CCFL

AGENDA ITEM 5

SOUTH AFRICA

APPENDIX I

SCIENTIFIC QUESTONS PERTAINING TO ORGANISMS DERIVED FROM GM/GE/BIOTECH: HAZARDS AND CONCERNS

Making the World GM-Free and Sustainable

http://www.westonaprice.org/farming/gm-free-sustainable.html

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Genetically modified (GM) crops epitomize industrial monoculture, with its worst features exaggerated. They are part and parcel of the "environmental bubble economy," built on the over-exploitation of natural resources, which has destroyed the environment, depleted water and fossil fuels and accelerated global warming. As a result, world grain yields have been falling for six of the seven past years. Expanding the cultivation of GM crops at this time is a recipe for global bio-devastation, massive crop failures and global famine. GM crops are a dangerous diversion from the urgent task of getting our food system sustainable in order to really feed the world.

We possess a wealth of knowledge for making our food system sustainable and for providing food security and health for all, while effectively mitigating global warming. The greatest obstacle to implementing that knowledge is the dominant economic model of unrestrained, unbalanced growth that has precipitated the current crises.

I have proposed to put together all the appropriate technologies in a potentially highly productive zero-emission, zero-waste food and energy

"Dream Farm 2" based on a model of sustainable systems as organisms. It is our best way forward to a greener, healthier and more fulfilling life without fossil fuels.

Stunted Rats

The latest alarming findings on the health hazards of GM food come from the laboratory of senior scientist Dr. Irina Ermakova at the Russian Academy of Sciences in Moscow. Her experiments began two years ago, and the initial results hit the world press when Ermakova was invited to address the 11th Russian Gastroenterological Week in Moscow in October, 2005.

Female rats given a supplement of GM Roundup Ready soya beginning two weeks before mating and continuing afterwards through pregnancy and lactation produced litters in which more than a third of the pups were severely stunted, and over half of the pups died within three weeks after birth.1 Stunting was five to six times, and mortality six to eight times those of control litters produced by females on normal rat pellets only, or rat pellets supplemented with non-GM soya. These results were confirmed in further experiments. In addition, the surviving pups from the GM soya-fed females were completely sterile when mated with one another whether they continued to be fed GM soya or not.

Criminal Negligence

Ermakova's findings are by no means an isolated case peculiar to a specific batch of GM soya. They are the latest in a long line of evidence (see sidebar) from all over the world indicating that GM food and feed may be inherently hazardous to animal and human health.

Many GM crops–soybean, tomato, maize, cotton, potato, pea–with different transgenes, fed to rats, mice, cows, sheep, chickens or human beings–have resulted in illness and deaths. You don't have to be a scientific genius to suspect that the genetic modification process itself or the artificial genetic material used in genetic modification could be causing problems.

Evidence of GM hazards has been emerging since the 1980s, evidence that should have halted the development of many GM crops.2 But our regulators have acted with bias in favor of GM from the beginning and have systematically ignored and dismissed research findings that might harm the fledgling biotech industry.11 By now, the evidence has accumulated to such an extent that regulators should be answering a charge of criminal negligence at the very least in continuing their campaign of denial and misrepresentation while failing to impose a ban on further releases of all GM crops until and unless they have been proven safe by thorough independent investigations.5

A ban on further releases is all the more important, as so many scientists have tried to tell the public what they know. But instead of decisive action, Ermakova's funding has been cut, and she is now strongly discouraged from continuing with the research. She is pleading for other scientists to repeat her work to see whether they can replicate her results.

Meanwhile, the biotech industry is aggressively pushing the next generation of GM food and feed, and our ever-permissive government regulators are obligingly reassuring everyone that "GM food is safe."

Think Again

For those who believe that "GM food is safe" because "people have been eating GM food since its first release in 1994 and no one has fallen ill or died from it," think again. First, there has been no labeling in countries like the US where GM food and feed are most available. Second, many GM products are "de-regulated" and hence not known or traceable as such. Third, there has been no post-release monitoring, so it is impossible to tell how many people and animals have become ill or have died from eating GM food and feed, even though in 1999, researchers at the Centers for Disease Control published a paper suggesting that food-related illnesses increased two- to ten-fold compared with results of a survey carried out just before GM food was commercially released in 1994.12,13

Fourth, GM food and feed may be linked to chronic illnesses such as autoimmune disease, slow viruses or cancer,14 which may be difficult to detect. Finally, animal feed accounts for up to half the world's harvest,15 so most of the GM produce so far has probably ended up in animal feed after being processed for seed oil, corn starch, corn syrup and, increasingly, ethanol and biodiesel.16,17 That means GM produce is seldom eaten directly by either animals or human beings so far. But that is soon to change, if proponents have their way.

