'played a fairly important role in putting public pressure on Nature.' In a fund-raising message, he went further and claimed AgBioWorld's campaign led directly to the disavowal of the research.

The next speaker, Dr. Peter Raven, dismissed anyone who had reservations about GE crops as ignorant and morally irresponsible. Those who questioned the safety of GE crops or asked whether they are the best solution for world hunger were ideologically driven. He accused the London-based Catholic Institute for International Relations (CIIR) – which rejected the portrayal of GM crops as a key part of the solution to world hunger – of being one of these.

Dr Raven tried to persuade his audience that raising questions about the terminator gene technology was both emotional and irrational. A company now owned by the giant Agribusiness Corporation Monsanto developed a Technology Protection System. Critics of the technology say that it could have a profoundly negative impact on subsistence farmers and more aptly called it 'terminator' technology. This is another reason for asserting that the 'feed-the-world' argument is spurious². Terminator seeds self-destruct after the first crop, which forces farmers to return to the seed company for seeds for each planting. This technology, if it becomes widespread, will surely strike the death knell for the almost 2 billion small subsistence farmers who live mainly in the Third World. Sharing seeds among farmers has been at the very heart of subsistence farming since the domestication of staple food crops eleven thousand years ago. The terminator technology would effectively stop farmers sharing seeds. Hope Shand, the research director with the Canadian ECT civil society organisation (CSO) is alarmed at such a development³. 'Half the world's farmers are poor. They provide food for more than a billion people but they can't afford to buy seeds every growing season. Seed collection is vital for them⁴.' Terminator technology will enable corporations like Monsanto to control and profit from farmers in every corner of the globe. It will lock farmers into a regime of buying genetically engineered seeds that are herbicide-tolerant and insect-resistant, copper-fastening them on to the chemical tread-mill.

A technology that, according to Professor Richard Lewontin of Harvard University, 'introduces a "killer" transgene that prevents the germ of the harvested grain from

developing,' must be considered an immoral act⁵. It is a sin against the poor, against previous generations who freely shared their knowledge of plant life with us, against nature itself and, finally against the God of all creativity.

Dr. Raven never condemns Monsanto. 'There is nothing I'm condemning Monsanto for,' he says. In fact he praises the company's efforts to win public acceptance for GMOs. The geneticist Wes Jackson, an old friend of Peter Raven, says of him, 'I wish Peter was more reflective..... the fact that living substance germplasm, can become the property of a corporation is going to come at a cost. I think that the boundaries of consideration need to be broader than Peter is willing to make them. In a certain sense he is a paid travelling salesman for Monsanto.' Dr. Raven is associated with an initiative called The Garden. This is based in St Louis – the home town of Monsanto. When Raven came to The Garden in 1971 it had 85 employees and a budget of \$550,000. Today there are 345 staff members and a budget of \$20 million, much of which comes from the U.S. Department of Agriculture and corporations like Monsanto.

The theological case for promoting genetically engineered crops was articulated by Father Gonzalo Miranda, dean of bioethics at the Regina Apostolorum University. He was firmly grounded in a 'domination theology' that assumes that all creation is there primarily for the benefit of human beings. He thinks that if genetic engineering can help feed the world, which many scholars and practitioners in the development community dispute, then the case for its use was clear and overwhelming. Miranda seemed to be unaware of other more eco-friendly contemporary ethical perspectives that take account of the intrinsic value of all creatures, and the claims that other creatures may have the right not to have their genetic integrity, which evolved over millions of years, interfered with, cannot be lightly dismissed. Miranda never addressed the moral appropriateness of patenting life. All GE seeds are patented. I argue in [Patenting Life? Stop!](#) that patenting undermines the biblical view that life is a gift of God to be shared by everyone - humans and other creatures. From the perspective of ecological theology, Father Miranda's paper showed little knowledge of contemporary developments in ecological ethics.

