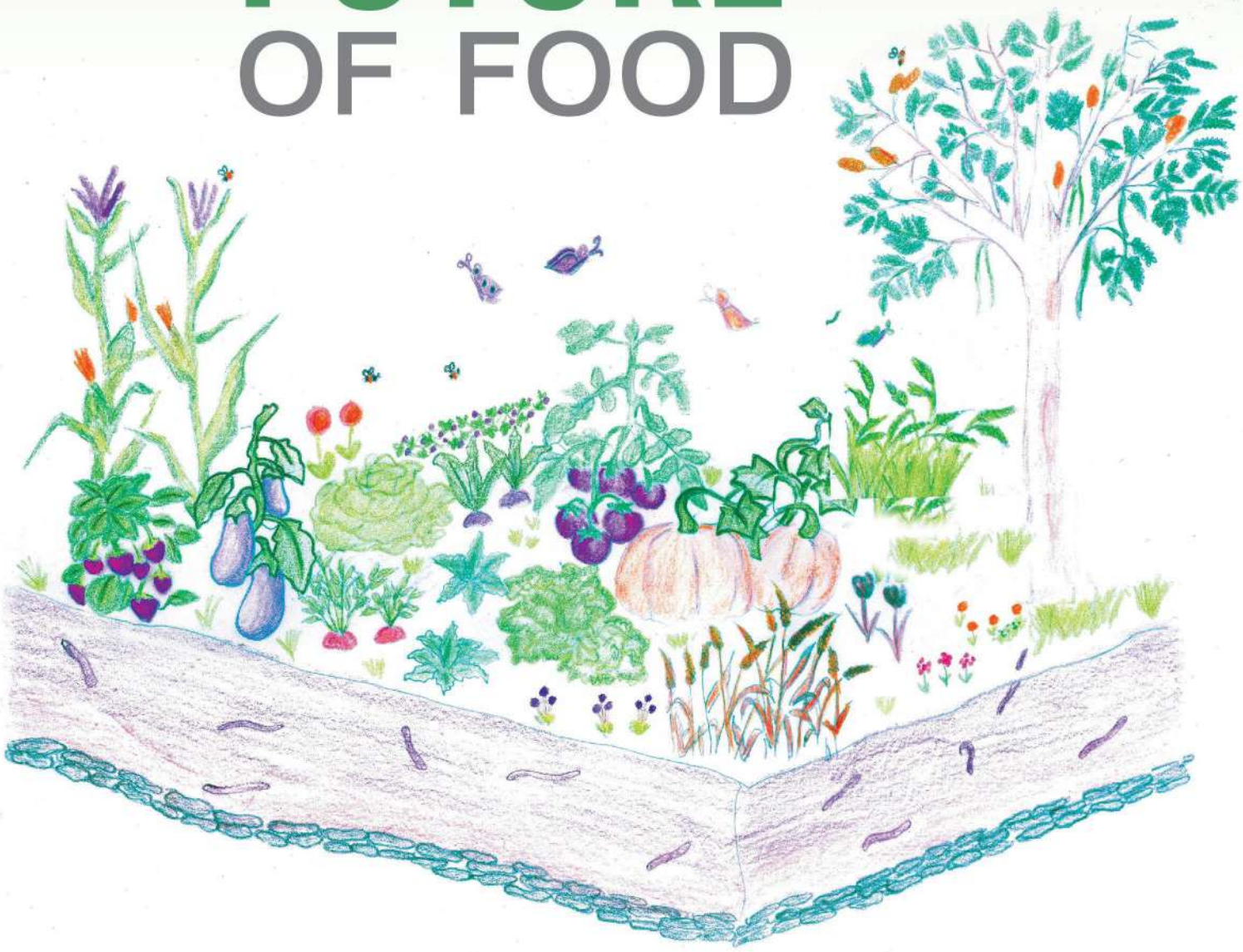
THE FUTURE OF FOOD



FARMING WITH NATURE, CULTIVATING THE FUTURE

Navdanya international

The Future of Food

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Farming with Nature, Cultivating the Future

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Which Future of Food and Farming will we Sow?

Vandana Shiva

There are two paths to the future of our food and farming.

The first path is made by walking with nature, co-creating and co-producing with sensitivity, intelligence and care with diverse species, the living earth and her complex web of life. This is the **path of life** which has sustained humanity in its diversity over millennia. Each community and culture have co-evolved its own distinctive path according to its climates, soils and biodiversity, and contributed to the diversity of food and farming systems. The diversity of cultures of food and agriculture are united through the common and perennial principles on which life is based.

The first is the principle of diversity. Nature does not work on the principle of sameness and uniformity. The natural world is a constant striving for diversity of expression. Cultural diversity of food and agriculture flows from nature's ways and her biodiversity. The monoculture of the mind and the imposition of uniformity on seeds, on farming, on diets is a product of the colonising mind and fossil fuel industrialisation. And it has led us to the sixth mass extinction with species being pushed to extinction at 1000 times the natural rate.

The second principle is the "law of return" or giving back in gratitude to maintain nature's ecological cycles of nutrients and water – nature's circular economies on which all life depends. Extractivism which grew with colonialism and the fossil fuel age have disrupted nature's ecological cycles, contributing to the ecological emergency, the crisis of desertification and the water crisis, and the crisis of hunger and poverty.

Sharing the earth's gifts in the commons is the third principle that flows from nature's laws. Since life is a web based on interconnectedness, no part of nature belongs to one species. Since food is the currency that weaves the web of life, food is a common good. In the paradigm based on nature's principles of how life works, food is not a commodity.

These principles have created food systems that have lasted over centuries because they walk the path of life as laid by nature.

Today these common principles practised by diverse schools of ecological agriculture - organic farming, permaculture, biodynamic farming, natural farming, are referred to as Agroecology[1].
This is the path to the future.

The second path is the industrial path based on fossil fuels and poisons. This path is **the path of death**. It goes against the principles of nature and life. It violates the principle of diversity and imposes monocultures and uniformity. It violates the principle of giving back and extracts from nature and farmers, disrupting ecological sustainability and social justice. It is the path to extinction and climate catastrophe, of destruction of small farms and

displacement of farmers, and the spread of hunger, malnutrition and chronic diseases.
All cultures of the world have been forced to walk this violent path with the false claim that it is the only way that we can "feed the world". The path of industrial agriculture has been paved by the Poison Cartel born during the war to create chemicals that kill. The Poison Cartel made millions in the economy of war and death in Hitler's Germany and after the war needed a way to continue making its enormous profits. So after WWII, they redeployed the chemicals into agrichemicals, producing fertilizers, pesticides, and herbicides, marketing them with the pretext that these agrichemical poisons are essential for the production of our food. In less than a century, industrial agriculture has eroded biodiversity, driven species to extinction, disrupted the planet's climate systems, desertified soils, and destroyed water systems.

According to the FAO, a billion people are permanently hungry in this system[2]. More than 2 billion suffer from food related diseases.

Contrary to the fallacy that small farmers and their agroecological systems are unproductive and therefore are dispensable, thus leaving our food future in the hands of the Poison Cartel, small farmers are providing 70% of global food using just 30% of the resources that go into agriculture[3]. In direct contrast, industrial agriculture is using 70% of the resources while providing only 30% of our food. This commodity-based fossil fuel intensive and chemical intensive agriculture has contributed 50% of the greenhouse gas emissions that are causing climate havoc, threatening agriculture[4] It has caused 75% of the destruction of soils[5], 75% of the destruction of water resources, and pollution of our lakes, rivers and oceans. It has pushed 93% of crop diversity to extinction. Additionally, intensive industrial agriculture is also creating a health crisis through the production of nutritionally empty toxic commodities and contributes to 75% of food related chronic diseases.

This path of food and farming leads to a barren, dead planet, spreading poisons and chemical monocultures across continents: Farmers committing suicide due to debt; children dying for lack of food; people dying because of chronic diseases as a result of toxic commodities, devoid of nutrition, sold as food. And climate havoc wiping out conditions for human life on earth.

Organic farming takes excess carbon dioxide from the atmosphere, where it doesn't belong, and through photosynthesis puts it back in the soil, where it does belong. It also increases the water holding capacity of soil, contributing to resilience in times of droughts, floods and other climate extremes.

Chemical agriculture does not return organic matter and fertility to the soil, essential for maintaining nature's life cycle. Instead it contributes to desertification and land degradation. It also demands more water since it destroys the soil's natural water-holding capacity. Industrial food systems have destroyed the biodiversity of the planet both through the spread of monocultures, and through the use of toxics and poisons which are killing bees, butterflies, insects, birds, leading to the sixth mass extinction[6].

Poison Cartel.Toxic Capital.

The Vanguard Group, Inc.
Norges Bank Investment Management
Northern Cross LLC
Jupiter Asset Management Ltd.
Fidelity Management & Research Co.
UBS AG (Investment Management)
Artisan Partners LP
Credit Suisse AG
Capital Research & Management Co. (World Investors)
Syngenta AG

The Vanguard Group, Inc.
Norges Bank Investment Management
Northern Cross LLC
Fidelity Management & Research Co.
Capital Research & Management Co. (Global Investors)
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UBS AG (Investment Management)
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Capital Research & Management Co. (World Investors)
The Vanguard Group, Inc.
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Wellington Management Co. LLP
Northern Trust Investments, Inc.
Capital Research & Management Co. (International Investors)
Franklin Advisers, Inc.

Capital Research & Management Co. (Global Investors)
The Vanguard Group, Inc.
SSgA Funds Management, Inc.
BlackRock Fund Advisors
Massachusetts Financial Services Co.
Glenview Capital Management LLC
Fidelity Management & Research Co.
Sands Capital Management LLC
PRIMECAP Management Co.
Davis Selected Advisers LP

Monsanto

MONOPOLY

NAVDANYA

The industrial agriculture and toxic food model is being promoted as the only answer to economic and food security despite the fact biodiversity-intensive and poison-free agriculture has clearly been shown to produce more nutrition per acre and at the same time regenerates the planet. It shows the path to "Zero Hunger"[7] in times of climate change.

Yet, as industrial agriculture brings the planet and our economies to collapse, it is re-inventing and re-investing its future based on "fake farming and fake food" with chemicals and GMOs, and Big Data based on surveillance drones and spyware as we describe below. Farming without farmers, farming without biodiversity, farming without soil is the vision of those who have already brought us to the brink of catastrophe[8].

But we are sowing the seeds of another future ...

All over the world, small farmers and gardeners are already implementing biodiversity-based, chemical free, organic agriculture, practicing agroecology, preserving and developing their soils, their seeds. They are feeding their communities with healthy and nutritious food while rejuvenating the soil and the planet.

They are thus sowing the seeds of food democracy – a food system in the hands of farmers and consumers, devoid of corporate control, poisons, food miles and plastics. A food system that nourishes the planet and all humans.

We cannot address climate change, and its very real consequences, without recognizing the central role of the industrial and globalised food system, which contributes more than 50% to greenhouse gas emissions through deforestation, animals in concentrated animal feeding operations (CAFOs), plastics and aluminium packaging, long distance transport and food waste.

We cannot solve climate change without small scale, ecological agriculture, based on biodiversity – living seeds and living soils and local food systems.

What we eat, how we grow the food we eat, how we distribute it will determine whether humanity survives or pushes itself and other species to extinction.

Real Farming is based on care for the earth by real farmers who produce real food

Agriculture is care for the land. It is born of the culture of caring. At the heart of real farming is care for the soil and biodiversity.

The English word 'agriculture' comes from a combination of the Latin words agrum (form of "ager", meaning "field, farm, land, estate") and cultura ("care", "growing", "cultivation"), and later agricultura (agriculture, farming): "agriculture' *(eng),* the art or science of cultivating the ground, including the harvesting of crops, and the rearing and management of livestock".

Real farming is farming with nature, in nature's ways, which are the laws of ecology. It leads to the rejuvenation of the planet through rejuvenation of biodiversity, soils, water; a rejuvenation of small farms, real farms with real farmers who care for the land , who care for life, who care for the future and produce diverse, healthy, fresh, ecological real food for all. Real food is a by-product of this economy of care. It protects the life of all beings on earth and also nourishes our health and wellbeing.

The ontology and ecology of Real Food

Food is not a commodity, it is not "stuff" put together mechanically and artificially in labs and factories. Food is life. Food holds the contributions of all beings that make the food web, and it holds the potential of maintaining and regenerating the web of life. Food also holds the potential for health and disease, depending on how it is grown and processed. Food is therefore the living currency of the web of life.

Ecological, real, good food is the basis of health. Industrial, fake, bad food is the basis of disease.

Industrial food systems have reduced food to a commodity, to some 'thing' that can then be constituted in the lab. In the process, both the planet's health and our health are being destroyed.

Three stages of Fake Farming of Industrial Agriculture: Chemicals, GMOs, and Big Data

Despite the documented failures of Industrial Agriculture, it continues to reinvent and reinvest in its future based on "fake farming and fake food" first with chemicals, then with GMOs and most recently with Big Data based on surveillance drones and spyware

1. Fake Soil Fertility: Chemical fertilizers - the disruption of the nutrient cycle and degradation of soils

Living Soil is a complex food web, teaming with earthworms, bacteria, fungi.

A Danish study analysed a cubic meter of natural soil and found 5,000 small earthworms, 50,000 insects and mites, and 12 million roundworms. A gram of the soil contained 30,000 protozoa, 50,000 algae, 400,000 fungi and billions of individual bacteria. It is this amazing biodiversity that maintains, rejuvenates soil fertility, and supports agriculture.

The living soil was forgotten for an entire century with very high costs to nature and society. Soil was defined as an "empty container" for pouring synthetic fertilisers into, which were falsely seen as the source of soil fertility. "Bread from air" was the slogan after the discovery of the Haber Bosch process for fixing atmospheric nitrogen by burning fossil fuels. The illusion grew that we did not need soil.

There was the exaggerated claim that artificial fertilizers would increase food production and remove all ecological limits that land puts on agriculture. Today the evidence is growing that artificial fertilizers have reduced soil fertility and food production and contributed to desertification, water scarcity and climate change. They have created dead zones in the oceans.

Explosives that were made by burning fossil fuels at high temperature to fix atmospheric nitrogen were later used to make chemical fertilizers.

Justus von Liebig was the father of organic chemistry, the first scientist to explain the role of nitrogen in plants, which was quickly appropriated by greed for commerce. A new industry was created for external inputs of nitrogen, dubbed as "growth stimulants". Outraged at the distortion of his scientific findings, in 1861 wrote a book," The Search for Agricultural Recycling".

Liebig's book was the voice of a true scientist, protecting his truth from distortions of a pseudo-science being created by commercial interests. As he writes "I thought it would be enough to just announce and spread the truth as is customary in science. I finally came to understand that this wasn't right, and the

alters of lies must be destroyed if we wish to give truth a fair chance." The truth that Liebig was defending was that the soil is living, and its life depends on recycling, or what Sir Albert Howard later called "The Law of Return" in his "Agricultural Testament" nearly half a century later. The lie he wanted to destroy was what he called the "chemical hocus pocus", that you can keep extracting nutrients from the soil, giving nothing back, and have "high yields".

He questioned the false metric of "yield" which merely measures the weight of the nutritionally empty commodity that leaves the farm. It is a measure of farming as an extractive industry, not real farming. It is an illusionary measure that displaced biodiversity for monocultures of commodities based on chemical inputs. It does not count the total biodiverse output, nor the total costs of inputs, nor the state of the soil and the farm. "Yield" as a construct to promote fake farming based on chemical fertilisers, artificially projects the reduction of nutrition per acre as increase in food production. The metric of biodiversity intensity and nutrition per acre evolved on the Navdanya Farm reflects the contributions and output of real farming against the costs of fake farming with fake external inputs.
As Liebig stresses, what matters is care of the land, not 'yield of harvest', as well as the state in which the field is left. Chemical fertilisers leave the field in worse health, destroy the true productivity, and hence food productivity.

The manufacture of synthetic fertilizer is highly energy intensive. One kilogram of nitrogen fertilizer requires the energy equivalent of 2 litres of diesel. Energy used in manufacturing fertilizer was equivalent to 191 billion litres of diesel in 2000 and is projected to rise to 277 billion in 2030. This major contributor to climate change is largely ignored. On the other hand, one kilogram of phosphate fertilizer requires half a litre of diesel[9].

Since synthetic fertilizers are fossil fuel based, they not only contribute to the disruption of the carbon cycle, but they also disrupt the nitrogen cycle. And they disrupt the hydrological cycle, both because chemical agriculture needs ten times more water to produce the same amount of food than organic farming, and it also pollutes the water in rivers and oceans.

Returning organic matter to the soil builds up soil nitrogen. A Navdanya study recently showed that organic farming increased nitrogen content of soil between 44-144 %, depending on the crops[10].

Fertilizer response has dramatically reduced: over a period of thirty years, from 13.4 kg grain/kg nutrient in 1970 to 3.7 kg grain / kg nutrient in 2005 in irrigated areas *(Sharma and Sharma 2009),* while in 1970, only 54 kg NPK / ha was required to produce around 2 t /ha and some 218 kg NPK/ha was used in 2005 to sustain the same yield (*Biswas and Sharma 2008).*

Farming according to nature's law of return is the only way to farm sustainably, with permanence.

Fake farming is theft of fertility and nutrients from the soil. Synthetic fertilisers have contributed to the death and desertification of soils, climate change, and dead zones in the oceans.

Not only is obeying nature's law vital to maintain the life of the soil, it is also vital for our health.
This is true agriculture.
This is farming with integrity.
It is Real Farming.
And it produces Real Food for the web of life.

2. GMOs as Fake Seed

Seed, uncontaminated seed, *Bija, Seme, semilla,* is the source of life, of regeneration and abundance. Seed renews and multiples.

After the Green Revolution was imposed on the Third World in the 1960s, we were told that without chemicals and GMOs - the "miracle seeds" of the Green Revolution - millions would continue to starve. Seeds of "dwarf varieties" were bred to withstand high doses of fertilizers. These were falsely named "High Yielding Varieties" (HYVs) when they were merely "High Response Varieties" that responded to chemicals as the UN Research Institute for Social Development (UNRISD) pointed out. The illusion of HYVs replaced the diversity of indigenous seeds bred for nutrition, taste and resilience. The Green Revolution failed because it destroyed soil, water and biodiversity, nature's capital on which food production depends. Hunger was not eliminated.

In the 1990s we were again told we would starve without GMOs, brought to us by the same Poison Cartel that had introduced chemicals which today continue to poison. GMOs have increased the use of toxic chemicals like Roundup and added new risks of their own. Furthermore, the exaggerated claim was spread that GMOs would remove all limits of the environment, grow food in deserts and toxic dumps. The real reason GMO's were introduced was to create patents on seeds based on invention. Navdanya is a movement that has from the start resisted the lie that seed can be claimed to be an invention of Monsanto or any other multinational agribusiness company.

GMO seeds are "fake" either through legal instruments like patents, or through biological methods which transform them from a renewable, self-organised living system that farmers have been freely saving and sharing down the ages, into a non-renewable, genetically engineered, patented commodity which cannot be saved or shared by farmers, thereby robbing them of their right to self-sufficiency.

Today there are only two GMO applications: herbicide resistance and Bt toxins in crops. The first was claimed to control weeds but has instead created super-weeds. Bt crops were supposed to control pests but have instead created new pests and super-pests. Furthermore, both applications have increased the use of toxic chemicals and water and pushed thousands of Indian, and other farmers to suicide because of debt through failed crops.

Roundup Ready GMOs have led to an explosion of the use of Roundup, today a known carcinogen as well as of cancer and chronic disease, including kidney failure and destruction of gut bacteria, and negatively affecting neurological functions of the brain.

This is clearly a disease producing system, and clearly not one that produces healthy and nutritious food.

3 -Third stage: Big Data - the Poison Cartel's future of Farming without farmers, Farming without care, Farming without knowledge

Having started with chemicals and GMOs, the Poison Cartel is now pushing the world to the next step of fake farming: farming without farmers, without nature's and farmers' intelligence. We are now being told 'Big Data' will feed us - the latest industrial input of fake farming.

They call it 'Digital Agriculture' based on Big Data and Artificial Intelligence. Talk of 'farming without farmers' is increasingly heard and it is why the suicide epidemic of Indian farmers is drawing no response.

In 2013 Monsanto acquired the world's largest climate data corporation Climate Corporation for $1 billion. In 2014 it acquired the world's largest soil data corporation, Solum Inc. Thus, farming becomes increasingly robotic and mechanistic, increasingly disconnected from the living intelligence and innate generosity of the earth: "Monsanto is implementing a program this year in the Midwest to deliver IntelliScanSM field guides and IntelliSeedSM[11] custom planting recommendations to farmers. This is the first phase of Monsanto Prescriptive Ag Solutions, a program with the vision of providing growers increased confidence in seed choice and the best placement and plant populations for their farm".[12]

But data is not knowledge. It does not give insights into how the solution to climate change lies in the soil nor how the rich soil food web is composed of bacteria, fungi, and earth worms essential for soil fertility. It is just another commodity to make the farmer more dependent and less connected to the earth, outsourcing his or her mind to big agribusiness, steadily moving towards a dead-end future that ignores the intelligence of seeds, plants, soil organism, our gut bacteria, of farmers, and the knowledge accumulated and handed down from generation to generation[13].

Data collection through machines can generate wrong data such as was the case in 2010 when "Monsanto began crunching 15 years of data using algorithms to adapt its GM maize varieties to each season's predicted diseases. Then one year the algorithm neglected to include the Goss's wilt disease in its plant breeding calculations, leading to significant crop losses; John Deere's Blue River subsidiary's robots' 'see and spray' technology, based on 100,000 digital photos taken by their robots, hosed down healthy cotton plants and spared the weeds with disastrous consequences".[14]

Just as first chemicals and then GMOs have failed, so too digital agriculture is already heading for failure. Evolution is taking place all the time. Living systems are not machines and mechanical, artificial intelligence is partial and fallible in the living, complex, evolving world of self-organisation and interconnectedness.

Fake Food, Fake Meat: Big Food's Desperate Attempt to Further the Industrialisation of Food

The repeated failures of each stage of industrial agriculture's fake farming has led to a new mediatic spin and a new industry of Fake Food – the false claim that fake food is better for the health of the planet and people.

The explosion of chronic diseases with the increase in industrial food production and processing has already shown that Faking Food is neither good for people, nor good for the planet[15].
Fake Food, including Fake Meat, is a product of fake farming, hence bad for the planet.

Fake Food needs Fake Farming and Fake Farming produces its next Fake Food commodity.
As Bob Reiter, Bayer's head of research and development said in reference to plant-based meat companies. "They are sourcing different types of crops, and that also could create opportunity for us, being a company that is a plant-breeding company". [16]

Even as more and more people are shifting to agroecology and organic food as farmers and eaters, and more and more communities are creating local, ecological, systems based on diversity, the Poison Cartel is hoping Fake Food will create new markets for Fake Farming and so push us further down the dead-end path.

The EAT-Lancet Report: A proposal to continue the harm to the health of the planet and people

Source: https://eatforum.org/initiatives/fresh/

The Eat Forum recently released the 'Eat-Lancet Report', that tried to impose a monoculture diet of chemically grown, hyper industrially processed food on the world, claiming that a "healthy and sustainable (plant-based) diet" protects the health of the planet and of people, completely ignoring the glaring chronic disease epidemic related to pesticides and toxics in growing and processing food imposed by chemically intensive industrial agriculture and food systems. By not addressing this key reality, the Report is actually promoting a diet of hyper-industrially grown and processed food based on monocultures and chemicals.

In writing the report, EAT Forum partnered with FRESH of the junk food industry and Big Ag, including Bayer, BASF, Cargill, Yara, Pepsico among others:

Bayer became the biggest GMO seed and agrochemical company after it merged with Monsanto, and Yara is the biggest chemical fertliser corporation in the world. Thus, we could call the report "the Poison Cartel diet" - where *real* health and sustainability are two alien concepts to its authors and promoters.

FRESH with the Poison Cartel have together contributed to 50% greenhouse gases leading to climate change, and to 75 % of the chronic disease epidemic related to chemicals in food, loss in diversity in the diet, industrially processed and junk food, and fake food. From feeding the world with Fake Farming, the rhetoric has shifted to Saving the Planet and people's health through Fake Food.

The report can be seen as an advertisement for industrial food and fake food, with the fig leaf of "plant-based diet".

