

Opening Address

Food Meets Media

Dr. Vandana Shiva

Food meets media in advertisements and public relations. However, media rarely goes to the real economy and real ecology of food. And the media has totally ignored the politics of food and the power of global corporations over the food system. The media has also totally ignored alternatives for feeding the world.

Industrialized agriculture and globalized food systems have been put forth as sources of cheap and abundant food. However, food is no longer cheap. The era of cheap food and cheap oil is over. The food crisis, mainly triggered by rising prices that emerged in 2007 and 2008 has led to food riots in many countries. From 2007 to 2008 the price of wheat increased by 130 percent. The price of rice doubled during the first three months of 2008. Biofuels, speculation, destruction of local food economies, and climate change have all contributed to the rise in food prices. Climate change is aggravated by industrialized, globalized agriculture based on fossil fuels, and the resulting climate crisis in turn impacts food security in numerous ways, including intensified floods such as those Iowa experienced in 2008 and intensified and extended droughts like the one Australia witnessed in 2007. Globalization has also led to the destruction of local food economies and increased control by corporations like Monsanto and Cargill over our food systems. Global integration of agriculture in effect means global control over the world's food supply.

While millions go hungry, corporate profits have increased. Cargill saw profits increase by 30 percent in 2007; Monsanto's profits increased by 44 percent. These profits will increase as corporate monopolies deepen. Monsanto increased the price of corn seed by \$100 per bag to \$300 per bag. For a 1000 acre farm in the U.S, this means an increased cost of \$40,000.

The rise in food prices in 2007-2008 did get media attention, but without an investigation into why the prices were rising, and how acts in the U.S were triggering food riots in Mexico, Egypt and India.

I will therefore talk of the stories that the media did not cover, stories that the media missed, stories that determine the life and death options of millions of our fellow citizens.

First, the Seed

Seed Monopolies, Genetic Engineering and Farmer Suicides

An epidemic of farmers' suicides has spread across four states of India over the last decade. According to official data, more than 160,000 farmers have committed suicide in India since 1997.

These four states are Maharashtra, Andhra Pradesh, Karnataka and Punjab. The suicides are most frequent where farmers grow cotton and have been a direct result of the creation of seed monopolies. According to official data, more than 160,000 farmers have committed suicide in India since 1997.

Increasingly, the supply of cotton seeds has slipped out of the hands of the farmers and the public system, into the hands of global seed corporations like Monsanto. The entry of seed MNCs was part of the globalization process.

Corporate seed supply implies a number of shifts simultaneously. *Firstly*, giant corporations start to control local seed companies through buyouts, joint ventures and licensing arrangements, leading to a seed monopoly.

Secondly, seed is transformed from being a common good, to being the “intellectual property” of Monsanto, for which the corporation can claim limitless profits through royalty payments. For the farmer this means deeper debt.

Thirdly, seed is transformed from a renewable regenerative, multiplicative resource into a non-renewable resource and commodity. Seed scarcity and seed farmers are a consequence of seed monopolies, which are based on renewability of seed, beginning with hybrids, moving to genetically engineered seed like Bt-cotton, with the ultimate aim of the “terminator” seed which is engineered for sterility. Each of these technologies of non-renewability is guided by one factor alone – forcing farmers to buy seed every planting season. For farmers this means higher costs. For seed corporations it translates into higher profits.

Fourthly, the creation of seed monopolies is based on the simultaneous deregulation of seed corporations, including biosafety and seed deregulation, and super-regulation of farmers seeds and varieties. Globalization allowed seed companies to sell self-certified seeds, and in the case of genetically engineered seed, they are seeking self-regulation for biosafety. This is the main aim of the recently proposed National Biotechnology Regulatory Authority, which is in effect a Biosafety ‘Deregulation Authority. The proposed Seed Bill 2004, which has been blocked by a massive nationwide Gandhian Seed Satyagraha by farmers, aims at forcing every farmer to register the varieties they have evolved over millennia. This compulsory registration and licensing system robs farmers of their fundamental freedoms.

State regulation extinguishes biodiversity, and pushes all farmers into dependency on patented, corporate seed. Such compulsory licensing has been the main vehicle of destruction of biodiversity and farmers rights in U.S. and Europe.

Fifthly, corporate seeds impose monocultures on farmers. Mixed croppings of cotton with cereals, legumes, oilseeds, vegetables is replaced with a monoculture of Bt-cotton hybrids.

The creation of seed monopolies and with it the creation of unpayable debt to a new species of money lender, the agents of the seed and chemical companies, has led to hundreds of thousands of Indian farmers killing themselves since 1997.

The suicides first started in the district of Warangal in Andhra Pradesh. Peasants in Warangal used to grow millets, pulses, oilseeds. Overnight, Warangal was converted to a cotton growing district based on non-renewable hybrids which need irrigation and are prone to pest attacks. Small peasants without capital were trapped in a vicious cycle of debt. Some ended up committing suicide.

This was the period when Monsanto and its Indian partner Mahyco were also carrying out illegal field experiments with genetically engineered Bt-cotton. All imports and field trials of genetically engineered organisms in India are governed by a law under the Environment Protection Act called the “Rules for the Manufacture Use, Import, Export and Storage” of Hazardous Microorganisms, Genetically Engineered Organisms or Cells 1989.

We at the Research Foundation for Science, Technology and Ecology used these laws to stop Monsanto’s commercialization of Bt-cotton in 1999, which is why approval was not granted for commercial sales until 2002.

The Government of Andhra Pradesh filed a case in the Monopoly and Restrictive Trade Practices Act (MRTP), India’s Anti Trust Law, arguing that Monsanto’s seed monopolies were the primary cause of farmers’ suicides in Andhra Pradesh. Monsanto was forced to reduce its prices of Bt-cotton seeds.

The high costs of seeds and other inputs were combined with falling prices of cotton due to \$4 billion U.S. subsidy and the dumping of this subsidized cotton on India by using the W.T.O. to force India to remove Quantitative Restrictions on agricultural imports. Rising costs of production and falling prices of the product is a recipe for indebtedness, and indebtedness is the main cause of farmers’ suicides. This is why farmers’ suicides are most prevalent in the cotton belt on which seed industries own claim is rapidly becoming a Bt-cotton belt. Bt-cotton is thus heavily implicated in farmers’ suicides.

The International Food Policy Research Institute (IFPRI) has recently released a discussion paper ‘Bt-cotton and Farmers’ Suicides in India: Reviewing the Evidence’.

The report is manipulative of the truth about farmers suicides and Bt-cotton at every level.

Firstly, it states that “Farmers suicides is a long-term phenomena”, and the “long term” is 1997-2007.

Ten years is not a long term in a 10,000 year old farming tradition. And 1997 is precisely when the suicides take on an epidemic proportion due to seed monopolies, initially through hybrids and from 2002 through Bt. Hybrids.