Fr Miranda was also rather selective in his use of papal statements. He quoted a 1989 papal pronouncement which stated that 'we are not yet able to measure' the consequence of an unchecked use of genetic manipulation. He went on to state that he felt confident that during the intervening 15 years there has been enough testing to justify the benefits of GE food. He forgot, however, to mention that in an address to the Jubilee of the Agricultural World on November 11, 2000 the pope reminded people that 'the earth is entrusted to man's use not abuse.' He went on to state that, 'this is a principle to be remembered in agricultural production itself, whenever there is question of its advance through the application of biotechnologies, which cannot be evaluated solely on the basis of immediate economic interests. They must be submitted beforehand to rigorous scientific and ethical examination to prevent them from becoming disastrous for human health and the future of the earth.' Two years later, on November 12, 2002 the pope spoke to an estimated fifty thousand Italian farmers. He exhorted them to, 'resist the temptation of high productivity and profit that work to the detriment of the respect for nature.' He added, 'when farmers forget this basic principle and become tyrants of the earth rather than its custodians. ...sooner or later the earth rebels.' Later in the talk the pope returned to this theme and said that if modern farming techniques do not 'reconcile themselves with the simple language of nature in a healthy balance, the life of man will run ever greater risks, of which we already are seeing worrying signs⁶.'

A number of farmers at the conference described how biotechnology crops had revolutionised their lives. Everything about GE crops was bright, positive and modern. One of the farmers, Mr Edwin Y. Paraluman, is from Mindanao. I was interested to hear his praise for GE crops which he is growing in the vicinity of General Santos City. I lived with T'boli people in that area for over 12 years and I never heard of SARGEN the non-governmental organisation which Mr Paraluman chairs. I do know, however, that the Bishop of the Diocese of Marikina, which includes General Santos, is the most vociferous critic of GE crops among the Philippine Bishops. He attended the seminar organised by Cardinal Martino in November 2003, so his position on GE crops ought to have been known to the organisers of the September 2004 Conference. Mr Paraluman did not refer to the claims by the scientist Dr Terje Traavik of the Norwegian Institute of Gene Ecology, who analysed blood samples from 39 out of the 100 people who became ill after eating Bt corn. The people claimed that they suffered from flu-like symptoms - coughing and vomiting. Dr Traavik felt that there might be a link between the GE crops and the health problems which the people were experiencing. Only further research could establish the facts. Given the fact that the incident was given international coverage – it appeared in The Guardian on March 3, 2004 – I was surprised that Mr Paraluman did not even refer to it.

No representative of farming organisations in the Philippines opposed to GE crops was invited, neither was there a representative from Caritas Internationalis, which represents a network of Catholic non-governmental agencies with decades of experience in fighting hunger and malnutrition. Caritas Internationalis and CIDSE issued a statement on September 24, 2004:

Caritas and CIDSE's interest in the debate on GMOs and hunger is not limited to the scientific debate on the longer-term effects of GM crops on food production and availability and on public health, but also takes in the economic, social, legal and environmental issues involved. Our main concerns relate to the food security implications for poor farmers and their communities in developing countries. We are concerned, inter alia, with poor farmers becoming dependent on agri-business as far as their capacity of producing and cultivating seeds is concerned. The companies that are promoting GM crops are essentially looking for new markets. We are concerned that GM crops are a technology in search of a market, rather than a market in search of a technology.

Since the early 1980s, large Trans-National Corporations have become the driving force behind genetically modified food, the global spread of industrialized agriculture and the privatization of knowledge. Today's regime is biased towards protecting the narrow interests of a handful of TNCs, partly as a result of the TRIPs Agreement. The power of biotechnology companies in the global system is enormous and growing. Large-scale adoption of GM technology gives seed and agrochemical companies unprecedented control of the food chain; they both sell the seed and agricultural chemicals with which they are paired.

Not one of these crucially important concerns was aired at the September 24, 2004 Conference.

The World Food Summit in Rome in November 1996 recognised that poverty was the main cause of hunger and malnutrition. Poverty is caused by global and local economic and social policies. People are hungry because they do not have access to food production processes or the money to buy food. Those who wish to banish hunger should address the social and economic inequalities that create poverty and not claim that a 'magic bullet' technology will

solve all the problems.

My experience as a Columban missionary confirms this approach. I lived in Mindanao in the Philippines during the El Niño-induced drought of 1983. There was a severe food shortage among the tribal people in the highlands. The drought destroyed their cereal crops and they could no longer get food in the tropical forest because it had been cleared during the previous decades. Even during the height of the drought, an agribusiness corporation, Dole Pineapple, was exporting tropical fruit from the lowlands. There was sufficient rice and corn in the lowlands but the tribal people did not have the money to buy it. Had it not been for food-aid from NGOs many of the tribal people would have starved.

Do the proponents of GE food think that agribusiness companies will distribute genetically engineered food free to the hungry poor who have no money? There was food in Ireland during the famine in the 1840s but those who were starving did not have access to it or money to buy it.

