

Bio-Engineering Our Food and Our Future

Vikas Nath, Policy Analyst, ActionAid

Exchanges. Issue No. 23. 1998.

Email: Vikas.Nath@gmail.com <http://www.VikasNath.org>

As monopolistic multinational companies come to control every aspect of a commodity as fundamental as food through the genetic engineering of food products, the author, policy analyst, ActionAid India, makes a case for public awareness and action in the interest of informed choices so that genetically engineered seeds, crops, and foods would not have the capacity to adversely impact on the lives of millions of small farmers and uninformed consumers.

Rapid advancements have been made after the first genetically engineered food product went on sale in the US market in early 1994. Profit margins of the multinational companies who invested in the products have sky-rocketed, there has been a deluge of genetically engineered products in the open market and an increasing number of unsuspecting consumers have been subjected to higher health risks arising because of consumption of these little tested products. The technology continues to grow by leaps and bounds.

The picture which is emerging is that of a handful of multinational companies rising with astonishing rapidity to govern the global development, production, processing and marketing of the most fundamental commodity on which the survival of human race is pivoted: food. Genetic engineering technology is gaining momentum when there is a widespread concern about the long-term sustainability of our food production systems and their impact on global food security. Unknown to us, our future is being ceded to the hands of a few agri-business giants.

Genetic Engineering: What is it ?

Genetic engineering is the process of manipulating the pattern of proteins in an organism by altering the genes in a way which cannot be achieved by natural methods. New genes are either added or the existing genes are changed so that they are made at different times or in different amounts. The general process of moving genes between the species is called transformation and the result is a transgenic organism or a genetically modified organism (GMO).

Genetically modified organisms have the ability to pass alien genes onto the

Genetically modified organisms have the ability to pass alien genes onto the following generations and even to related wild species. The genetically engineered crops are not equivalent to conventional crops since they stem from genetically modified DNA and protein. It is reported that since 1990, nearly 3000 varieties of genetically engineered plants, animals and bacteria have been developed and field tested in the US. The first genetically modified plants were produced in 1982 and the field tests conducted in 1986. Today, the global area under transgenic crops is estimated to be over 26.3 million hectares worldwide, up from 2.8 million hectares in 1996.

The picture which is emerging is that of a handful of multinational companies rising with astonishing rapidity to govern the global development, production, processing and marketing of the most fundamental commodity on which the survival of human race is pivoted: food. Genetic engineering technology is gaining momentum. Unknown to us, our future is being ceded to the hands of a few agri-business giants.

The Major Players

Genetically modified organisms (GMOs) have become a commercial reality. The reverberations of the genetic engineering revolution are being felt on the Wall Street. The potential for minting money from this technology was underscored when DuPont spent \$1.7 billion last year to purchase a 20 percent stake in Pioneer Hi-Bred International - a leader in this field. Monsanto, an American multinational, is another example in the race for power consolidation and profiteering. It has been heavily investing in the genetic engineering technology over the last two decades. In less than two years, Monsanto has spent \$8 billion acquiring seed and biotechnology companies to increase the demand for its own products. Millions of dollars have been pumped by Monsanto to retain a market for its cash cow, the herbicide Roundup. Roundup, the world's largest selling weed killer, accounts for almost 17 percent of Monsanto's total annual sales of \$19 billion. Interestingly, Monsanto is the same company which manufactured Agent Orange - the notorious defoliant used in the Vietnam War and is the inventor of poly-chlorinated biphenyls (PCBs), now banned but still a menacing soil, food and water contaminant worldwide.

Novartis AG, the world's largest drug and crop chemicals company has plans to spend millions of dollars on research and development activities over the next decade to retain the competitive edge in the emerging market for genetically modified crops. It recently tied up with Land O' Lakes, one of the largest dairy food producers in the US to produce genetically engineered white corn for the food industry and high protein yellow corn for animal feed.

It is estimated that the global market for agricultural seed is worth nearly \$45 billion a year, a third of which is commercial proprietary seed - seed uniformly produced in bulk. The value of the Indian seed market, according to Monsanto, is estimated to be around \$2 billion in 7-10 years time. The international seed market is however dominated by only a few large corporations. The top ten

companies controlled 30 per cent of the worldwide sales early this year. They include Monsanto, Dupont, Dow Elanco, Novartis, Agrevo and Zeneca which concentrate on high volume crops with good profits such as soya beans, maize, cotton, oil seed rape, potatoes and tomatoes.