The use of synthetic fossil-fuel-based nitrogen fertilisers is a major contributor to the climate crisis, dead zones, and the death of soils. Instead of recognising the role of organic farming and agroecology for providing sustainable ways for repairing the broken nitrogen cycle, the Eat report recommends "redistribution of global use of nitrogen and phosphorus" which in effect is saying chemicals should continue to be spread in the Third World. This is what the GATES foundation/AGRA are also doing.[17]

The report is a desperate but failed attempt at "sustaining" the agrichemical industry through unscientific promotion of "Sustainable intensification".
It reinforces Bayer and the Poison Cartel's focus on "yield" which, as previously

mentioned, is simply a measure evolved for industrial agriculture based on chemicals to produce nutritionally empty toxic commodities.

In effect the report is recommending the destruction of the biodiverse small farms that provide 80% of the food we eat when it states that "The current global food system requires a new agricultural revolution that is based on sustainable intensification and driven by sustainability and system innovation. This would entail at least a 75% reduction of yield gaps on current cropland, radical improvements in fertilizer use".

The report deliberately tries to divert attention from chemical free agriculture and agroecology which provide Real Food through Real Farming and are recognised as the food paradigm for the future. Organic farming and Regenerative Agriculture are the proven paths for rebuilding soil health.

The most significant scientific understanding in recent years is the harm to health from industrially processed food. The report makes unscientific claims on fats. Solvent extraction of vegetable oils with hexane has been established as unhealthy. The report says diets should be based on unsaturated fats. However hydrogenated vegetable oils become trans-fats which account for most fats used in industrial foods. These have been identified as a major health problem. Trans-fats help increase the shelf life of processed food and allow processed food to stay solid at room temperature. According to a 2012 study published in the Annals of Internal Medicine, a mere forty calories per day increase in trans-fats increases the risks of heart disease by 23%. The Centre of Disease Control has also attributed heart attacks to trans-fats. Healthy saturated fats like "ghee" recommended in Ayurveda is unscientifically declared "unhealthy". Trans-fats are not even mentioned in the report.

Six months prior to the release of the Eat report, Navdanya International released a **Manifesto on Food for Health** written by leading health experts and ecologists which identified toxics as the leading cause for the disease epidemic.[18]

Toxics is the elephant in the planetary and human health room that the Eat report is totally silent on. More than a century after Silent Spring, more than 34 years after the Bhopal genocide, a year after the UN rapporteur on food put out her report on pesticides[19], a few months after the Johnson trial firmly established that Roundup is a carcinogen, the report fails to mention that toxics are driving species to extinction and have led to an epidemic of cancers, neurological problems, endocrine disruption, and infertility.

Those who have contributed to the planetary collapse and collapse of our wellbeing have now joined hands to force feed us **hyper industrial toxic diets** in the name of protecting our health and saving the planet.

We can feed the world and protect the planet by getting rid of fossil fuels and chemicals.
The EAT report is a recipe for Sustaining the Non-sustainable industrial food system, and not for Regenerating the Health of the Planet or People. It violates the fundamental tenets and principles of Diversity and Democracy on which both freedom and sustainability rest.

Impossible Burger made of GMO soya is a threat to the environment and unsafe for the eater

In a recent article "How our commitment to consumers and our planet led us to use GM soy"[20] Pat Brown, CEO & Founder of Impossible Foods states that: "We sought the safest and most environmentally responsible option that would allow us to scale our production and provide the

Impossible Burger to consumers at a reasonable cost".

Source: *https://www.cnet.com/news/where-to-buy-the-impossible-burger-2-0-fast-food-and-chain-restaurants/*

But Roundup-sprayed GMO soya has already caused massive ecological devastation as well as chronic worldwide health problems.

Monsanto's glyphosate-based Roundup herbicide was first classified to be a class C carcinogen by the EPA in 1985 though this did not stop its continued widespread use throughout the world. More recently in 2015, the WHO's International Agency on Cancer Research's study showed that Glyphosate, the main active ingredient in Roundup, is probably carcinogenic to humans (Group 2A)[21]. Despite this and an intense campaign[22] [23]to stop the renewal of this most widely used herbicide all over the world, the European Commission nonetheless granted the behemoth another 5 years extension for its use.

The WHO study has led to a spate of lawsuits against Monsanto and Bayer, after the German pharmaceutical behemoth bought Monsanto in 2018. All brought by people who through the use of Roundup have developed cancer. Courts have ruled in favour of the first three plaintiffs[24] [25] [26] with millions of dollars in awards, and there are some eighteen thousand other plaintiffs waiting in line. [27]

The "Impossible Burger", based on vast monocultures of GMO, Roundup-sprayed soya cannot be considered a "safe" option, both for its high levels of glyphosate and for its effect on our gut microbiome. As Zen Honeycutt of Moms across America states: "The levels of glyphosate detected in the Impossible Burger by Health Research Institute Laboratories were 11 times higher than the Beyond Meat Burger. This new product is being marketed as a solution for "healthy" eating, when in fact 11 ppb of glyphosate herbicide consumption can be highly dangerous". [28]

Furthermore, Roundup residues disrupt the all-important biological pathway in our gut bacteria, the shikimate pathway, on which we depend to supply essential nutrients if they are deficient in our food.

The foundations of India's ecological civilisation is based on Diversity. The nutritious uncultivated edibles like Bathua (Chenopodium album) and Chaulai (Amaranth), medicinal plants such as Bhuiamla (Phyllanthus Niruri) which heals the liver and is a cure for jaundice and hepatitis, and grass for our animals. All scientific literature shows that biodiversity and mixed cropping has a higher "land equivalence ratio" and that we get more output of produce

per acre when we mix crops than when we grow monocultures. Navdanya's metric of nutrition per acre measures Biodiversity Based Productivity, rather than the reductionist "yield" of one commodity from a chemically based monoculture.

Biodiverse mixed cropping is the principle Sir Albert Howard learnt from Indian farming and spread across the world as Organic Farming. As he writes in his Agricultural Testament: "*Mixed crops are the rule. In this respect the cultivators of the Orient have followed Nature's method as seen in the primeval forest. Mixed cropping is perhaps most universal when the cereal crop is the main constituent. (Crops like millets, wheat, barley, and maize are mixed with an appropriate subsidiary pulse, sometimes a species that ripens much later than the cereal. The pigeon pea (Cajanus indicus Spreng.), perhaps the most important leguminous crop of the Gangetic alluvium, is grown either with millets or with maize). The mixing of cereals and pulses appears to help both crops*".[29] As our report "Health Per Acre" has shown, by conserving biodiversity we can feed two India's.[30]

Roundup is not just a broad-spectrum weedicide. It is a broad-spectrum biocide that kills beneficial insects like pollinators, and soil organisms. Given that 90% of the monarch butterflies have disappeared due to Roundup Ready Crops, and we are living through what scientists have called an "insectageddon" [31], using GMO soya is hardly an "environmentally responsible option".

Roundup Ready crops which have led to an increase of 1,500% in Roundup spraying in the USA, failed in their primary objective of weed control. Weeds have evolved resistance to Roundup and have become "superweeds" now requiring more and more lethal herbicides. Beneficial plants like amaranth have turned into superweeds, Bill Gates and DARPA are even calling for the use of gene drives to exterminate amaranth, a sacred and nutritious food in India, since the Palmer Amaranth has become a superweed in the Roundup Ready soya fields of the USA.

Thus, gene drives have become BigAg's latest tool not only in the war against biodiversity – but also in the extermination of the superweeds they themselves have created[32].

For Monsanto's militaristic, anti-nature mind, biodiversity is a problem: monocultures are fundamental to its profit-at-all-costs policies. And so, biodiversity must be exterminated with their number one toxic herbicide product, Glyphosate. Crops must be genetically engineered to resist glyphosate, so the Genetically Modified Organism survives and everything else dies.

By destroying sources of food and fodder, medicine and organic matter, Monsanto steals the livelihoods of millions. Promoting GMO soya 'plant-based meat' as 'fake and healthy meat" is misleading the eater both in terms of the ontology of the burger and more importantly on claims of its safety.

It also steals our health and our future.

Big Food, Big Ag and Big Money are driving the Fake Food Goldrush

The Poison Cartel, Big Food and Big Money are investing millions in the Fake Food Industry to support the mass proliferation of fake food products such as eggs, dairy and meat. [33] [34]

Indeed, the promotion of fake foods seems to have more to do with giving new life to the failing GMO agriculture and Junk Food Industry, and the threat from the rising of consciousness and awareness everywhere that organic, local, fresh food is real food which regenerates the planet and our health. In consequence, investment in "plant-based food companies" has soared from near 0 in 2009 to $600m by 2018[35]. And these companies are looking for more.

Among the new players pushing the Fake Food agenda are Companies including Beyond Meat (BYND.O)[36] and Impossible Foods, and even traditional meat producers including Tyson Foods Inc (TSN.N)[37], Maple Leaf Foods Inc (MFI.TO)[38] and Perdue Farms

Pat Brown of Impossible Foods declares, "If there's one thing that we know, it's that when an ancient unimprovable technology counters a better technology that is continuously improvable, it's just a matter of time before the game is over." He added, "I think our investors see this as a $3 trillion opportunity."
This is about profits and control. He, and those jumping on the Fake Food Goldrush, have no discernible knowledge, consciousness about, or compassion for living beings, the web of life, nor the role of living food in weaving that web or in our health.

Their sudden awakening to "plant based diets", including GMO soya, is an ontological violation of food as a living system that connects us to the ecosystem and other beings, and indicates ignorance of the diversity of cultures that have always used a diversity of plants in their diets.

Ecological sciences have been based on the recognition of the interconnections and interrelatedness between humans and nature, between diverse organisms, and within all living systems, including the human body. Ecological sciences have thus evolved as an ecological and a systems science, not a fragmented and reductionist one. Diets have evolved according to climates and the local biodiversity the climate allows. The biodiversity of the soil, of the plants and our gut microbiome is one continuum. In Indian civilisation, technologies are tools. Tools need to be assessed on ethical, social and ecological criteria. Tools/ technologies have never been viewed as self-referential. They have been assessed in the context of contributing to the wellbeing of all.

Through fake food, evolution, biodiversity, and the web of life are being redefined as an "ancient unimprovable technology", ignorant of the sophisticated knowledges that have evolved in diverse agricultural and food cultures, in diverse climate and ecosystems to sustain and renew the biodiversity, the ecosystems, the health of people and the planet.
Fake food is thus building on a century and a half of food imperialism and food colonisation of our diverse food knowledges and food cultures.

We need to decolonise our food cultures and our minds of Food imperialism

"Fake Food" is just the latest step in a history of food imperialism, dismissive of the knowledge and cultures it has colonized.

While Indian peasants knew that pulses fix nitrogen, the west was industrialising agriculture based on synthetic nitrogen which contributes to greenhouse gases, dead zones in the ocean, and dead soils. While we ate a diversity of "dals" in our daily "dal roti" the British colonisers, who had no idea of the richness of the nutrition of pulses, reduced them to animal food. Chana became chickpea, gahat became horse gram, tur became pigeon pea.

When GMO soya oil started to be dumped on India, local oils and cold press units in villages were made illegal and women from India's slums mobilized to bring back the mustard. Soya is a gift of East Asia, where it has been a food for millennia. It was only eaten as fermented food to remove its' anti-nutritive factors. Today, GMO soya has created a soya imperialism, destroying plant diversity. It continues the destruction of the diversity of rich edible oils and plant-based proteins which India is known for.

India, the land of rich biodiversity of edible oils - mustard, sesame, coconut, linseed, groundnut etc., is now 70% dependent on imports of palm oil, and GM soya oil.

But what goes around, comes around. Our artisanal processed coconut and mustard oils are now being recognised as healthy, in spite of all the pseudo-scientific propaganda against our edible oils for decades by the industrial food processing lobby which has been promoting trans-fats in the diet, displacing healthy oils and fats, through their influence on food policy, trade policy, scientific research, and the huge money they spend on misinformation and misleading advertisement.

We stand at a precipice of a planetary emergency, a health emergency, a crisis of farmers livelihoods. Fake Food will accelerate the rush to collapse by promoting and sustaining the failed Fake Farming model of Industrial Agriculture. Real food gives us a chance to rejuvenate the earth, our food economies, food sovereignty and food cultures through Real Farming based on caring for the Earth and people. Through real food we can decolonise our food cultures and our consciousness.

We remember that real food is living and gives us life.

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Feeding the World: Delusion, False Promises and Attacks of Industrial Agriculture

Nadia El-Hage Scialabba

"First they ignore you. Then they laugh at you. Then they fight you. Then you win." (Mahatma Gandhi)

Introduction

Purpose. This chapter reviews the state of affairs in food and agriculture as of the 90's, following the 1992 Earth Summit and the 1996 Word Food Security conference where governments of the world committed to sustainable agriculture in order to redress past failures. Ironically, those years left the space open for multinational corporations and private interests to take control over institutions, citizens and the planet. In the meantime, organic agriculture and agroecology[1] came out of the niche with sole grassroots support, while their efforts are continuously undermined to prevent their scaling-up and keep industrial agriculture in the mainstream. Unfortunately, today's food and agriculture conversations are fraught with misinformation and largely affected by a mind blindness syndrome. This chapter aims to unveil to open-minded readers that more of the same will not lead humanity towards sustainability and food and nutrition security, and that our common future cannot be possibly healthy without agroecology and like-minded food production approaches.

The Green Revolution delusion. In the 60s, researchers, policy-makers, farmers and citizens believed in the 'miracle seeds' that converted industrial inputs into food, as this fossil-fuel based development was new in the agriculture sector. By the 70s, traditional farming practices and knowledge were replaced by technological packages of seeds, irrigation, synthetic fertilizers and pesticides. Despite the huge increase of harvest yields, the limits of the Green Revolution's promise became obvious in the mid-80s, as a World Bank study[2] concluded that a 'rapid increase in food production does not necessarily result in less hunger'. New historic research even argues that the Green Revolution did not even have a role in averting famine[3]. Furthermore, and in line with the concepts of thermodynamics such as entropy, free energy and gradient dissipation, excess agricultural inputs have resulted in extensive chemical pollution and consequently, wide degradation of natural systems and human wellbeing, all of which are largely documented[4].

Agricultural transformation. Agriculture has radically changed over the last few decades in developed regions of the world. What was once a biological process driven by sunshine, rainfall and human labour has become an industrial process dependent upon ever increasing synthetic inputs and financial capital. What was once a healthy way to raise a family has become an occupation filled with risks and isolation, with the needs of the agrifood industry overriding the

[1]Agroecology, defined by FAO as a science, a practice and a social movement for sustainable agriculture could be considered similar to uncertified organic agriculture; agroecology principles are very similar to organic agriculture but agroecology has no precise standard with dos and dont, which makes it subject to interpretation.

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need for healthy food and decent livelihoods. While technological 'breakthroughs' keep emerging from corporate laboratories, the food and agricultural sector continues its race towards catastrophe, as witnessed by the multiple food and environmental crises of our era and most importantly, the loss of food sovereignty. Just as agricultural salinization during Sumerian times had devastating effects on civilizations as far back as 3500 BC[5], risks caused by industrial agriculture threaten human existence today. Despite all current efforts to produce more with less, issues like climate change and food-related diseases are threatening to alter our existence on a scale larger than we've ever experienced. Luckily, the food and agriculture system have the potential to substantially contribute to resolving natural and societal aches, should there only be political will to adopt proven approaches, such as agroecology, along with a more democratic (or decentralized) governance.

Sustainability aims of the 90s

Conventional agriculture's attempts

The SARD promise. On the occasion of the Earth Summit, FAO coined the term "Sustainable Agriculture and Rural Development" (SARD), as reflected in Chapter 14 of Agenda 21, with the triple aim to enhance food security, rural livelihoods and natural resources. Productivity was thus paired with social and environmental imperatives and the impetus for sustainable development and intra- and inter-generational equity was genuine. The SARD concept complemented the technocratic agricultural approach with socio-political action areas at international (trade agreements), national (conducive policies and incentives), local (civil society participation) and household levels (equity). SARD's implementation, however, proved challenging due to institutional boundaries of line ministries and other institutions. Also, the multi-functionality aspect of SARD raised suspicions among many developing countries in terms of potential trade barriers. Within a decade, SARD faded from countries' agenda, while the sustainability fad survived to serve essentially non-sustainable enterprises. In fact, the lack of an operational definition of sustainability, for SARD and beyond, opened room for green-washing, with increasing sustainability codes, standards and reports and ever less sustainability on the ground.

Call for a New Green Revolution. A 1996 World Food Summit technical document[6] stated that 'sustainable intensification in more fertile areas … and a greater focus on developing technologies for the less fertile areas, are likely to give new opportunities for increasing food production, alleviating poverty and reducing the risks of environmental degradation'. An eventual perpetuation of the Green Revolution pollution concerns was swept away by stating that it is 'the limited education level of many smallholders that often prevents a proper understanding of both the environmental and health risks associated with agrochemical use'. Even erosion risks were condoned by stating that 'although HYVs often replaced older landraces, it is less certain that the world has actually suffered significant genetic erosion'. The document made a renewed call for more of the same (and worse), asserting that 'improved technology delivery systems are the key to bringing the benefits of science-based technology to small-scale farmers, including the benefits of genetic engineering'. The professed New Green Revolution thought to address equity issues by 'improving small-scale farmers' access to mineral fertilizers, as well as further developing biotechnology and IPM-methods in order to achieve higher and environmentally sustainable yields with low inputs, while including those which are adapted to vulnerable and marginal areas of lesser immediate potential.' While equity kept being trumpeted, the gap between poor and rich was widening and agrifood oligopolies strengthened.

Sustainable intensification. The Green Revolution engendered a petro-dependent agriculture (it takes 10 calories of energy to produce 1 calorie of food energy[7]) and chiefly, a system in the hands of the

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agrifood industry. Over thirty years, the annual growth of fertilizer use on Asian rice has been from three to forty times faster than the growth of rice yields. Once on the path of industrial agriculture, farming could only be more profitable if the prices farmers received for their crops stayed ahead of the costs of petrochemicals and machinery, thus creating a cost-price squeeze for all the world's farmers. By the early 1990s, the costs of agricultural production had risen from about half to over 80 percent of gross farm income, favouring wealthier and bigger farms. With population growth, the 'feeding the world narrative' within a sustainability context prompted the concept of 'sustainable intensification', whereby the technologies and knowledge of the Green Revolution could be adapted to new areas (such as Africa) and other crops. Strictly speaking, sustainable intensification is an oxymoron, as physical laws do not permit 'sustained' intensification without huge externalities, among which is the not so minor issue of climate change.

Grassroots demand for Agri-Culture

Like-minded approaches. As the downsides of the industrial revolution started showing in the food and agriculture sector, several forms of sustainable agriculture emerged during the last century, from the Vedic Rishi Kheti in India, to biodynamic agriculture in central Europe (after Rudolf Steiner, 1924), organic farming in the UK and USA (after Sir Albert Howard, 1943), agroecology in Latin America (after Efraim Hernandez, 1977), natural agriculture in Japan (after Masanobu Fukuoka, 1980), permaculture in Australia (after Bill Mollison, 1988) and holistic management in Africa (after Allan Savory, 1988)[8]. The increasing demand of western countries' consumers and the multitude of confusing organic labels on the markets triggered the promulgation of the Organic Food Production Act of 1990 in USA and the EU organic regulation (EEC 1535/92) in 1992. Incentive measures were thereafter put in place to assist farmers' conversion and to regulate 'third countries' access to the European market. The European and North American demand for organic foods and beverages, which has been greater than supply for the last three decades, fuelled developing countries' interest for organic agriculture exports and subsequently, in developing equivalent organic regulation in order to access lucrative markets. Although the organic market trend was the beginning of the commodification of organic produce, 'side-effects' were largely positive for ecological resources. In addition to the sustainably managed organic lands over 11 million hectares in 1999, agrobiodiversity was boosted because traditional varieties were more viable under no external input conditions, and humus achieved higher soil carbon sequestration in nearly climate-neutral organic operations[9].

Organics enters inter-governmental fora. In 1999, the FAO/WHO Codex Alimentarius Commission issued the Guidelines for Organic Food, adopted on the trail of the EU organic regulation in order to safeguard a fair playing field in international food trade and protect consumers from fraudulent claims. Also in 1999, the FAO Committee on Agriculture unanimously approved the first ever organic agriculture programme, mainly to harness export opportunities offered to developing countries, as well as a new programme on biotechnology, in order to respond to different countries' requests. Organic agriculture was finally out of the doldrums by necessity, and its potential was to be explored in its own merit. However, that same Committee on Agriculture session also approved a new programme dedicated to bioengineering, which subsequently over-shadowed the organic programme in terms of allocated financial resources and institutional support.

Awakening the beast. The different forms of regenerative agriculture that emerged in the past century were largely ignored in institutional circles. As organic agriculture started to shape in the 90s through government regulations, those practicing it were often laughed at and marginalized by their neighbours. Despite the total lack of public research and training, organic gardens were flourishing and consumers rewarded producers' stewardship with price premiums or community-supported schemes. With a view to discourage adoption of organic practices by neighbouring farmers, extension officers - commissioned

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by agribusinesses - carried a fear crusade in developing nations, arguing that organic fields were at high risk of pest ravages and that organic food was a risky choice, due to higher incidence of microbial and mycotoxin contamination. Towards the end of the decade, especially after the clear rejection of any transgenic technology by the international organic community[10], the agricultural industry started organizing its systematic offensive against organic proponents and practitioners.

Turn of the millennium struggles

Renewed industrial agriculture promises

New Green Revolution. The deaf policy discourse of modern agricultural development opened the space for private pursuit of profit in the food and agriculture sector. The fuzzy sustainability claim and 'feeding the world' mantra, coupled with equating laboratory-based technologies with modern agriculture, propelled bioengineering and its applications in the most remote areas of the world. In fact, the Alliance for a Green Revolution in Africa (AGRA), promoted since 2006 by Bill and Melinda Gates Foundation and the Rockefeller Foundation, aims to feed Africa by improving access to chemical fertilizers and unleashing the potential of genetically-modified seeds, while aiming to decrease pesticides use and resolving climate change challenges with the long-promised drought-tolerant engineered varieties. A rough comparison of AGRA's investments in the Millennium Villages Project, as compared with the Export Programme for Organic Products from Africa (EPOPA) after 10 years of donor' investments suggests that much better results can be obtained when investing in organic agriculture, while cutting investments 60 folds. AGRA investments of US$120/person/year tripled maize yields but increased water scarcity and N-fertilizers prices while market linkages remained challenging. EPOPA, on the other hand, invested less than US$2/person/year and saw organic exports of US$35 million in 2010 while more than doubling AGRA's outreach, benefitting 1 million people in Uganda between 1997 and 2008[11].

Industry concentration. Although the so-called 'life industry' consolidated with seeds, agrochemicals and pharmaceutical companies in the 80s in order to develop and commercialize agricultural input packages, biotechnologies and 'conservation agriculture' practices required further industry consolidation. Conservation agriculture is an approach that applies a few organic practices (such as mulching and cover cropping) to no tillage systems, whereby genetically-engineered cultivations require drilling, chopping, glyphosate spreading and precise water management – all requiring appropriate machinery. The world's four leading farm machinery companies (i.e. John Deere, CNH, AGCO and Kubota), which together accounted for one third of the total market in 2000, controlled more than half of the market in 2009. Since 2001, John Deere started investing in the new Big Data platform technologies, with tractors logging GPS data, as well as started to make deals with each of the seed and pesticide majors, first with Syngenta in 2007[12].

Feeding people? Technologies pushed by Monsanto/Bayer, DuPont/Dow, Syngenta/ChemChina, and other chemical-cum-biotechnology companies to 'feed the hungry' have well-documented ecological and social impacts, and the second Green Revolution they promised did not end hunger any more than the first. Between 2000 and 2004, the prevalence of undernourishment stagnated at 14.7% of the world population. Thanks to safety nets and other measures put in place by governments for the MDGs, global hunger reached its lowest levels in 2015 at 10.6 percent - before rising to 10.8 in 2016 and 10.9 percent in 2017, mainly due to political instability and conflicts[13]. Most importantly, the mid-decade food price crises increased the global number of people under-nourished from 900 million to 945 million, as food price spikes paralleled fossil-fuel prices on which the food system depends, in terms of synthetic fertilizers prices and grains prices for bioenergy production. In fact, the agroindustry focus on increasing grain yields, mainly genetically-engineered corn, shifted from feeding people to feeding large confinement animal farms and biofuel production factories.