In the remaining section of this paper I will attempt to critique the Pontifical Academy's 'Study-Document on the Use of "Genetically Modified Food Plants" to Combat Hunger in the World' which was presented to each participant at the September 24, 2004 conference.

Recommendation Number 1 states that, 'The rapid growth of the world population requires the development of new technologies to feed people adequately; even now an eighth of the world's people go to bed hungry. The genetic modification of food plants can help meet part of this challenge.'

The document presents no evidence to support the claim that GE food will help alleviate hunger. It fails to deal with the issue of distribution. The Caritas and CIDSE critique of the September 24, 2004 conference points out that many countries where poverty and hunger are endemic actually export food. Brazil, for example, is the third largest food exporter in the world, but a fifth of its people (32 million) do not have enough food. About 100,000 children die of hunger each year. Clearly, hunger is not due to lack of food but is caused by both the highly unequal distribution of wealth and the huge number of people who are landless. Adopting a purely 'technology can fix it' approach to hunger problems can create more hunger and more food at the same time. Most missionaries and development workers know this. In May 2004, more than 60 groups from 15 African countries, including environmental and development organisations and farmers and consumer groups, wrote an open letter to the World Food Programme denouncing the way in which hunger is being cynically used to impose GE crops and food on developing countries⁷.

Recommendation Number 2 states that, 'Agriculture as it is currently practiced is unsustainable, as is indicated by the massive losses of topsoil and agricultural land that have occurred over the past decades, as well as by the unacceptable consequence of massive applications of pesticides and herbicides throughout most of the world. Techniques to genetically engineer crop plants can make an important contribution to the solution of this common problem.'

There is no evidence to support this claim. The massive increase in the application of chemicals in agriculture is a direct result of the so-called Green Revolution. The cultivation of GE crops will exacerbate rather than solve this problem. And the plant that is genetically engineered to kill pest insects may end up killing non-targeted insects. In agriculture, as in every other sphere, one never gets something for nothing.

Claims that GE crops lead to fewer chemicals in agriculture in the long-term are also being challenged. A comprehensive study using US government data on the use of chemicals on GE crops was carried out by Charles Benbrook, the head of Northwest Science and Environment Policy at Sandpoint, Idaho. He found that when GE crops were first introduced they needed 25% fewer chemicals for the first three years. In 2001, 5% more chemicals were sprayed, compared to conventional crop varieties. Dr. Benbrook stated that: 'the proponents of biotechnology claim GE varieties substantially reduced pesticide use. While this is true in the first few years of widespread planting ... it is not the case now. There's now clear evidence that the average pound of herbicide applied per acre planted to herbicide tolerant varieties have increased compared to the first few years⁸.'

Tudge's book So Shall We Reap (Penguin Books 2003) exposes the devastating fallout of today's relentless drive for maximum food production at rock bottom cost, as health scares spiral, rural workers are driven off the land and poor nations are forced to export their goods in a cut-throat marketplace. In his book he looks at the global food industry and shows how – without resorting to GE crops – we can take back control from the corporate barons, feed the world and, ultimately, ensure the survival of humanity.

Recommendation Number 3. 'Virtually all food plants have been genetically modified in the past; such a modification is, therefore, a very common procedure.'

True, all food plants have been genetically modified since the beginning of agriculture, but not by the present technique of genetic engineering. This is a new and radically different technique that has no resemblance to any previous breeding methods used by humankind. It is not natural for one species to cross-breed with a completely unrelated species. Genetic engineering circumvents the barriers that exist between completely different species. It has unique risks which do not apply to methods used in the past.

Recommendation Number 4, 'The cellular machinery of all living organisms is similar; and the mixing of genetic material from different sources with an organism has been an important part of the evolutionary process.'

This is misleading. In previous breeding methods it was only possible to mix the genetic material of closely-related species most of the time. Recombinant gene technology makes it possible to transfer any gene to another species no matter how distant they are in the evolutionary scale. A gene from a flounder fish has been engineered into a tomato. Such transfers create the possibility of unique risks.

Recommendation Number 5. 'In recent years, a new technology has been developed for making more precise and specific improvements in strains of agricultural plants, involving small, site-directed alterations in the genome sequence or sometimes the transfer of specific genes from one organism to another.'