Battle for Genes

A custody battle recently ensued between Thailand and a British university over strains of local marine fungi which has potential medical uses. Last year, a rice patent was granted to a Texas firm, Rice Tech, on a variety of rice produced by crossing Indian Basmati rice with the US "semi-dwarf" variety. The US Government approval of the patent on Basmati - a high quality rice grown only in India, Pakistan and Nepal is another example of gene-piracy. Similar battles between the multinationals and the developing countries are ensuing worldwide. The incidents indicate how genetic diversity has become a much sought after commodity with corporatisation of agriculture.

It has come to light that Monsanto has funded a huge plant systematics institute in St Louis which has been working at a frantic pace to patent economic plants from all over the world. Critics point out that almost half the plant varieties of economic value in Brazil have been patented by US interests.

Higher Cost, Even Higher Claims

To tackle the problem of weed growth through the use of herbicides, genetic engineering has been used to develop crops which can withstand one specific herbicide. The technology has been heralded as a boon to the farmers as it would result in huge cost-savings in the use of herbicides. What has been hidden from the public is that the modified genes in the engineered crops can spread through pollen to the surrounding weeds making them equally resistant to the herbicide. Experiments have shown that oilseed rape pollen can reach weeds more than a mile away. The farmers may be able to make immediate savings in herbicide costs but the transfer of herbicide resistance to weed species will make the technology impotent sooner or later, which implies that the farmers would have to invest in even costlier technologies to control the menace. According to Dr. Allison Snow of the Ohio University, "if farmers spray their crops with the same herbicides every year, the only weeds to survive will be the ones with the transgenes and then the transgenes will spread even faster."

Monsanto claims that transgenic crops marketed by them produce higher yields and reduce the input costs incurred by farmers on herbicides. However, data gathered from sources such as Cyanamid and Canadian seed assessment authorities, indicate that some of Monsanto's herbicide-resistant crops are producing lower yields and profits for farmers than unmodified varieties. Genetically modified soya and oilseed products from Monsanto are producing yield losses up to 20 per cent compared to unmodified varieties in spite of the

crops being herbicide-resistant. Greenpeace reports from Soviet Union point out that farmers growing Monsanto's genetically modified "Naturemark" potatoes have been producing yields at half to one third the expected levels. A number of farmers have been pushed into a debt trap as a result.

Monsanto advertised its engineered cotton, furnished from the bacterium *Bacillus thuringiensis* (Bt) to be resistant against caterpillar attack without using chemicals through a selfprotecting gene. The so-called Bollgard plants were supposed to produce the Bt toxin in their own leaves. The claims turned sour when American farmers who planted 70,000 hectares of land under the new strain found that Bollgard did not produce enough of the insecticide to protect the young shoots against caterpillar attacks. The damage for this harvest period is estimated to be at approximately one billion dollars.

What has been hidden from the public is that the modified genes in the engineered crops can spread through pollen to the surrounding weeds making them equally resistant to the herbicide.

The poor agronomic performance of these genetically modified crops are explicit indicators that the biotechnologists do not have control over the knock-on effects of randomly introducing foreign genetic material into crops. Margaret Mellon, Director of Agriculture and Biotechnology for the Union of Concerned Scientists, warned in the May issue of *Pesticide and Toxic Chemical News* that agricultural biotechnology is "not a miracle technology. It has a lot of mistakes and it is an expensive technology." Besides, who can possibly predict its other long-term effects?

Terminator Technology: the Final Countdown

The seed of destruction has been sown. Never before in the history of the earth, has mankind come so close to scheming potentially perfect machinations to threaten its own future and freedom. The Terminator Technology has made its appearance aimed at reversing the very process on the which evolution of life is centred. In March 1998, a seed company Delta & Pine Land Company, later to be purchased by Monsanto, in collaboration with the US Department of Agriculture (USDA) was awarded the US Patent Number 5,723,765 on a new agricultural biotechnology. Benignly titled, "Control of Plant Gene Expression", the new patent will permit its owners and licensees to create sterile seed by cleverly and selectively programming a plant's DNA to kill its own embryos. The coverage of the patent is broad as it applies to plants and seeds of all species, including genetically engineered and conventionally-bred seeds.