Secondly, the chronology of Bt-cotton introduction is false. The story begins with Monsanto’s illegal Bt. trials, not with commercialization in 2002.

Thirdly, the report states that “In specific regions and years, where Bt-cotton may have indirectly contributed to farmer indebtedness (via crop failure) leading to suicides, its failure was mainly the result of the context or environment in which it was introduced or planted; Bt-cotton as a technology is not to blame”.

This is an interesting argument. A technology is always developed in the context of local socio-economic and ecological conditions. A technology that is a misfit in a context is a failed technology for that context. You cannot blame the context to save a failed technology.

The technology of engineering Bt-genes into cotton was aimed primarily at controlling pests. However, new pests have emerged in Bt-cotton, leading to higher use of pesticides. In Vidharbha region of Maharashtra, which has the highest suicides, the area under Bt-cotton has increased from 0.200 million ha in 2004 to 2.880 million ha in 2007. Costs of pesticides for farmers has increased from Rs. 921 million to Rs. 13,264 billion in the same period, which is a 13 fold increase. A pest control technology that fails to control pests might be good for seed corporations which are also agrichemical corporations. For farmers it translates into suicide.

The IFPRI study uses industry data to falsely claim reduction of pesticide use in Bt-cotton when the empirical data and ground reality shows pesticide use increase.

There are alternatives to Bt-cotton and toxic pesticides. Through Navdanya we have promoted 'Organic Farming and Seeds of Hope', to help farmers move away from Monsanto's "Seeds of Suicide".

Organic farmers in Vidharbha are earning Rs. 6287 per acre on average, compared to Bt-cotton farmers who are earning Rs. 714 per acre on average. Many Bt-cotton farmers have a negative income, hence the suicides.

The field data of Bt-cotton is also manipulated when cotton yields are shown as low in the pre-Bt-cotton years, it is not mentioned that cotton has traditionally not been grown as a monoculture but as a mixed crop converting biodiversity to monocultures of course leads to increase in "yield" of the monoculture, but this is accompanied by a decline in production at the biodiversity level.

The IFPRI paper has attempted to play with figures, just like the investment bankers and hedge fund managers played with figures and caused the collapse of Wall Street. Manipulation of reality with numbers does not make for truth. In the case of seeds, it is threatening farmers' lives.

Technologies are tools. When the tool fails it needs replacing. Bt-cotton technology has failed to control pests or secure farmers lives and livelihoods. It is time to replace GM technology with ecological farming. It is time to stop farmers' suicides.

Toxic Genes

The financial meltdown that started in September 2008 was a result of the investments based on "toxic" paper – worthless financial instruments traded for super profits, even while they failed to reflect any value in the real economy. "Toxic Assets" and "Toxic Paper" do not refer to the business of companies of trade in deadly toxics. It still means deadly, but deadly to financial institutions and banks because of these inherent risks.

There are similar "toxic papers" being generated in the defense of GM crops, especially Bt. Cotton. Like the toxic papers of Wall Street they have no grounding in reality. They assume false number crunching can be a substitute for truth. And they are deadly for food and agriculture security, and farmers livelihoods.

A recent paper from IFPRI "Bt. Cotton and Farmers Suicides in India" falls in this category of a doubly toxic paper because it covers up the risks of toxic genes and is

detached from reality. Yet it is aimed at shaping public opinion about GM crops by using every trick in the trade to separate the impact of GM crops on farmers from the seed monopoly and the technology of producing non-renewable, toxic seeds through genetic engineering.

Bt. Cotton is the only GM crop approved for commercial planting in India to date.

The majority of farmers suicides in India are a harvest of toxic genes of Bt. Cotton. The Bt. Gene is literally a toxic gene. It produces a high dose toxin. The Bt. in the genetically engineered crops is substantially different from the Bt. in the naturally occurring soil organism, *Bacillus Thurengensis*. A false principle of “Substantial equivalence” assumes that because natural Bt. Sprays are safe, genetically engineered Bt. Crops such as Bt. Cotton are safe. This assumption is not justified. Bt. Sprays do not cause allergic reactions, Bt. Crops do. Further the Cry proteins in Bt. Sprays break down within a fortnight upon exposure to UV light. This does not happen in Bt. Crops since the Bt. Toxin is produced internally in grains and other plant tissues. Further, the Bt. Spray is used only once or twice in a season, whereas the Bt. Toxin in GM crops is released all the time, by every part of the plant, thus increasing the risks from chronic exposure. Finally, Bt. Sprays are composed of endo toxins in an inactive crystalline form. They only become toxic in the guts of particular insects which processes the crystal into a protoxin and then an active toxin. On the other hand, Bt. Crops are genetically engineered to produce the Bt. Toxin which is active. The Bt. Toxin in GM crops is thus harmful to a wide range of species as the study on the Monarch butterfly from Cornell, and animal deaths reports from India indicate.

However the toxicity of Bt. Crops is much deeper and wider than the toxicity of the gene.

Bt. Cotton was introduced to control the American Bollworm, which is why Monsanto’s trade mark for Bt. Cotton is ‘Bollgard’. The argument was that by engineering the Bt. Toxin into the plant, the plant would be pest resistant. However, the bollworm has evolved resistance to the Bt. Toxin and new pests have emerged. The non target pest infestation has led to an increase in the use of pesticides. Our field studies in Vidharbha show a thirteen fold increase of pesticide use by farmers since Bt. Cotton was introduced in 2004.

While the reality shows that Bt. Cotton fails to control pests and has in fact led to increase in pest occurrence and pesticide use, the “toxic” paper from IFPRI states that Bt. Cotton reduces the number of pesticide sprays by 32-40 percent, reduces pesticide costs by 30-52 percent, increases the total cost of production by 32-40 percent, has no clear effect on seed cotton prices, increased yields by 34-42 percent, and raises net returns by 52-71 percent.

Every claim in this statement is false. The high costs of Bt. Cotton seed is not just reflected in farmers indebtedness and suicides, it is confirmed by the case brought to the Monopoly and Restrictive Trade Practices (MRTP) Commission by the Government of Andhra Pradesh (AP) in which our foundation also intervened.

On June 26, 2006 the A.P. Government filed a case of contempt against Monsanto – Mahyco Biotech (India) Ltd for not obeying the commission order on reducing its royalty which Monsanto charges as “trait – value” of Rs. 1750 per pack of 450 gms of seed. Since Monsanto introduced, Bt. Cotton in India before India’s patent laws allowed patents on GM seeds, it cannot formally claim royalty.

The corporation buys the seed from farmers at Rs. 300/- per pack of 750 grams and then claims the right to sell it back to farmers at exorbitant prices.