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Organic agriculture growing branches

Gaining traction. Many new-generation organic growers are attracted to non-chemical farming because it re-establishes agriculture as a human skill and a healthy lifestyle. The global organic food supply of around 1% of global food market is constrained by the fact that organic management requires more efforts and good ecological knowledge, in a context of fierce competition with industrial farmers who disproportionally benefit from government assistance, private research and consolidated supply infrastructure. Still, world organic sales tripled in a decade, from USD 18 billion in year 2000 to USD 59 billion in 2010. Despite exponential sales' growth, supply is not keeping pace with demand, as organic farmland increased in the same period from 14.9 to only 35.7 million ha[14].

Inspiring good agronomy. Conventional farms regularly 'borrow' organic techniques, just because they are good agronomy and the narrative of ecological management is often used to raise the industrial agriculture profile. For example, conservation agriculture applies organic soil fertility practices (including permanent soil cover and diverse crop rotation) to no-till systems, then claims its superiority over organics in terms of soil carbon sequestration, thus attracting carbon credits. Conservation tillage is however challenging in terms of weed control, a problem that industrial agriculture resolves with glyphosates, often coupled with genetically-engineered cultivations. Long-term research on conservation tillage impacts on Soil Organic Carbon (SOC) sequestration indicates that SOC concentration increases in the surface layer and less in the subsoil, as it is residue management that is the key factor in SOC sequestration and dynamics[15]. The ecological knowledge that guides organic management has also become handy to bioengineers who capitalized, for instance, on the use of the naturally occurring soil bacteria Bacillus thuringiensis (Bt) for pest control with Monsanto's inclusion of Bt in genetically modified corn and cotton. Naturally occurring Bt has a short half-life when exposed to sunlight and the elements, while its genetic counterpoint persists within corn, with insects developing immunity against best agricultural practice. Individual organic practices keep inspiring good practices, demonstrating that the sector leads creativity and could become the hub of agricultural innovations. However, using bits and pieces of organic practices does not allow its full potential to unfold and the systemic organic approach that secures the long-term resilience to agriculture remains alien to quick (short-term) fix industrial agriculture.

Co-opting organics. The explosive growth of organic market has encouraged the participation of agribusiness interests, putting at risk the viability of the small-scale farming and the integrity of the organic claim. In 1995, the US organic community counted 81 major independent organic brands on the market and by 2007, all but 15 of these brands had been acquired by top food corporations[16]. As a result of these acquisitions, many brands began using cheaper, less sustainable ingredients in their products. In 2004, the world leading food and beverage industries[17] had made partnerships with organic companies, or developed their own organic lines, squeezing-out pioneer organic producers, displacing regional coop food warehouses, and most importantly, putting downward pressure on payments to farmers and forcing down prices for organic produce (i.e. Walmart). Underpaid migrant farm workers out-numbered self-employed organic farmers, and retailers implemented their own in-house certification (i.e. Whole Foods), with imports of cheap organic grains from Argentina and Brazil (i.e. Cargill) for livestock operations. Through research funding and government lobbying, agribusiness has also a predominating effect on agriculture-related science and policy, besides organic market rules. For instance, representatives of Tyson, Horizon, Heinz and Birdseye participating to the National Organic Standards Board in USA made recommendations that were listened to by regulators, such as allowing for the manufacture of organic high fructose corn syrup[18].

[14]FiBL (2019). The World of Organic Agriculture. Swiss Institute for Organic Farming Research.

[15]Zhang et al. (2014). Chapter One - Opportunities and Challenges of Soil Carbon Sequestration by Conservation Agriculture in China. Advances in Agronomy. Elsevier Volume 124.

[16]Howard, P. (2016). Organic Industry Structure: Acquisition & Alliances, Top 100 Food Processors in North America.

[17]Including ADM, Cadbury Schweppes, Coca Cola, ConAgra, Dean Foods, Dole, General Mills, Groupe Danone, H.J. Heinz, Kellogg, Mars, Parmalat Fianziana, Kraft, Sara Lee, and Tyson Foods.

[18]Henderson E. (2014). Growing our Roots. Upper Midwest Organic Farming Conference, February 2004.

Tainting public opinion on organic agriculture

Gagging FAO. The entry of organic agriculture into inter-governmental arena such as FAO was not deprived from pressure from the private sector. In 2000, Danone asked the French FAO Assistant Director-General to undermine the organic programme, as it was 'against French interest'. In 2006, a large FAO/IFAD project in India on Organic Production of Underutilized Medical, Aromatic and Natural Dye Plants saw the exceptional gathering of agriculture, livestock, forestry, health and environment authorities around the project objectives to improve poor household livelihoods, mainly by empowering rural poor communities through inter alia, solid fair trade platforms and networking, in a context of increasing farmers suicides due to agricultural input debts. Following the inception mission that unveiled the potential of this project, high-level instructions were received in the FAO Representation in New Delhi and FAO Headquarters in order to discontinue this project. Staff efforts to continue the project and an internal evaluation of field activities in India, which admitted 'administrative' errors regarding this project, were vain in the face of unidentified opponents to this project. In 2007, Croplife International contested the outcome of the first ever FAO International Conference on Organic Agriculture and Food Security, held back-to-back with the CFS, with the latter recommending that 'organic agriculture be considered within food security programmes. Consequently, the FAO Director-General issued a press release, six months after the organic conference, stating that the FAO report promoting organic agriculture was 'inconclusive'[19].

Seeding consumer doubts. The grip of the micro-organisms' fear that threatens in the absence of chemical input use, coupled with public concern to problems with Salmonella and Campylobacter in Europe, prompted the FAO Regional Conference for Europe to request a review of organic food safety in 2000. The study reported on potential sources of contamination of organic foods to be in the same range as conventional foods and that, 'as far as chemical contaminants were concerned, organic foods offered definite advantages due to the non-use of synthetic pesticides and chemical fertilisers. However, the use of organic fertiliser could be a source of microbiological contamination of primary produce and needed, therefore, to be controlled'[20]. In USA, the Hudson Institute accused the practice of spreading animal manure on organic farm fields to increase the incidence of food-borne diseases. Even though spreading manure on the field concerns 90% of conventional farms, and that organic farmers took the lead in developing strict limitations governing the use of raw manure, it was organic practices that were under scrutiny – rather than industrial food supplies that are loaded with pesticide residue cocktails and other contaminants. Even though the manure attack was subject of an independent study by the University of Minnesota that found no statistically different risk in the pathogenic contamination of certified organic food verses its conventionally produced counterparts[21], the Hudson Institute disputed the study results. A substantial number of attacks on every aspect of organic agriculture could be given, from being unhealthy, unsafe and constituting a nutritional hoax, to transmitting animal diseases, being ecologically damaging, elitist, fraudulent, unreliable, economically uncompetitive without subsidies, alienating to workers and not able to feed the world[22]. In particular, the fact that organic food fetches higher market prices created a sector particularly vulnerable to food fraud by non-organic parties, thus enabling the agrifood industry to foment spurious health and safety fears[23]. Aware of the fraud risks, the organic community pioneered guarantee systems and traceability protocols in order to safeguard

[19]All three incidents are documented in the internal FAO Registry file for Organic Agriculture.

[20]FAO (2000). Food Safety and Quality as Affected by Organic Farming. Report o f t he 2 2nd FAO regional Conference for Europe. Portugal, 24-28 July 2000 (ERC/00/7).

[21]Cornucopia Institute (2004). Study Confirms Safety o f Organic Food b ut Agrichemical Front Group Attempts to Twist Findings. Rodale Institute.

[22]IFOAM (2008). Criticisms and Frequent Misconceptions about Organic Agriculture. The Counter-Arguments. Compiled by the International Federation of Organic Agriculture Movements.

[23]Miller Henry (2018). The Organic Food Hoax. A Hoover Institution Journal. Standford University.

its claims, while the industry keeps denying the harmful impacts of agrochemicals to the extent that current efforts are made by the German Academy of Sciences to redefine different risk assessment protocols[24].

Public vs private goods. Organic agriculture's avoidance of synthetic inputs is by definition a lack of compliance with the industrial agriculture tenets and thus, an issue of producers' independence from agri-chemicals and genetically-engineered seeds. Consequently, agrochemical companies heavily invest in campaigns in order to discredit any form of practice that substitutes their private goods with public goods, intended as farmers' clever harnessing of natural resources and ecosystem services. Promulgated by well-funded surrogates, such as the right-wing Hudson Institute, Competitive Enterprise Institute, and the American Chemical Society[25], multinational corporations see their market threatened when consumers are voting with their pocketbooks, turning the organic food market from a small niche into the fastest growing segment of the food industry for several consecutive years. Publishing tainted reports, coupled with a robust round of press coverage, is a usual practice of the agroindustry, such as the 'independent' reviewers[26] report findings about consumers who unduly 'purchase price premium organic products based on false or misleading perceptions about comparative product food safety, nutrition and health attributes'. In this particular case, it later appeared that executives from Monsanto and allies engaged in fund raising for the review and collaborated on strategy and plans to hide industry funding[27]. With a view to build its own scientific evidence, and this prevent policy action to restrict harmful practices, the agrichemical industry has entered the research space, displacing publicly-funded independent research in agriculture. In 2013, the combined research and development budgets of the big six agrochemical and seed companies, valued at nearly USD 7 billion, was six times larger than the total US Department of Agriculture's Research and Information budget[28]. Thus, the agroindustry financial capital dedicated for influencing farmers, academics and policy-makers, along with research and development, is disproportionate to the means of public and civil society actors promoting non-synthetic farming.

Cain and Abel economies of this decade

The ever-bigger promise of industrial agriculture

Digitalization. The latest panacea for ending hunger and protecting the environment is Big Data in agricultural equipment, with on-farm devices transferring data wirelessly to corporate servers – often with limited farmer knowledge. Smart farming (and the latest climate-smart stunt) includes drones, driverless tractors and the use of climate and weather information, promising increased efficiency and sustainability. Applying these tools to nanoparticles, chemical reactions or genetic sequences is highly specialized. Those con¬trolling the industrial food chain apply market informa¬tion, climate projections, and soil and crop disease data in order to tweak fertilizer compositions, seed coatings and crop traits for the next growing season. Especially in the input sector – namely pesticides and seeds – the dominant companies seek to prescribe how, when and where farmers buy and use farm inputs, and who can access the resulting data, to their market advantage. Every part of the food chain uses remote and built¬-in sensors to gather data, clouds to store data, artificial intelligence to analyse infor¬mation, algorithms to manipulate it, and blockchains to distribute it. Agribusiness companies such as Bayer and Deere, but also Internet enterprises such as Amazon and Google are already in the process of establishing their dominance over the digitalisation of agriculture. Through mergers, they consolidate their power not only in one sector, but across multiple hubs along the industrial food chain. Political decision-makers support their efforts, by emphasizing the benefits of digitalisation and by removing investment barriers.

[24]Schäffer A. et al (2018). The Silent Spring - On the Need for Sustainable Plant Protection. Leopoldina Discussions No. 16; 61.

[25]Sprinkel S. and Kastel M. (2004). The Corporate Attack on Organic Agriculture. Common Dreams.

[26]Academics Review (2014). Why Consumers Pay More for Organic Foods? Fear Sells, Marketers Know it.

[27]Malkan Stacy (2017). Montsanto Fingerprints Found all over Attack on Organic Food. Huffpost, 30 June 2016 (emails obtained by US Right to Know of the Freedom of Information Act).

[28]ETC Group (2018). Too Big to Feed: The Short Report. Mega-mergers and the concentration of power in the agri-food sector: How dominant firms have become too big to feed humanity sustainably.

Mergers and acquisitions. Conservation agriculture, precision agriculture, sustainable intensification and genetically-engineered systems require intelligent machinery to top up synthetic input use. The merger of Bayer and Monsanto in June 2018 (now Bayer), the previous mergers of Dow and DuPont (now Corteva Agriscience) and ChemChina and Syngenta (soon part of Sinochem) in 2017, together with BASF, control 63% of the global industrial seed market and more than 70% of the global pesticide business. In 2014, only four corporations controlled 21% of the fertilizer market and almost 54% of the agricultural machinery market. Likewise, four firms controlled 70% of agricultural trade and 54% of food processing[29]. Above 40% market share, concentration makes it hard for new and smaller companies to enter the market. Markets are further controlled by strategic alliances, contracting arrangements and joint ventures among firms, for sourcing materials or sharing research and development costs. For example, John Deere has joint ventures with all six of the dominant seed/pesticide companies to expand its precision farming platform. Control over a wide range of agricultural inputs allows a major role in determining seed varieties, chemical inputs, irrigation techniques and even the type of crop insurance available to farmers. Through cartels, groups of firms engage in price-fixing, market-dividing or other reciprocal arrangements; for example, a small number of fertilizer companies have quietly cooperated on industry prices throughout the past century, and so did international grain trading companies since the 1950s. While recent acquisitions mature and vertical integration continues with further takeovers in the future. Traders, processors and retailers are currently acquiring companies on a weekly basis. Every sector in the industrial food chain is today structured under oligopolistic conditions and we are heading towards a duopoly, headed by machinery companies. Behind the scene, lie a handful of more powerful asset managers and investment brokers, whose transnational power financially exceeds any enterprise, any high street bank and almost any country. These financial investors are using new trading mechanisms, like blockchains and Dark Pools, to shift shares in companies over each of the links in the industrial food chain, which affords them insider knowledge of all the competing corporations. For example, the American investor BlackRock is the major shareholder of 282 of the 300 largest Western corporations (e.g. BASF, Bayer, Syngenta, Dow, DuPont, McDonald, Nestlé, Apple, Daimler, Lufthansa, Exxon, Shell), administering assets over USD 6.3 trillion and exercising enormous influence in the stock market. Market share is not the only measure of corporate power, as assets are constantly being shifted among the major players; they regularly sell off regional assets when prices are low, invest in rival companies, launch joint ventures and buy start-ups. On-going transformative forces include both technological disruptions and market place disruptions, and anti-trust regulators don't always have the tools to stop vertical and horizontal mergers[30].

Freedom of choice? Economic elites and political elites act as mutual stepping stones for one another to elevate each other's status through government regulation, subsidy, and taxes[31]. With the promise of economic growth, profits tend to accumulate in the top tiers of society instead of being distributed equitably. The carrot of poverty and hunger alleviation effectively lures agricultural workers into continued labour and resource exploitation, while providing little in return. This model expands to the environment as well, and most commonly, harms associated with pollution are borne by the marginalized groups in society without receiving any of the benefits that are gained by producing pollution. While farmers have been collecting information for 10,000 years for their own use and to share with their communities and with researchers, current industry practices raise questions about the ethical use of data ownership, and whose interests Big Data is ultimately serving[32]. The high concentration of power (for seeds, agrochemicals, fertilizers, livestock genetics, animal pharmaceuticals for livestock, aquaculture and seafood and farm machinery), soon extending to crop insurance companies, leaves no

[29]Ibid.

[30]ETC Group (2018). Between BlackRock and a Hard Place. Is the Industrial Food Chain Unraveling … or Rewinding? Communique 116, October2018.

[31]Holcombe and Boudreaux (2015). Regulation and Corruption. Public Choice (164:75). SpringerLink.

[32]Money Pat (2018). Blocking the Chain. ETC Group.

freedom to choose what to grow, how to manage the farm fields, where to buy inputs from, whom to sell to, at what price and ultimately, to choose what to eat.

Positioning of organic agriculture, agroecology and social justice

Organic 3.0. In 2015, 50.9 million hectares of agricultural lands were under organic certification. In addition, wild collection, beekeeping and areas used for aquaculture in forests, grazing and non-agricultural land totalled 39.7 million hectares. Thus, all organic areas sum-up to 90.6 million hectares, providing income to at least 2.9 million organic producers and global market sales of USD 75 billion. Organic agriculture expands worldwide and in 2018, organic data existed for 181 countries, with 93 countries having developed an organic legislation[33]. Some estimates put the organic market at USD 320 billion by 2025[34], with the highest growth in Asia, but with the growth in organic farmland slowing in parts of Europe and North America, there are concerns about supply shortfalls. In USA, data shows that rural counties with many organic farms and businesses have higher household incomes and reduced poverty rates by as much as 1.35 percent, even more than major anti-poverty programmes[35]. Despite its proven farm profitability worldwide[36], the organic community is increasingly concerned with the commodification of the organic supply chain and social justice among agricultural workers. Following the unanimous inter-governmental recognition of agroecology in 2013[37], IFOAM initiated opening-up to like-minded movements and launched the so-called Organics 3.0. With Organic 1.0 referring to organic pioneers and Organic 2.0 referring to the current era of standards and regulatory systems, the goal of Organic 3.0 is 'to enable a widespread uptake of truly sustainable farming systems and markets based on organic principles and imbued with a culture of innovation, of progressive improvement towards best practice, of transparent integrity, of inclusive collaboration, of holistic systems, and of true value pricing'[38]. Advances are underway on many fronts and breakthroughs in non-GM biotechnology, such as marker-assisted selection, which is expected to further narrow the yield gap, and even outperform, industrial farming. In the current context of climate extremes, organic soils have proven their superior resilience and hence, fertility.

Good food for all. A modelling[39] of the potential of a 100% conversion to organic agriculture in order to provide food to the 2050 population and simultaneously reduce environmental impacts from agriculture showed that organic management could indeed produce enough food for people without degrading the environment nor using more land, provided that the food system be designed to reduce by 50% food-competing feed use and food loss and waste. Consequently, reduced animal numbers (mainly, monogastrics) and reduced animal product consumption (globally, 11 to 38%) are necessary. To this end, a comprehensive food systems perspective (of production and consumption) is crucial, rather than simply addressing a maximum yield goal for single crops as a stand-alone performance criterion. Should agroecology and organic farming become the norm, changing agricultural practices entails abandoning synthetic inputs, redeploying natural grasslands and extending agroecological infrastructures (hedges, trees, ponds and stony habitats) in more localized and healthier food systems. Besides its capacity to provide enough energy food for the world population, organic food is now recognized for its nutritional quality, with more polyphenolics in fruits and vegetables, less Cadmium in cereals and higher fatty acids and Omega-3

[33]FiBL (2019). The World Statistics of Organic Agriculture. Swiss Institute for Organic Farming Research.
[34]Grand View Research (2017). Organic Food & Beverage Market Size Worth $320.5 Billion By 2025.
[35]Klein Kendra (2019). 2018 Farm Bill Watch: A Sneak Attack on the Organic Standards? Friends of the Earth. Blog Food and Agriculture.
[36]Nemes N. (2009). Comparative Analysis of Organic and Non-Organic Farming Systems: A Critical Assessment of Farm Profitability. FAO.
[37]FAO (2014). International Symposium on Agroecology for Food Security and Nutrition. 18-19 Sept. 2014.
[38]IFOAM (2016). Organic 3.0 for Truly Sustainable Farming & Consumption. Second Updated Edition. IFOAM Organics International and SOAAN.
[39]Muller A. et al. (2017). Strategies for Feeding the World more Sustainably with Organic Agriculture. Nature Communications volume 8, Article number: 1290 (2017).

in dairy[40]. On the other hand, the increases in industrial yields have been paralleled with a loss, in the last half century, of 5 to over 40 percent[41] in crop nutritional value (due to the introduction of hybrid seeds, synthetic fertilization and irradiation), and the abundance of ultra-processed, energy-dense and nutrient-poor foods have drastically impoverished diets. Chiefly, the decreased content of chemical residues in organic food confers them superiority over industrial foods, as toxic residues in food are largely responsible for the modern non-communicable disease epidemics. Although industry proponents have profusely campaigned on the safety levels of pesticide residues in food, the fact is that many of the synthetic agricultural chemicals used in the past century have been banned and more are continuously listed for prohibition – usually once the agrochemical company has migrated to the next level of poisons, including both synthetic chemicals of synthetic biology.

People and self-determined transformation. The organic agriculture pioneers of the last century envisioned a system where care for nature went hand in hand with fair treatment of workers and decent prices. Once the initial family farms and independent small-scale processors faced overwhelming competition from the organic industry, and large-scale farms converted to organic purely on a marketing ground, social justice in organic systems became an issue similar to that of industrial agriculture. Although IFOAM principles and standards include social justice[42], current organic regulatory frameworks do not consider pricing and labour issues, claiming that the social component is not in their purview. Ethical organic foundations are currently trying to position fair contracts, fair pricing and fair access to productive inputs (i.e. land, credit, organic seeds) in mainstream government instruments; for instance, the US National Organic Action Plan underlines the urgency of reuniting the principles of fairness and organics[43]. Through fair employment and decent living conditions, the sector can potentially contribute to halting the trend of disenfranchising farming communities, while providing better jobs to the 1.6 billion smallholder farmers around the world. Thanks to conducive rural revitalization policies, reverse urbanization is a new trend in many countries, with educated young couples choosing to establish organic farms and eco-agritourism in rural Europe, as well as over 7 million people in China who returned to rural areas to start businesses to raise livestock and agritourism to attract visitors to farms[44]. Recently, civil society networks have jointly called for a fair and sustainable European consumption and production agenda ahead of the European Parliament elections; their fictious issue of a 2024 newspaper includes examples of what could be achieved if transformative policies were adopted and implemented by the EU, from organic farming to ethical financing, community-led initiatives to sustainable public procurement, as well as the need to tackle imbalances of power in supply chains[45]. Basic human rights also encompass the rights of all people to follow their own cultural and traditional knowledge systems and the rights of farmers and farm workers to have an empowered voice in the continued improvement of an ethical food system[46]. With a view to counter agriculture industrialization, food market concentration and the commodification of Earth resources such as soil, as well of human labour, a group of biodynamic enterprises (e.g. Purpose AG, Alnatura) is currently rethinking the concept of property in order to combine entrepreneurial freedom

[40]Baranski et al (2014). Higher Antioxidant and Lower Cadmium Concentrations and Lower Incidence of Pesticide Residues in Organically Grown Crops: a Systematic Literature Review and Meta-analyses. The British Journal of Nutrition, September 14; 112(5): 794–811.

[41]Davis Donald (2009). Declining Fruit and Vegetable Nutrient Composition: What Is the Evidence? American Society for Horticultural Science. Volume 44, Issue 1.

[42]IFOAM (2005) Standard requires operators to have a policy on social justice, where the violation of basic human rights and social injustice leads to non- approval of the operation as organic.

[43]NOAP (2010). From the Margins to the Mainstream – Advancing Organic Agriculture in the U.S.

[44]Chenglong Jiang (2018). Reverse Urbanization Provides New Direction for Rural Regions. China Daily. 28 December 2018.

[45]IFOAM (2019). Civil society launches a campaign calling on next Members of the European Parliament to make Europe sustainable and fair by 2024. Joint Press Release, 15 April 2019.

[46]Coody Lynn (2010). The Organic Standard. June 2010 issue.

with fraternity and protect them from profit-oriented interests. This new legal structure called 'enterprises in responsible ownership', was discussed in October 2018 by hundreds scientific, political and business background associations and managers[47]. The ultimate aim of the biodynamic community is to establish an associative approach to finance, capital and property.

Corporate offensive on organic agriculture policies

Undermining organic policies. Having somewhat failed to influence consumer choices, the agroindustry is multiplying its efforts to influence policy-makers. Corporate interests and big farm groups that claim to speak for all farmers are driving agricultural policies in many countries, making it harder to promulgate fair policies, or to file a complaint against unsustainable practices. In 2018, US Republican Senator Pat Roberts, leader of the Senate Committee on Agriculture, heavily supported by agrichemical industries, wrote the Senate version of the Farm Bill that attempted to open-up the organic standards to allow toxic pesticides and GMOs. By proposing a shift of authority, from the National Organic Standards Board (NOSB) to the Secretary of Agriculture through the loophole of "emergency exemptions" over the USDA National List of Allowed and Prohibited Substances[48], the aim was to take away from the NOSB the gatekeeping authority it has over what types of fertilizers, pest control agents and other inputs could be used in organic agriculture. Under the 'emergency exemptions' status, the Secretary of Agriculture could greenlight a new "crop protection substance" (i.e. pesticides). For 20 years, organic farmers have succeeded without emergency exemptions, while the emergency loophole has allowed conventional agriculture to apply restricted or banned toxic pesticides. Although the assault on the NOSB was curtailed by a House version of the Farm Bill, funding was cancelled for programmes[49] helping small and mid-size farmers transition to organic and afford certification, with organic research receiving less than 1% of federal agricultural research funds. Concurrently, politicians are enticed to prevent laws banning toxic substances, such as Dow/DuPont chlorpyrifos insecticide used on a variety of crops and deemed a danger to kids' brain development; according to filings with the Federal Election Commission, among the 330 House members who chose not to sponsor the bill to ban the insecticide, 118 had received money from Dow in a total of USD 379 651 from Dow since 2017 and by July 2018, President Trump had appointed three former Dow executives to top posts within the US Department of Agriculture[50]. The EU Common Agricultural Policy is similarly influenced by corporate interests, determining prioritization of funding research and the future of agriculture. In 2011, the European Transparency Register reported 151 organisations representing agribusinesses who declared a total of €49,2 million euro in lobbying expenditure, with Syngenta listed as spending €650,000 and Bayer €2,525,000[51]. The 'emergency' excuse that allows public authorities to act in derogation of environmental and health protection principles, at times purposely targeting successful organic businesses, is an agroindustry strategy world over. From vibrant organic cotton enterprises, victims of DDT sprays to counteract malaria mosquitos in Uganda in 2009 (compromising the whole organic cotton sector[52]), to the 2018 Italian 'Emergency Decree' (no. 152/2006)[53], massive pesticide use is transforming the exception into common practice. June 2019 marked a new step of offensive strategy, with farmers in India (Akot, Maharashtra) pushed by Monsanto to declare

[47]Gerald Hafner (2018). Rethinking Property. A contribution of the Social Science Section, Anthroposophy Worldwide, no. 12/18.