If saved at harvest for future crops, the seed produced by these plants will not germinate. The "Terminator" gene technology changes the genetic make up of the plant cell in a manner that the plants regenerated from this cell will develop seeds which are sterile. Simply, the technology enables a seed company to genetically alter seed so that it will not germinate if replanted for the second time. Pea pods, tomatoes, peppers, heads of wheat and ears of corn will essentially

...sa peas, tomatoes, peppers, heads of wheat and ears of corn will eventually become seed morgues putting a chilling end to 12 thousand years of farm seed conservation and community plant breeding. The gradual spread of sterility in seeding plants would result in a global catastrophe that borders on the unthinkable.

According to the Rural Advancement Foundation International (RAFI): "If the Terminator Technology is widely utilized, it will give the multinational seed and agrochemical industry an unprecedented and extremely dangerous capacity to control the world's food supply." The technology would render all modern, legal measures of control obsolete, as it is potentially so powerful, so effective and so flawless in its applicability that its corporate owners and licensees will literally have complete biological control over the food crops in which it is applied. Terminator technology is a death sentence for the farmers and threatens global bio-diversity and food security. Nonetheless, the company has already applied for patents in 87 countries and the first commercially available seeds are likely to be in the market by the year 2000.

The "Terminator" gene technology changes the genetic make up of the plant cell in a manner that the plants regenerated from this cell will develop seeds which are sterile. Simply, the technology enables a seed company to genetically alter seed so that it will not germinate if replanted for the second time.

A Death Sentence for the Farmers

Genetic engineering technology seeks to industrialise agriculture to the point that control of the bulk of agricultural production rests in the hands of large corporations. The technology is increasingly turning independent farmers into captive contractors. The freedom of farmers to grow crops of their choice to fulfil their requirements is being traded with growing crops which push up the profit-curves of the multinational companies who share little ethical responsibility about the welfare of farmers. The companies can programme the yield of the genetically engineered crops in their favour, depending on the market forces which govern their availability resulting in heavy losses to the farmers. It is difficult to conceive how the technology would benefit farmers in the Third World Countries for whom agriculture is both a source of sustenance and livelihood.

The Terminator Technology has been unleashed to prevent farmers from saving open pollinated, non-hybrid or genetically altered seeds marketed by seed companies. According to the European based Genetic Resource Action Network (GRAIN), seed saving is necessary for farmers to adapt the seeds to their own needs, thereby generating and nurturing bio-diversity in their fields. Traditionally, it has been the women farmers who not only save seeds but also use purchased seeds to cross with other breeding stocks to improve and adapt the seeds to their local needs. However the mantra - "no seed, no food unless you buy more seed" adopted by these multi-national companies to expand the market for their products would prove to be the bane of farmers in the developing countries. It would coerce farmers to stop saving seeds for future use and at the same time

buy engineered seeds and herbicides each year at exorbitant prices. Open-pollinated crops like wheat and rice which are staples for most of the world's population would be the first ones to be affected. The "terminator gene" technology will further compound the problem of the farmers by introducing sterility to non-hybrid crops such as wheat.

The consequences to farmers are becoming increasingly clear. Farmers must pledge not to give seeds to others, or to save any seeds from the crop for planting and use genetically engineered herbicides and pesticides - a Faustian bargain that would make them even more dependent on these companies. The widespread adoption of the Terminator Technology will ensure absolute dependence of farmers and the people they feed on multinational corporations for their seed and food. The process would exacerbate the marginalisation of farmers even more as such technologies are under corporate control and protected by patents, and would be expensive and inappropriate to their needs. Farmers can look forward to paying inflated prices for seed-chemical packages and a reduced control over their own land and seeds. There is an increased chance of farmers being forced out by agri-businesses and seed corporations as increased profit rather than sustainability is the motive of these companies.