The A.P. Government's contention was that the high price of the Bt. Cotton is one of the reasons for distress among farmers. When the case was filed, more than 3000 farmers had committed suicide in A.P. and most of them were cotton farmers.

The A.P. petition demanded a reduction of "trait value" from Rs. 1750 to Rs. 750 per 450 gm pack and a return of Rs. 4 billion to farmers for over charging them. Monsanto lost the case and was forced to reduce its price.

The MRTP case exposes the false claim by IFPRI that there is "no clear effect on seed cotton prices" in Bt. Cotton. It also exposes the bias in the narrow base of literature used. Research sponsored by Monsanto and the Biotech industry forms the basis of the "peer reviewed" literature. Government orders, Court Orders, independent studies are totally ignored.

The IFPRI report is also toxic in terms of contradictions and inconsistency. The report admits increase in costs of production. This translates into lower incomes for farmers. Yet in spite of farms spending more, IFPRI claims upto 71 percent higher net returns.

This claim to higher returns is also falsified by multiple field surveys. A 2008 survey by Navdanya comparing Bt. Cotton with organic cotton showed that organic producers earn nearly ten times more than Bt. Cotton farmers.

Cost Benefit Analysis of Bt. Cotton and Organic Cotton

	Bt. Cotton (Rs. / acre)	Organic Cotton (Rs. / acre)
a) Expenses – Seeds, pesticides, fertilizer, irrigation etc.	8 164	3 788
b) Output Value	8 876	10 075
Net Income (a – b)	714	6 287

Our earlier studies in A.P., M.P. and Karnataka also show that non-Bt. Cotton farmers have higher net incomes than Bt. Cotton farmers.

Input / Output Bt. / non-Bt. / Desi Cotton Per Acre

	Bt. Cotton	Non Bt. Hybrids	Desi Varieties
Expenditure Input (seeds, fertilizers, pesticides, irrigation etc)	Rs. 9 700/-	Rs. 5 750/-	None
Total Yield	2 quintals	10 quintals	5 quintals
Output Value	Rs. 3 300/-	Rs. 16 500/-	Rs. 8 250/-
Loss / Profit per acre	Loss – Rs. 6 400/-	Profit – Rs. 10 750/-	Profit – Rs. 8 250/-

Cost Benefit Analysis – Madhya Pradesh

	Bt. Cotton	Non Bt. Varieties
Expenditure input (seeds, fertilizers, pesticides, irrigation, labour)	Rs. 6 675/-	Rs. 7 005/-
Expected total yield	4.01 quintals	7.05 quintals
Output Value	Rs. 7 218/- (Rs. 1 800/- quintal)	Rs. 12 690/- (Rs. 1 800/- quintal)
Profit per acre	Rs. 543/-	Rs. 5685/-

Cost Benefit Analysis – Karnataka

	Bt. Cotton	Non Bt. Varieties
Expenditure input (seeds, fertilizers, pesticides, irrigation, labour)	Rs. 8925	Rs. 10250/-
Expected total yield	3.82 quintals	7 quintals
Output Value	Rs. 7 640/- (Rs. 2 000/- quintal)	Rs. 14 000/- (Rs. 2 000/- quintal)
Loss / Profit per acre	Loss of Rs. 1 285/-	Profit of Rs. 3 750/-

A study by the Andhra Pradesh Coalition in Defense of Diversity (APCIDD) showed how biased the results of the Monsanto sponsored A.C Nielson study was.

Monsanto Commissioned versus Independent Study

State	Bollworm Reduction	Pesticide Usage Reduction		Yield increase		Increase in Net Profit
	%	Rs	%	Quintals / Acre	%	Rs / Acre
Monsanto Study Andhra Pradesh	58%	1 856/-	24%	1.98	92	5 138/-
APCIDD Study	14%	321/-	2%	0.09	(-)9%	(-) 750/-

Since the IFPRI study is biased in its selection of literature, its claims are also biased. Just as securitization of mortgages did not secure peoples homes but merely piled up trade in toxic paper IFPRI's manipulated paper does not secure farmers survival, it merely piles up toxic papers on toxic Bt. Cotton.

The IFPRI paper is totally contradictory in its defense of Bt. Technology. Where the cotton crop fails or pests increase or farmers commit suicide, the cause is farmers stupidity or the fault of the varieties into which Bt. is introduced. As the study states

The loss observed in some studies is largely due to the lack of adequate Bt. Varieties (particularly for rainfed conditions under draught), the lower quality of cotton of some of these varieties, the high price of seed compensating for the reduction in pesticide use, the improper use of the technology associated with the limited knowledge of the technology among cotton growers. In other words, the technology represented by the Bt. trait, should not be blamed, instead, the conditions in which it was introduced, sold and used explain some of the observed losses in specific regions of India.

When the Bt. Cotton performs well it is “the technology”. When it does badly, it is “the context”. This opportunistic separation of “technology” and “context” when convenient is at the heart of IFPRI’s false argument that Bt. Cotton and farmers suicides are not related. As it states “In specific regions and years, where Bt. Cotton may have indirectly contributed to farmer indebtedness (via crop failure) leading to suicides, its failure was mainly the result of the context or environment in which it was introduced or planted; Bt. Cotton as a technology is not to blame”. This argument is toxic. All technologies are embedded in context. There are no dis-embodied technologies, except in ideology.

Bt. Toxins in a crop are embodied in a seed, a seed is planted in the soil. Bt. Technology does not exist independent of the seed, and hence it is pure ideology to talk of Bt. Cotton as a technology independent of the seed and soil. The seed has been sold to farmers as a “magic bullet” at super profits. When Monsanto collects royalties as “trait value”, it collects from the rainfed farmer and the irrigated farmer, it collects from companies using different hybrids for introducing the Bt. Trait. It cannot own the trait to collect royalty, and disown it for the negative consequences of putting toxic genes into plants to create a toxic agriculture where farmers are pushed to commit suicide.

Just as the toxic papers brought Wall Street down, the toxic papers Monsanto sponsors to protect its interests will bring agriculture down. But unlike the bail out of banks, when the last seed is “terminated” and the last farmers is gone, there will be no bail out possible.

That is why we need to create GMO freedom now. And that also includes freedom from toxic papers that manipulate truth while farmers die.

From Seed Dictatorship

The Commodification of Food

Globalization of agriculture implies the corporate control of agriculture. The World Bank structural adjustment policies have allowed the entry of global seed corporations into India. The WTO – TRIPs Agreement is forcing countries to introduce monopolies on ownership of seed, either through patents or breeders rights. The WTO Agreement on Agriculture which forces countries to liberalized exports and imports, allows global corporations to take over control of domestic production, domestic markets and global trade.

The entire grain supply of the world is basically controlled by a handful of privately held companies: Cargill, Continental, ConAgra, Louis Dreyfus, Bunge, Carnac, Mitsui/Cook and Archer Daniels Midland. Cargill recently bought up Continental, the second biggest Grain Giant.