The reality is that recombinant gene technology is neither precise, nor site-specific. It is random, as the transgene usually integrates itself into the genome of the recipient plant's genome in an unpredictable way. Furthermore, it does not necessarily improve the GE plant. Yet this is the main reason why the pro-GE lobby would like us to believe that GE food will feed the world. Early in 2003 Aaron deGrassi, a researcher at the Institute of Development Studies at Sussex University, published an analysis of the GE crops which biotech companies are developing for Africa. Cotton, maize and sweet potato were among the crops studied. He discovered that conventional breeding procedures and good ecological

management produced a far higher yield at a fraction of the cost. The GE research on sweet potato is now approaching its 12th year and has involved the work of 19 scientists at a cost of \$6 million. The results indicate that the yield has increased by 18%. On the other hand, conventional sweet potato breeding, working with a much smaller budget has produced a virus-resistant variety with a 100% yield increase and it is not patented⁹.

Recommendation Number 6. 'Genetically modified food plants can play an important role in improving nutrition and agricultural products, especially in developing countries.'

The document of the Pontifical Academy of the Sciences does not offer any evidence to support such a claim. In fact the opposite is the case. The bulk of GE corn and soya during the past few years has been fed to animals. If people in the First World and the middle class in the majority world increase the percentage of meat in their diet this will exacerbate, not solve, the problems of world hunger. Most of the GE soya and maize grown in Argentina is exported as animal feed and is not used to feed hungry people at home.

Recommendation, Number 7. 'The scientific community should be responsible for the scientific and technological research leading to the advances described above, but it must also monitor the way it is applied and help ensure that it works to the effective benefit of people.'

This aspiration shows little knowledge of the forces which are driving GE technology. In my book, Patenting Life? Stop! Is corporate greed forcing us to eat genetically engineered food? I begin with a chapter on the growth in corporate power in recent decades and follow that up with a chapter on the power of agribusiness. GE crops are being promoted by four giant corporations – Monsanto, DuPont, Syngenta and Aventis. The needs of their shareholders and not altruistic motives about feeding the world, are what drives such corporations. There are currently no adequate mechanisms for monitoring TNCs because these institutions have opposed regulations at every turn in the road.

Recommendation, Number 8. 'There is nothing intrinsic about genetic modification that would cause food products to be unsafe. Nevertheless, science and scientists are - and should further be – employed to test the new strains of plants to determine whether they are safe for people and the environment, especially considering that current advances can now induce more rapid changes than was the case in the past.'

But food based on GE plants is largely untested, not independently risk-assessed, and is produced by an unpredictable, untested and potentially unsafe technology. The very few independent risk-assessments of GE food have indicated that potential dangers have not been addressed. In such a situation the precautionary principle should apply because the consequence of failure could be horrific. It is worth recalling one of the first principles of the philosophy in relation to current, small scale trials of GE crops: absence of evidence is not evidence of absence.

Eminent scientists question the belief that GE foods are safe. For example, Professor Richard Lewontin, professor of Genetics at Harvard University states, 'We have such a miserably poor understanding of how the organisms develop from its DNA that I would be surprised if we don't get one rude shock after another.' Dr. Suzanne Wuerthele, a toxicologist who worked at the US Environmental Protection Agency (EPA), writes, 'This technology is being promoted in the face of concerns by respectable scientists and in the face of data to the contrary, by the very agencies which are supposed to be protecting human health and the

environment. The bottom line in my view is that we are confronted with the most powerful technology the world has even known, and it is being rapidly deployed with almost no thought whatsoever to its consequences¹⁰. Dr. Erik Millstone of Sussex University: 'The fundamental problem of the way in which GM foods have been approved is that they haven't really been tested properly at all. All that is happening is something which I would characterize as an exercise in wishful thinking.' Dr. Harash Narang, microbiologist and senior research associate at the University of Leeds, who originally pointed to the possible link between mad cow disease (BSE) and CJD in humans: 'If you look at the simple principle of genetic modification it spells ecological disaster. There are no ways of quantifying the risks...the solution is simply to ban the use of genetic modification in food.'

Recommendation, Number 9. 'The methods used for testing the safety of new genetically modified strains (or more precisely, cultivars) of plants should be publicly available, as should the results of these tests, in both the private and public sectors.'