The compliance of farmers to the irrational demands of companies marketing genetically engineered products would be ensured using all possible mechanisms. In the US, farmers using Roundup Ready seeds were made to sign the Roundup Ready Gene Agreement. The terms: a farmer must pay a \$5 per bag as "technology fee"; the farmer must give Monsanto the right to inspect, monitor and test his/her fields for up to 3 years; the farmer must use only Monsanto's brand of herbicides known as Roundup; the farmer must give up his/her right to save and replant the patented seed; the farmer must agree not to sell or otherwise supply the seed to "any other person or entity". The farmer must also agree, in writing, to pay Monsanto "... 100 times the then applicable fee for the Roundup Ready gene, times the number of units of transferred seed, plus reasonable attorney's fees and expenses..." should he violate any portion of the agreement. A farmers' outcry against the stringent inspection and monitoring of their private property caused Monsanto to modify a part of the agreement. It would be interesting to note that in the US, Monsanto had hired Pinkerton detectives last year to make sure that the farmers are not reusing transgenic cotton seeds as per the Roundup Ready Gene contract between Monsanto and individual farmers.

The vicious cycle of using genetically modified products does not end here. Even those farmers who are against using genetically engineered farm inputs would eventually be compelled to use them. According to critics, as farmers put increasing areas under genetically engineered seeds and spray their fields with increasing doses of genetically engineered herbicides, the herbicide "drift" may increase significantly. As a result, the neighbouring farmers may also be forced to switch to genetically engineered seeds in order to keep their crops from being destroyed by the airborne herbicide.

Food security is further undermined when seed availability and food production is

Food security is further undermined when seed availability and food production is made increasingly dependent on external sources of supply over which there is little control. Many scientists have raised questions on the elixir aura conferred on genetic engineering. Genetic engineering is being claimed as the ultimate remedy to end starvation,

The widespread adoption of the Terminator Technology will ensure absolute dependence of farmers and the people they feed on multinational corporations for their seed and food. There is an increased chance of farmers being forced out by agri-businesses and seed corporations as increased profit rather than sustainability is the motive ,of these companies.

Seeds of Food Insecurity

Food security simply cannot exist in a market system where food is a business. The business of tweaking a crop by fiddling with its genetic material to make it slightly more productive can put global food security in a jeopardy. The target of genetic engineering technology is the developing world, particularly Asia and sub-Saharan Africa, where the promoters argue it will "help feed hungry people and increase productivity". The image of the poor and hungry in developing countries is being used by multinationals to push a market for their genetically engineered food products which are neither tested for safety, nor are environmentally friendly nor are beneficial to both producers and consumers. The Global Business Access company in the United States has circulated a letter asking for signatories from the Third World to support Monsanto's claim that everyone shares the "same planet and the same needs". However the claims of tomorrow without hunger through genetic engineering are baseless and aims to justify food scarcity as the sole cause of hunger when history has proved otherwise.

Focussing narrowly on increasing food production cannot put an end to starvation but on the contrary may aggravate it as it fails to alter the tightly concentrated distribution of economic power that determines who can buy the additional food. Hunger still persists in nations like India and Mexico where the Green Revolution to increase productivity was proclaimed to be a huge success. The Third World Network has warned that the terminator technology threatens to restrict farmer expertise in selecting seed and developing locally adapted strains, thereby risking food security and agricultural bio-diversity. This narrowing of the species base could have devastating impact on food production. Further, the push for uniformity will destroy the diversity of genetic resources and disrupt the very biological complexity that underlies the sustainability of the traditional farming systems.and contribute to global food security, improved health and economic growth. The expertise in genetic technology held by a few private companies could be used as a potential weapon against human beings, the effect of which would be worse and even more long-lasting than a nuclear holocaust. It would force the Third World to pay higher prices for food and farm inputs leaving them even more on the brink of starvation rather than food surplus.

Genetically Engineered Food is Everywhere

What we eat is changing: agri-business giants are genetically engineering corn, beets, rice and soyabean. In this era of intensified economic exploitation and corporate globalization, consumers worldwide are being subjected to an increasing contamination of food supply. Because of Monsanto and FDA's aggressive steps to prevent labelling of rBGH (recombinant bovine growth hormone) produced milk, consumers in US are ingesting increased quantities of toxic residues on consumption of milk, cheese, cream, yoghurt and even baked products. In India, Monsanto has been successful in persuading to allow the import of one million tonnes of split soyabean from the US - the first genetically engineered food in India. Between 50 and 60 percent of processed food contains soya. There are tens of thousands of food products which contain soya in one form or another, from baby food to animal feed. The consumer will have no idea whether any of these products is contaminated by Roundup Ready soybean. The Roundup Ready soybeans bring no benefits whatsoever to the consumers - they are not cheaper, tastier or healthier.