These Grain Giants are both the architects and beneficiaries of the globalization of agriculture. They control agriculture and food production, from seed to table, from farm to factory. They control the inputs farmers buy, and they control the markets to which farmers sell their produce. They determine the price at which farmers sell their produce. In the short run they lower prices to capture markets. In the long run such monopoly control will lead to high prices of food.

All around the world, food production has been transformed into a negative economy as farmers spend ever increasing amounts on purchasing inputs and receive decreasing prices for their produce. Low farm prices are more closely linked to monocultures

and monopolies. When all farmers grow only one commodity, there will of course be a supply of that one product. But this is a pseudo-surplus, not a real surplus. It is not the surplus left after nature's needs for ecological maintenance have been met, and also the farm's family needs for food and sustenance. The destruction of biodiversity in industrial agricultural systems means that all the functions that biodiversity could perform for the farmer at no cost has to be bought. Given the vertical integration of agriculture and food production, the same agribusiness corporations sell external inputs to the farmer and buy farmers' produce. In developed countries, only 15 per cent of the price of loaf bread goes to the farmer – the rest goes on milling, baking, packaging, transport and marketing. For agribusiness high production costs and low commodity prices translate into two way profits. For the farmer, they translate into a negative economy and spiraling debts.

Even though U.S. farm exports are booming, farmers cannot survive. More American farmers die of suicides than any other unnatural cause. As a group, farmers are likely to kill themselves at least three times as often as the general population.

The epidemic of farmers suicide has now reached India. Thousands of farmers have killed themselves because globalization of industrial agriculture has implied costly inputs and unpayable debts.

Argentinean farmers too fare facing a crisis, and 200,000 small and medium farmers went on a strike in October 2000 against a negative economy of high inputs costs and low commodity prices. Fuel prices are 300 percent higher than 10 years ago and agricultural commodity prices have collapsed by upto 50 percent over the past three years.

Farmers everywhere are being paid a fraction of what they received for the same commodity a decade ago. In the USA wheat prices at the farm dropped from \$5.75 a bushel to \$2.43, soya bean prices dropped from \$8.40 to \$4.2 and corn prices dropped from \$4.43 to \$1.72. In India, from 1999 to 2000, prices for coffee dropped from Rs. 60 to Rs. 18 per kg, and prices of oilseed declined by more than 30 per cent.

The Canadian National Farmers Union put it like this to the Senate in a report called *The Farm Crisis*, 18 February 2000:

While the farmers growing cereal grains – wheat, oats, corn – earn negative returns and are pushed close to bankruptcy, the companies that make breakfast cereals reap huge profits. In 1998 cereal companies Kellogg's, Quaker Oats, and General Mills enjoyed return on equity rates of 56 per cent and 22 per cent respectively. While a bushel of corn sold for less than \$4, a bushel of corn flakes sold for \$133. In 1998, the cereal companies were 186 to 740 times more profitable than the farms. May be farmers are making too little because others are taking too much.

A false logic is often established according to which industrial agriculture produces more food, and increased production leads to lower prices. When viewed in terms of total food output, industrial agriculture does not produce more nutrition, and low prices are connected to monopoly control, not to productivity.

The globalization of corporate agriculture is aggravating all the problems linked with the centralized system of food production and distribution. It is increasing chemical use, through conventional methods as well as genetic engineering. It is increasing transport and food miles, and fuelling food insecurity through climate change. It is promoting the mining of water and soil fertility by putting profitability above sustainability. It is giving primacy to trade and undermining domestic production. It is putting exports

above the food entitlements of domestic consumers. Trade liberalization and globalization is threatening the food rights of the Indian people and the survival of farmers and agriculture in many ways.

The emerging trends of globalization of agriculture show concentration of the ownership of the seed industry, introduction of intellectual property rights in agriculture and genetic engineering technologies in the hands of few big corporations. The consequence of such concentration will enhance the costs of production and displace small farmers while adding social and environmental costs to the existing economic and ecological degradations of the Green Revolution.

For couple of years farmers in the green revolution region are committing suicides, which highlight the increasing social costs. Thousands of cotton farmers committed suicide in Andhra Pradesh since 1997. When farmers commit suicide liberalizers propose free exports without thinking of how exports will lead to domestic shortages and rising food prices. When food prices rise, globalizers propose free imports without concern of how cheap imports can wipe out the livelihoods and food rights of millions of farmers.

The Agreement of Agriculture (AoA) is another example of external liberalization. Agriculture has never been part of GATT, which was introduced during Uruguay Round. The AoA has three sections:

- Export competition or export liberalization
- Market access or import liberalization
- Domestic support or reduction of domestic subsidies

In addition, the Agreement on Sanitary and Phyto Sanitary Measures as well as the Agreement on Trade Related Intellectual Property Rights (TRIPs) also affect agriculture and food security.

The WTO clauses on subsidies protect the subsidies of the rich and hence allow dumping of food grains and agricultural commodities on poor countries deepening their poverty and debt by undermining livelihoods and draining scarce foreign exchange.

It has been said that WTO's Agreement on Agriculture will abolish subsidies to the North. Contrary to this, northern subsidies have been doubled since the Uruguay Round instead of falling.

The Clinton Administration planned to use \$5.5 billion in export credits in 2000. Direct payments to farmers in the US have gone up to \$9 billion to \$15.3 billion.

The subsidies that an Indian farmer gets are passed from the government to the agricultural, seed and tractor industry. The subsidy or loan that the farmer gets to purchase these items is passed on directly to the manufacturer. Rather than actually getting a subsidy, the farmer pays interest (however low the rate is) on the money transferred from the government to the industry. In fact, this 'negative' subsidy for the Indian farmer totals to – 23.7 billion US dollars.

In contrast the subsidies that the US farmers get, allowed by the green box, have almost doubled from 1989 to 1995. Such subsidies in the US and the EU total to 353 billion US dollars today. For example, the US government pays \$193 per ton to US Soybean farmers, which is higher than the soy price at \$155 per ton. This artificially cheap soy is then imported with low import duties to destroy India's edible oil economy

displacing millions of farmers in oilseed production and millions of people whose livelihood depends on processing of edible oil.

The US subsidies are not touched by WTO. WTO & World Bank work in synergy to dismantle the support for Indian farmers, increasing costs of production and decreasing the price farmers receive for their produce, pushing them into debt and suicides.

While farmers' subsidies are declining, corporate subsidies are increasing. Therefore, the transnational corporations gain from both northern subsidies and southern subsidies under the WTO rules. Further, northern subsidies to agribusiness have not been touched. Since the WTO was established, the United States has expanded export credit and marketing promotion programs. Even IMF loans to Third World countries have been used for export subsidies to US agribusiness.