[48]Food Tank (2018). 2018 Farm Bill Watch: A Sneak Attack on the Organic Standards?

[49]National Organic Certification Cost Share Program and the Agricultural Management Assistance program.

[50]Philpott Tom (2019). DowDupont Lavishes Campaign Cash on Politicians Who Voted Against a Ban on its Blockbuster Pesticide. Mother Jones. 24 May 2019.

[51]Corporate Europe Observatory (2013). Agribusiness Interests vs. Family Farms, Workers, Consumers, Local and Environmental Interests in the EU: Towards a Ratio in Lobbying Expenditures.

[52]After a decade of promoting sustainable, organic production of cotton and other crops in northern Uganda, the Dutch company Bo Weevil refused the 2009's harvest and closed the business.

[53]Navdanya International (2019). A Coalition of Scientists, Doctors, Jurists and Economists Against Art. 6 and 8 of the New Italian 'Emergency Decree'. Press Release of 19 April 2019.

'civil disobedience agitation' in order to remove the ban introduced in 2010 on Bt Brinjal; this agroindustry-led action was justified for the sake of 'freedom from government control for accessing modern technology'[54], while instrumentalizing Gandhi's Satyagraha to stop brute law based on violence. More than ever, the economic interest of a few is threatening the right of all people to a healthy environment and free choice.

Innovation before precaution? In 2013, the chemical, veterinary pharma, tobacco, plastic and fossil fuel corporations, joined under the European Risk Forum (ERF) to launch the 'innovation principle' (IP), endorsed by the European Council in 2016 and successively supported by EU presidencies, thus achieving significant prominence within the EU institutions. The IP seeks to ensure that "whenever legislation is under consideration, its impact on innovation should be assessed and addressed". Without defining innovation, the principle allows risky products to be kept on the market with the least possible restrictions and regulation. The ERF has invoked this principle to make REACH, the EU chemicals legislation, more business-friendly. The IP is being used to undermine EU laws on chemicals, novel foods, pesticides, nano-products and pharmaceuticals, amongst others, as well as legal principles of environmental and human health protection which are enshrined in the EU Treaty. By claiming harm to innovation and economic efficiency, the innovation concept opens-up new opportunities for corporations, while threatening the Precautionary Principle, or Polluter-Pay-Principle. The IP concept has been included for the first time in a draft legal text to be voted on by the European Parliament: the draft Horizon Europe that lays-out the rules for the EU's research and innovation programme of 100 billion euros from 2021 to 2027, favouring even more EU funds being spent on industry research and development. In 2017, DG Research set-up an internal, dedicated 'Innovation Principle Task Force' in order to implement the IP and the DG Research 2018 Work Programme lists the screening of future policy and legislative initiatives "to identify those where the innovation principle could be implemented." Recent pesticide industry meetings with DG Research focused on the "incompatibility" of policies or regulations: those that promote the "innovation principle" on the one hand, and those that are "black-listing substances considered innovative or indispensable/useful" on the other. Evidently, good old glyphosate-based herbicides are considered as "indispensable", so the IP comes to the rescue also of old and much-criticised products[55]. In reality, the agricultural innovations that have best served agriculture have been the prerogative of ecological agriculture practioners in order to find solutions to their conscious avoidance of synthetic inputs; through a mix of genetic, mechanic and ecological means, practices were put in place to enhance soil fertility (biodynamic preparations), control weeds (mechanical thermal control), protect crops (beneficial arthropods) and care for animals (essential oils).

Subverting science and obscurantism. For decades, the tobacco industry called 'junk science' any independent science which showed the harm caused by its products, referring to its own sponsored studies as 'sound science'; this kind of language is now used by the agroindustry. In particular, the pesticides industry uses the 'science-based' argument to both hide its politics and lobby politicians. The fact that GM systems are not proving their better yields, less chemical inputs, safety, impact on the environment, nutritional value, or improved farmers' income, leads to the preferred industry tactic to denigrate alternative solutions by manipulating information[56]. Most worryingly, corrupt corporations have penetrated the scientific integrity of editors, publishers, regulators and governments. Scientific studies funded by industry tend to deliver results benefiting their sponsors, or not to be published when unsuitable to their interest, twisting the available scientific literature and literature reviews informing public decisions. The Monsanto Papers show that ghost-writing by company employees on behalf of supposedly independent experts is a common practice, as disclosed for several important studies on glyphosate in the scientific literature, as well as destruction of the credibility and reputation of individual scientists, such as the 2012 retraction of the Séralini et al.

[54]Swarna Bharat Party webpage. Genetic Modification. Accessed o n 1 5 J une 2019.

[55]ECO (2018). The 'Innovation Principle' Trap: Industries Behind Risky Products Push for Backdoor to bypass EU Safety Rules. Corporate Europe Observatory. 5/12/2018.

[56]Druker Steven. Altered Genes, Twisted Truths.

study[57] that critically evaluated Roundup ready corn (Monsanto's NK603) as probably carcinogenic and endocrine-disrupting[58]. In Italy, recent attacks on organic agriculture took the twist of pure obscurantism. From mid-2018 to early 2019, Italian Senator for life Elena Cattaneo has been using all means, including open letters, media articles, communiqué, TV talk shows, documents publicly supported by hundreds of scientists, and asking academia not to host biodynamic meetings (that threatens the credibility of scientific and public institutions, in the very 'country of Galileo that gave birth to the scientific method')[59], in order to prevent the approval of Law 988 that promotes organic agriculture for the nation's health and environment. Her attacks use rather medieval arguments, based on the science/anti-science polarity, whereby she referred to biodynamic agriculture as a 'witch craft practice', organic agriculture a 'beautiful but impossible tale', and agroecology proponents as 'phonies' promoting a 'vision of backward development, based on ideology when not on magic' - while strongly asserting that sustainable agriculture cannot be but intensive, with genetic engineering as a solution to decreased pesticide usage. Alas, misappropriation, misconduct, and retraction of scientific evidence apply also to food science, with soda companies sponsoring nutrition research (such Coca-Cola on obesity[60] in a period of rising efforts to tax sugary drinks) and contributing to the nutrition and health chaos of our time, with diet as the leading cause of mortality.

Looking forward

Hunger will persist in 2030. In 2017, 821 million people were chronically hungry. Malnutrition is compounded by increasing micronutrient deficiencies and obesity affects over 2 billion people. In addition, moderate food security includes those who struggle or worry about the ability to access or globally, nearly 1.8 billion were moderately food insecure in 2015. Whilst the greatest number are in Sub-Saharan Africa and South Asia, moderate food insecurity is (and will remain) a major issue across all regions, even high-income countries[61]. Despite the 'zero hunger' target of Sustainable Development Goal 2 for 2030, it is estimated that 625 million people will be still chronically hungry by then[62]. Multiple challenges include inequalities, conflicts, climate change, demand for resource-intensive animal feed and non-food uses (e.g. biofuels) – and resource depleting farming systems such as industrial intensification.

Projections for a healthy 2050. The results of the FAO global scenario analysis for 2050[63] clearly show that 'business-as-usual', where outstanding food and agricultural challenges are left unaddressed, 'leads to significant undernourishment by 2050, even if gross agricultural output expands by 50 percent from 2012 to 2050, which would in turn contribute to increasing GHG emissions. These negative trends are further exacerbated in the "stratified societies" scenario of increased inequality. The only feasible future can be achieved through a "towards sustainability" scenario (with agroecology assumptions) that requires proactive changes for more sustainable food and agriculture systems: in such a scenario, the 'SDG target could be met with a much lower expansion of agricultural output, as long as production systems are more sustainable, on the one hand, and income and food are more equitably distributed between and within countries, on the other. In the "towards sustainability" scenario, under-nourishment shrinks drastically even if agricultural production increases only in the vicinity of 40 percent, while GHG emissions are significantly cut. Undernourishment is drastically reduced because income and food are more fairly distributed between and within countries. More balanced diets in high-income countries, likely to bring beneficial impacts on overweight, obesity and related non-communicable diseases, also contribute to curbing the expansion of

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livestock activities, which is in turn a key factor to achieve the more limited expansion of agricultural output and arable land, and the significant reduction in GHG emissions. However, action in the food and agriculture sector alone will not suffice and a more equitable distribution of income within and across countries is indispensable. Thus, a structural transformation away from global capitalism is necessary to improve the equity of economic systems.

Agroecology and democratic governance for sustainable food and nutrition security. Having seen food production advance while hunger widens and planetary boundaries dangerously over-shoot, the only alternative is to create a viable small and medium-size agriculture using the principles of agroecology. Clearly, much needs to be done to advance agroecological science and practices, but even today's agroecological wisdom has the potential to feed the citizens of the world, protect biodiversity and the environment, and the productivity of the land for future generations - should there only be political will to scale it up. As a new global society, agricultural system and environment converge, and when we export entropy or mid-line wastes, we do it in our own backyards. Agri-Culture must be revitalized as the most dignifying human activity harnessing natural resources, through fair prices, responsible consumption and investments in rural areas - our inalienable gardens. However, addressing the global corporate governance is a pre-condition to sustainable and equitable food and nutrition security. The UN in its quality of global governance institution, should bring the rule of law to the power relations governing the global agricultural economy that currently determines who gets what, when and how. More specifically, the FAO High-Level Panel of Experts on Food Security and Nutrition, through an inclusive public debate of the Committee on Food Security, should examine the potential dangers of emerging agriculture technologies (e.g. synthetic biology, gene editing, driveless tractors) and supervise corporations developing them. Although countries in both the North and South have dismantled UN mechanisms to track technologies and corporations in the 90s, today's reality is that corporations are getting what they want and developing countries are losing out. Hence, time has come to consider a UN treaty on mergers and acquisitions, as well as technologies with implications for more than single nations. This process could be informed by existing UN tools, committees and initiatives, such as the UNCTAD Model Law on Competition Policy, the UNCTAD Commission on Science and Technology for Development and the UN Secretary General's Forum on Science, Technology and Innovation and its Technical Facilitation Mechanism[64]. Recognizing that this will be a long journey, global corporate governance must be somehow substituted by democratic governance for sustainable food and nutrition security.

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Nurturing Diversity in our Guts and on our Farms to Reduce Health Risks and Increase Food System Resilience

Salvatore Ceccarelli

Key Messages:

- Crop diversity increases resilience of farm production to climate changes and damage from pests and diseases.
- Science has associated biodiversity with human physical and mental health linked to the composition and diversity of the microbiota in our intestines.
- Dietary diversity is of paramount importance for having a healthy microbiota.
- A diverse diet needs diversity in production systems. So we need to rethink plant breeding from 'cultivating uniformity' to 'cultivating diversity'.
- One way to cultivate diversity quickly and inexpensively is by using a method called evolutionary plant breeding.

Introduction: seed at the heart of global challenges

Climate change, poverty, hunger and malnutrition, water, biodiversity in general and agrobiodiversity in particular are issues that have featured strongly in a number of recent reports and reviews (1–4). These issues are often covered separately even though they are closely interconnected with each other. One major interconnection is seed.

Seed is related to climate change because we need crops better suited to the climate as it changes. Seed is associated with food as most of our food comes directly or indirectly from plants. Through food and child nutrition, seed is linked to poverty (5). Seed is related to water, because about 70% of fresh water is used in agriculture (6), so varieties producing a yield with less water will make more water available for human uses. Seed is associated with malnutrition: the three crops from which we derive about 60% of our plant-based calories and 56% of our plant-based proteins – namely maize, wheat and rice (7, 8) – are far less nutritious than barley (9) or millets and sorghum (10, 11). Millets and sorghum are not only more nutritious, they also need less water than maize, rice and wheat, which use nearly 50% of all the water used for irrigation.

Finally, seed is related to biodiversity in general and to agrobiodiversity in particular. Agrobiodiversity is important for food security (12), for increasing farm income and generating employment, and for reducing exposure to risk (13, 14).

Maintaining or increasing agrobiodiversity reverses the tendency of modern plant breeding towards uniformity (15). The main cause for the dramatic reduction of genetic diversity is breeders selecting predominantly for varieties to be usable under the widest possible conditions. This decline in diversity has increased the vulnerability of crops (16–19) because their genetic uniformity makes them unable to respond to climate changes, especially short-term changes. In addition, uniform crops provide an ideal breeding ground for the rapid emergence of fungicide-resistant variants (19) as shown by the potato late blight epidemic and ensuing famine in 19th century Ireland (20). Crop diversity, by contrast, has been shown to be highly beneficial in restricting the development of diseases (21–24). For example in China, the use of variety mixtures of rice led to a reduction of rice blast of 94% and increase in yields of 89% compared to monocultures. Farmers were able to cease use of fungicidal treatment of crops within two years. One of the most notable examples of the advantages of mixtures was the expansion of barley mixtures in the

former German Democratic Republic during the years 1984–1991. Expanding the barley mixtures to 360,000ha led to a reduction of the percentage of fields affected by severe mildew epidemics from 50% to 10% and a threefold reduction of the percentage of fields sprayed with fungicides (25).

The biodiversity inside us

Science has associated the decrease of biodiversity with the increase of certain diseases in humans, ranging from inflammatory bowel disease, to ulcerative colitis, cardiovascular disorders, various liver diseases and many types of cancer (26). In turn, the increase in the frequency of inflammatory diseases has been associated with a decreased efficiency of our immune defences (26). Recently, the association has been confirmed between the microbiota – namely the complex of bacteria, viruses, fungi, yeasts and protozoa that is in our intestinei – and our immune system and with the likelihood of contracting inflammatory diseases (27).

The average human microbiota weighs around 2kg (about 0.5 kg more than the average human brain) and plays a number of important functions, from the synthesis of vitamins and essential amino acids, to the breakdown of what has not been digested in the upper intestinal tract. Some of the products of these activities represent an important energy source for intestinal wall cells and contribute to intestinal immunity.

Some of the most recent research (28) has shown that in melanoma patients who were capable of responding to immune therapy, the microbiotas had a different composition and were more diverse than those of patients who did not respond well. The research concluded that both the composition and the diversity of the microbiota are important in determining anti-tumour immunity. The response of laboratory mice that received a faecal transplant from human patients who had responded to the therapy supported the results. Faecal transplantation involves transferring the microbiota from a healthy patient to a patient with a disease and is becoming a widespread practice for the treatment of diseases that do not respond to antibiotics (28).

The microbiota also appears to be involved in several neuropsychiatric disorders such as depression, schizophrenia, autism, anxiety and stress response (29). This is likely due to the damage that inflammatory processes cause to myelin, the sheath surrounding the neurons, thus altering the normal transmission of nerve impulses.

Diet, human health and environmental health

Diet strongly influences the microbiota: a change in diet alters its composition in just 24 hours. It takes 48 hours, after changing the diet back again, before the microbiota returns to its initial conditions (30).

Given the important roles of the microbiota on the one hand, and the fact it is so strongly and rapidly influenced by diet on the other, it is understandable that there have been many studies on the effect of various diets (Western, omnivorous, Mediterranean, vegetarian, vegan, etc.) (30). Recent results demonstrate that the composition and diversity of gut microbiota are not significantly associated with genetic ancestry, but shaped predominantly by environmental factors (diet and lifestyle) (31). Diet diversity is of paramount importance for having a healthy microbiota (32).

The diet also links environmental and human health. Rising incomes and urbanization are among factors driving a global dietary transition in which traditional diets are replaced by diets higher in refined sugars, refined fats, oils and meats (33). By 2050 these dietary trends, if unchecked, will be a major contributor to global land clearing and to an estimated 80% increase in global agricultural greenhouse gas emissions from food production (33). Moreover, these dietary shifts are greatly increasing the incidence of type 2 diabetes, coronary heart disease and other chronic non-communicable diseases that lower global life expectancies (33). Diet is now the number- one risk factor for the global burden of disease (34).

A study conducted in Zambia showed that household dietary diversity is positively associated with production diversity, and in turn, production diversity is positively associated with indicators of nutritional status of children aged two to four (35). This effect has been confirmed by some studies (36) but not by others partly because of difficulties associating indicators of agricultural diversity with indicators of nutritional status (38).

So, human health needs a diverse microbiota, a diverse microbiota needs a diverse diet, and a diverse diet needs diversity in production systems. However, global trends and policies do not work in favour of

diversity. How can we have a healthily diversified diet if, as mentioned earlier, 60% of our calories come from just three crops, namely wheat, rice and maize (7)? And how do we diversify our food if almost all the food we eat is produced from crop varieties that, to be legally marketed, must be registered as uniform (Box 1)? How can we have a diversified diet if the agriculture that produces our food is based on uniformity?

BOX 1 – Registry of plant varieties

In most countries today, plant varieties need to be registered before they can be released in markets.

Registry of plant varieties was introduced in Europe in the mid-19th century to protect consumers by guaranteeing that purchased seed would be:

- Distinct from other varieties
- Uniform in its essential characteristics
- Stable so that it would not change when multiplied.

The characteristics that are promoted in this system are the opposite of those needed in a sustainable food system. Adaptability not stability is needed in order to adapt to new and changing climate conditions. Variability not uniformity supports yield stability when conditions are unfavourable and changeable.

Between the need to diversify our diet and the uniformity imposed by law on seed and thus on crops there is an obvious contradiction. In addition, there is a further contradiction between uniformity and stability on the one hand and the need to adapt crops to climate change on the other.

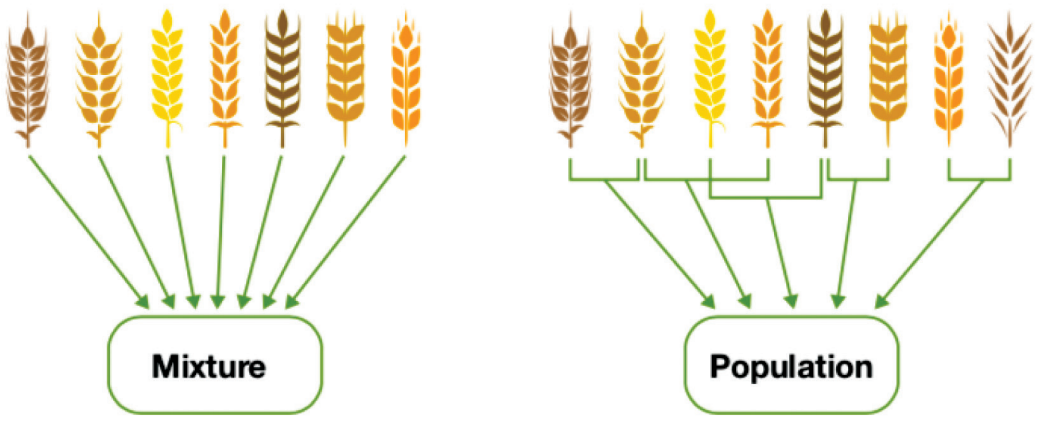
Cultivating diversity

Most food derives from seeds. Therefore, a primary solution to the health problems affecting the world today can be sought in the way that seeds are produced. Since seeds are produced by plant breeding, to change things we have to rethink how plant breeding is conducted in order to move from 'cultivating uniformity' to 'cultivating diversity'.

Today, much institutional plant breeding (both private and public sector) has industrial agriculture as its objective. Institutional plant breeding aims to 'cultivate uniformity', complying with the seed laws mentioned earlier, and producing uniform varieties bred to maximize crop yields with the support of fertilizers and pesticides. Once considered the only option to feed the world, the effectiveness of this model of agriculture is being questioned by recent research as being neither resilient nor sustainable (39). The human cost of the current food system is that almost 1 billion people are hungry and almost 2 billion people are eating too much of the wrong food (39, 40) which is artificially cheap (41). Evidence suggests that more than 80% of the world's food in value terms is produced on family farms (42).

One way of 'cultivating diversity' quickly and inexpensively is by using a method called evolutionary plant breeding (43, 44) (Box 2). Evolutionary plant breeding consists of cultivating mixtures or populations (Figure 1).

FIGURE 1 – The difference between mixtures and populations: a mixture is obtained by mixing seed of different varieties while a population is obtained by crossing different varieties



The starting point of evolutionary plant breeding could be a mixture of seeds, obtained by mixing an equal quantity of seed of a number of varieties of the crop in question (Figure 1, left). Alternatively, it could be an evolutionary population made by crossing a number of varieties (Figure 1, right). The ideal evolutionary population would be made up of all possible combinations of varieties. In either case, the choice of how many or which varieties depends on the farmer's objectives. For example, if disease resistance is one of the problems affecting productivity in the target environments, one or more parents of the evolutionary population or one or more varieties in the mixture should carry the desirable genes of disease resistance. The increasing availability of genetic markers associated with desirable genes is making the handling of evolutionary populations ever easier.

Once a mixture or a population is planted, it is left to evolve as a crop. In other words, it is planted and harvested, using part of the harvest as seed for the next season, or to select the best plants, or both. Thanks to the natural crossings that occur between plants, what was originally a mixture also becomes a population. The only difference is that in this case, we have no control over the crossing and therefore we do not know how the different parents contributed to the population.

Through the joint effects of natural selection and natural crossing, the seed which is harvested is genetically different from the seed that was planted. In other words, the populations (including those derived from an original mixture) evolve continuously. This is why they are called 'evolutionary'. The farmers therefore have the opportunity to adapt the crops to their soil, their climate and to the particular way in which each of them practises agriculture, including organic farming.

BOX 2: Evolutionary plant breeding: a history

The science of evolutionary plant breeding goes back to 1929. Harlan and Martini proposed the composite cross method of plant breeding and synthesized a barley composite cross (known as CC II) by pooling an equal number of F2 seedsii obtained by 378 crosses between 28 superior barley cultivars representing all the major barley growing areas of the world (45). Composite crosses and mixtures have shown that they are able to evolve towards a higher yield, higher yield stability over time, and a higher level of disease resistance during subsequent generations (43, 46–51).

Evolutionary populations adapt to different geographical areas by ripening earlier in warm locations and later in cold locations (52). They tend to perform better than uniform varieties in years affected by drought (53) and they can combine higher yield and higher yield stability (54–56). A meta-analysis of 91 studies and more than 3,600 observations concluded that cultivar mixtures are a viable strategy to increase yield, yield stability and disease resistance (57).

In a project which introduced evolutionary populations in Iraniii customers reported that the bread made from an evolutionary population of bread wheat was beneficial to health (58). Experiences in Italy found that an evolutionary population of over 2,000 different types of bread wheat from all over the world brings forth a bread that, besides having an extraordinary smell and taste, is tolerated by people suffering from gluten intolerance. This population has been dubbed the 'Aleppo mixture' in recognition of its provenance from Syria. In Iran, shepherds who have used an evolutionary barley population to feed sheep have noted an improvement in milk quality. Recently, pasta produced from a population of durum wheat by three different producers in Italy was unanimously considered by different informal panels of consumers of superior taste to what is considered the best quality pasta.

The rapid adoption of these evolutionary populations, and the reports on the benefits of their products, which are receiving constant confirmation, indicate that the cultivation of evolutionary populations, represents a dynamic way of cultivating crops.

Conclusions

Seed connects climate change, poverty, malnutrition, water and biodiversity – both wild and agricultural. Even the diversity in our guts, fundamental to good physical and mental health, relies on diversity in diets, which in turn relies on diversity in agriculture.This means cultivating diversity rather than cultivating uniformity, the opposite to current industrial agricultural models.