Chapter 5 of Patenting Life? Stop! is devoted to what I call the 'Unholy Trinity – Regulatory Agencies, Biotech Corporations and Governments'. As presently constituted, the interests of the biotech corporations take precedence over everything else. In many situations the biotech companies insist on the confidentiality of their data so that there is no mechanism for making public the methods which they used or the results of safety tests carried out by them. In 1997 two reporters from The Guardian criticized the relationship between governments and the regulatory agencies. They found:

- a revolving door between the US government and the biotech industry.
- Heavy lobbying to rewrite world food safety standards in favour of biotechnology.
- New laws protecting the US food industry from criticism.
- Unexpected environmental problems.
- Local contracts locking farmers into corporate control of production.
- Attempts by the world's leading PR companies to massage the debate in favour of genetic engineering.
- The use of world organizations like the World Trade Organisation to challenge governments opposing genetically modified crops.
- Consumers being given no effective choice of food.
- Widespread fears that the economies of developing countries will be affected¹¹.

Recommendation Number 10. 'Governments should have the responsibility for ensuring that the tests and their results are conducted in line with the highest criteria of validity. Protocols of evaluation should be made widely accessible.'

This noble aspiration overlooks the fact that many governments, under pressure from biotech companies and the US government, are now actively promoting GE crops. Given the enormous amounts of money at stake and the effects of original sin, is it realistic to expect that data which might be unfavourable to GE foods would be widely disseminated? Page 126- 129 of Patenting Life? Stop! gives an account of how the biotech industry dealt with the biochemist Dr. Arpad Pusztai when his research raised questions about the impact of GE potatoes on rats. He lost his job in the Rowett Institute in Scotland and he was harassed in numerous ways by pro-biotech scientists. That is the real world of the biotechnology industry.

Recommendation Number 11. 'Governments should increase their funding for public research in agriculture in order to facilitate the development of sustainable productive

agricultural system available to everyone.'

The document shows no awareness of what has been happening to public research during the past 20 – 30 years. Since the Reagan-Thatcher era, governments have been reducing public research budgets, saying that private enterprise delivers such research in a more cost-effective way. I do not think that is going to change even in the wake of an exhortation from the Pontifical Academy.

Recommendation Number 12. 'Intellectual property rights should not inhibit a wide access to beneficial applications of scientific knowledge. In the development of this modern genetic technology for agriculture, efforts should be made to facilitate cooperation between the public and private sectors and to secure the promotion of solidarity between the industrialized and developing worlds.'

It is difficult to understand how an Academy with organic connections with the Catholic Church can countenance the legitimacy of patenting living organisms. It was not possible to patent life until 1980, when the U.S. Supreme Court in a 5 to 4 decision decided in the *Diamond versus Chakrabarty* case that a genetically-engineered microbe could be patented. The majority ruling stated that 'the relevant distinction was not between living and inanimate things but whether living products could be seen as "human-made inventions"¹².' This is not the vision of life that is enshrined in the Bible, where life is seen as a gift of God to be received with gratitude and humility and to be shared with all creatures. The Bible challenges the patenting claim that, somehow or other, a scientist or corporation created life and therefore can legitimately claim ownership of it. Living organisms should not be patented, just as humans should never have been enslaved by other humans. Patenting of the living world was introduced to the world stage through the lobbying of a single US corporation during the Uruguay Round on the General Agreement on Tariffs and Trade (GATT) and was enshrined in the section on Trade Related Intellectual Properties (TRIPs 27. 3 (b)). The impact of such patenting will create permanent dependency by Third World countries on First World Corporations for the most important reality of their lives – food. The Church, from her pro-life stance, should oppose patenting life in every forum. I treat this topic at length in chapter 6 of Patenting life? Stop!

Recommendation, Number 13. 'Special efforts should be made to provide poor farmers in the developing world with access to improved crop plants and to encourage and finance research in developing countries. At the same time, means should be found to create incentives for the production of vegetable strains suitable to the needs of developing countries.'

In the corporate world, where profits drive everything, this is a pie-in-the-sky aspiration. What will happen around the globe is what is currently taking place in Argentina, where previously sustainable agriculture and animal husbandry has been replaced by large-scale GE soya and GE maize. This has benefited large landowners, agribusiness companies and some middle men. The poor, previously sustainable rural communities and the environment have lost out. No wonder Argentina's leading agronomist, Jorge Eduardo Rulli said in 1992 that; 'our brief history of submission to the world of biotechnology giants has been so disastrous that we fervently hope that other Latin American nations will take it as an example of what not to do¹³.'