Biofuels

Industrial biofuels are being promoted as a source of renewable energy and as a means to reduce greenhouse gas emissions. However, there are two ecological reasons why converting crops like soy, corn and palm into liquid fuels can actually aggravate the CO₂ burden and worsen the climate crisis while also contributing to the erosion of biodiversity and the depletion of water resources.

SNO p. 80-82 David Pimental Water Supplies.

Movements for Food Democracy and Food Sovereignty

We are what we eat.

But what are we eating?

What are we growing on our farms? How are we growing it?

What impact does it have on our health and on the planet?

Food safety, food security and agriculture are intimately inter-related. How we grow our food and what we grow determines what we eat and who eats. It determines the quality and safety of our food. Yet food safety, food security and agriculture have been separated from each other. Food is being produced in ways that is robbing the majority of people of food, and those who are eating are eating bad food. One billion people on the planet are hungry. Another two billion are suffering from food related diseases such as obesity, diabetes and hypertension. Those who are not getting access to food are victims of the malnutrition related to being poor. Those who can buy food in the global supermarket are also victims of another kind of malnutrition, the malnutrition of the rich.

Third World countries are carrying a double burden of food related disease, hunger and obesity. The WHO / FAO have predicted that by the year 2020 it is projected that 70 percent of ischaemic heart disease deaths, 75 percent of stroke deaths, and 70 percent of diabetes deaths will occur in developing countries. These diseases, called non-communicable diseases, are directly linked to diet.

The Roots of Hunger

The world is producing enough food for all. However billions are being denied their right to food. The globalized industrialized food system is creating hunger in many ways.

Firstly, industrialized agriculture is based on destruction of small farmers. Uprooted and dispossessed peasants join the ranks of the hungry.

Secondly, industrialized agriculture is capital intensive. It is based on costly external inputs such as purchased and non-renewable seeds, synthetic fertilizers, pesticides, herbicides. Peasants get into debt to buy these inputs. To pay back debt they must sell all they grow, thus depriving themselves of food. If they cannot pay their debts they lose their land. And they are increasingly losing their lives. More than 150,000 farmers in India have committed suicide as costs of inputs have increased, and the price of their produce has fallen, thus trapping them into debt.

Malnutrition and hunger is also growing because farmers are being pushed into growing cash crops for exports.

The nature of agriculture, and the nature of food is being transformed. Agriculture, the care of the land, the culture of growing good food is being transformed into corporate, industrial activity. Food is being transformed from being a source of nutrition and sustenance into being a commodity. And as a commodity, it will first flow to factory farms and now cars. The poor will get the left over.

Factory farms are a negative food system. They consume more food than they produce. Industrial beef requires 10 kg of feed to produce 1 kg of food. Industrial pork requires 4.0-5.5 kg of feed to produce 1 kg of food. Factory farmed chicken requires 2.0-3.0 times more feed than it produces as food.

Industrial biofuels are putting a new pressure on food. Food prices in Mexico have doubled since corn, the staple for Mexican tortillas, is being increasingly used to make ethanol for fuel. Corn, soya, canola are all being diverted to feed cars while people starve.

Food Safety: Freedom from Hazards or Imposition of Industrial Uniformity?

Food safety is a growing concern with the industrialization and globalization of food. Food related diseases have spread.

As Tim Lang, Professor of Food Policy at City University, London reports:

incidence of food borne disease has in fact risen during the era of the productionist Paradigm. In West Germany cases of infections *S. Enteritidis* rose from 11 per 100,000 head of population in 1963 to 193 per 100,000 in 1999, in England and Wales formal notifications of the same disease rose from 14,253 cases in 1987 to 86,528 in 2000.

Food hazards have increased with industrialization of food production and processing. As Colin Tudge observes:

the modern food supply chain is convoluted and so long that it allows endless opportunities for malpractice of all kinds – including many that beggar the imagination of those who are not criminally inclined. The supply chain is impossible to police because it is so complex, and because policing is so expensive (and nobody wants to pick up the bill – certainly not the governments who win votes by keeping the price of food down). Sometimes though, it is not at all easy to draw a line between outright villainy (like the adding of contaminants) from the standard, legitimate practices of the modern food industry.

On a global scale, new diseases are emerging and more virulent forms of old diseases are growing as globalization spreads factory farming and industrial processing and agriculture. Disease epidemics and food hazards are the outcome of food production methods based on hazardous inputs and processes.

In the U.K., more than 2 million cattle were found to be infected with Bovine Spongiform Encephelopathy (BSE) – the mad cow disease. By August 2002, 133 people had died from variant Creutzfeldt-Jacob Disease (vCJD) – the human equivalent of BSE.

New strains of E. coli O157 have led to 75 million cases of food poisoning annually in the US, resulting in 325,000 hospitalizations and 5000 deaths.

The Swine fever in Asia led to the killing of millions of pigs. A newly emerged Nipah Strain killed 100 pig farm workers, infected 150 with non-fatal encephalitis and led to the slaughter of a million pigs to control the disease.

The Avian flu has already led to human deaths and the killing of millions of ducks and chickens. The first sightings of the H5N1 virus behind the Avian influenza came in November. The epidemic has spread to 10 countries. The disease has jumped from chickens to humans and killed eight people in Vietnam and Thailand. In 1997 the H5N1 Strain killed six people in Hong Kong.

Food production technologies have undergone two generations of changes over the last few decades. The first shift in food production technologies was the introduction of chemicals in agriculture under the banner of the Green Revolution. Toxic chemicals used in warfare were deployed in agriculture in times of peace as synthetic fertilizers and pesticides. Agriculture and food production became dependent on “Weapons of Mass Destruction”. The Bhopal disaster in which a leak from a pesticide plant killed thousands in 1984, and has killed nearly 30,000 since then is the most tragic reminder of how agriculture has become dependent on war technologies designed to kill.

Genetic Engineering will Introduce New Food Hazards

New traits of viral promoter, antibiotic resistance markers being introduced in GM foods need public approval and strict monitoring for safety.

Dr. Mae-Wan Ho in “Genetic Engineering: Dream or Nightmare? (1999) has identified the following risks to human health from genetically engineered foods.

- Toxic or allergenic effects due to transgene products or interactions of transgene with host genes.
- Vector-mediated spread of antibiotic resistance marker genes to gut bacteria and to pathogens.
- Vector-mediated spread of virulence among pathogens across species by horizontal gene-transfer and recombination.
- Potential for vector-mediated horizontal gene transfer and recombination to create new pathogenic bacteria and viruses.
- Potential of vector-mediated infected cells after ingestion of transgenic foods, to regenerate disease viruses, or for the vector to insert itself into the cell’s genome causing harmful or lethal effects including cancer.

While Toxic and GM foods need stricter laws, local, natural processing in small dhabas, small outlets cannot be subjected to industrial regulation, both because they are not a

source of toxic threat and because they are not centralized producers needing centralized regulation.