Blatant violation of human rights are taking place as people are being made uninformed victims of genetic engineering experiments. In Oxfordshire, prison inmates are the unwilling participants in genetic food experiments. A prison inmate became so concerned that he might be eating genetically modified food that he went on hunger strike and stopped eating completely.

GENERAL

All over the US, UK and in many parts of Europe people are choosing to avoid foods that contain genetically modified organisms. Consumers simply do not want their food to be genetically modified. Polls in Germany point out that 80 percent of the consumers are opposed to genetically engineered food. Survey results in Europe point out that 85 percent of Europeans would shun genetically engineered food if given the choice. Dozens of companies in Europe are demanding food products that have not been genetically engineered. Yet the harvest of genetically engineered crops continues. It would be interesting to note that the US produces most of the world's soyabean and exports about half of it to Europe and Asia. Germany purchased over 1.2 million metric tonnes of soybean from US in 1996 and Europe continues to be the largest market for the US genetically engineered soyabean. Pushing of genetically engineered food in the market when consumers are unwilling to consume it is in antithesis of the shifting trend towards an economy dominated by market-forces.

Environmentalists worldwide are worried that genetically modified plants will upset the natural balances once they are released into the environment. Genetically engineered organisms have been known to cross-breed with wild plants causing irreversible and unpredictable damage to natural ecosystems. The problem of pollen spreading from these genetically engineered crops cannot be overlooked and may lead to a chain of disasters. US soyabeans are exported to Asia, Africa and the Pacific islands, the home to original wild soyabeans. In these regions, there is a risk of genetically engineered beans cross-breeding with wild

regions, there is a risk of genetically engineered beans cross breeding with wild varieties, the impact of which is unpredictable. Animals, wild and domestic are subject to heavy risks on grazing these crops. Antibiotic resistance genes inserted into plants that we eat could be transferred to bacteria, leading to the emergence of new strains of antibiotic-resistant "superbugs". Scientists at the University of Chicago have found that gene-altered plants are 20 times more likely to cross-pollinate with nearby wild relatives than natural strains are. The findings, published in Nature, intensify fears that gene-modified crops will, by crossing with wild relatives, produce weeds that are immune to sprays and weedkillers.

Genetically engineered products are not eco-friendly. The genetically engineered maize produced by Novartis altered to provide its own pesticide - has been shown to kill useful insects alongside crop pests. Often farmers end up spraying more pesticides than the conventional dosage when the in-built organic defences of genetically engineered plants fail.

Health Risks

Genetic engineering has increased the likelihood of the world heading for a major crisis in public health. As new and re-emerging diseases continue to occur with increasing frequency and the current strains of pathogens become resistant to known treatments, there can be little doubt that the transfer of genes across unrelated species of animals and plants are responsible for the development of drug and antibiotic resistance. The phenomenal increase in virulent infections and antibiotic resistance coincides with the commercialisation of genetic engineering. The Pasteur Institute has recently come up with the finding that the crop's antibiotic resistant genes are capable of being transferred to bacteria in the gut. This has led the Royal Society to advise against marketing of crops with antibiotic-resistant genes.

Genetic engineering is inherently hazardous because it depends on gene-transfer vectors to crosswide species barriers. Genetic recombination can produce products with untoward consequences and unexpected toxicity. The Global Policy and Campaigns unit of the Consumer International, UK has published a paper entitled Genetic Engineering and Food Safety wherein it has identified four major areas of concern to consumers i.e., Toxicity, Allergenicity, Antibiotic Resistance and Product Information. A tomato with genes from peanuts might cause allergic reactions in people with peanut allergies who unsuspectingly consume the tomato not labelled as genetically engineered.