Evolutionary breeding is one way to confer resilience and adaptability through cultivating diversity. The evolutionary populations adapt to local conditions, resist disease and have sensory qualities that consumers appreciate. Very few inputs are needed, which contributes to increasing farmers' independence from an industrialized and financialized agricultural

model. Evolutionary breeding increases genetic diversity within crops. For healthy environments, healthy diets and healthy microbiota, diversity is needed across the landscape, with a variety of species, functional types, and land uses fostering resilience and health. Increased diversity in the field will support food and diet diversity, which through gut diversity and composition are key to human health and nutrition.

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Notes

i. Sometimes called the microbiome, which actually refers to the genes of the microbiota.

ii. In plant breeding every cross is assigned an F (filial) number: F1 is the first generation cross (i.e. between the first two original parents). An F2 is the second generation after a cross.

iii. This project ('Using Agricultural Biodiversity and Farmers' Knowledge to Adapt Crops to Climate Change in Iran' Grant # 1214 October 2010–September 2014) was supported by the International Fund for Agricultural Development (IFAD).

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Italy

Poisoned Apples and Brave Mayors

Manlio Masucci

The May tour in Trentino Alto Adige, organized as part of Navdanya International's global campaign for Poison-free Food and Farming, gave the Navdanya team the opportunity to see first hand the state of degradation of an immense territory under assault of industrial intensive monocultures. The team met with numerous local organizations, farmers and citizens battling against the real consequences of an intensive industrial system of production that is damaging their environment, their health, and local economies along with the beauty of the natural landscape for which their Trentino valley in the Alto Adige is famous.

Plastic tents over two meters high to protect the organic farm from pesticides

The surroundings of Gluderer farm before the monoculture's invasion

Apple's monocoltures in Trentino

Apple monocultures are extensive and pervasive, they occupy and reshape the entire mountain landscape of Trentino, with incursions up to, and even inside the towns. Apple trees as we know them are nowhere to be seen: instead there are rows upon rows of mutilated branches, individually propped up and attached to concrete or metal poles, like sentinels for as far as the eye could see, giving the impression of an immense cemetery.

The local communities have deep concerns about the massive and unregulated use of pesticides that go into supporting these monocultures. Vandana Shiva said, "People's concern is justified. The current epidemic of chronic diseases is also the result of the spread of toxic substances in our food systems. We are the first generation forced to watch our children become more ill than we are, particularly with cancer. We know that only 5% of cancers are of genetic origin, the remaining 95% are due to the toxicity of the surrounding environment".

The UN estimates that 200,000 deaths a year are caused by pesticides.

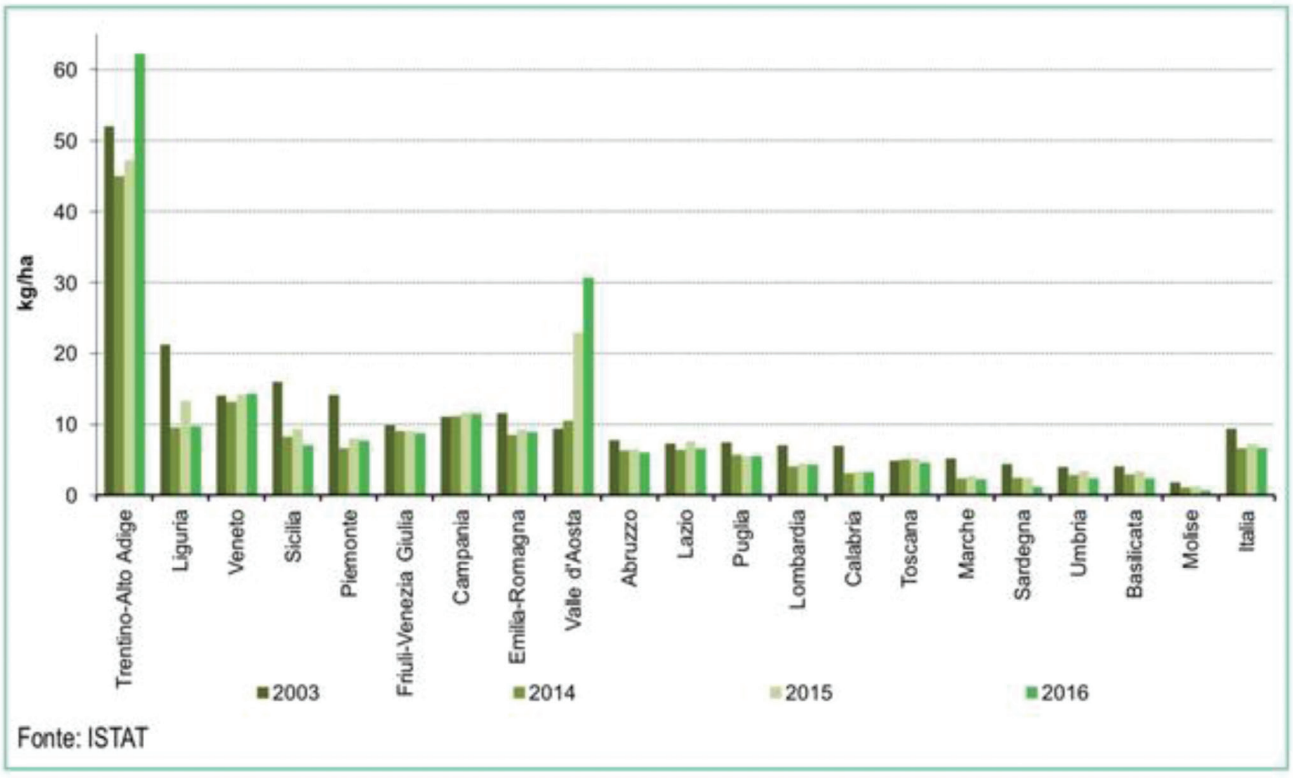
The effects of the industrial production system are not only perceived but also widely documented, as is the case in Trentino. The latest data from Ispra (Higher Institute for Environmental Protection and Research) speaks for itself: in the National Report on Pesticides in Water, 2018, the presence of pesticides was found in more than 90% of the points of surface water in the province of Bolzano and more than 70% in the province of Trento. This trend is confirmed by Istat data, contained in the Ispra Environmental Data Yearbook 2018, which certifies that, in 2016, an average of 62.2 kg of active ingredients per hectare were sprayed in Trentino Alto Adige, almost ten times the national average of 6.63 kg/hectare. It is difficult not to relate these data to the intensive monoculture of apples which in 2016 reached a production of 1,500,000 tons, equal to 70% of Italian production of apples and 15% of European production.

Protest is rampant: from the farmers to citizens and residents of the countryside

Safety distances not respected, treatments carried out without notice at all hours of the day and regardless of weather conditions, even on particularly windy days that facilitate the dispersion of chemicals at great distances. The stories are repeated identically throughout the region of Trentino Alto Adige which, for ten years now, seems to have turned into an immense monoculture. The lack of controls makes many farmers impermeable to protests from citizens and organic farms who see their crops threatened by contamination.

A manager of a local organic farm explains that "The safety distances between the treated fields and the other fields are rarely respected and often there are no protection hedges; to this we must add the arrogance of many operators who know very well that from the moment the irregular treatment starts to the moment the police intervene, enough time will have

Figure 1: Data on active ingredients of pesticides distributed for agricultural use, per hectare of arable land



passed to complete the operation; once on the spot, the policemen, in the absence of any illicit activity, decide not to intervene despite the noxious air, still soaked with pesticides recently sprayed."

The nascent coalition of organic farmers and citizens is simply the next logical step as is the case of Andrea's agriturismo, part of the Ortazzo network, an organization that has begun to question institutions not only on ecological sustainability but also on long-term economic sustainability. Entering the city of Trento, the capital of the Province, you can see how monocultures have now broken through the urban defensive lines, positioning themselves in flowerbeds, traffic dividers and roundabouts.

But Trentino is only the tip of the iceberg. This phenomenon can be found throughout the country. Citizens are mobilizing to demand that safety distances be enforced as well as the obligation to forewarn be taken seriously. This is reflected in the petition of 25 thousand signatures presented to the Parliament by the Facebook group 'No Pesticides' as well as in the case of the Forum Marcia Stop Pesticides (March to stop Pesticides) that (faced with the evidence of non-compliance with the rules) calls for a total ban on the use of chemicals in agriculture and an immediate halt to the expansion of intensive monocultures.

These requests come from an increasingly large section of the population which, on the basis of the principles of subsidiarity and precaution, claims the right to live in a healthy environment as enshrined in Article 32 of the Italian Constitution.

Paradise lost: how industrial agriculture is endangering organic production

Organic farming is increasingly under attack. It is in a state of siege and the most natural response to this appears to be the construction of a bunker to protect against chemical bombardment from industrial agriculture.

This is the story of the Gluderer family which was forced to spend over 150,000 euros to protect themselves from the surrounding pesticides. A heavy metal and plastic bunker of hundreds of square meters that protects crops, workers and members of the Gluderer family who, for four generations, have lived and worked in Coldrano, in Val Venosta, a beautiful valley in Trentino, in the North East of Italy. At the edge of the property the hedges have been replaced by plastic tents over two meters high. The organic farm gives the idea, at first glance, of a military camp surrounded by enemies, hundreds of hectares of monocultures of conventional apples ready to launch their chemical attacks on a daily basis.

The Gluderer family had to dig its surreal trench to preserve the health of its members and its organic farming activity, which is constantly threatened with contamination from toxic drift: "We could not do otherwise - explains Annamaria, 59 years old, looking worried at the bunker and the barriers that have covered the entire property for five years - it was the only way to maintain the organic farm and keep the job for our family".

Annamaria's daughter, Marion, holding Lena, her 6 years old child under the protection arches

This is what organic farmers are being forced to do in the face of the dangerous drift of pesticides, left alone by the authorities despite the repeated and obvious abuses: "We started the production of organic apples in 1990 and of organic herbs in 2005 - Annamaria tells us - on a total of 3.647 square metres; we began to suffer serious damage from pesticide drift in 2010 and since then we have submitted three criminal reports to the Asl; we won the lawsuits but the costs and the repetition of abuses have forced us to invest all the money to isolate our land from the surrounding intensive monocultures". This is a drastic, partial solution that does not do justice to the beauty of the Trentino landscape.

Yet, seeing the children of the family playing inside the fenced space, one has the impression that the solution adopted by the Gluderer family is absolutely correct. However, the bitterness of the barricade in the face of injustice remains. The injustice of having to see children grow up with a background of

plastic tents rather than uncontaminated countryside and mountains. A medieval castle under siege of the advancing chemical plague that provides only one other solution: that of escape.

Annamaria's grandchildren continue to play among the huge arches of heavy plastic

Annamaria's grandchild Lena playing in the property

This is the second option: Moving the production higher and higher, in the impervious but still friendly mountains, as far away as possible from the toxic miasmas. The Gluderer family have thus begun to explore the possibility of working where pesticides have not yet arrived, at least for the moment: "We bought a plot of land in Tubre, near Mals, at a height of 1,300 meters because there are as yet no problems of drift, so we decided to move all the hives there for the processing of honey". A defense and retreat to the bitter end in an attempt to defend health, work and life itself. Showing a photo of the countryside, her countryside before it all began, the chemical war and bunker, Annamaria whimsically tells us "My dream is that they give us back what we had, the countryside where I grew up but where my grandchildren can no longer grow freely".

While Annamaria's grandchildren continue to play among the huge arches of heavy plastic, we wonder if that dream will ever come to be. Enjoying a fragrant herbal tea of organic herbs on the farm with Manuel, Annamaria's 35 year old son, we ask him this. His opinion on local development is clear and at the same time disturbing: "It is a development model that works to promote a certain type of industry – he tells us, sipping his tea - supported by propaganda, because the truth is that we do not need pesticides or chemical fertilizers to grow, as evidenced by our production and that of other organic farmers; yields are very good and economic sustainability is ensured even without using copper or sulfur, but the industry pushes for so-called innovation, that's to say, sell new products, new technologies, even if in this way we continue to threaten our health and destroy biodiversity; in our fields insects and pollinators have almost completely disappeared".

The political choice: nothing to do with transition – the priority is to preserve the status quo!

Politics and business are intimately connected, in every sense, given the enormous economic interests at stake and the overwhelming power of the agro-industrial lobbies. This is the case of the Province of Bolzano, which with its resolution of 12 March 2019 authorized the use of a significant number of pesticides in drinking water even in areas where water is protected. And this despite the recent alarm launched by Ispra on the high level of contamination by pesticides found in surface and deep waters of Italy. Among the pesticides tolerated are not only Glyphosate, defined as carcinogenic by the IARC, but also Acrinathrin, Chlorpyrifos, Captan, Dithianon, Fluazinam, Mancozeb and many others.

A resolution that is not a novelty but, on the contrary, seems to fit into the national trend as in the case of the Decree 43/R of July 30, 2018 of the President of the Regional Council of Tuscany: "It's a scandal - decries the oncologist Patrizia Gentilini of Isde, the Italian doctors for the environment - that we continue to grant permits of this type; with this Resolution of the Regional Council of Tuscany, authorization is given throughout the region in the areas of groundwater

protection for human consumption, to the use of 29 pesticides with an extremely negative environmental profile, including Chlorpyrifos and Glyphosate, what is more five of which are not authorized in Europe such as Acrinathrin, Azinfos ethyl, Azinfos methyl, Demeton S-methyl and Omethoate; in the last three years - concludes Gentilini - 176 derogations have been granted to banned substances, so much so that the consumption of pesticides in our country, already among the first in Europe, has increased by 7.8%".

And if the regions do not do well, nor does the Parliament which continues to approve decrees which at the least are questionable, triggering the protest of civil society organizations. This is the case with the recent controversial Emergency Decree which undermines the enforcement of the obligation to assess the environmental effects of plant protection plans. This is what the more than two thousand signatories of the open letter to Parliament claim, calling for the application of a key principle of the transition phase: the system of agricultural production, as well as the management of plant diseases has to be inseparable from social, environmental, climatic, food, health, landscape and economic considerations.

Provinces, regions and governments seem to be continuing along a path that is the opposite of that called by citizens, civil society organisations and organic farmers who no longer are willing to stand by and watch, and are ready to ally themselves to get out of the trenches in which they have so far been relegated to.

Transition going on, despite the politics

The change will necessarily have to start from the bottom up. From communities that democratically claim their right to a healthy environment to live and to healthy and nutritious food. This is what is happening in Italy. Spontaneous movements of citizens are giving rise to increasingly strong and cohesive coalitions that claim the constitutional right to live in a healthy environment. And leading this are the municipal administrations: in 2018, 65 Italian municipalities activated rules and regulations in favor of organic farming in urban and suburban areas.

The cumbersome state bureaucratic apparatus and the corporate interests continue, however, to build a wall against the beginnings of a transition.

The story of the citizens of Mals, a small village in the Venosta Valley in South Tyrol, and its courageous mayor, Ulrich Veith is particularly telling. In 2014, the municipality of Mals held a popular referendum on pesticides, considering that in South Tyrol the average use per hectare is among the highest in Italy because of the monoculture of apples. About 70% of the population entitled to vote, participated in the referendum and, with a large majority of 76%, voted to ban pesticides from the territory of Mals. However, the Regional administrative tribunal (Tar) blocked the vote from becoming operational, and the Court of Auditors asked the mayor of Mals to reimburse the municipality the sum of twenty-four thousand euros, the sum spent on the organization of the anti-pesticides referendum.

At a press conference in the Italian Parliament, organized by Navdanya International, Mayor Veith declared that he intends to respect the will of his citizens by continuing to fight to free the municipality from pesticides. A commitment that has recorded a first important victory: the complete acquittal by the Court of Auditors in April 2019.

The implementing regulation on the use of plant protection products in the municipality of Mals, approved in March 2016, is a model for those responsible administrations that intend to enter a transitional phase to protect the environment and the health of their citizens.

Through the Regulation, the Municipality undertakes "to take all useful measures and actions according to the precautionary principle in order to avoid dangers to human, animal and plant health and to ensure the highest level of protection for the environment".

The Regulation aims to "protect the health of residents and guests as "fundamental right of the individual and interest of the community" (Art. 32 Constitution of the Italian Republic) and to ensure "a high level of environmental protection and improvement of its quality in accordance with the principle of sustainable development" (Art. 37 Charter of Fundamental Rights of the EU) through the regulation of the use of plant protection products in the municipality.

The Venosta Valley is an area of intense apple production with a high use of different pesticides. Life in the valley is no longer what it used to be. Areas famous for their clean air and pure water are now ruined and unhealthy by the daily spraying of chemicals. Air, water

and biodiversity have all been affected because of this intensive production system.

The battle of Mals continues.

On 1st October 2017, at Bhoomi, the Earth festival in New Delhi, communities from the Himalaya who have been practicing chemical free organic farming partnered with pesticide free communities in the Alps and launched the creation of a Global Network of Poison Free Organic communities and Zones. Joining them in the launch of the Poison Free Network, were also the Chief Minister of Sikkim who, over a period of 25 years succeeded in making Sikkim the first 100% organic state in the world, and Mayor Ulrich Veith of Mals.

In April 2019 Dr. Vandana Shiva, during her visit to Mals in April 2019, and Mayor Ulrich Veith renewed their shared commitment for an immediate transition to agro-ecological production models that respect biodiversity and counter climate change.

Picture Credits: Manlio Masucci

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Dr. Vandana Shiva's Visit to the Pesticide-Free Town of Mals, Italy

Katharina Hohenstein & Koen Hertoge

Dr. Vandana Shiva was one of the early supporters of the citizens of Mals Venosta in Italy who voted in a public referendum for a pesticide-free future in 2014 and have been pursuing that aspiration through advocacy, political action, legal battles, and citizen science ever since 75% of the town's population voted in support of the ground-breaking referendum. On April 11th, 2019, Dr. Shiva travelled to Mals to meet the members of the town that has inspired so many other communities around the world. The Aula Magna room in the School Centre was completely packed with people who came to see the Livelihood Award Holder Vandana Shiva and to celebrate the brave people of Mals.

The evening was unprecedented in Mals. While it was not the first time that an event in Mals was so successful in gathering a large crowd--in the past, there had been plenty of events and information sessions focused on the pesticide-free village of Mals--but this time it was the village of Mals and BGO who invited Vandana Shiva to be the keynote speaker for the event. The president of Navdanya International, a member of the World Future Board and also an advisor to the FAO, Dr. Shiva found the right words to describe the people in Mals: they are "brave."

The evening started with the Matscher Musikapelle, a traditional group of musicians coming from the nearby locale of Matsch, the first South-Tyrolean Mountain-Climber village, also on the way to becoming an organic valley.

In 2018, Dr. Shiva invited the mayor of Mals, Ulrich "Uli" Veith to India to present the Mals initiative and to celebrate the Himalaya communities pursuing similar pesticide-free goals. He was also able to directly experience some of what Dr. Shiva and her colleagues in Navdanya had been working on during the last few decades.

What would it be like if South-Tyrol would become the organic province in Italy, similar to the Kingdom of Bhutan? Such was one of the questions raised by Dr. Shiva.

"South-Tyrol is a paradise, but my travel to Mals is also a travel to support democracy," Dr. Shiva said, referring to the referendum advanced by the people in Mals. "Agriculture is 'agri' - 'culture'. The culture of soil and nature and land. And this is what we destroy by using chemicals."

Dr. Shiva also referred to the cost of industrial agriculture - economic costs as well as health costs of pesticides which resulted in problems of immigration from poor countries, the limited nutritional value of conventional grown products and the dangers faced by the future generations if they don't have a proper soil to build on.

"I wish there would be more people like the citizens of Mals," Dr. Shiva said, to resounding applause. "The Mallesers are not only fighting for themselves, but for the world."

The event concluded with a final highlight. The Mallesers who were involved in the pesticide-free initiative were joined by organic farmers to perform their best version of the "Sing for the Climate". This song reminds us of the future that we should all pursue together, not only for ourselves, but particularly for the next generations. Dr. Shiva closed the keynote by urging the audience to continue their work, with speed and passion: "Let us go together on this path to 2030: we only have 10 years!"

Mayors of the World Banning Glyphosate

Around the world, more and more mayors and other representatives of local municipalities are taking a stand to protect the health of their citizens and their right to an environment without poisons. Here are a few examples.

ITALY

According to estimates which came out from the meeting called "Free from pesticides: Italy begins with municipalities" organized by Cambia la Terra in Rome in June 2019, approximately 70 municipalities have banned or restricted the use of pesticides on the basis of the Precautionary Principle in the country. Among those are the four provincial capitals of Belluno, Bolzano, Trento and Verona. Regulations vary from banning the use of chemicals on private and public greenery in cities, to creating more strict and controlled safety distances between residential areas and fields where chemicals are sprayed, as well as calling for larger areas under organic farming and more protection for organic farms from accidental pesticide contamination. In Vallarsa municipality (province of Trento), citizens also succeeded in bringing about the application of the "Polluters Pay Principle", whereby those who do not cultivate organically must activate an insurance policy for the compensation of expenses and damages caused by pollution due to their activity.

Source: Liberi dai pesticidi: l'Italia comincia dai Comuni, Cambia la Terra, 12 June 2019 https://www.cambialaterra.it/2019/06/liberi-dai-pesticidi-litalia-comincia-dai-comuni/;

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"Un esercito di Comuni dice no ai pesticidi", by Micaela Cappellini, Il Sole 24 Ore, 7 September 2019 https://www.ilsole24ore.com/art/un-esercito-comuni-dice-no-pesticidi-ACMKR5d

FRANCE

At the end of August 2019, the administrative court of Rennes ruled against a decree, issued by the mayor of Langouët (Ille-et-Vilaine) in Brittany, which imposed a distance of 150 meters between people's homes and workplaces and chemically treated fields. In response, citizens' movements gathered outside the court building, expressed their outrage and the political debate became heated across the country. Around 56 other small French towns and villages have issued similar anti-pesticide orders and are putting pressure on the government, which launched a public consultation on safety distances on 7 September. This was followed, on 10 September, by the signature of an order, by the president of the Val-de-Marne departmental council banning the use of pesticides that contain glyphosate throughout the department. On 12 September, the metropolitan areas of Paris, Lille, Nantes, Grenoble and Clermont-Ferrand also announced a ban on the use of pesticides in their territories.

Source: French mayors ban glyphosate weedkiller, defying government, Reuters, 22 August 2019, https://www.reuters.com/article/us-france-agriculture-glyphosate/french-mayors-ban-glyphosate-weedkiller-defying-government-idUSKCN1VC2C1;

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Pesticides: la carte des communes qui ont déjà pris des arrêtés, Le Figaro, 10 September 2019, http://www.lefigaro.fr/actualite-france/pesticides-la-carte-des-communes-qui-ont-deja-pris-des-arretes-20190910 ;

Pesticides-free cities put pressure on French government, By Cécile Barbière, EURACTIV.fr, 13 September 2019, https://www.euractiv.com/section/agriculture-food/news/pesticides-free-cities-put-pressure-on-french-government/

PHILIPPINES

In 2017, 200 municipalities in the Philippines, members of the League of Organic Municipalities and Cities (LOAMCP) signed a joint agreement, along with Regeneration International to create new policies based on preserving soil health as a powerful tool to enhance climate resilience, banning the use of toxic agrichemicals and genetically modified organisms (GMOs) as well as establishing a reward and sanctions system for farmers. Once fully implemented in 2022, the agreement will cover 1.2 million hectares of land. Since 2017, the League of Organic Municipalities and Cities has expanded by also bringing lawmakers together, and it is pushing towards 100% country farmland converted to organic, as the existing Philippines' law only requires 5%. Meanwhile, the Department of the Interior for Local Governments (DILG) has officially asked every municipality in the Philippines to become a member of LOAMCP, which is a very encouraging step in the right direction.

Argentina

Defending Seed Freedom

Fernando Cabaleiro

In Argentina we defend seed freedom as a human right

In Argentina, patent law does not allow plant patents. However, shortly after obtaining the marketing authorization of the first genetically modified soybeans in 1996, the Monsanto company claimed rights of Intellectual property before the state agency responsible for granting patents (INPI – National Institute of Industrial Property) for a double-stranded recombinant DNA molecule and plant cells with the insert of that molecule.

The state agency rejected Monsanto´s request because the law is very clear: plants cannot be patented. Consequently, Monsanto went to court arguing that the patent law violated their property rights.

In November 2015, the Federal Chamber of Civil and Commerce of the City of Buenos Aires rejected Monsanto´s claim to patent the plants. In its decision the court was blunt, it stated that the recombinant DNA molecule, the plant cells transformed by it and the plants generated from them included in Monsanto´s request, were not included in the protection provided by the patent systems because they did not comply with the provisions established by law.