Whose Safety Rules? Whose Standards?

However, while food hazards grow, food safety laws are being shaped which deregulate large corporations and over-regulate the small scale self organized economy. Such industrial food safety standards promote large scale globalized production, and act against local foods. These laws are also the basis of the Sanitary and Phyto Sanitary Agreement of WTO.

Food safety is no longer defined as safe for health and good for nutrition. It is being defined industrially – as the size of produce, the capital investment in processing. This is a Cartesian definition and chemical definition of safety. It is creating uniformity and it is creating food hazards through chemical additives and industrial processing. It is destroying diversity, artisanal production and the real sources of good, healthy food – local and indigenous food systems.

Beyond Monocultures of the Mind

Humanity has eaten more than 80,000 edible plants through its evolution. More than 3000 have been used consistently. However, we now rely on just eight crops to provide 75 percent of the world's food. And with genetic engineering, production has narrowed down to three crops – Corn, Soya, Canola.

Monocultures are destroying biodiversity, our health, and the quality and diversity of food.

Monocultures have been promoted as an essential component of industrial isolation and globalization of agriculture. They are assumed to produce more food. However, all they produce is more control and profits – for Monsanto, Cargill and ADM. They create pseudo surpluses and real scarcity by destroying biodiversity, local food systems and food cultures.

In 1998, India's indigenous edible oil made from Mustard, Coconut, Sesame, Linseed, Groundnut processed in artisanal cold press mills were banned using "food safety" as an excuse.

The restrictions on import of soya oil were simultaneously removed. 10 million farmers livelihoods were threatened. One million oil mills in villages were closed. More than twenty farmers were killed while protesting against the dumping of soya on the Indian market, which was leading to fall in prices of domestic oil seed crops. And millions of tons of artificially cheap GMO soya oil continue to be dumped on India.

Women from the slums of Delhi came out in a movement to dump soya and bring back mustard oil "Sarson bachao, soyabean bhagao" (save the mustard, drive away the soyabean) was the women's call from the streets of Delhi. We did succeed in bringing back mustard through our "sarson satyagraha" (non cooperation with the ban on mustard oil).

I was recently in the Amazon, where the same companies that dumped soya on India – Cargill and ADM, are destroying the Amazon to grow soya. Millions of acres of the Amazon rainforest, the lung, the liver, the heart of the global climate system are being burnt, to grow soya for exports. Cargill has built an illegal port at Santaren in Para and

is driving the expansion of soya in the Amazon Rainforest. Armed gangs take over the forest and use slaves to cultivate soya. When people like Sister Dorothy Stang oppose the destruction of the forests and the violence against people, they are assassinated.

People in Brazil and India are being threatened to promote a monoculture that benefits agribusiness. People in U.S and Europe are threatened indirectly with 80 percent soya going to cattle feed to provide cheap meat. Cheap protein to feed factory-farmed animals is destroying both the Amazon Rainforest as well as people's health in rich countries. One billion people are without food because industrial monocultures robbed them of their livelihoods in agriculture and their food entitlements. Another 1.7 billion are suffering from obesity and food related diseases. Monocultures lead to malnutrition – for those who are under fed as well as those who are over fed.

Corporations are forcing us to eat untested food such as GMO's. Even soya, which is now in 60 percent of all processed food, was not eaten by any culture 50 years ago. It has high levels of Isoflavones and phyto-oestrogens which produce hormone imbalances in humans. Traditional fermentation as in the food cultures of China and Japan reduce the levels of isoflavones. The promotion of soya in food is a huge experiment promoted with US \$ 13 billion subsidies from the U.S Government between 1998 and 2004, and US \$ 80 million a year from the American Soya Industry. Nature, Culture and people's health are all being destroyed. Local food cultures have rich and diverse alternatives to soya. For protein we have thousands of varieties of beans and grain legumes – the pigeon pea, the chick pea, mung bean, urud bean, rice bean, azuli bean, moth bean, cow pea, peas, lentils, horse gram, faba bean, winged bean. For edible oils we have sesame, mustard, linseed, niger soffola, sunflower, groundnut.

In depending on monocultures, the food system is being made increasingly dependent on fossil fuels – for the synthetic fertilizers, for running the giant machinery, for the long distance transport, which adds “food miles”. With the spread of monocultures and the destruction of local farms, we are increasingly eating oil, not food threatening the planet and our health.

Moving beyond monocultures of the mind has become an imperative for repairing the food system. Biodiverse small farms have higher productivity and they generate higher incomes for farmers. And biodiverse diets provide more nutrition and better taste.

Bringing back biodiversity to our farms goes hand in hand with bringing back small farmers on the land. Corporate control thrives on monocultures. Citizen's food freedom depends on biodiversity. Human freedom and the freedom of other species are mutually reinforcing, not mutually exclusive.

The Not so Green Revolution

The so-called green revolution was neither green, nor revolutionary. It has dispossessed small peasants, pushed our rich agro biodiversity to extinction, mined our aquifers, desertified our soils and undermined our nutrition and health. It was supposed to create peace, but sowed the seeds of terrorism, extremism and violence in Punjab (Ref. V. Shiva, *Violence of the Green Revolution*). It was supposed to create prosperity, but it left farmers steeped in debt. Both in financial and ecological terms, industrial agriculture and chemical farming is based on a negative economy – it uses more inputs than it produces. The consequence is impoverished eco-systems and impoverished and indebted farmers.

The High Ecological Costs of Industrial / Chemical Agriculture

Humanity has farmed ecologically for 10,000 years. The last half century has been a short lived experiment with non-sustainable, chemical intensive, water intensive and capital intensive industrial agriculture. The five most important ecological costs of industrial farming are:

1. Destruction of biodiversity
2. Toxic pollution
3. Pollution and depletion of water resources
4. Erosion of soil and soil fertility
5. Emission of green house gases inducing climate change.

From Biodiversity to Monocultures

Industrial agriculture based on high external inputs of chemicals and water creates a push for uniformity and monoculture. This leads to erosion of biodiversity at three levels

- a. ecosystem level
- b. crop diversity
- c. varietal diversity

Each agroclimatic zone has evolved farming systems based on species adapted to it. Industrial agriculture destroys ecosystem and farming diversity. It also pushes crops to extinction. Thus rice and wheat monocultures have replaced diverse millets, pulses and oilseeds, often grown as mixtures and in rotation. Finally, industrial farming destroys diverse varieties of crops and replaces them with uniform varieties adapted to chemicals, not to ecosystems and climate.