In the case of milk from rBGH treated cows, though both Monsanto and the US Food and Drug Development Authority (FDA) proclaim that it is not "significantly different" compared to the milk from non-treated cows, the fact is that Monsanto's rBGH is not identical to a cow's natural growth hormone. A number of studies have pointed out to possible association of rBGH with increased chances of uterine cancer in women and prostate cancer in men. Further, cows treated with rBGH are at an increased risk for clinical mastitis (visibly abnormal milk) which results in greater use of antibiotics by the farmers and hence a greater antibiotic

residue in milk. A ruling given by WTO that the European Union can no longer exclude meat and milk from cattle treated with bovine growth hormone, despite the protests of farmers and consumers, substantiates this. In the case of milk from rBGH treated for cows, a number of studies have pointed out to possible association of rBGH with increased chances of uterine cancer in women and prostate cancer in men.

All over the US, UK and in many parts of Europe people are choosing to avoid foods that contain genetically modified organisms. Consumers simply do not want their food to be genetically modified. Pushing of genetically engineered food in the market when consumers are unwilling to consume it is in antithesis of the shifting trend towards an economy dominated by market-forces.

To counter the opposition against its products, Monsanto mounted a multi-million dollar public relation campaign to convince consumers of the ecological and global benefits of such food whilst admitting that the ethical, scientific and health concerns were underestimated as it pushed its product into the market without an explanation!

Spread Mechanism Behind Genetic Engineering

The transnational companies who invested heavily in the technology have been successful in suppressing two powerful means of restraining their activities - government regulations and the choice of consumers. The situation in Europe and Australia where there is no labelling of genetically engineered goods despite public awareness of issues related to genetic engineering speaks of the influence of the companies. Despite consumer resistance, Monsanto's Roundup Ready Soya Bean was dumped in the European markets.

Monsanto and other companies have been most successful when appealing to multi-lateral bodies. When European consumers demanded labelling, the US Agricultural Secretary called this an "interference in free trade". Genetic engineering technology has become so widespread that any country would next risk breaching the rules of World Trade Organisation (WTO) should it ban or stall the cultivation of crops which have been approved abroad. During the WTOs committee meeting on Trade Barriers to Trade (TBT), US and Canada vehemently opposed a new EU resolution requiring labels for products made from genetically modified organisms. The EU government finally had to vote against the labelling of genetically engineered products after the American government had threatened Europe with trade sanctions.

Monsanto has comprehensive plans to increase its presence in India. It has entered into a joint venture with the Maharashtra Hybrid Seeds Company (Mahyco) to introduce insect-tolerant cotton in India. To spread its presence to remote corners of the country, it has signed up an agreement with Rallis India for distribution of its Roundup products. India is the fourth country in the world where Monsanto has introduced its new herbicide named "Leader". Monsanto has recently tied up with the Indian Institute of Sciences, Bangalore a Research and

recently tied up with the Indian Institute of Sciences, Bangalore a Research and Development Centre. Critics fear that publicly funded research could thus end up in private hands. Monsanto will be investing about \$30 million over the years for research and marketing of its specialised agro-inputs.

The US Food and Drug Administration (FDA) sided with Monsanto in giving final approval to its genetically engineered product rBGH. The product is intended for needle injection into cows every two weeks to make them produce more milk. It even went a step further and threatened legal action against milk suppliers and grocers who label their milk as free of rBGH drug. This is because Monsanto, the chemical company, which brought the first rBGH product to the market, vigorously opposes labelling.

Plant patents, gene licensing agreements, intellectual property laws, investigations and lawsuits brought against farm families for infringing on a seed company's monopoly on seed varieties are some of the means now used by the transnational to protect their business interests. Monsanto's US patent on Roundup runs out in three years - contrary to affecting the company's profit, it is an opportunity for Monsanto to make its position in the market even more dominant beyond 2000. Enter Roundup Ready soyabeans and Roundup Ready Cotton. Among the St. Louis-based Monsanto's biggest money maker are cotton, soyabean and corn seeds that are genetically modified to tolerate direct applications of Roundup herbicide. Farmers who once confined the use of herbicides to the borders of the plant area can now douse the entire fields with Roundup. The catch however is that farmers using Roundup Ready seeds can only use Roundup herbicide, because any other broad spectrum herbicide will kill their crops. According to Monsanto's own spokesman Gary Barton, "it expands the Roundup market." It recently reduced the price of its Roundup brand of herbicides in US as a bait for farmers to get hooked to these products and henceforth expand the market for their products.