New Generation GM foods

The first GM crop, Calgene's Flavr Savr tomato for prolonged shelf life, was approved for commercial release in 1992. It was a complete flop. Since then, however, the area planted to GM crops has been steadily increasing, and, according to industry sources, reached 90 million hectares in 2005.19 It should be emphasized that this comprises only 1.8 percent of the world's agricultural land, and is confined largely to the US, Argentina and Canada. Two traits–herbicide-tolerance and insect-resistance–currently account for nearly all GM crops, but not for long.

New GM crops with other traits and other GM gut bacteria are poised to enter the market, in the guise of nutritional benefits and health foods.20,21 Food crops genetically modified to overproduce single nutrients could be public health hazards, as overdoses of many single nutritional factors are known to be toxic; and genetically modifying natural gut bacteria could turn into pathogens pre-adapted to invade the human gut.

In addition, the US FDA is set to approve foods derived from genetically modified animals for commercial release.22 ,23 These are likely to be contaminated by potent vaccines, immune regulators and growth hormones, as well as nucleic acids, viruses and bacteria that have the potential to create pathogens and to trigger cancer. The Institute for Science in Society has submitted strong objections to United Nations regulator Codex Alimentarius on these new developments.

Inherently Hazardous

Let me start with some basics. GM food is derived from genetically modified organisms (GMOs). A GMO is an organism whose natural genetic material has been modified by having synthetic genetic material inserted into it in the laboratory, so as to give it special traits or characteristics.

It is generally not easy to get the synthetic gene or genes to work in an organism, so a very aggressive signal or promoter is needed for each gene, literally to force the cell to make the desired protein.25 The cauliflower mosaic virus (CaMV) 35S promoter is the most popular one used, and is often accompanied by other "boosters" from a variety of sources. The gene (coding sequence) itself could also be a composite of pieces copied from other organisms, with substantial changes in the coding sequence.

For example, MON863 maize is described on the AGBIOS Database as follows: "The introduced DNA contained the modified cry3Bb1 gene from B. thuringiensis subsp. kumamotoensis under the control of the 4-AS1 promoter (CaMV 35S promoter with 4 repeats of an activating sequence), plus the 5' untranslated leader sequence of the wheat chlorophyll a/b binding protein (wt CAB leader) and the rice actin intron. The transcription termination sequence was provided from the 3' untranslated region of the wheat 17.3 kD heat shock protein (tahsp17). The modified cry3Bb1 gene encodes a protein of 653 amino acids whose amino acid sequence differs from that of the wild-type protein by the addition of an alanine residue at position 2 and by seven amino acid changes."26

Thus, MON863 maize contains 9 bits of DNA from different sources including the coding sequence, which has been quite substantially altered from the natural gene.

The synthetic genes and combinations of genes inserted into GMOs and introduced into our food chain have never existed in billions of years. The genes code for proteins completely foreign to our food chain and are likely to provoke immune reactions including allergy. That could happen even when

the proteins are copies of those in a closely related species. Thus, a transgenic (GM) pea with a copy of a normally harmless bean protein provoked debilitating immune responses in mice,4 simply because each species processes its proteins differently, decorating them with distinct carbohydrate chains. Transgenic proteins also differ from the native proteins in amino acid sequences, some of which are intentional and others unintentional. And if you just look at the amino acid sequences, 22 out of 33 transgenic proteins in GM crops already commercialized are found to have similarities to known allergens, and are therefore suspected allergens.27

Direct evidence also exists indicating that the synthetic genes are not the same as the natural genes. Take the Bt toxins isolated from the soil bacterium Bacillus thuringiensis and incorporated into many GM maize, cotton and other crop varieties to kill insect pests. Green lacewings suffer significantly reduced survival and delayed development when fed an insect pest (lepidopteran) that has eaten GM maize containing the Bt toxin Cry1Ab, but not when fed the same pest treated with much higher levels of the natural toxin.28,29 This extremely important effect, which is passed on through the food chain, has been documented in several laboratories. Unfortunately, the researchers misrepresented the results only to mean that natural Cry1Ab does not harm beneficial insect predators.30