The court considered that any technical contribution made in the field of biotechnology which has an industrial application is not necessarily patentable as mere innovation is not comparable to inventiveness. It said that what was present in this case was a modification of a matter already existing in nature which does not constitute any human creation, an essential requirement for proceeding with the patenting as stated in the legislation. The ruling of the Chamber was confirmed by the Supreme Court of Justice of the Nation, in April 2019.

Even with that judicial decision, both Monsanto and Bayer went back to the justice system. Now that the claims consist of the recognition of patenting rights of genetic sequences, both companies maintain that the genetic sequences are constructions that are made artificially in the laboratories. Therefore, according to these corporations, they would not be part of the plant. This would make them patentable. They also argue that genetic sequences are inventions with surprising results that are not derived from a regular technique.

Both legal actions are ongoing. From Naturaleza de Derechos we question this claim for two specific reasons. First, it is not an invention. Second, it is reductionist to segment, separate, the genetic sequence of the plant. Once the molecule inserted with the genetic sequence is introduced into the plant, it forms part of it in an inseparable way. Therefore, the non-patenting of plants includes all its components: organelles, genes, leaves, bulbs, stems, etc.

On the political level, Monsanto and Bayer are pressuring the legislature to modify the Seed Law. In Argentina, use of seeds, falls within the scope of the UPVO Act 1978. Under this law farmers are allowed to save seeds, build their own varieties from them and exchange them without any restrictions or conditions. Along with the patent claim, Monsanto and Bayer are demanding that the use of seeds by the farmers be absolutely banned for three years, through modifications in the Seed Law. With this change in the law, farmers would not be able save seeds and will be forced to buy them in each sowing season.

While the bill proposes an exemption for farmers from family, peasant and indigenous agriculture, the requirements for the validity of the exemptions are impractical and cumbersome. In reality, what is sought after with the change in the Seed Law is control by the agribusiness corporations and large seed companies over all varieties of seeds, not only over GMOs. Hence, this amended law would promote a seed oligopoly, which by proscribing farmers' use of seeds, would put the genetic diversity and food sovereignty at serious risk.

We reject intellectual property over plants as well as the Seed Bill as they only aim to strengthen the incentives for the commercial development of plant varieties that have the maximum trade potential and that require agrotoxics associated with the industrial production model of GMOs. Continuing this way, plant varieties created ancestrally by peasants and indigenous communities which possess a high genetic diversity and resilience to climate change would be gradually replaced by those produced by the private sector oligopoly of transnational companies with a high degree of uniformity and vulnerability, eroding the very basis of agricultural diversity.

Closely connected to the defence of freedom of seeds for their non-patenting and their own use as a human right is the commons and the community rights such as free access to seeds, adequate availability of food, biodiversity preservation, public health, food security and sovereignty. If these community rights are affected, the rights of mother earth, small farmers, indigenous communities and peasants, and indirectly, all consumers (especially the needy, the old, children, pregnant women and people with certain pathologies) are also affected.

It must be assumed that what is at stake is not something minor, it is our own freedom as stewards of nature's given fruits. We have to think not only of the current society we are a part of, but also of future generations. This way of thinking is something too alien for agribusiness merchants but too important and crucial for our steadiness and conviction, because the freedom of the future generations depends on the fact that we keep ours intact.

Brazil

Popular Resistance, Agroecology and Food Sovereignty in Brazil

Murilo Mendonça Oliveira de Souza

Brazilian agribusiness has established technical and political parameters to create a world-renowned model of agriculture. In Brazil, agribusiness is the result of a historical process enforced on lands through large monocultures and violence against indigenous people, traditional communities and peasants. It expropriated their territories and eliminated their livelihoods.

The agribusiness-based production model has accumulated social and environmental impacts. Its consolidation, which aims to produce commodities, resulted in the expulsion of traditional and peasant communities from the countryside to make way for corn, soybean, cotton and sugarcane monocultures. According to data from the 2017 Censo Agropecuário[1], rural establishments with 1,000 hectares or more occupy 47.5% of the country's land, while farms with size between 100 and 1,000 hectares occupy 32% of the land. This indicates that less than 20% of the land remains for the vast majority of peasants, who represent more than 80% of farmers.

Agribusiness also represents violence against peasant families and indigenous nations. In 2017, 2,307 families were expelled from their lands, 28 peasant were murdered, 27 were tortured, 167 were threatened with death and 1,465 identified as working in slave labour conditions, according to the annual report "Relatório de Conflitos no Campo" of the Brazilian institute Comissão Pastoral da Terra[2].

With the cultivation of transgenic seeds, violence also occurs through contamination of nature, water and our food with pesticides. For over a decade, Brazil has been the largest consumer of pesticides in the world. In 2017 alone, 539.9 thousand tons of pesticide active ingredients were consumed in Brazil, more than 45% referring to Glyphosate. In the first half of 2019, around 240 new pesticides were approved to be used in the country's fields, many of them banned in Europe and elsewhere[3]. Most part of pesticides which is consumed is related to GMO planting. In 2016, Brazil had 41.9 million hectares of transgenic seeds crops, which makes the country the second largest producer of transgenics in the world[4].

Recent research has shown that a cocktail of 27 different pesticides has been identified in drinking water from 1 in 4 Brazilian municipalities[5]. Similarly, 58% of the analyzed foods (rice, beans, potatoes, corn, and 21 other foods) between 2013 and 2015 contained pesticide residue[6]. Therefore, agribusinesses don't produce food. They produce commodities. They produce contamination and violence on the people and the environment.

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Brazilian family peasants are responsible for producing the real food consumed in the country. They're responsible for 70% of beans, 34% of rice, 87% of manioc, 46% of corn, 38% of coffee, 21% of wheat and 60% of milk[7]. This production process is based on peasants and traditional communities. Thus, they represent the social and cultural realities of the Brazilian people, which produce food respecting nature and people. It is also related to the struggle for land, organized by landless rural workers in Brazil, which created new spaces for food production and a large contingent of farmers, ensuring a healthy life for the entire consumption chain.

Landless Camp Dom Tomás Balduino - Photo: Gwatá/Agroecology Brazil

Agroecology is the basis of this diverse and culturally fair production. Agroecological farming, in addition to ensuring healthy food production, also ensures respect for diversity (natural and cultural), respect for indigenous and peasant groups, respect for women and respect for the youth.

Currently, Brazil has approximately 70,000 certified organic producers. Agroecological experiences are increasingly multiplying. Farmers from the Movimento dos Trabalhadores Rurais Sem Terra (Landless Rural Workers Movement - MST) harvested more than 16,000 tons of organic rice in 2019, ensuring healthy food for all[8].

Organic Rice - Photo: Alex Garcia/MST

Agroecology is the only way to produce socially and environmentally healthy food, respecting the culture and the struggle of indigenous peoples, traditional populations and peasants. Agroecology must be understood as a practice, a movement and a science, an articulation that guarantees the production of real food. And it can only be built collectively by peasants.

[7]IBGE Istituto Brasileiro de Geografia e Statisticas, https://ww2.ibge.gov.br/home/estatistica/economia/agropecuaria/censoagro/2006_segunda_apuracao/default.shtm

[8]RBA Rete Brasil Atual, MST comemora colheita estimada em 16 mil toneladas de arroz agroecológico, 16/03/2019, https://www.redebrasilatual.com.br/cidadania/2019/03/mst-comemora-colheita-de-16-mil-toneladas-de-arroz-organico/

The Sweet Medicine of Agroecology for the Bitter Chemical Sprayed Monoculture

Fabian Pacheco Rodríguez and Mauricio Alvarez Mora

History repeats itself because of the stubborn mindset of those who promote chemical sprayed monocultures. In different environments in the tropical countries of Latin America, we could see the warnings of the arrival of a new fungus called: "Fusarium oxysporum f. sp. cubense (TR4)". This fungus causes the so-called "Panama Disease", and it is so aggressive that nowadays it has the capacity to destroy large banana plantations causing huge economic damage to the agro-export sector.

In Costa Rica, a first strain of Fusarium was detected in the 1950s. The Panama Disease bears its name because it was detected for the first time in that country. In those times a banana variety called Gros Michel was used, that was very susceptible to the Panama Disease. The Gros Michel variety is by far one of the sweetest and exquisite bananas, but it has unfortunately disappeared from transnational food chains because of its susceptibility to the disease, which makes it not viable for monocultures. It is no coincidence that it is instead possible to produce this banana variety under agroecological conditions. An example of this is the Association of Small Farmers of Talamanca (Asociación de Pequeños Productores de Talamanca - APPTA) from the South Caribbean region of Costa Rica, where they produce the exquisite variety of Gros Michel. APPTA is made up of some 600 families of which 80% are indigenous[9].

Costa Rica has 3,298.78 hectares registered under organic banana cultivation, compared to 50,000 hectares of banana monoculture, mostly concentrated in the hands of transnational corporations and large local companies[10].

The agro-industrial "development" model that is applied to the production of agricultural commodities for the international markets has left a deep scourge of environmental impact : the destruction of tropical forests to expand agricultural fronts, the contamination of water aquifers by different "cocktails" of agrochemicals among others. These are affecting community access to clean water systems, as well as aquatic ecosystems in general where we see entire tides of fish and amphibians killed by acute intoxication. These and other phenomena have become common in the pineapple monocultures and banana plantations areas in Costa Rica.

The ecological consequences of the agro-industrial banana cultivation model have spread in the past 150 years, through the dispossession of the valleys and fertile lands that the indigenous inhabited, and who were displaced towards the highlands that have scarce agriculture suitability. At the same time, intensive and polluting exploitation was established, that also implied great violations against workers, such as low wages, poor health services, union persecution, hiring of undocumented workers[11]. In environmental matters, the banana agro industry is responsible for infertility

[9]APPTA (2019). Producimos respetando la madre tierra. Availble at: http://www.appta.org/index.php/es/

[10]SEPSA. 2019. Boletín Estadístico # 29. Availble at: http://www.mag.go.cr/bibliotecavirtual/BEA-0029.PDF

[11]Palmer, P. (1986) "Wa'apin man": La historia de la costa talamanqueña de Costa Rica, según sus protagonistas. Costa Rica: Instituto del Libro

issues of thousands of workers, who suffered - in the late sixties - from the effects of the spraying of products such as Nemagon and DBCP (Dibromochloropropane)[12].

To challenge the tropical biodiversity with green deserts of monocultures and not to understand the lessons of the past, such as that of the Panama Disease (whose history is about to repeat itself with the return of Fusarium TR4) is one more step in the wrong direction. Monoculture, in our biodiverse regions, is only viable through the use of intensive biocidal substances. To understand how modern industrial agronomic practices ignore the enormous potential of indigenous wisdom and how it is possible to live and produce food on the planet without destroying it, we can look at how such different and antagonistic agricultural ecosystems are carried out in the same region of Costa Rica.

In comparison with the agrochemical-addicted banana plantations that have replaced the sweet variety of Gros Michel with the Cavendish variety - in order to keep the monoculture model going and avoid the Panama Disease - today there are hundreds of indigenous families producing the Gros Michel organic banana without the need of one single drop of agro toxic or synthetic fertilizers. Their production of organic bananas and other foods within the forest is a clear challenge to what Vandana Shiva defines as the "monocultures of the mind"[13]. This ecological and family production is facilitated since bananas are planted inside the forest, under trees that are used for wood, fruit and medicine. When the arboreal component is respected, a fresher microclimate is obtained which prevents the sigatoka fungi spores (Mycosphaerella fijiensis) from aggressively germinating. It should also be noted that these producers use a larger planting distance between banana plants, so despite their great susceptibility to the Panama Disease, this does not result in economic damage to the family farmers. The aforementioned distance of planting in agro-ecological systems allows for the establishment of a true forest of food, wood, medicine, etc. which allows communities of Talamanca to live in a true food paradise and marks a limit to the expansion of pesticide sprayed monocultures.

Unlike the organic banana production model, the corporate approach, which is aimed at producing more kilos of banana per area creates multiple problems. It completely removes the trees and this generates greater density of banana plants per area, as well as a microclimate that favours the germination and dispersion of the sigatoka fungus spores. As a consequence of removing all the trees, in order to maximize banana production, it becomes necessary to spray hundreds of hectares with fungicide once a week. The most frequently used is the well-known Mancozeb, which happens to be the most imported agrochemical in Costa Rica.

The Infants and Environmental Health Program (Programa Infantes y Salud Ambiental - ISA) of the National University carried out an investigation 6 years ago with school children from 6 to 9 years old in the canton of Talamanca. It found significant concentrations of toxic substances like Mancozeb in their urine. It has been established that children with greater exposure to these substances have more learning problems and are more restless[14]. Another study included pregnant women from Matina, where agrochemical spraying practices by the banana corporations are similar to those of Talamanca. Thus, a high content of manganese (one of the components of Mancozeb) was found in the hair of these women, which suggests that foetuses could also be exposed to the toxic chemical, since it is easily absorbed by the placenta[15].

In addition, a 2005-2008 study on sloths (Bradypus variegatus y Choloepus hoffmanni) on a farm located in Pueblo Nuevo de Guácimo, surrounded by intensive

[12]Solano, S.M., 2013. Reflexiones para e l a nálisis comparativo d e movimientos s ociales: e l caso d e extrabajadoras y extrabajadores bananeros afectados por el nemagón en Costa Rica y Nicaragua. Anuario de Estudios Centroamericanos, pp.211-232.

[13]Shiva, V. (1993). Monocultures of the mind: Perspectives on biodiversity and biotechnology. Palgrave Macmillan.

[14]van Wendel de Joode, B.V.W. Mora, A.M., Lindh, C.H., Hernández-Bonilla, D., Córdoba, L., Wesseling, C., Hoppin, J.A. and Mergler, D. (2016). Pesticide exposure and neurodevelopment in children aged 6–9 years from Talamanca, Costa Rica. Cortex, 85, pp.137-150

[15]Mora, A., Córdoba, L., Cano, J., Hernandez-Bonilla, D., Pardo, L., Schnaas, L., Smith, D. Menezes-Filho, J., Eskenazi, B., van Wendel de Joode B. (2018). Prenatal Mancozeb Exposure, Excess Manganese, and Neurodevelopment at 1 Year of Age in the Infants' Environmental Health (ISA). Environmental Health, 29.

cultivation of banana, pineapple and paddock, found traces of pesticides in hair, arm washing and oral cleansing of the sloths analyzed. Among the substances found: ametrine, chlorpyrifos, chlorothalonil, diazinon, difenoconazole, deet, ethoprophos and thiabendazole. All of these are used in banana and pineapple plantations. According to the study, this contamination is produced "probably by the ingested food contaminated and by direct contact with pesticides"[16].

The Regional Institute for Toxic Substance Studies of the National University (Instituto Regional de Estudios en Sustancias Tóxicas de la Universidad Nacional - IRET-UNA) has found that the fungicide chlorotalonil in 95% of samples of dust collected from schools and residential houses in communities of the Costa Rican Caribbean near pineapple and banana plantations[17].

Organic agroforestry system with plants of Gros Michel banana, cocoa, pejibaye, etc.

What is clearly evident to our oldest inhabitants, gets destroyed by the corporate academy of the monoculture of the mind: the greater the diversity, the greater the sustainability, not only ecological, but also economic for those who live from agro-ecosystems. The logic of the "mental deserts" is to dismantle the agro ecosystems and condemn farmers to become dependent on external inputs; particularly those who pay attention to the advice of the industry to produce agricultural commodities.

In order to exemplify the above, let us continue to look at the case of banana plantations and understand the differences in agricultural management practices: those that favour social and environmental benefits, and those that result in the opposite.

Fertility and soil of two very different systems

In the agroforestry systems that produce bananas in indigenous territories, a constant cycle of nutrients can be observed, thanks to the decomposition of leaves and branches left on the ground. This contribution of the arboreal component allows for an almost total independence from external inputs. Monocultures of pazco bananas, instead, must get all nutrients in the form of synthetic fertilizers in order to maintain production. On the other hand, the non-use of herbicides and nematocides, among other substances, allows the presence of a vegetable cover that besides providing organic matter to the soil, favors the life of multiple macro and microscopic organisms - or, better said, the life in the soil. This is essential to maintain the nutrients cycles, as well as to keep certain organisms in balance. which could become true plagues in absence of a diversified ecosystem. Phytopathogenic nematodes are favoured in those soils which are depleted of organic matter for many different reasons, beginning with the fact that the only thing left to eat are the roots of the banana crops because of the lack of competition in the soil ecosystem with other organisms that oppose them. As a consequence, monoculture engineers resort to coarse applications of agrochemicals with outstanding "collateral" impacts, e.g.: contamination of ecosystems, water, fauna and people. In contrast to this logic of devastation of biodiversity, it turns out that in soils full of organic matter and other plants (called "weeds" by

[16]Pinnock, M. (2010). Evaluación de la exposición a plaguicidas en una población de perezosos (Bradypus variegatus y Choloepus hoffmanni: Xenarthra) en un paisaje agrícola y un centro de rescate del Caribe de Costa Rica. Tesis para optar por el grado de Magíster Scientiae en Manejo de Recursos Naturales con Mención en Gestión de la Biodiversidad. UNED: Costa Rica.

[17]Sáenz, M; Sánchez, J. 2008. Informe Final "Diagnóstico: tendencias laborales, socioeconómicas y ambientales del monocultivo del banano y la piña, en los últimos cinco años en el Caribe costarricense." Foro Emaús.

the engineers) nematodes do not represent a major problem.

In conclusion, it must be said that the new threats of plagues and diseases that devastate monocultures should not surprise us, as it is a biological phenomenon to be expected in any agricultural system that imposes genetic uniformity where biodiversity would be the norm. The example of organic production of the sweet organic banana Gros Michel - susceptible to the Panama Disease - within the edible forests, should become the example to follow. Agroecology is the sweet medicine against the diseases that the chemical sprayed monocultures entail.

Photo of chemical sprayed banana monoculture plantation.

A Knife to the Throat
Think before you Dance to the GMO Beat

Nnimmo Bassey

A popular saying has it that the person that pays the drummer dictates the tune. That saying may not hold true at all times because the drummer may on occasion allow her innate artistic flair to take over. The saying, however, finds a wide parallel in situations where governments do not fund their research institutions and agencies, thereby pushing them into the embrace of funding agencies with motives that may not be in sync with that of the governments.

A case in point has to do with the way we are handling issues of biosafety. We do not appear to worry that the surveyors of genetically modified (GM) crops and products, apart from their pretentious messianic posturing are mostly concerned with making profit out of our miseries. We do not worry that our staple crops are targeted and that these marketers are the ones declaring our vitamin or mineral deficiencies and presenting GM crops and foods as silver bullets to solve all our problems.

We are happy when we are assured that GM foods and products will be labelled and that we will definitely have a choice with regard to whether or not we wish to eat them. We do not consider the fact that most of our staples are sold in ways that do not permit labelling. We do ourselves harm when we gloss over this issue. We do know that in the global north you can know the origin of the bananas, oranges and other fruits you buy from the labels stuck on them.

We have said several times that our socio-cultural context does not allow for labelling in our informal marketing and sharing systems. The African Agricultural Technology Foundation (ATF) announces that GM beans will be planted in Nigeria in 2020. We must not lose sight of the fact that we are in breach of the law if any GMO is released into our environment and to our markets if it is not, and cannot, be labelled. Without the right of choice, we are forced to eat GM foods with a knife to our throats.

Back to the payer and the drummer. Sometimes the drummer may go into a flourish, but that often happens when the payer starts what may look like limitless spraying of currency notes. If the Alliance for a Green Revolution in Africa (AGRA), Bill and Melinda Gates Foundation or Monsanto sprays you with seeds, or a laboratory, the dancer can go into a frenzy.

The fervour with which we are open to being used as testing fields of hypotheses dreamt by speculators, and even by students in foreign laboratories, should capture our attention. We recall when the great work IITA did in developing natural cassava varieties and methods for controlling the dreaded cassava leaf mosaic disease. These days they appear more bent to working on GM cassava for the increase of starch content in the tubers, not for foods for humans, but probably for industrial purposes. One such GM cassava was developed in a student project in a laboratory in Switzerland and brought to Ibadan, Nigeria, for testing. The so-called confined field trials have since been concluded but information on the outcome is not in the public sphere.

The routine response of the agency when asked for information on the basis of which they issue permits is to refer the enquirer to their website.

When told that the information is not on their website, their response is to again reiterate their blanket reference to their website.

The same laboratory from Switzerland recently sent another GM cassava for a willing Nigerian institute, the Nigerian Root Crops Research Institute (NRCRI) located at Umudike, to obtain a permit and carry out confined field testing of a cassava variety engineered to contain high levels of iron and zinc. Despite very detailed comments sent to show why approval should not be

granted for its field testing, the approval was granted by mid-July 2019.

Expert comments sent to show why certain applications should not be approved are treated with contempt and brushed aside. The agency is averse to giving a response as to why they reject the contrary points raised by concerned citizens and groups. The arrogance and hostility towards those who do not dance to the GM beats keeps increasing by the day. This has to stop.

The NRCI got the permit to carry out a confined field trial of the GM cassava on a plot measuring not more than 200 square metres. That is small, right? However, NRCI is to ensure a buffer or exclusion zone of 1.5 kilometres in which there must not be any non-GM cassava planted or growing wild. Is that possible in Abia State, or anywhere in Southern Nigeria? 1.5 kilometres without a cassava plant? Another requirement is that the place in which the GM cassava is to be planted must have security personnel keeping watch on a 24 hours basis. Really?

The immediate area of the trial zone is to be surrounded by a pollen trap to prevent the spread of pollen grains from the GM cassava. The trap is not something mechanical, like a mouse trap. It is rather a planted area where the crops planted there must flower at the same time as the GM cassava in the confined trial area. If that is not preposterous enough, consider who would ensure that the area is decontaminated after the field trial. That task will be done by "persons trained by the permit holder." It is doubtful if such a person can be trusted to be objective in carrying out the task. It is obvious that entire scheme is a wild, needless gamble.

Some of us are wondering if the biosafety regulatory agency in Nigeria should bother to advertise applications for introduction of GM crops and call for comments when they already have their minds set on being little besides a permitting agency. Expert comments sent to show why certain applications should not be approved are treated with contempt and brushed aside. The agency is averse to giving a response as to why they reject the contrary points raised by concerned citizens and groups. The arrogance and hostility towards those who do not dance to the GM beats keeps increasing by the day. This has to stop.

USA

The 2019 Northeast Earth Journey for Poison-Free Food & Farming by 2030

Philip Ackerman-Leist

The issues that inspire our activism seldom make their way into international morning headlines--and that is part of the reason for our public advocacy. However, on May 6th, 2019, we were wedging our car into a coveted parking space right in front of the Vermont Statehouse so that Dr. Vandana Shiva could make her way to the front steps of the capitol building for our rally for a "Poison-Free Food & Farming by 2030,". That's when the National Public Radio host read the first of the morning headlines: "Up to 1 million of the estimated 8 million plant and animal species on Earth are at risk of extinction — many of them within decades — according to scientists and researchers who produced a sweeping U.N. report on how humanity's burgeoning growth is putting the world's biodiversity at perilous risk."

Source: Chappel B., Rott n., Npr news, "1 Million Animal And Plant Species Are At Risk Of Extinction, U.N. Report Says", 6 May 2019, https://www.npr.org/2019/05/06/720654249/1-million-animal-and-plant-species-face-extinction-risk-u-n-report-says?t=1571662890531

As if on cue for the upcoming rally, the broadcaster continued, "...the assessment is the most accurate and comprehensive review yet of the damage people are inflicting on the planet. And they warn that nature is declining at 'unprecedented' rates and that the changes will put people at risk." In his statement about the report, UNESCO Director-General Audrey Azoulay had just hours earlier noted that "Protecting biodiversity amounts to protecting humanity."

Few human activities impact biodiversity or climate change more significantly than food and agriculture systems, and the "Northeast Earth Journey for Poison-Free Food and Farming by 2030" provided the opportunity for Navdanya and Sterling College to advance the issues in four of the Northeastern states of the US: Vermont, Massachusetts, Connecticut, and New York. Following a rousing commencement speech by Dr. Shiva on May 4th, Sterling College hosted an all-day activists' workshop focused on "Strategies for Social

and Environmental Justice," attended by more than 200 people from across the Northeastern United States.