A Weapon Against the Third World Economies

Genetic engineering technology spells doom for the Third World economies. It results in steady erosion of a country's control over its food production making it even more susceptible to farm policies and business motives of food exporting countries and transnational companies. In a recent interview with RAFI (the Canada-based Rural Advancement Foundation International) the US Department of Agriculture (USDA) spokesman, Willard Phelps, without embarrassment explained that the USDA wants terminator technology to be "widely licensed and made expeditiously available to many seed companies." The goal, he said, is "to increase the value of proprietary seed owned by US seed companies and to open up new markets in Second and Third World countries." The situation is precarious as genetic engineering could be forced upon vulnerable Third World economies to expand business interests and attain political leverage.

The technology will undermine exports from the Third World countries especially from the small-scale producers. It holds the potential to foreclose rural

employment opportunities. Nearly 10 million sugar farmers in the Third World may face a loss of livelihood as laboratory produced sweeteners begin to invade world markets. Temperate arable crops are being engineered to replace lucrative tropical perennial crops - an important source of cash for many developing countries. In the Indian scenario, the flooding of the domestic market by genetically engineered soyabean would prove to be disastrous to the domestic economy as it would lead to the disappearance of a market for the oilseeds grown by Indian farmers.

Further, import of these products would be a drain on the scarce foreign exchange reserves of the developing countries. Third World farmers who have diligently preserved and adapted the age-old, traditional knowledge go unrewarded while the multinationals seek to earn billions of dollars on royalties from the harvest of Third World countries. On the ecological side, the Third World countries have all the likelihood of becoming a genetic dump site for the experiments conducted by the transnationals involved in this business.

The Way Forward

To counter the rapid infiltration of genetically modified products in the open market, there is need to press for a worldwide moratorium on cultivation of genetically engineered crops so as to allow further scientific and ethical research on the subject. The European Union is seriously contemplating a five year moratorium on genetically modified products. UK has recently announced a three-year voluntary moratorium against planting and approval of genetically engineered crops.

Pressure groups should be formed to force USDA to abandon the international patent application on Terminator technology on the basis of public morality clause as provided in Article 27(2) of TRIPS.

Concurrently, independent regulatory bodies, at different levels need to be set up to monitor and regulate the enforcement of regulations covering growing of such crops. Continued surveillance is essential to ensure that no undesirable, transgenic organism is created. In May this year, the UN Conference to the Parties to the Convention on Biological Diversity directed the scientific body to examine the technology's impact on farmers and bio-diversity, and recommended that the "precautionary principle" be applied to the new genetically engineered seeds.

Labelling of genetically modified products should be made mandatory and the associated risks on using the products clearly mentioned in an unambiguous language. A stringent and rigorous testing of genetically engineered product for their ecological and health risks should be done. Last, but not the least, awareness of the general public regarding issues related to genetic engineering should be raised to enable the public to be more informed of its choices. A 'Genetically Engineering Free Food List' is currently circulating in Australia with every genetically engineering free labelled product marked with a big asterisk

every genetically engineering free labeled product marked with a big asterisk, which means -'Buy these products rather than the competition and support genetically engineering free labelling'. Companies are responding to this, and will do so even more as the number of products on these lists increase'. Media support is essential to put the issues concerning genetic engineering into public domain and give producers and consumers a choice to decide for themselves.

In the Indian scenario, against the backdrop of continuing gene-piracy, agricultural policies need to be amended to ensure the preservation of genetic diversity and protecting the rights of the local communities in accessing these resources. Bio-safety laws need to be made more stringent to check the entry of genetically modified products promoted by multinational companies in the domestic market. The policies, at present, continue to suffer from the same drawbacks which gave India a Green Revolution instead of an Evergreen Revolution, and rendered it even more susceptible to the trade policies of the western governments.

The Ongoing Debate

Genetic engineering is an area of public concern. In a world of burgeoning populations and their growing demand for food, giant, multinational seed companies hope to sell a lot of proprietary, genetically engineered seed. Food is big business that will only get bigger, and they want farmers around the world to come back to them, year after year, to buy the seed and, in most cases, the chemicals to grow it.