The synthetic genetic material is introduced into the cells of organisms with invasive methods that are far from precise–they are uncontrollable, unreliable and unpredictable. They end up damaging the natural genetic material of the organism with many unpredictable, unintended effects, including gross abnormalities that you can see, and metabolic changes that may be toxic that you can’t see.31

The transgenic line is essentially derived from a single cell which has taken up the trans gene, so its properties will depend on where and in what form in the genome–the totality of the organism’s genetic material–have landed in the insert or inserts, and what collateral damage is done. That is why EU regulation now requires “event specific” characterization of the transgenic insert or inserts, which also provides a way of detecting

transgenic contamination of GM produce, an increasingly frequent occurrence involving transgenic lines that have not even been approved for commercial release.32

Even more serious, transgenic lines are genetically unstable, so it is impossible to control for safety or quality. This instability increases the dangers from unintended horizontal gene transfer. The expression of the genes can change from generation to generation and, most worrying of all, the inserts may rearrange, insert at new sites in the genome or insert into other genomes by horizontal gene transfer.24,25

The transgenic inserts in practically all the commercially approved lines were found to have rearranged since they were first characterized by the biotech companies. A frequent breakpoint is the cauliflower mosaic virus promoter present in most, if not all transgenic lines, which we have warned about.35,36 We have also warned about the fact that the promoter is active in animal and human cells, contrary to the assumption of GM proponents that it is active only in plant cells37 and this warning has also been recently confirmed.38 The genetic instability itself is worrying, as the transgenic variety effectively changed into something else, thereby invalidating all previous safety assessments and making it difficult to detect contaminating transgenic material.

Horizontal Gene Transfer

Another major worry is horizontal gene transfer and recombination. Many foreign synthetic genes are copies of those from bacteria and viruses that cause diseases and include antibiotic resistance marker genes to help track the movements of the foreign gene inserts and select for cells that have taken up the foreign genes.

Right from the beginning of genetic engineering in the mid 1970s, geneticists themselves were concerned that releasing those synthetic genetic materials increased the risk of creating new disease-causing viruses and bacteria and spreading antibiotic resistance that would make

infections untreatable.39 They even imposed a moratorium subsequent to the 1975 Asilomar Declaration, which endorsed sustainable agriculture. Unfortunately, the moratorium was short-lived, as geneticists were in a hurry to begin commercial exploitation of genetic engineering. The guidelines set up were totally inadequate, and remain so to this day.40

It is important to realize that the toolkit of genetic engineering is precisely the same as that for making biological weapons.41 The US government has been ostentatiously concerned about "biosecurity" ever since September 11, which extends to experiments directly or indirectly involved in creating lethal biological agents. Yet the regulators are still reassuring us that all genetic engineering experiments and the release of GMOs and products thereof are safe. I have warned the UK government that there can be no biosecurity without biosafety.42 The numerous "biodefense" labs set up in the US and elsewhere to research and genetically engineer lethal pathogens for the stated purpose of creating vaccines pose the most serious public health risks.

The genetic material persists long after the cell or organism is dead, and can be taken up by bacteria and viruses in all environments. This process–called horizontal gene transfer and recombination–is the main route to creating dangerous pathogens. Genetic engineering is nothing if not greatly enhanced horizontal gene transfer and recombination, and nasty surprises have been sprung already. For example, researchers in Australia "accidentally" transformed a harmless mousepox virus into a lethal pathogen that killed all the mice, even those that were supposed to be resistant to the virus.

Headlines in the New Scientist editorial of January, 2001 proclaimed: "The genie is out, biotech has just sprung a nasty surprise. Next time, it could be catastrophic."43 The lead article continued in the same vein: "Disaster in the making. An engineered mouse virus leaves us one step away from the ultimate bioweapon."44

The researchers added a gene coding for an immune signalling molecule to the virus, which they thought would boost antibody production; instead, it

suppressed immune responses. The researchers had previously put the same gene into a vaccinia virus and found that it delayed the clearance of virus from the animals, so it may well have the same immune suppressive effects for all viruses. Imagine what would happen if this gene ever got into A smallpox virus.