The Real Green Revolution: Biodiverse Organic Farming

Industrial agriculture has been promoted, financed, subsidized in spite of its high negative environmental externalities. The argument used is that these ecological costs are a necessary part of increasing productivity. However, the productivity of industrial agriculture is actually negative. More resources are used as inputs than are produced as outputs. Usually labour productivity is of labour displacing machinery and chemicals are therefore, by definition, increasing “productivity”. However, labour is not the scarce input. Land and water are. If instead of labour, energy and natural resources and external inputs are taken into account, industrial agriculture does not have higher productivity compared to ecological alternatives. The shift from internal input to high external input agriculture reduces productivity from 20 to 0.33, a sixty six fold decrease in the productivity ratio over the last fifty years.

We need to make an ecological transition to produce more food using less resources.

This productivity analysis is based on a study comparing traditional polycultures with industrial monocultures shows that a polyculture system can produce 100 units of food from 5 units of inputs whereas an industrial system requires 300 units of input to produce the same 100 units. The 295 units of wasted inputs could have provided 5900 units of food. This is a recipe for starving people, not for feeding them.

A usual argument used in promoting industrial agriculture like the Green Revolution earlier and genetic engineering in agriculture now is that only industrial agriculture and industrial breeding can keep up increased food productivity for feeding a growing population. However, increased mouths to feed imply more efficient resource use so that the same resources can feed more people. Since resources, not labour, are the limiting actor in food production, it is resource productivity, not labour productivity, which is the relevant measure. A sixty-fold decrease of food producing capacity in the context of resource use is not an efficient strategy for using limited land, water and biodiversity to feed the world.

Not only is the measure of productivity of industrial agriculture partial because all inputs, including resource and energy inputs are not taken into accounts, it is also partial because not all outputs are taken into account.

Ecological agriculture is based on mixed and rotational cropping, and the production of a diversity of crops.

Biodiversity Organic Farms Produce More

Studies have shown that the common organic agricultural combination of lower input costs and favourable price premiums can offset and make organic farms equally or often more profitable than conventional farms. Hundreds of farmers in Andhra Pradesh who grew cottonseeds supplied by multinational companies, applying chemical fertilizers and pesticides, committed suicide because they could not control the pests. At the same time Tamilnadu farmers practising organic methods were able to get cotton yield of more than 15 quintals an acre (The Hindu, 2004). The studies showed that the average yield of sugarcane is 40 tonnes an acre in chemical farms as compared to 60-70 tonnes an acre in organic farms in the Erode District of Andhra Pradesh (The Hindu, 2004). Like wise other crops also record higher yields inorganic farming as compared to chemical farming.

A number of research studies have shown that organic farming ensures better yield and fetches more income. For instance, in 1998, a paper, "The Greening of the Green Revolution" (David Tilman, Nature 396), showed that not only were the yields of organic maize as high as those of maize grown with fertilizers and pesticides, but also the soil quality in the organic fields improved dramatically.

Field trials in Hertfordshire (United Kingdom) reported consistently higher yields in the case of wheat grown with manure than wheat grown with artificial nutrients.

Prof. Jules Pretty of Essex University ('Feeding the World', *SPLICE – A Genetic Research Magazine*, Volume 4, 1998) has shown how farmers in India, Kenya, Brazil, Guatemala and Honduras have doubled or tripled yields by switching to organic or semi-organic techniques.

Cuba, forced into organic farming by the economic blockade, has now adopted it as policy, having discovered that it improves both productivity and the quality of the crops ('Castro Topples Pesticides in Cuba', Renee Kjartan, *Washington Free Press*, August 2000).

Summary of Scale and Impacts of Certified and Non-certified Organic Projects and Initiatives

Country	Project	Number of farm households	Area under organic agriculture (ha)	Changes in productivity
1. Bolivia	Prodinpo integrated from development programme	2 000	1 000	Potato yields 4 to 10-15 t/ha
2. Brazil	AS-PTA alternative agriculture	15 000	60 000	Bean yields up 50-100%
3. Brazil	Agroecology in Zona da Mata	215	50	Coffee – nd
4. Cameroon	Macecoop organic coffee	600	300	Coffee – nd
5. Chile	CET organic vegetable gardens	10	5	Vegetables, 20-30kg/month
6. Cuba	Organic urban gardens	26 000	8 000	Total production up from 4000 to 700000 t/yr
7. Dominican	Plan Sierra soil conservation	2 000	1 000	Maize – nd Republic
8. Egypt	SEKEM biodynamic cotton	150	2 000	Cotton from 2.25 to 3.0/t ha
9. Ethiopia	FAO Freedom Hunger	2 300	2 150	Sweet potato yields up from 6 to 30 t/ha
10. Ethiopia	Cheha integrated rural development	12 500	5 000	Cereal yields up 60%
11. Guatemala	San Jose Poacil ADECCA	1 450	1 260	Mixed crops – nd
12. India	SPEECH, Tamil Nadu	500	409	New rice crop in dry season
13. Kenya	Manor House Agriculture Centre	70 000	7 000	Maize yields from 2.25 to 9 t/ha; new vegetable crops
14. Kenya	C-MAD programme	500	1 000	Maize from 2 t/ha to 4 t/ha
15. Kenya	Mumias Education for Empowerment project	2 069	217	Beans/groundnut yields from 300 to 600 kg/ha
16. Kenya	Push-pull pest management	300	150	Maize yields up 60%
17. Lesotho	Machobane farming systems	2 000	1 000	Whole system productivity improved
18. Malawi	Small-scale aquaculture	200	10	New fish crops
19. Mexico	ISMAM organic coffee	1 200	1 000	Coffee – nd
20. Mexico	UCIRI fair trade and organic coffee	4 800	5 000	Coffee yields from 300-600 kg/ha to 601-1200 kg/ha
21. Nepal	Community welfare and development	600	250	Maize and rice yields up citrus up from 1.2 to 1.6 t/ha
22. Nepal	Jajarkot permaculture	580	350	Maize and rice yields up Programme (nd), new vegetable crops
23. Pakistan	Sindh Rural Women's Uplift Group	5 000	2 500	Mango yields from 7.5 to 22.5 t/ha; citrus up from 12 to 30 t/ha
24. Senegal	Rodale Regenerative Agriculture Research Centre	2 000	2 000	Millet/sorghum yields from 0.34 to 0.6-1.0 t/ha
25. Senegal	ENDA organic cotton	523	233	Cotton yields – no change at 300 kg/ha
26. Tanzania	GTZ organic cotton	134	778	Cotton yields – no change at 300 kg/ha
27. Zimbabwe	Chivi Food Security Project	500	600	Sorghum/millet yields doubled; new vegetable crops
28. Zimbabwe	Silveira House	1 211	735	New vegetable crops
29. Zimbabwe	Zambezi Valley organic cotton	400	2 000	Cotton – nd
	Total	154 742	106 197	

Note: nd=no confirmed data on yields.