Labelling of genetically modified products should be made mandatory and the associated risks on using the products clearly mentioned in an unambiguous language. More stringent and rigorous testing of genetically engineered products for their ecological and health risks should be done. Last, but not the least, awareness of the general public regarding issues related to genetic engineering should be raised to enable the public to be more informed of its choices.

It is important to realise that the thrust of the biotech industry is not to solve agricultural problems as much as it is to create profitability. The intellectual property rights of the local communities are being infringed upon as the multinationals are busy making a fast buck. Many of the proprietary seeds marketed by the companies are no more than genetically altered versions of older, reliable, conventionally bred strains that have been carefully preserved for many, many years. Change a gene to give a seed resistance to some new strain of disease, the logic goes, and the seed no longer belongs to the people to grow and save as they like, the seed now belongs to the seed company. This is a cruel blow for the 1.4 billion poor farmers in the south who depend on farm-saved seeds from previous harvests and m seed exchanged with neighbours as their primary seed source.

The dearth of bio-safety laws in most of the developing countries, including India, implies that it is extremely difficult to prevent the entry of GMOs in the open

market. The Bio-safety protocol which is expected to be finalised and adopted at a Conference of Parties to the United Nations Convention on Biological Diversity in 1999 can only prevent misuse, escapes and accidents arising out of genetic engineering, that could have irreversible consequences, but can it prevent the use of food as a weapon?

Often these biotech companies hold both the purse and puppet strings in influencing the decision of governments. This however is only a drop in the deluge of accusations about corporate tyranny. Trends in a number of western countries are witness to the fact that the public is being denied consumer choice regarding unlabeled mutant foods and access to critical information from scientists with an insider's perspective on genetic engineering and its implications. The influence of these companies on the local media is also very strong through which they have been able to influence farmers in remote areas where the presence of government machinery is minimal.

Governments need to examine the havoc that blind acceptance and approval of genetically engineered technologies can wreak on the lives of farmers and consumers, and the economy of the country on the whole. A public debate is certainly called for before such a crucial policy decision is taken.

The pertinent question is, how much are countries willing to gamble for a softer bread crust or a firmer tomato?

References

"Agriculture Industry Profiteers Threaten Farmers", Inter Press Service, Washington, 14 September 1998.

Atteiri, Miguel, "Bio-technology Myths", University of California at Berkeley, www.nature.berkeley.edu/agroeco3

"Big Brother is Good for You ?", *Splice of Life*, volume 4, issue 6, August/September 1998.

Bridges Weekly Trade News Digest, volume 2, number 36, 21 September 1998.

Bridges Weekly Trade News Digest, volume 2, number 39, 10 October 1998.

Cummins, Ronnie, *Food Bytes*, number 12, 23 September 1998.

Daorueng, Prangtip, "Tussle Over Fungi Strain Brings Painful Lessons", Inter Press Service, Bangkok, 4 September 1998.

Bio-Engineering Our Food and Our Future

"Ethical and Ecological Aspects of Industrial Property Rights in the Context of Genetic Engineering and Biotechnology",
www.foundation.novartis.com/proprght.htm

"Genetic Crops May Be Banned", *The Independent (UK)* Saturday, 10 October 1998.

"Genetically Engineered Foods Debate Sows Seed of Discontent", *The Lancet*,
www.free.de/gentec/earth.html

"Genetically Modified Foods Need Better Labelling", *The Guardian*, 1 September 1998, www.free.de/gentec/earth.html

Guidetti, Geri, "Seed Terminator and Mega-Merger Threaten Food and Freedom", The Ark Institute, www.free.de/gentec/earth.html

Monsanto: Peddling "Life Sciences" or "Death Sciences"? Research Foundation for Science, Technology and Ecology, New Delhi, July 1998.

Sharma, Devinder "Turning A Blind Eye to Bio-piracy"
www.hindustantimes.com/nonfram/140898/detopiO2.htm

"The Pros and Cons of Genetic Modification", *Farmer's Guardian*, 25 September 1998.

"Truly the Seeds of Destruction", *The New Straits Times*, 13 October 1998.

"World's Largest International Agricultural Research Network Vows Not to Use Terminator Technology", Rural Advancement Foundation International (RAFI) News Release, 23 October 1998, www.rafi.org