[Genetic material combines and recombines in viruses in nature. The same is true of genetic material in bacteria. This recombination does not limit itself to natural genetic material but includes unpredictable transmission of genetically modified DNA as well. REL]

More surprisingly, in 2003, researchers at the University of California at Berkeley reported that disrupting a set of disease-causing genes in the tuberculosis bacterium resulted in a hyper-virulent mutant strain that killed all infected mice by 41 weeks, while all the control mice exposed to the unmodified bacterium survived.45 This goes to show how very little we understand about the way bacteria and viruses cause diseases.

Cancer Triggers

Genetic engineering poses yet another insidious danger. The synthetic genes created for genetic modification are designed to cross species barriers and to jump into the genome of cells. Such constructs jumping into the genome of human cells can trigger cancer. This is not just a theoretical possibility; it has happened in gene therapy,46 which is genetic modification of human cells using synthetic constructs very similar to those for genetic modification of plants and animals.

In 2000, researchers in the Neckar Hospital in Paris, France, treated infants with X-linked Severe Combined Immune Deficiency apparently successfully by isolating bone marrow cells from the patients, genetically modifying them in the test tube, and then injecting the genetically modified cells back into the patients. In this way, they thought they had avoided the widely acknowledged major hazards of gene therapy: creating replicating viruses and triggering cancer. But since 2002, three infants have developed leukemia, and one has died. The foreign synthetic gene carried by the virus vector was inserted near a human gene that controls

cell division, making it overactive, resulting in uncontrollable multiplication of the white blood cells.

Failure on All Counts

GM crops are industrial mono cultures, only far worse. Two traits account for nearly all GM crops planted: herbicide-tolerance (almost all glyphosate-tolerant or Roundup Ready) accounting for more than 80 percent of GM crops, and insect-resistance (Bt-crops engineered with toxins from the soil bacterium Bacillus thuringiensis to kill insect pests), accounting for 30 percent.19 (Eleven percent of GM crops have both traits.)

Evidence has been accumulating over the years that both types of GM crops have failed on every count: yield drag, poor performance in the field, more pesticides used, reduced profits for farmers (at times drastically so, causing poor farmers to commit suicide), and bad for health and the environment;49 so much so that many people, including me, were ready to say, "Good-bye, GMOs," in 2002.50 We were too optimistic; we did not consider how powerful were corporate propaganda and disinformation.51

But a spate of recent findings not only confirms what we already know, but also completes the debacle. And health hazards of GM food and feed are not the only worry; Roundup-resistant super-weeds and Bt-resistant insect pests have now been documented, rendering useless both Roundup-tolerant and Bt crops.

The problems don't end there. Roundup herbicide causes sudden crop death. It is lethal to frogs and highly toxic to human placental cells, even at one-tenth the recommended dosage. It is linked to cancers, neuro-defects and spontaneous abortions.52 Bt crops express variable amounts of the toxins, often insufficient to kill target pests but sufficiently poisonous to harm beneficial insects including predators, bees and soil decomposers. And Bt toxins are known to be actual or potential allergens that can provoke strong immune reactions.53

Farmers from all over the world are now reporting that GM crops require

more water, and are less tolerant to drought than non-GM varieties;63 this finding may prove to be a final nail in the coffin for GM crops.

It is sheer lunacy to expand the cultivation of GM crops across the world, as the pro-GM lobby is pushing for. It can lead nowhere else but towards global bio-devastation, massive crop failures and global famine.

A Dangerous Diversion

GM crops are a dangerous diversion that prevents us from addressing the global energy and food crises. Perhaps people are still unaware or in denial of the crises as food54,55 and energy run out56 and as global warming accelerates.57

World grain yield has fallen for six of the past seven years, bringing reserves to the lowest level in more than thirty years.58 Chronic depletion of aquifers in the major bread baskets of the world, droughts, and soaring temperatures, all from global warming, are taking their toll and are set to do even more damage to food production. An international team of crop scientists has already reported that crop yields fall by 10 percent for each degree Centigrade rise in night-time temperature during the growing season.59

The Inter government Panel on Climate Change (IPCC) predicted that the earth's average temperature would rise by 1.4 to 5.8 degrees C within this century.60 But the IPCC model fails to capture the abrupt nature of climate change, which could be happening over a matter of decades or years.61 A group based in Oxford University in the UK is predicting a greater temperature rise of 1.9 to 11.5 degrees C when the carbon dioxide level in the atmosphere doubles its pre-industrial level of 280 parts per million sometime within the present century.62

Dream Farm

The good news is that we have a wealth of existing knowledge that can provide food security and health for all while significantly mitigating

global warming.64,65 We have the knowhow to be food and fuel rich without fossil fuels. A major obstacle to implementing this knowledge is the overwhelming commitment of our elected representatives to the dominant neo-liberal economic model, otherwise known as the environmental bubble economy.