Mr. Balbeer Singh, a Navdanya member in Utircha who was amongst the first farmer converted to organic reduced the chemical inputs in his field as given in the table below:

Year	Urea / Bigha	DAP / Bigha	Potash / Bigha	Cow Dung Manure/Bigha
1994-1995	10 kg (100%)	10 kg (100%)	2 kg (100%)	2 qt (20%)
1995-1996	8 kg (80%)	8 kg (80%)	20%	3 qt (30%)
1996-1997	4 kg (40%)	4 kg (40%)	Nil	20 qt (100%)
1997-1998	Nil	Nil	Nil	40 qt (200%)
1998-1999	Nil	Nil	Nil	20 Qt (100%)

Source: Balbeer Singh, Village Utircha and Navdanya Records.

Yield analysis of his one big ha field was done continuously during his conversion period. Following table shows that how Mr. Balbeer Singh reduced the inputs, saved money and got better yield, which is now stable. He has more diversity in the field as well as of food.

Year	Wheat Yield / Bigha	Cost of Agrochemicals	Rice Yield / Bigha
1994-1995	1.60 qt.	100	1.8
1995-1996	1.08	68	0.90
1996-1997	0.98	32	0.92
1997-1998	1.8	Nil	2.00
1998-1999	2.2	Nil	2.50
2004-2005	2.5	Nil	3.0

Source: Balbeer Singh, Village Utircha, and Navdanya Records.

The yields of our farmers and their incomes have doubled and tripled by giving up the negative economy of chemical farming and shifting to biodiverse organic agriculture. The organic project in Madhya Pradesh has also led to increased yields as reported by Dr. G.S. Kaushal, Ex-Director, Agriculture of Madhya Pradesh, who spread organic farming in 21 districts for 11 crops using 12 treatments in the period 2001-2002.

Since organic farming produces more food and higher incomes for farmers there is absolutely no justification for not adopting it as the national policy to address the agrarian crisis threatening the livelihoods of our small farmers, two thirds of our population.

Organic agriculture does not merely produce more food at lower financial and ecological costs, it produces healthier, more nutritious, better quality food.

It has been demonstrated that organically produced foods have lower levels of pesticides and medicinal and hormonal residues and in many cases lower nitrate contents. Nitrates are significant contaminants of foods, generally associated with intensive use of nitrogen fertilizers. Studies that compared nitrate contents of organic and conventional products found significantly higher nitrates in conventional products. Quality after storage has been reported to be better in organic produce relative to chemical based produce after comparative tests.

According to an International report from Journal of Applied Nutrition, 1993, the organically grown food averaged 63 percent higher in Calcium, 78 percent higher in Chromium, 73 percent higher in Iron, 118 percent higher in Magnesium, 178 percent

higher in Molybdenum, 91 percent higher in Phosphorus, 125 percent higher in Potassium and 60 percent higher in Zinc. The organically raised food averaged 29 percent lower in mercury than chemically grown food.

Here are a few examples of the mineral that were found in higher levels in organic foods in different studies.

Nutrient	Property	% Nutrient found more in organic food
Iron	Required for blood haemoglobin formation	21% more in organic food
Phosphorus	Required for bone formation	14% more in organic food
Chromium	Its deficiency is associated with the onset of diabetes and atherosclerosis (hardening of arteries)	78% more in organic food
Selenium	Antioxidant that protects us from damage by environmental chemicals. It is also protective against cancers and heart diseases.	390% more in organic food
Calcium	Needed for stronger bones.	63% more in organic food
Boron	Works along with calcium to keep bones strong.	70% more in organic food
Magnesium	Reduces mortality from heart attacks, keeps muscles from spasming	138% more in organic food
<i>Heavy Metals</i>		
Aluminium	Aluminium has been found to be associated with Alzheimer's disease	40% less than that in commercial food
Lead	Lead can adversely affect children's IQ, can cause impaired neuro-behavioral development, decreased stature and growth	29% Lower than that in commercial food
Mercury	Mercury is associated with neurological damage, autism and Alzheimer's disease.	25% lower than that in commercial food
Cadmium	Cadmium has been linked to lung, prostate and testicular cancers.	
Tartrazine(the yellow food colouring E102)	Linked to allergic reactions, headaches, asthma, growth retardation and hyperactivity in children.	
<i>Vitamins levels</i>		
Vitamin C	Antioxidant	27% more
Vitamin E & Beta carotene	Antioxidant associated with a reduced incidence of coronary heart disease and some cancers.	10% to 50% more

Source: soilassociation.org, lookwayup.com, landofvos.com

The seed / chemical package of the not-so-green revolution is justified on the basis of higher productivity and higher incomes, which in turn are supposed to reduce hunger and poverty.

However, both in terms of productivity and incomes, for the small peasant in Asia and Africa, costly non-renewable seeds and costly chemicals create a negative economy, with farmers spending more on inputs than they can earn from the produce. This is

made worse by globalized free trade and dumping of subsidised products on markets of the South, which further lower prices, and rob farmers of incomes. Indebtedness and farmers suicides are rooted in this crisis of falling incomes due to rising costs and falling prices.

The solution to hunger and poverty is to increase food output per unit acre and reduce inputs. Biodiverse organic farming increase output per unit acre while reducing costs of inputs. Across Asia and Africa small organic farms based on biodiversity are producing more food than chemical monocultures.

Organic producers of wheat using native varieties are getting 6.2 tonnes per ha in Western U.P in India. Under all agro-climatic zones, biodiversity intensification increases output while reducing input costs.

Navdanya's member Rajender Singh of Village Pulinda in Uttaranchal is earning Rs. 90,000/- per ha growing diversity of 35 crops organically on his 0.5 bigha (1/10th of an acre) farm. Yogambar Singh is earning Rs. 69500/- per ha growing 13 crops. Chemicals are intolerant to diversity. They need monocultures.

In Uttaranchal, biodiverse farms give the farmers Rs. 24,000 per acre and yields of 14 quintal / acre. While monocultures give Rs. 6720 / acre and yields of 12 quintal / acre.

In Rajasthan, monoculture farms give 10 quintals / acre and Rs. 1805 as income while biodiverse give 11.9 quintal / acre and Rs. 5835 as income.

Navdanya member has obtained 6.3 tonnes of wheat from a hectare using native seed and ecological methods.

Biodiverse organic farming, based on indigenous crops, using participatory breeding, is the solution to hunger and poverty.

We need to promote biodiversity intensive agriculture, not chemically intensive agriculture as the Green Revolution model promotes. The Real Green Revolution based on biodiverse organic farming is already happening in the fields of farmers. These small-farmer centered, ecologically sustainable initiatives need scaling up to protect the environment, protect the land and livelihoods of small farmers, and produce more food.

Biodiverse organic small-scale farms are the solution to malnutrition and hunger. For the environment, public health and for our farmers livelihoods ecological agriculture is the real green revolution.