Recommendation Number 14. 'Research to develop such improvements should pay

particular attention to local needs and to the capacity of each country to engage in a necessary adaptation of its traditions, social heritage, and administrative practices in order to achieve the success of the introduction of genetically modified food plants.'

By Number 14 the so-called Study-Document on the Use of 'Genetically Modified Food Plants' to Combat Hunger in the World has been transformed into a promotion of GE crops.

I dispute the claim on page 9 that 'we know a great deal about the DNA in organisms.' We have very little knowledge of the living world. We do not know to a factor of 5 or 10 how many species share this planet with us. It could be 5 million or 50 million or even 100 million. We do not know, and yet we are told that tinkering with life at a fundamental level carries no risks. We have only a vague idea of how genes work together, of the epigenetic mechanisms and of the interaction between genes and the environment. The genome of plants and animals have developed over 3.8 billion years through selection and adaptation in a co-evolutionary way. Every living organism is exactly the way it is because it has proved to be appropriate for its specific environment and ecosystem, otherwise it would have become extinct. And now one species – homo sapiens – itself a product of evolution, believes it is able to improve the basic building blocks of life.

The zoologist, Colin Tudge, articulates these concerns very clearly:

'Genetic engineering, even at its simplest, implies the ad hoc introduction of exotic genes into the genomes of established organisms; and this, in principle, immediately suggests a hierarchy of possible problems.'

Most obviously, the newly introduced gene could disrupt the host genome in undesirable and quite unpredictable ways. The theoretical problem can readily be seen through an analogy. It's often said that the genetic code is 'digital', so in a general way it is. Each gene and so, by implication, each functioning length of DNA, corresponds to some specific 'bit' of information. We get closer to reality, though, if we compare genes to language (as in the title of Steve Jones's 1993 book: The Language of the Genes). Individual genes are then compared to words. But the meaning of individual words is not to be captured in the stripped-down, dictionary, definition. Anyone who tries to speak a foreign language out of a dictionary knows how droll the natives find such efforts. The meaning of words depends very much on their context – what words they are surrounded by. Behind the dictionary definitions of individual words lies the syntax of the language, and the actual use of it: the colloquialism, the cross-references, the historical allusions, the puns. Genes work in this way too because genomes evolve, trailing their history behind them. They are not simply 'digital', but work to rules that are in part logical and in part a matter of historical accident. If genes are compared to words, then the genome of any particular creature as a whole should be compared to literature. Genetic engineering is not really engineering. It is more like gardening, in which you plant and then stand back, and watch; or, to pursue the present metaphor, it is more like editing. Every writer knows that the injudicious alteration of a single word can change the import of a text absolutely, and prays for a gentle and competent editor

At present, after 100 years of formal Mendelian genetics and a few decades of genomics, we have some small insight into the function of a few genes in a few genomes (including a few human genes). For some organisms, in short, we have the beginnings of a dictionary. But the genome of an organism – any organism – might be compared in literary terms, to some sacred, poetic text written in a language of which we have virtually no inkling: medieval Tibetan, or Linear B. Would you, or anyone who was halfway sane, undertake to edit such a text if all they had to guide them was a bad dictionary?¹⁴

Tudge reflects on the fact that engineers and architects often, even after exhaustively exploring the physical properties of their building materials, get things wrong.

How much more will we get it wrong in biology, he asks, where the complexities are multiplied by orders of magnitude, and - relative to that complexity – almost nothing is known? We drop novel genes into genomes, and exotic organisms into ecosystems, at our peril – ours and the world's. There is simple no way of knowing, a priori, what will happen¹⁵.

Tudge argues that GE crops will not feed the world.

The startling truth is (at least I think it's startling, in view of the hype) that genetic engineering has contributed nothing of significance to world food security - that is, to issues that really matter - and is not likely to do so in the foreseeable future. As far as human survival goes its contribution is precisely zilch. In reality, it is locked into and is designed to promote an economic strategy that is already proving pernicious, and in the longer term could well prove disastrous. The net contribution of genetic engineering to human well-being is negative¹⁶.

What about the 'yellow rice' which is rich in carotene - the raw material from which the body synthesizes vitamin A? Deficiency in this vitamin can cause xerophthalmia (dry eyes leading to blindness). Tudge writes;

Vitamin A-rich rice therefore is surely a godsend, and only the effete, afflicted only by the long sight of genteel middle age, would presume to protest.