The dominant model glorifies competitiveness and unlimited growth involving the most wanton and destructive exploitation of the earth's natural resources, laying waste to agricultural land and biodiversity, and impoverishing billions of souls in the process.

In order to overcome these obstacles to implementing the knowledge, we have proposed to set up Dream Farm 2.66

Dream Farm 2 is a model, integrated, zero-emission, zero-waste, highly productive farm that maximizes the use of renewable energies and turns "wastes" into food and energy resources, thereby completely obviating the need for fossil fuels. It is our answer to the food and energy crises, climate change and many other problems. It is a microcosm of a different way of being and becoming in the world, and in that respect, nothing short of a social revolution.

In a way, I have dedicated the past 20 years towards developing Dream Farm 2. The technical underpinnings are described in my book The Rainbow and the Worm - The Physics of Organisms (2nd Edition),67 which presents a theory of the organism and sustainable systems, and the social and spiritual revolution this theory entails.

The ideas have been taken further forward recently, thanks to theoretical ecologist Robert Ulanowicz at the University of Maryland who co-authored a paper with me entitled Sustainable Systems as Organisms?;68 and George Chan's Integrated Food and Waste Management System (IFWMS),69 which inspired me to extend the theory of sustainable systems as organisms to include growth and development explicitly. I call his model Dream Farm 1.

The farms are very diverse, depending on local resources, ingenuity and

imagination. Anaerobic digestion is the core waste-treatment and energy technology in Dream Farm 1. It has numerous advantages over other waste-treatment and energy technologies, including other biofuels71 The Chinese government, by the way, is promoting the widespread use of biogas digesters to support a burgeoning eco-economy.72

Unsustainable Versus Sustainable Systems

Dream Farm 1 gave me a lot of food for thought on how my theory of the organism and sustainable systems contrasts with the dominant model.

The dominant model of infinite competitive growth can be represented as the bigger fish swallowing the smaller ad infinitum, and it describes equally how a person should behave and how a company should develop in order to be successful. Another way to represent it is a diagram in Figure 1. The system grows relentlessly, swallowing up the earth's resources, laying waste to everything in its path, like a hurricane. There is no closed cycle to hold resources within, to build up stable organized social or ecological structures.

Spiral

The dominant economic model of infinite unsustainable growth that swallows up the earth's resources and exports massive amounts of wastes and entropy.

In contrast, the archetype of a sustainable system is a closed life cycle, like that of an organism. It is ready to grow and develop, to build up structures in a balanced way and perpetuate them, and that's what sustainability is all about. Closing the cycle creates a stable, autonomous structure that is self-maintaining, self-renewing and self-sufficient.

In order to do that, one needs to satisfy as much as possible the zero-entropy or zero-waste ideal. All natural systems tend towards this ideal, which is why we don't fall apart, and why we grow old only very slowly. If we were perfect, we'd never grow old. The secret

is described in my book, the Rainbow Worm.

Zero Entropy Model

The "zero-waste" or "zero-entropy" model of the organism and sustainable systems essentially predicts balanced development and growth at every stage, as opposed to the dominant model of infinite, unsustainable growth. This immediately disposes of the myth that the alternative to the dominant model is to have no development nor any growth at all, which is how most of the dominant model critics see it.

Cycles Within Cycles

The system's cycle contains more cycles within that are interlocked to help one another thrive and prosper. The minimum integrated farm has the farmer, livestock and crops. The farmer prepares the ground to sow the seeds for the crops to grow, which feed the livestock and the farmer; the livestock returns manure to feed the crops. Very little is wasted or exported to the environment. In fact, a high proportion of the resources is recycled and kept inside the system. The system stores energy as well as material resources such as carbon. The extra carbon is sequestered in the soil as the soil improves and in the standing biomass of crops and livestock.

The farm can perpetuate itself like that quite successfully and sustainably, or it can grow by engaging more cycles, that is, units of devolved autonomy that help support the other cycles so that all become more productive and efficient.