Under the watchful eye of the statue of the goddess Ceres perched upon the gold capitol dome in Montpelier, Vermont, activists from around the state gathered on the morning of May 6th both to celebrate recent legislation limiting the use of neonicotinoids in Vermont and to support Navdanya's international pledge for "Poison-Free Food & Farming by 2030." Policymakers and representatives from various Vermont organizations spoke and linked their work to the goals put forward in the Pledge for Poison-Free Food and Farming. Dr. Shiva gave a rousing speech, and attendees had the opportunity to sign on to the pledge and explore ways in which they can engage in important policy issues related to limiting the use of synthetic pesticides, within Vermont and beyond. Supporting organizations included the Vermont Healthy Soils Coalition, Rural Vermont, Northeast Organic Farming Association of Vermont (NOFA-VT), Soil4Climate, Building A Local Economy (BALE), the Real Organic Project. They lined the steps of the capitol with tables, tents, and banners promoting their own initiatives related to the collective movement toward a poison-free world.

Following a drive southward, Dr. Shiva's reputation and the work of multiple collaborators-- including NOFA/Mass and Friends of Navdanya--helped to fill the ornate interior of First Churches in Northampton, Massachusetts. After several presentations o n local organic farming initiatives, Dr. Shiva was introduced by Bill Braun, a NOFA/Mass Board member, organic farmer, and founder of the Freed Seed Federation, an organization dedicated to involving farmers in the restoration and development of regionally adapted and farmer-controlled seed stocks. Dr. Shiva urged community members not only to advance local and regional initiatives but to unite with advocates from around the world who are focused on similar issues while using a diversity of strategies. The signing of a large copy of the pledge traveling to each stop along the Earth Journey was a fitting culmination to Dr. Shiva's message.

The next morning featured a farmers' gathering at The Hickories, a beautiful CSA farm in Ridgefield, Connecticut. The owner of the farm, Dina Brewster, who is also the Executive Director of NOFA-CT, hosted the event. Tea and refreshments were served to the participants under an expansive willow beside an amphibian-filled pond, reminding the participants of the biodiversity they were protecting in their work as conscientious farmers and activists as they listened to Dr. Shiva's perspectives on how they might link their work to an ever-widening circle of concerned citizens promoting poison-free food and farming around the world.

Later that evening, NYU-Steinhardt hosted Dr. Shiva for a special presentation with invited students, thanks to the support of Dr. Krishnendu Ray and his colleagues in the Department of Food Studies. Graduate students and faculty members had the opportunity to explore the socio-political aspects of how different communities around the globe might best advance a collective agenda in transforming principles put forward in the pledge into local and international realities.

The tour concluded on May 9th with a visit to Kingston, New York and the Hudson Valley Farm Hub, where Dr. Shiva toured the farm and facilities--a place where so many of the ideals put forward in the pledge for Poison-Free Food and Farming by 2030 are already at work and providing both educational and market opportunities for farmers and consumers in the region.

The Northeast Earth Journey offered activists, farmers, policymakers, and scientists the opportunity to exchange ideas, contacts, and shared aspirations. Ultimately, the Earth Journey exemplified just how Gandhi's vision of "ever-widening, never-ascending circles" can be put into action, with benefit not just to humans but to all living creatures.

For more information on the pledge for a "Poison-Free Food and Farming by 2030," please download the PDF at https://navdanyainternational.org/wp-content/uploads/2019/03/Poison-Free-Pledge-and-Action-4.pdf

Poison-free, Fossil-fuel Free Agriculture & Farming Communities at the National Heirloom Seed Expo in Santa Rosa, CA

Mary Jacob

A conference on Poison-free, Fossil Fuel-free Food and Agricultural Communities was chaired by Mary Jacob , President of Friends of Navdanya and addressed by Dr. Vandana Shiva, Bob McFarland and Robert Kennedy Jr. at the National Heirloom Expo in Santa Rosa, California on September 11 , 2019.

Left to right: Bob Mc Farland, Michael L Baum (from the law firm Baum, Hedlund, Aristei & Goldman), Vandana Shiva and Robert Kennedy Jr.

Dr. Shiva laid out the global picture of how just three companies (the Poison Cartel) came to control worldwide production of the herbicides and pesticides that poison our soils, water and food. And control our seed. She reminded the audience that we have just ten years to create a poison-free world to prevent the 6th mass extinction and climate catastrophe.

Bob McFarland, president of the California Guild, recounted the success of coalitions getting the chemical glyphosate added to the California list of carcinogenic chemicals. He urged the audience to support the next legislative step in creating poison-free communities in the state: a ban on glyphosate in California. Robert Kennedy Jr. outlined the challenges and recent successes of lawsuits against Monsanto (now part of Bayer corporation) for its glyphosate-based herbicide, Round Up. Mr. Kennedy recalled the history of the changing balance of power between governments and corporations and stressed that convergence of corporate power with state power creates tyranny and is a threat to the freedom of people. Citizens must walk the thin line to hold both governments and corporations accountable, and ensure that just democracies and a healthy planet prevail.

Left to right: Robert Kennedy Jr., Bob McFarland, Vandana Shiva and Mary Jacob

California

Glyphosate ditched by California University

Jonathan Latham

University of California president Janet Napolitano halts use of glyphosate on all ten of its campuses.

The president of the University of California has banned the use of the pesticide glyphosate from its campuses - where 200,000 students attend - in the wake of health fears.

The universities' decision cites "concerns about possible human health and ecological hazards, as well potential legal and reputational risks associated with this category of herbicides."

Glyphosate is the active ingredient in the Monsanto weed killer products Roundup and Ranger, as well as over 700 other commercial herbicides. Glyphosate herbicides and the manufacturer Monsanto were just implicated in a third lawsuit, where the plaintiffs were awarded over $2 billion dollars.

Source: Yan H., CNN, "Jurors punish Monsanto with a record $2 billion verdict over Roundup weedkiller. But the story's not over", 15 May 2019, https://edition.cnn.com/2019/05/14/health/monsanto-2-billion-dollar-roundup-cancer-verdict/index.html

Herbicide ban

The suspension follows a campaign to end the use of herbicides across the University of California campuses by Herbicide-Free UC.

This initiative started out as an Herbicide-Free Cal campaign that was founded by two UC Berkeley student-athletes in 2017, Mackenzie Feldman and Bridget Gustafson, after they were made aware of herbicides being used around their volleyball court.

At the UC Berkeley campus, the Herbicide-Free UC students worked with the Grounds Operations Manager to pilot herbicide-free practices on two large campus spaces and nine smaller spaces during the 2018-2019 school year. After graduating, co-founder Mackenzie Feldman expanded the campaign UC-wide.

Feldman said: "It would be irresponsible for the University of California to not take action at this point, especially after three separate juries in the state of

California have decided that Monsanto's glyphosate-based herbicides cause cancer." She met with a UC Regent, who became interested in the issue.

Feldman continued: "Being at the first trial, Johnson v. Monsanto, and hearing Lee Johnson's story made me realize that I needed to expand this campaign beyond Berkeley. This work is too important not to do. If I can prevent even one groundskeeper from getting cancer and going through what Lee is going to, then I must."

Organic practices

Herbicide-Free UC released the following statement: "We are thrilled that the UC President and Regents have made the decision to ban glyphosate, but feel that there is no need to wait for more research to make the ban permanent.

"The science is clear: a number of the chemicals utilized by the University of California or its subcontractors pose a serious health risk to students, faculty, and staff. The University of California's own faculty were even involved in designating many of these chemicals as dangerous.

"We are asking for a permanent glyphosate ban, as well as a ban on all Proposition 65 pesticides and other herbicides that cause harm to human health and the environment."

"There are many alternatives to harmful pesticide and herbicide use. Some costs are associated with adopting organic practices, yet when faced with the alternatives of legal liability, and the human cost of harming members of the UC community with these practices, we think the costs of maintaining our current policies far outweigh the costs of switching to organic land management practices.

"We will keep working with the University of California to transition each campus to all-organic land management practices."

The decision is effective from 1 June, 2019.

Original Source: The Ecologist, 28th May 2019
https://theecologist.org/2019/may/28/glyphosate-ditched-california-university
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Poison-Free Food and Farming Movements

HAWAII

In July 2019 a federal judge found Hawaii Agribusiness Development Corporation (ADC) guilty of polluting ocean waters along Kaua'i's West Side without a permit, in violation of the federal Clean Water Act. ADC's permit had expired in 2015, when they withdrew the renewal application. The company, which manages tens of thousands of acres of state-owned agricultural lands located primarily on Kauai and on Oahu, was sued by Community groups Na Kia'i Kai, Surfrider Foundation, and Pesticide Action Network — represented by Earthjustice. It was sued for discharging millions of gallons of waters each day, contaminated with pesticides, sediment, and heavy metals from the drainage ditch system. This system is on the Mānā Plain which then discharges the water into the ocean near Kekaha and Waimea on the island of Kaua'i.

Tests show that the ditches contain pollutants that are harmful to people and the oceanic ecosystem, such as pesticides like amniomethylphosphonic acid (AMPA), a degradate of glyphosate, dichlorodiphenyldichloroethylene (DDE), a degradate of dichlorodiphenyltrichloroethane (DDT) along with glyphosate, ametryn, atrazine, bentazon, chlorpyrifos, cispropiconazole, diuron, fipronil, hexazinone, MCPA, metolachlor, prometryn, propoxur, simazine, and trans-propiconazole.

Tenants of ADC's lands are mostly chemical companies, such as Dupont, Dow, Syngenta/Hartung etc. Their main activity in Hawaii is to experiment on new genetically engineered plants. They also extensively and regularly use Restricted Use Pesticides (RUPs) as categorised by the U.S. EPA due to their harm on human health and environment.

In addition to this, these same companies have for decades refused to disclose the details about their use of these chemicals.

But now, after the court's order is in force, to obtain and comply with a National Pollutant Discharge Elimination System permit to monitor and limit pollution levels from the drainage ditches, ADC must determine and report the amount of any type of pesticides, heavy metals, and other pollutants present in the waters they intend to discharge.

Reflecting on the momentous occasion created by this court order, Gary Hooser, President of the Board of Directors for the Hawaii Alliance for Progressive Action (H.A.P.A.) and Executive Director for the Pono Hawaii Initiative (P.H.I.) declared: "It took many hands and many voices to make this happen".

It was in fact the collective effort and endurance of many citizens' movements, along with the support and help of many others across the world, including Navdanya, which made this victory possible.

Navdanya created the first mobilization tour in Hawaii with Dr. Vandana Shiva in 2013, in collaboration with Centre for Food Safety, titled "Raise Awareness, Inspire Change". As described by the Centre for Food Safety: "From a groundbreaking march to the state capitol with a peaceful, powerful rally, to the largest turnout in the history of Kaua'i at the Kaua'i Convention Centre, the tour was a huge success, and ignited and empowered the food movement in Hawaii. And since the 2013 tour, the forward motion has only increased on the island. Before the ADC case, as highlighted by the piece by Centre for Food Safety: "a law passed on the Big Island that bans new GE crop planting took effect on Kaua'i to establish buffer zones between GE fields and schools, hospitals and residential areas".

"Pesticides and GMOs are leaving Kauai, thanks to Gary Hooser's courageous leadership and the Kauai teams who worked diligently. Special thanks to Dr Vandana Shiva who in Jan, 2013 woke us up and said: "They have been here long enough, It is time for the pesticide companies to go". Much gratitude to Many. This is another achievement for coherent collective consciousness for the Aina of Kauai"

— Michael Coon and Jenica K. Waymen, concerned citizens and activists, July 2019

Source: CIVIL NO. 18-00005 DKW-RLP, ORDER RE: SUMMARY JUDGMENT AND DISMISSAL, UNITED STATES DISTRICT COURT DISTRICT OF HAWAI'I, https://earthjustice.org/sites/default/files/files/Order_Summary-Judgment-and-Dismissal_2019-07-09.pdf

Source: Federal Judge Finds Hawai'i Agribusiness Development Corporation Is Unlawfully Contaminating Kaua'i's Shores, Earthjustice, 10 July 2019, https://earthjustice.org/news/press/2019/federal-judge-finds-hawai-i-agribusiness-development-corporation-is-unlawfully-contaminating-kaua-i-s-shores

Source: Huge news for Kauai's west side waters – chemical companies take another hit., Gary Hooser's Blog, 10 July 2019, https://garyhooser.blog/2019/07/10/huge-news-for-kauais-west-side-waters-chemical-companies-take-another-hit/

Source: Raise Awareness, Inspire Change: Creating a New Food Future, Center for Food Safety, January 2013, https://www.centerforfoodsafety.org/video/2519/cfs-videos/cfs-hawaii/3003/raise-awareness-inspire-change-creating-a-new-food-future

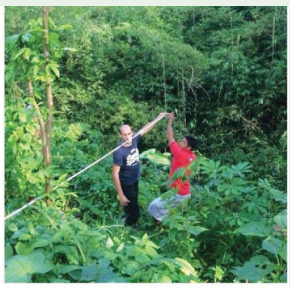
PHILIPPINES

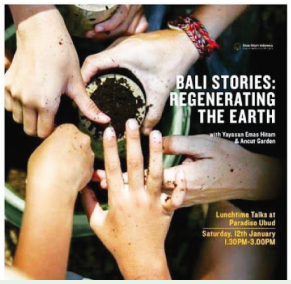



Bread of Freedom is a movement, that was launched in October 2018, and aims at providing education on ecological and sustainable practices that create good health for the people, honouring the role of small local farmers in creating a vibrant local living economy centered on life-based production systems from seed to table. The mission is to connect networks that have the common goal to reclaim freedom through local, organic and biodiverse food heritage extracted from traditional and indigenous knowledge. Bread of Freedom initiates campaigns to spread awareness of national issues surrounding unjust structures in food system and facilitates events, workshops and conversations that inspire creative and non-violent action in the field to defend the rights of people to have good health through safe, poison-free food and to help protect the dignity of farmers through seed sovereignty. Bread of Freedom collaborates with Masipag in stepping up its campaign against the release of GMO Golden Rice for commercialization in the country. By preserving and promoting a culture of breaking bread, they ensure that every person in every community gets her fair share of a healthy meal. In October 2019, Bread of Freedom group joined Masipag and co-organised the national event “Food. Farming. Freedom : A conference that seeks to raise the critical issues surrounding food system and help strengthen the food and farming connection, with workshops to help strengthen consumer awareness and action and protect food freedom”.

Sources: Bread of Freedom Facebook Group, https://www.facebook.com/groups/2194113070869012/ ;
Food. Farming. Freedom. event https://seedfreedom.info/events/food-farming-freedom/

INDONESIA





Yayasan Emas Hitam Indonesia (EHI) is a grassroots permaculture organisation, that aims to promote, support and develop regenerative solutions to poverty and development across Indonesia, particularly to address problems of limited access to funding and assistance suffered by rural populations. The name means 'black gold', and refers to humus: the dark, nutrient rich organic material that forms in soil from the natural decay of plants and other living organisms. Therefore, livelihood improvement through soil regeneration is a key aspect of their work. EHI's objectives are:

1. To train and empower farmers in regenerative agriculture techniques to improve livelihoods and promote ecological restoration;
2. To assist communities adapt to climate change and the Bali water crisis through practical, local and cost-effective solutions that protect and regenerate the natural environment;
3. To create and maintain their project site in Petulu (Ancut Garden) for local farmers and the wider community to share knowledge and promote sustainable ways of seeing and interacting with the environment;
4. To apply permaculture ethics and principles in their work that align with the Balinese Tri Hita Karana philosophy, inspiring the community to redistribute, recycle, reuse or return surplus and waste to the soil

Sources: Yayasan Emas Hitam Indonesia Facebook page, https://www.facebook.com/EmasHitamIndonesia/; Ancut Garden Agroecology Facebook page, https://www.facebook.com/ancutgarden/

SOUTH AFRICA

The initiative “GMO and Poison free zones” was started by activists and farmers concerned with the high level of GMO and agro-chemical contamination in South Africa, and the insufficiently stringent Maximum Residue Levels (MRL) set by South African policy.

They celebrate existing and emerging new spaces that are intimately connected to nature. Areas where the soil is treasured and enriched, seed is shared and saved and where pure food is clean and wholesome and the environment is thriving. In these zones, farmers are protected from contamination, communities celebrate their presence, the environment is preserved and farmers’ knowledge, trust, seeds and communities are nurtured. This platform focuses on two kinds of contamination: 1) contamination through poison (spray drift or other poison contamination incidents suffered from the application of agro-chemicals) - 2) the contamination of fields by genetically modified organisms (GMOs).

The purpose of the GMO & Poison free zones is two-pronged:

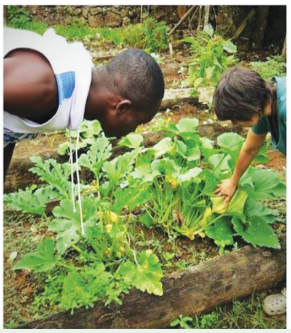
1. The initiative aims to protect uncontaminated land from agro-chemical exposure by mapping all land that is “GMO and poison free” in the country as well as high-risk contamination zones. Through GIS mapping, South African farmers are given the opportunity to reclaim land that has fallen prey to chemical farming methods and to give parties affected by spray drift and GMO contamination, a platform to denounce what is happening.
2. It is also a platform to record incidents and cases of spray drift/poison incidents/GM contamination, with the aim of encouraging affected parties to open legal cases regarding the health/environmental/agricultural contamination suffered. This make the magnitude of the problem more apparent to the policy makers, so that they take action to amend the current weak policy regulating the use of pesticides. In this way, farmers/other activists/citizens are empowered with the legal and practical knowledge available”

Sources: GMO & Poison free zones website, https://gmopoisonfreezones.org.za/ ;
African Centre for Biodiversity, No Safe Limits for Toxic Pesticides in Our Foods: Comments on Draft Regulations for MRLs, July 2017, https://www.acbio.org.za/wp-content/uploads/2017/07/No-Safe-Limits-for-Toxic-Pesticides-in-Our-Food.pdf

PORTUGAL







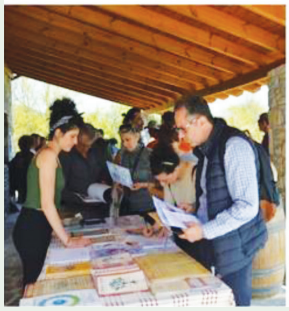
Círculos de Sementes (Circles of Seeds) is a project of the association Wakeseed, which began in October 2012 in response to the first global Call to Action for Seed Freedom of Navdanya. After the first Seed Saving workshop event in Evora in October 2012, the founders felt that they could do more and after some research they conceived the Circles of Seeds project, based on the idea of a network of living seed banks. The aim of the project is to create a Circles of Seeds Network throughout Portugal to rediscover, gather and share its national heritage of ancient and traditional seed varieties, as well as enforce awareness campaigns and knowledge sharing practices about Seed and Food sovereignty. Every local Circle of Seeds consists of a group of people in which each individual takes a commitment of saving, multiplying and sharing one or more seed variety. Each local Circle holds a meeting at least once every 3 months and a national Circles of Seeds meeting takes place once a year. Since 2016, Circulos the Sementes decided to reach out internationally and started to export their Seed Network model by sharing their knowledge and experience with other organisations.

Alongside the seed project, the association Wakeseed also has an agroecology education program. Also, the founders attended the A Z on Biodiversity, Agroecology and Organic Food Systems course at Navdanya in 2015, to improve their expertise. They offer agroecology courses not only in Portugal, but also programs in Ilha do Principe (Sao Tome and Principe), Mozambique and Colombia.

Sources: Círculos de Sementes website, http://circulosdesementes.blogspot.com/ ;
Wakeseed website, http://www.wakeseed.org/ ;
Circles of Seeds website, http://circlesofseeds.blogspot.com/ ;
Wakeseed, núcleo de agroecologia, http://producoesronron.blogspot.com/

GREECE



Peliti (which means “oak tree”), is a Greek Non-Governmental Organization for the protection and dissemination of Traditional Seeds, which are freely distributed and reproduced as part of the Commons. It collaborates with groups in other countries, and with the Greek national seed bank in Thessaloniki. Volunteers come to work and learn at the Peliti centre. A catalogue is issued annually (in Greek only), with a listing of growers in the Peliti network who offer to share seeds that they have saved. Peliti puts on a big national and international festival every year, between the end of April and first week of May, to which anyone may go, with or without seeds to share. Throughout the years this festival has proved to be a unique opportunity to build solid connections and networks within groups, organizations and movements from all over the world, working on the common ground of promoting Seed Freedom and farmers rights to produce, keep, sow and exchange their seeds. It also represents, everytime, a great chance to strengthen the movement to collectively shape a different Food system, which provides more and better food, which preserves the environment, its biodiversity and the Common Good.

Sources: Peliti website, https://peliti.gr/;
Peliti Seed festival, https://seedfreedom.info/events/4th-olympic-seed-festival-2020/

Seeds of Sustenance & Freedom vs Seeds of Suicide & Surveillance

Dr. Vandana Shiva
Prerna Anilkumar
Neha Raj Singh

Seed is the basis of food and agriculture.

Seed Sovereignty is the foundation of food sovereignty.

Corporations that made war chemicals introduced these chemicals as agrichemicals.

In India, in the first Green Revolution they changed the seeds to adapt to chemicals.

In the second Green Revolution they tried to own and control the seed itself through genetic engineering and patents.

There is now an attempt to introduce the third Green Revolution with total control over the seed through the convergence of industrial breeding and surveillance digital technologies.

What is at stake is our biodiversity, and our freedom.

Seeds of Chemicalisation: First Green Revolution

In the 1960s , when the Green Revolution was imposed on the Third World, we were told without chemicals and the "miracle seeds" of Green Revolution we will starve.

The rhetoric was "chemicals will feed us".

The first Green Revolution was the re-colonization of India's food and agriculture. Punjab as the first colony of this green revolution was forced to adopt chemicals and dwarf varieties adapted to chemicals.

Through the seed, the corporations and their war chemicals completely destroyed peaceful ecological agriculture in Punjab.[1] Seeds of "dwarf varieties" were bred to withstand high doses of fertilisers. They were falsely named "High Yielding Varieties" (HYVs) when they were merely "High Response Varieties" that responded to chemicals as Dr. Palmer concluded in the United Nations Institute for Social Development (UNRISD) study on the impact of seeds.

As discussed in the book "The violence of the Green Revolution"[2]:

"The dwarf gene was essential to the technological package of the Green Revolution, which was based on intensive inputs of chemical fertilizers. The taller traditional varieties tended to 'lodge' with high applications of chemical fertilizers because they converted the nutrients into overall plant growth. The shorter, stiffer stems of dwarf varieties allowed more efficient conversion of fertilizer into grain…The linkage between chemical fertilizers and dwarf varieties that were established through the breeding programs of CIMMYT and IRRI created a major shift in how seeds were perceived and produced, and who controlled the production and use of seeds."

The illusion that was created was that the Green Revolution produced more food. However HYVs seeds replaced the diversity of indigenous seeds bred for nutrition, taste and resilience. Rice and wheat monocultures increased at the cost of pulses, oilseeds, millets, vegetables, fruits . Punjab was made the "bread basket" to supply rice and wheat to all of India, but

[1]For more, see Shiva, V. (1991). The Violence of the Green Revolution: Third World Agriculture. Ecology and Politics. London: Zed Books.

[2]Shiva, V. (1991). The Violence of the Green Revolution: Third World Agriculture. Ecology and Politics. London: Zed Books.

Punjab was destroyed because the Green Revolution destroyed soil, water and biodiversity which are the nature's capital on which food production depends.