But carotene is one of the commonest molecules in nature. It is the yellow pigment found in yellow fruit such as mango and papaya but also -much less exotically and expensively - in green leaves of all kinds, including spinach. Traditional farming always included horticulture. The vegetable patch and the occasional fruit tree were and are standard; taken for granted, like chairs and tables. So long as people have horticulture, they have all the vitamin A they need. Obsessive monoculture, in which there is no room for local produce to feed the local people, is a modern aberration, another example of obsessive commercialism. It is in many ways pernicious, socially, economically, ecologically; and the blindness of children is only one of the consequent evils¹⁷.

Colin Tudge is not against genetic engineering per se. For example, sorghum is the staple crop of the people of the Sahel region of Africa. This crop is resistant to drought and heat but not resistant enough. Scientists from ICRISAT (the International Crops Research Institute for the Semi-Arid-Tropics) have searched international gene banks for relatives of sorghum that could be crossed with sorghum to provide the gene(s) that are required for this super-toughness. They have been unable to find such genes. They are now looking for genes from other sources - possibly groundnuts which are very tough indeed.

But groundnuts are legumes (relatives of beans) while sorghum, a cereal, is a grass. So the necessary genes could not be introduced by conventional breeding. Genetic engineering would be necessary. Here (if it can be made to work) is a prime example of the highest technologies deployed to help the world's poorest people. For people in some of the harshest environments, such science could in principle be a godsend¹⁸.

But even here Tudge urges caution, given the limits of our present knowledge.

It could be said that the September 24th Conference at the Gregorian University came across as little more than a promotional event for US biotech corporations who are poised to make billions of dollars if GM food is forced on the majority countries of the world. As the former European commissioner for the environment, Margot Wallstrom said in London in October 2003: 'Far from developing GM crops to solve the problem of starvation in the world, as they claimed, the biotech companies did so to solve starvation among their shareholders.' (Independent October 14, 2003).

Reflecting on the September 24, 2004 and the Pontifical Academy's document two things come to mind – lack of adequate preparation for such an important conference and a certain selectiveness in its choice of speakers. The Conference, which was aimed at addressing hunger and malnutrition, did not consult key experts in agronomy, development studies and front line workers from agencies like Caritas, CAFOD, Trocaire or missionary societies.

Since it can be claimed with some justice that only one side of the argument was aired on September 24, 2004, there would now seem to be a moral obligation to organise a consultation on hunger and how to combat it at which all sides in the debate have a say.

October 20, 2004.

¹ C. S, Prakash, Profiles, <www.gmwatch.org> 17/09/2004. Page 2 of 4.

² Brittenden, Wayne: “‘Terminator’ seeds threaten a barren future for farmers”, The Independent, March 22, 1998, page 3.

³ ECT was formerly called RAFI (Rural Advancement Foundation International) is a civil society organisation devoted to Third World issues, especially those that deal with rural agriculture.

⁴ quoted in John Vidal, "Mr. Terminator Ploughs in ", The Guardian, April 14, 1998.

⁵ Jean-Pierre Berlan and Richard C Lewontin, “It’s business as usual”, The Guardian, February 22, 1999, page 14.

⁶ Pope John Paul II, Talk to Italian Farmers, reported by Eric Lyman for the Bureau of National Affairs, Inc, Washington DC, November 15, 2002.

⁷ What’s Wrong With GM? CIIR Environmental Action Leaflet, October 2004.

⁸ John Vidal, “GM crops linked to rise in pesticide use”, The Guardian, January 8, 2004, page 45.

⁹ George Monbiot, “Force-fed a diet of hype”, The Guardian, October 7, 2003, page 25.

¹⁰ Article from www.GMWatch, May, 29, 2004, page 1.

¹¹ John Vidal and Mark Milner, “Big Firms Rush for Profits and Power despite Warnings” The Guardian, December 15, 1997, page 4.

¹² Andrew Kimbrell, 1993, The Human Body Shop, Harper, San Francisco, page 193.

¹³ Sue Branford, “Why Argentina Can’t Feed itself”; How GM Soya Is Destroying Livelihoods and the Environment in Argentina”, The Ecologist, October 2002, page 23.

¹⁴ Colin Tudge, 2002, So Shall We Reap, Penguin, London, page 255.

¹⁵ Ibid, page 261.

¹⁶ Ibid, page 268.

¹⁷ Ibid, page 269.

¹⁸ Ibid, page 254.