In the old paradigm, organisms are predominantly viewed as competing for resources and for space. But in nature there are three space dimensions and the time dimension also. We've got space-time that we can fill up more thickly with life cycles of different sizes that occupy different space-times. That is exactly what organisms in a naturally biodiverse ecosystem do to maximize the reciprocal, symbiotic relationships that benefit all the species. So you can add fish, algae, poultry, worms, mushrooms, and so forth, turning the "waste" from one cycle into resources

for another.

The more lifecycles incorporated, the more energy and standing biomass are stored within the system, and the more productive the farm. It will also support more farmers or farm workers.

Productivity and biodiversity always go together in a sustainable system, as generations of farmers have known, and recent academic researchers have rediscovered. It is also the most energy efficient. Why? Because the different life cycles are essentially holding the energy for the whole system by way of reciprocity, keeping as much as possible and recycling it within the system.

In contrast, industrial monoculture–particularly monoculture based on GM crops–is the least energy efficient system in terms of output per unit of input, and often less productive than sustainable systems in absolute terms, despite high external input, because it does not close the cycle, it does not have biodiversity to hold the energy within, and it ends up generating a lot of waste, entropy and soil depletion

In a recent visit to China as part of the Dream Farm 2 project, I was delighted to discover that something very similar to my model of sustainable systems as organisms is in the official Chinese mainstream discourse–they call it the "circular economy." Chinese farmers have perfected this elegant system over the past two thousand years73 especially in the Pearl River Delta of southeast China. This integrated agriculture and fish farming system is a key component of George Chan's IFWMS. The success of this system really disposes of the Malthusian myth that a given piece of land has only a constant carrying capacity in terms of the number of people it can support. There is a world of difference between industrial monoculture and circular integrated farming. The Pearl River Delta sustained an average of 17 people per hectare in the 1980s, a carrying capacity at least ten times the average of industrial farming, and two to three times the world average.

Dream Farm 2 is a particular implementation and extension of George Chan's IFWMS concept, in that it consciously integrates food and energy production, emphasizing consumption of both at the point of production. While it operates as a farm, it will also serve as a demonstration, education and research center and incubator for new ideas, designs and technologies. Its aim is to promote and support similar farms springing up all over Britain and the rest of the world, not only through publicity about Dream Farm 2 itself, but also by collating and analyzing data from all similar farms, and by serving as resource center and center for information exchange (see Sidebar).66

Most significant of all, it runs entirely without fossil fuels. As Robert Ulanowicz says, "I'll bet people will be surprised at how quickly the carbon dioxide levels in the atmosphere can come down if we stop burning fossil fuels." I think he may well be right.

Sidebars

Damning Evidence Against the Safety of GM Food and Feed

1. Scientists at the Russian Academy of Sciences reported between 2005 and 2006 that female rats fed glyphosate-tolerant GM soya produced excessive numbers of severely stunted pups with more than half of the litter dying within three weeks, and the surviving pups completely sterile (see main article).

2. Between 2004 and 2005, hundreds of farm workers and cotton handlers in Madhya Pradesh, India, suffered allergy symptoms from exposure to Bacillus thuringiensis (Bt) cotton.2

3. Between 2005 and 2006, thousands of sheep died after grazing on Bt cotton crop residues in four villages in the Warangal district of Andhra Pradesh in India.3

4. In 2005, scientists at the Commonwealth Scientific and Industrial Research Organization in Canberra, Australia reported that a harmless

protein in beans (alpha-amylase inhibitor 1) transferred to peas caused inflammation in the lungs of mice and provoked sensitivities to other proteins in the diet.4

5. From 2002 to 2005, scientists at the Universities of Urbino, Perugia and Pavia in Italy published reports indicating that GM-soya affected cells in the pancreas, liver and testes of young mice.5

6. In 2003, villagers in the south of the Philippines suffered mysterious illnesses when a Monsanto Bt maize hybrid came into flower; antibodies to the Bt protein were found in the villagers, there have been at least five unexplained deaths and some remain ill to this day.5

7. In 2004, Monsanto's secret research dossier showed that rats fed MON863
GM maize developed serious kidney and blood abnormalities.6

8. Between 2001 and 2002, a dozen cows died in Hesse, Germany after eating Syngenta GM maize Bt176, and more in the herd had to be slaughtered due to mysterious illnesses.7

9. In 1998, Dr. Arpad Pusztai and colleagues formerly of the Rowett Institute in Scotland reported damage in every organ system of young rats fed GM potatoes containing snowdrop lectin, including a stomach lining twice as thick as controls.8

10. Also in 1998, scientists in Egypt found similar effects in the gut of mice fed Bt potato.9

11. The US Food and Drug Administration had data dating back to early 1990s showing that rats fed GM tomatoes with antisense gene to delay ripening had developed small holes in their stomach.8

12. In 2002, Aventis company (later Bayer Cropscience) submitted data to UK regulators showing that chickens fed glufosinate-tolerant GM maize Chardon LL were twice as likely to die compared with controls.10

The Language of the Dance

The greatest danger is the mindset of the GM proponents. Genetic engineering of plants and animals began in the mid 1970s under the illusion that the genetic material is constant and static and the characteristics of organisms are hardwired in their genes. One gene determines one characteristic. But geneticists soon discovered to their great surprise that the genetic material is dynamic and fluid, in that both the expression and structure of genes are constantly changing under the influence of the environment. By the early 1980s, geneticists had already coined the term, "the fluid genome," to mark this major paradigm shift, as described in my book, Living with the Fluid Genome.47

The processes responsible for the fluid genome are precisely orchestrated by the organism as a whole in a dance of life that is necessary for the organism to survive and thrive. In contrast, genetic engineering in the lab is crude, imprecise and invasive. The synthetic genes can land anywhere, in any form, causing a lot of collateral damage to the genome, and tending to be unstable, basically because these rogue genes do not know the language of the dance. Genetic engineers haven't learned to dance with life.

Call for a Ban

In 2003, accumulating evidence on the many dangers of GM organisms prompted dozens of prominent scientists from around the world to launch themselves as the Independent Science Panel (ISP). Our stated goal: to overcome the campaign of disinformation from pro-GM scientists who are working to promote the corporate agenda, and to reclaim science for the public good.

We compiled all the evidence against GM crops as well as the evidence on the successes and benefits of sustainable non-GM agriculture in an ISP report, The Case for a GM-Free Sustainable World.48 Based on this evidence, we have called for a ban on the environmental releases of GM crops and a comprehensive shift to sustainable agriculture. Please support these efforts by sending this article, which updates the evidence contained in the ISP report, to your policy makers and elected representatives.

Advantages of Anaerobic Digestion to Recover Methane

* Potential to provide 11.7 percent of all energy needs or 50.2 percent of transport fuels in the UK.
* Methane can be used as fuel for mobile vehicles or for combined heat and power generation.
* Methane-driven cars are already on the market, and currently the cleanest vehicles on the road by far.
* Biogas methane is a renewable and carbon mitigating fuel (more than carbon neutral).
* Saves on carbon emission twice over, by preventing the escape of methane and nitrous oxide into the atmosphere and by substituting for fossil fuel.
* Conserves plant nutrients such as nitrogen and phosphorus for soil productivity.
* Produces a superb fertilizer for crops as a by-product.
* Prevents pollution of ground water, soil and air.
* Improves food and farm hygiene, removes 90 percent or more of harmful chemicals and bacteria.
* Can be adapted to produce hydrogen either directly or from methane.

Dream Farm 1

The anaerobic digester takes in livestock manure plus wastewater and generates biogas, which provides all the energy needs for heating, cooking and electricity. The partially cleansed wastewater goes into the algal basin where the algae produce by photosynthesis all the oxygen needed to detoxify the water, making it safe for the fish. The algae are harvested to feed chickens, ducks, geese and other livestock. The fishpond supports a compatible mixture of five or six fish species. Water from the fishpond is used to "fertigate" crops growing in the fields or on the raised dykes. Aquaculture of rice, fruits and vegetables can be done in floats on the surface of the fishpond. Water from the fishpond can also be pumped into greenhouses to support aquaculture of fruits and vegetables. The anaerobic digester yields a residue rich in nutrients that is an excellent fertilizer for crops. It could also be mixed with algae and crop residues for

culturing mushrooms after steam sterilization. The residue from mushroom culture can be fed to livestock or composted. Crop residues are fed back to livestock. Crop and food residues are used to grow earthworms to feed fish and fowl. Compost and worm castings go to condition the soil. Livestock manure goes back into the anaerobic digester, thus closing the grand cycle. The result is a highly productive farm that's more than self-sufficient in food and energy.

Farm animals are central to this model. Dream Farm 1 is strong on animal welfare.70 The animals are organically fed. The pigs are especially easy to toilet-train(!) to deposit their manure directly into the digester, so the animals and their living quarter are spotlessly clean, which makes for healthy and contented animals.

Dream Farm 2

The complete model of Dream Farm 2 will be implemented at potential sites now under consideration. Because this is an organic system in the sense I have described, we don't have to have all the elements all at once. We can have a very simple system consisting of biogas digesters, livestock, crops and algae basins without fishponds, as that essentially does the water purification already and closes the cycle. The algae can be used to feed livestock, as an alternative to grain or soybeans.

Notice that three biogas digesters are present, connected both in parallel and in series. This is advisable, because it provides spares in case one is not working properly. It also provides for the production of both hydrogen and methane in a two-stage digestion process. I am also suggesting that we include human manure in the biogas digestion, as well as restaurant wastes. That way, we hardly export any waste to the outside.

The challenge now is to make Dream Farm 2 a reality, to put flesh on the bare bones of the diagram, so we can start building the best when sites are agreed upon, and we can promote and support a worldwide movement. Already, we have potential partners in UK, US, China, Malaysia, Indonesia, Ethiopia, Mauritius, and France. We believe this is the best way forward to a

greener, cleaner, healthier and more fulfilling life without fossil fuels.59

Benefits of Dream Farm 2

1. Assembles in one showcase all the relevant technologies that can deliver sustainable food and energy and a profitable zero carbon economy.

2. Generates all its own energy for heating and electricity, including clean fuel for transport.

3. Energy use at the point of production enables combined heat and power generation and improves efficiency by 70 percent.

4. Runs entirely without fossil fuels.

5. Saves substantially on carbon dioxide emissions, by preventing methane and nitrous oxide escaping, by substituting for fossil fuels and by improved energy efficiency.

6. Increases sequestration of carbon in soil and standing biomass.

7. Reduces wastes and environmental pollution to a minimum.

8. Conserves and purifies water and controls flooding.

9. Produces a diversity of crops, livestock and fish in abundance.

10. Fresh and nutritious food free from agrochemicals produced and consumed locally for maximum health benefits.

11. Provides employment opportunities for the local community.

12. Provides a showcase and incubator for how appropriate new energy and food technologies are implemented.

13. Provides hands-on education and research opportunities at all levels from infants to university students and beyond.

14. Supports and promotes similar farms in the UK and all over the world.

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About the Author

Mae Wan Ho, PhD Mae-Wan Ho, PhD, obtained her B.S. degree in biology in 1964 and her Ph.D. in biochemistry in 1967 from Hong Kong University. She was a postdoctoral fellow in biochemical genetics from 1968 to 1972 at the University of California in San Diego, during which time she won a competitive fellowship of the U.S. National Genetics Foundation.

Since 1994, Ho has been scientific adviser to the Third World Network and has played a major role in informing policy makers and the public during negotiations of the Cartagena Protocol on Biosafety, an international agreement regulating the trade of genetically engineered products. Ho continues to play a prominent part in exposing what she calls "the bad science" of genetic engineering that's driven both by a Darwinian perspective of the world and the mistaken view that organisms are hardwired in their genes.

In April 2003, she initiated the Independent Science Panel to oppose the corporate takeover of science, and drafted an influential report, "The Case for a GM-free Sustainable World," in which independent scientists will be joining forces with all sectors of civil society in a bid to make our food system sustainable, that would also ameliorate the worst excesses of global warming and provide food security for all. In April 2006, she co-authored an extremely influential Which Energy report sponsored by dozens of civil society organizations which sets out clear options for shifting to a zero-carbon economy.

She has more than 300 publications and a dozen books spanning several disciplines, including The Rainbow and the Worm, The Physics of Organisms (1993, 1998), Genetic Engineering: Dream or Nightmare? (1998, 1999), and

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Jeffrey M. Smith is the author of publication Genetic Roulette: The Documented Health Risks of Genetically Engineered Foods, which presents 65 risks in easy-to-read two-page spreads. His first book, Seeds of Deception, is the top rated and #1 selling book on GM foods in the world. He is the Executive Director of the Institute for Responsible Technology. www.responsibletechnology.org, which is spearheading the Campaign for Healthier Eating in America. Go to www.seedsofdeception.com to learn more about how to avoid GM foods.

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* As is often the case, the US position is not verified by the underlying international agreement: according to the Codex Statute, the first purpose of Codex is “protecting the health of the consumers and ensuring fair practices in the food trade.” (Codex Statute, Article 1(a))