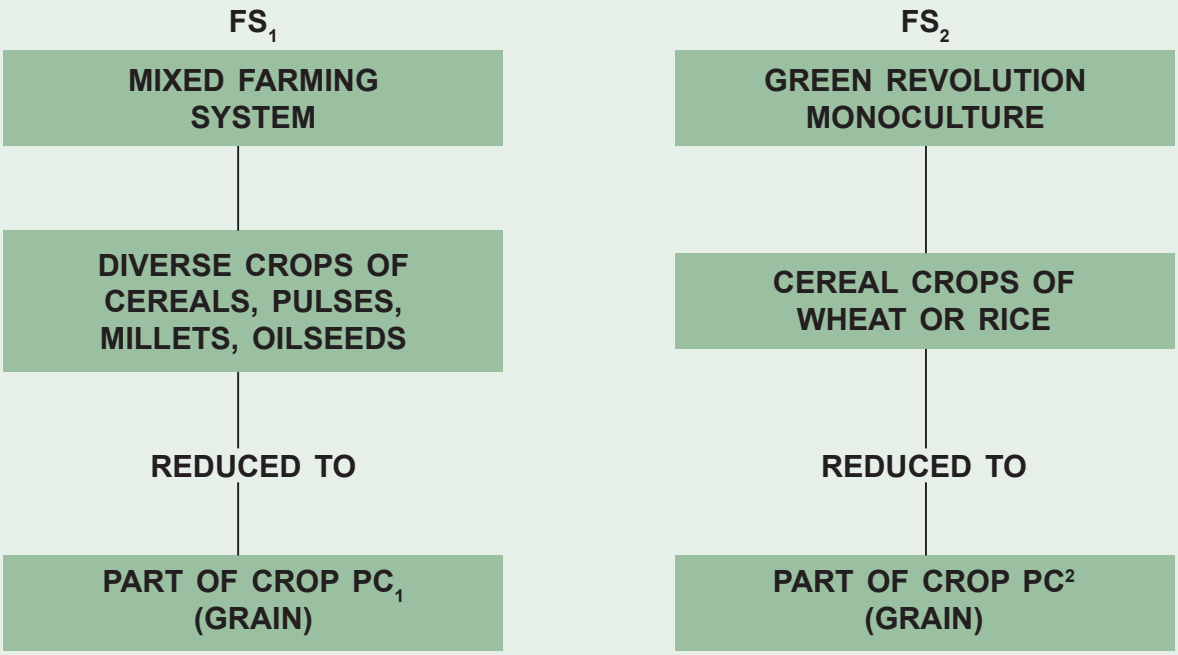
And more food and nutrition was not produced. What was increased was rice and wheat as commodities. And the metric of "Yield per Acre" was used to hide true productivity.

"Yield per Acre" measures commodities extracted from farms, not the health of the farm, the farmer, or the food.

The false claim that 'Chemicals produce more food and are necessary to feed the world is based on the claim of productivity gains and the higher "yield per acre" of the Green Revolution, but as the Violence of the Green Revolution and Health Per Acre[3] show us, this was just a false comparison.

The real metric is nutrition per acre or health per acre in a biodiversity paradigm, not yield per acre in the paradigm of a Monoculture of the Mind[4]. When one looked at the system holistically instead of looking

How the Green Revolution makes unfair comparisons



- THE REAL SCIENTIFIC COMPARISON SHOULD BE BETWEEN TWO FARMING SYSTEMS – FS_1 AND FS_2 WITH THE FULL RANGE OF INPUTS AND OUTPUTS INCLUDES.
- THIS WOULD BE THE COMPARISON IF FS_2 WAS NOT GIVEN IMMUNITY FROM AN ECOLOGICAL EVALUATION.
- IN THE GREEN REVOLUTION STRATEGY, A FALSE COMPARISON IN MADE BETWEEN PC_1 AND PC_2
- SO WHILE $PC_2 > PC_1$ GENERALLY $FS_1 > FS_2$

Source: Shiva, V. (1991). The Violence of the Green Revolution. p 69.

[3]Shiva, V., & Singh, V. (2011). Health Per Acre: Organic Solutions to Hunger & Malnutrition. Navdanya/Research Foundation for Science, Technology & Ecology.

[4]See Shiva, V. (1993). Monocultures of the mind: Perspectives on biodiversity and biotechnology. Palgrave Macmillan.

at it through the lens of reductionism one instantly understands the lies and the myths sold to us by industrial agriculture where the emphasis was on the yields of individual crops and not on the output of the food system and its nutritional value. Because all industrial agriculture produced was hunger and malnutrition.

Navdanya's study shows that a biodiverse farming system can feed two times the population of India.[5]

The Poison Cartel (the companies having the monopoly on seed industry as well as the pesticide industry including companies like Bayer- Monsanto, ChemChina- Syngenta, Dow-Dupont, among others) changed the life affirming seeds of biodiversity into chemically responsive, life deadening seeds and monocultures. And now they are using the crisis they have created to impose new mono cultures of Monsanto's hybrid maize.

Problems created by the Green Revolution: Create New Market Opportunities for the Poison Cartel

The dwarf varieties created in the first green revolution, and spreading ever since, need chemicals to respond to them. Chemicalisation increases water use and is the primary reason India is facing a Water Emergency. The seeds of the Green Revolution have also resulted in cancer reflected in the cancer train of Punjab.

The monocultures of rice and wheat did not just increase chemicalisation but also promoted mechanization. Combine harvesters were imposed on farmers to harvest crops because this agriculture thrived on uniformity and large scale monoculture production. Because of the combine harvester being used, only the grain gets harvested and the stubble is left on the ground. This stubble then has to be burned.

Furthermore, in the past couple of years stubble burning has been delayed to late October in the Northern states of India, particularly Punjab and Haryana. The delay to clear the fields was imposed on the farmers by the Government, by introducing the law, Punjab Preservation of Subsoil Water Act in 2009. According to this law, farmers can no longer sow rice in April, but have to wait until the middle of June to do so. The law was pushed to prevent the depletion of groundwater through rice cultivation. BS Bains, director, Punjab Agriculture Department said: "We are promoting short-duration paddy varieties developed by Punjab Agriculture University over late-maturing PUSA varieties that require more water and leave heavier stubble."

The pressure to move away from rice cultivation to 'crop diversification' was imposed by the United States Agency for International Development (USAID). The primary beneficiary of USAID's purported solution for Punjab's problems was Monsanto. According to their solution, farmers need to stop growing rice and replace it with Monsanto's genetically modified (GMO) maize. In 2012, the then Punjab Chief Minister asked Monsanto to set up a research centre for creating maize seeds and announced plans to reduce the area under the cultivation of rice by around 45% in order to grow maize. Monsanto now offers the replacement of rice by its GMO crops as a solution that will increase the level of subsoil water.

Punjab was not a rice growing region traditionally. It was forced to grow rice because of the Green Revolution. Now rice and farmers are being criminalised, and the negative impact of the Green Revolution is being used to create new market opportunities for corporations like Monsanto.

The problems created by the very same industrial agriculture are being used to shift the discourse to now blame the farmers instead of holding the corporations and their industrial agriculture responsible.

[5]Shiva, V., & Singh, V. (2011). Health Per Acre: Organic Solutions to Hunger & Malnutrition. Navdanya/Research Foundation for Science, Technology & Ecology.

Corporate Globalization & Pepsi's Entry in India

The PepsiCo project in Punjab was introduced as a solution to the Punjab crisis in 1984. Pepsico promised to bring 100 years of spring.

Source: Shiva, V. (1991). The Violence of the Green Revolution: Third World Agriculture. Ecology and Politics. London: Zed Books. Pg. 194.

As goes with all colonial projects, even this one was pegged as a "peace program" while in reality it only caused more violence on our land and on our bodies.

This project was a collaboration between Punjab agroindustries, Voltas and Pepsico. The four activities which were covered by the project were: agro-research and biotech seeds, potato and grain processing plant, fruit and vegetable processing unit and the soft drink unit.

Integral to this project was the development of "improved" varieties of potato and tomato. But "improved" is always contextual. Here it meant making these varieties more appropriate to PepsiCo's processing plant.[6] This is how the processed varieties replaced the native varieties.

The propaganda that was spread was: "yields in India are substantially lower than international standards." And this was used to create a "need" for PepsiCo's project. It claimed that the production would increase to 30 tonnes per hectare. But Indian farmers were already producing yields of more than 40 tonnes to 60 tonnes in Gujarat.[7]

This was the Pepsi project: completely denying the knowledge and expertise of Indian farmers to make itself look indispensable.

This project completely twisted the logic of comparative advantage. Crops for which we had a unique climatic advantage in growing and for which we have major domestic markets such as coconut, spices and pulses were declared "non-competitive". Such a

[6]Shiva, V. (1991). The Violence of the Green Revolution: Third World Agriculture. Ecology and Politics. London: Zed Books. pg. 202.

[7]Ibid. Pg. 203.

calculus only suited the global agribusinesses not the Indian farmers or Indian consumers.[8] The strategy was to give up the crops that we have evolved through our efforts over millennia and shift to crops for which we will need to depend on imported germplasm and will have to sell on foreign markets.[9]

This was contract farming where the multi-nationals in agroprocessing industry make one sided contracts with illiterate farmers and the farmer is held liable for carrying out the entire production, paying wages, meeting fertilisers and pesticide costs etc. The contract stated that the company reserved the right to reject the crop in case quality standards are not met by the producer or when the harvested seed is damaged and becomes qualitatively unacceptable due to rains or disease. Even in these cases, the farmer was not allowed to sell the seed outside, he or she had to sell it to the company. The company specified that its decision regarding the seed quality 'will be final and binding on the producer' and in cases of doubt, farmer was left with no recourse to any other dispute settlement option.[10]

Contract farming for the agro-processing industry was a shift from food crops to cash crops. This weakened the food security even more. The crop and the variety to be planted were determined by the corporation with the sole aim of making profits and not feeding the hungry.[11]

Pepsico's entry into the Indian processed food sector was accompanied by a tremendous pressure for new agricultural technology. This resulted in the inception of the corporation's tomato paste plant in Zahura, Hoshiarpur district in Punjab which till 1993 had processed over 65,000 tonnes of tomato, of which more than 70% had been exported to Japan.[12]

Pepsi suggested the idea of contract forming in Punjab, with the main objective being to create a surplus of tomato in the market, so that the corporation could meet its plant's requirements at low rates.[13] Creating a surplus through contracting ensured that the raw material can be purchased at a predetermined price.

However, the experiment proved disastrous for both Pepsi and the contract farmers. Pepsi gave them the seedlings as a loan. The farmers had to use higher doses of fertilizers and pesticides, again supplied by the company. Pepsi's rates for the tomato were lower than market rates. The company paid Rs. 0.80 per kg in 1993 while the market rates were Rs. 2 per kg.[14] When the cost of seedlings and the other inputs was subtracted, the farmers were left with nothing, falsifying the myth even more that industrial agriculture served the farmers' interest.

Furthermore, rather than creating a surplus to meet local demands and maintaining low prices for themselves, Pepsi's tomatoes were rejected by the people as the skin was too hard for domestic use.[15] Hard skin is a requirement for transportation and for agroprocessing. In 1994, the Hoshiarpur mandis were piled high with tomatoes no one wanted and the price of tomatoes dropped from Rs. 2 per kg to as low as Rs. 0.50 per kg.[16] The farmers who started cultivating hybrid tomatoes in the western region had initial incomes of Rs. 30,000 per hectare but later as the technology failed and pests evolved resistance, their incomes fell from Rs. 30,000 to a few hundred rupees.[17]

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[8]Globalization of agriculture, food security and sustainability. Sustainable Agriculture and Food Security, The Impact of Globalisation, Sage Publications India Ltd, New Delhi. Pg. 21.

[9]Ibid.

[10]Globalization of agriculture, food security and sustainability. Sustainable Agriculture and Food Security, The Impact of Globalisation, Sage Publications India Ltd, New Delhi. Pg. 48.

[11]Ibid. at pg. 49.

[12]Ibid. at pg. 50.

[13]Ibid. Pg. 50.

[14]Ibid. Pg. 50.

[15]Ibid. Pg. 50.

[16]Ibid. Pg. 51.

[17]Shiva, V. (1991). The Violence of the Green Revolution: Third World Agriculture. Ecology and Politics. London: Zed Books. Pg. 221.

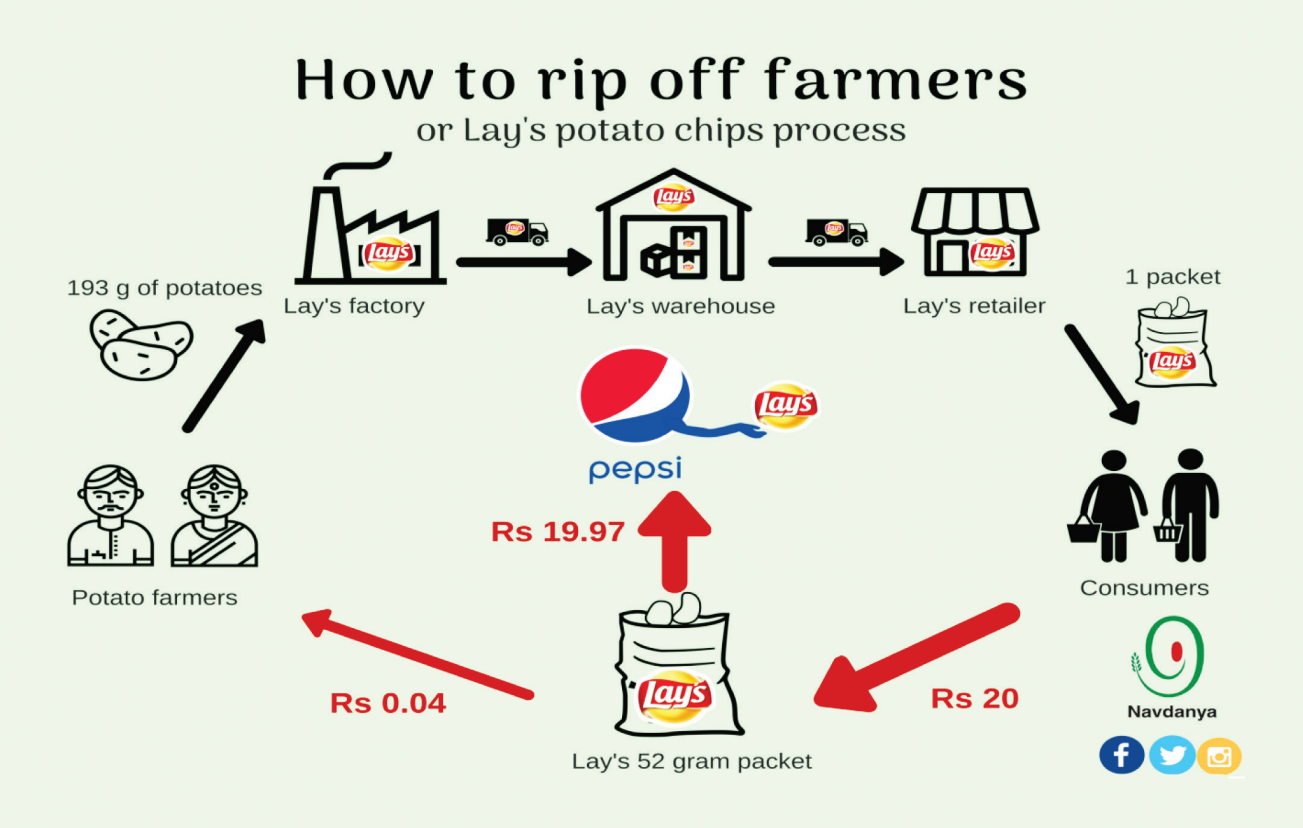
By early 1996, the Pepsi tomato experiment had failed and Pepsi sold out its plant to Brooke Bond.

This project harmed the land and its people. It never solved the hunger crisis. It impacted the availability of staple food as more and more land was diverted to fruits and vegetables for export while hunger and food scarcity continued to be a reality.

Exporting potato chips was never going to feed the hungry in India.

Thus, the Pepsi solution to the 'failed green revolution' failed in its promise once again. Neither did it bring more food nor did it bring more prosperity for the farmers. It only brought more hunger for our people and more debt for our farmers.

Inspite of the Punjab failure, the Pepsico model of growing tomatoes and potatoes for the junk food industry as a raw material instead of staple foods for people and for the food security of the country, was imposed nationwide through the World Bank Structural Adjustment of 1991, and the economic reforms since then.[18] Pepsi potatoes have spread across the country and with monocultures of potatoes grown as raw material, prices of potatoes have collapsed.



Source: Shiva, V and Shiva, K. 2018. The Future of our daily bread: Regeneration or Collapse. Navdanya International / Research foundation for science, technology and ecology.

[18]Shiva, V. (2001). Yoked to death: globalisation and corporate control of agriculture. Research Foundation for Science, Technology, and Ecology; Shiva, V. (2002). Globalization of agriculture, food security and sustainability. Sustainable Agriculture and Food Security, The Impact of Globalisation, Sage Publications India Ltd, New Delhi, 64; Shiva, V., Jafri, A. H., & Jalees, K. (2003). The mirage of market access: how globalisation is destroying farmers lives and livelihoods. Navdanya.

Continuation of PepsiCo's Colonialist Arrogance

Protection of plant varieties and farmers' rights act (PPV&FRA) recognizes farmers as the breeders of seed. It faced its biggest test in its implementation phase of nearly a decade and a half, when PepsiCo India initiated legal proceedings against four farmers in Gujarat (a state in India) for "illegally" growing its potato variety registered under the PPV&FRA.

The company applied for the registration of two hybrid potato varieties FL 1867 and FL 2027 in February 2011. These varieties were registered under the PPVFRA in February 2016 for a period of 15 years. PepsiCo marketed the latter variety under the trademark FC-5, and filed a 4.2 crore lawsuit against farmers of Gujarat.

PepsiCo withdrew its claims with the raising of Section 39 of the PPV&FRA.

Section 39: Farmers' right.—Notwithstanding anything contained in this Act,—a farmer shall be deemed to be entitled to save, use, sow, resow, exchange, share or sell his farm produce including seed of a variety protected under this Act in the same manner as he was entitled before the coming into force of this Act.

Once again, PepsiCo in April 2019, sued a total of 4 farmers for 10 million rupees each in Gujarat for growing a variety of potatoes, claiming infringement of intellectual property rights under the Protection of Plant Varieties and Farmers Rights Act, 2001 for cultivating their proprietary FC5 variety of potatoes that are used to make Lay's chips.

On May 2, 2019, due to section 39 and having no ground in law to sue the farmers, PepsiCo withdrew its lawsuit against the farmers in Gujarat.

Seeds from the Poison Cartel: GMO's & the Second Green Revolution

Monsanto's GMO colonisation

In the 1990s we were told we would starve without GMOs brought to us by the same Poison Cartel that had introduced chemicals in agriculture. GMOs are not a substitute for chemicals, they have increased the use of toxic chemicals like Roundup, and added new risks of their own. There was an exaggerated claim that GMOs would remove all limits of the environment, grow food in deserts and toxic dumps. But the real reason GMO's were introduced was to get patents on seeds.

Now the rhetoric had become "GMOs will feed us".

In India, movements including Navdanya worked with the parliament to ensure that when we implemented the WTO's TRIPS agreement, we used the exemption allowed in Article 27.3 (b). As a result, section 3(j) of our patent law now excludes seeds from patentability.

Section 3(j): plants and animals in whole or any part thereof other than micro-organisms but including seeds, varieties and species and essentially biological processes for production or propagation of plants and animals.

Monsanto repeatedly tries to challenge this article but has failed.

We were sold "fake seeds" in the form of GMOs because the cartel transformed the seed from something alive to something dead. It did so, either through legal instruments like patents, or through biological methods. It transformed the seed from a renewable, self organised living system which farmers can freely save and share, into a non renewable, genetically engineered, patented commodity which cannot be saved or shared.

Integral to this second Green Revolution was Monsanto illegally introducing Bt Cotton in India (this was later approved).[19]

The poison cartel genetically engineered seeds to take patents which in turn further the creation of a monopoly on the seed. Nearly 85% of the more than

[19]For more, See Shiva, V. et. al. 2018. Origin: The Corporate War on Nature and Culture. Nataraj Publishers.

300,000 farmers suicides are in the cotton areas where Monsanto established a 99% monopoly.[20]

The foundation of this monopoly was created by selling the Indian farmers three basic frauds:

Fraud 1: Monsanto cheated Indian farmers by claiming that its Bt cotton will control the bollworm. The claim of Bt cotton being a pest control technology has been proven false with the emergence of resistant pests and farmers are being forced to use pesticides. Farmers are now dying due to pesticide poisoning.

Fraud 2: the claim that GMO Bt crops are safe for biodiversity and the environment, inspite of the scientific knowledge that GMO Bt is not the same as natural Bt. Pollinators have been killed because of high dose supertoxins in Bt crops, which have also led to poisoning the soil and killing soil organisms threatening the very foundation of agriculture and food security.

Fraud 3: The false claim that Monsanto had a patent on Bt cotton seed, locking Indian companies through licensing arrangements, and collecting illegal royalties from farmers, until the Seed Price Control order of 2015 which started to regulate prices.

Inspite of not having a patent, Monsanto started to collect royalties on its illegally introduced Bt cotton. It collected an upfront, one time non-refundable fee of Rs 50 lakh from each licensee and a recurring fee. Since it did not have a patent, it cooked up a category called "Technology Trait" to collect a "Trait Fee", just another name for royalty. This royalty is finally extracted from poor farmers.

India's peasants are too small and too many to do contracts for a non existant IPR. So Monsanto locked in 28 Indian seed companies to collect royalties on Monsanto's behalf. Such agreements are illegal because when Monsanto locked Indian companies into these agreements to extract royalties and trait fees, it had no approval for commercial planting. And it did not, and cannot have patents on seed.

It transpires from the facts placed before the competition commission of India (CCI) that the fixation of trait value has been a matter of dispute/litigation since 2005. It is alleged that in the year 2005, the trait value fixed by Mahyco-monsanto was Rs.1250/- per packet for BG- I which led to high value of Bt Cotton seeds manufactured using the said technology i.e. Rs.1700/- – Rs.1800/- per packet. This was allegedly very high in comparison to the price of non-Bt cotton seeds which were available for Rs.300/- per packet."(Ref. Case No. 02/2015 & Case No 107/2015 Page 4 of 26).

Since the legalisation of Bt Cotton in 2002, Monsanto has looted Rs 7000 crore from the poor Indian cotton farmers and is directly responsible for pushing Indian farmers into debt and suicide. Since '95, over 3,10,000 have committed suicide most of whom are from the cotton belt of India.

The Centre issued 'Cotton Seed Price Control Order' (CSPCO) to control prices of cotton seeds by fixing a uniform Maximum Retail Price (MRP) from March 2016.

The government has steeply reduced the royalty component from Rs. 183.46 that Monsanto and Mahyco Monsanto charge the farmers through seed companies to Rs 49. Trait value paid to Monsanto comes down by 73%.

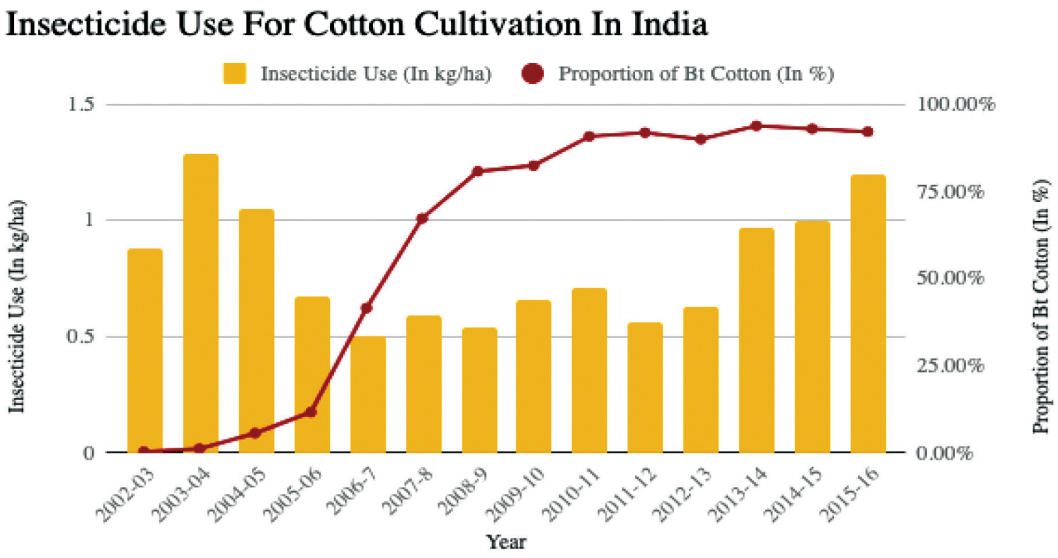
Monsanto immediately tried to challenge the Seed Price Control Order. Navdanya intervened in the Karnataka High Court and the case was dismissed. (writ petition 15173 and 15174 of 2016 in Karnataka High Court).

In 2015, the Government of India initiated a case in the CCI on Monsanto's monopoly in the cotton seed sector. The CCI observed that there was prima facie evidence of Monsanto's monopoly and started an investigation. Monsanto was imposing: excessive trait fee, unfair clauses in the sub-licensee agreements leading to a monopoly (Case No. 02/2015 & Case No 107/2015).

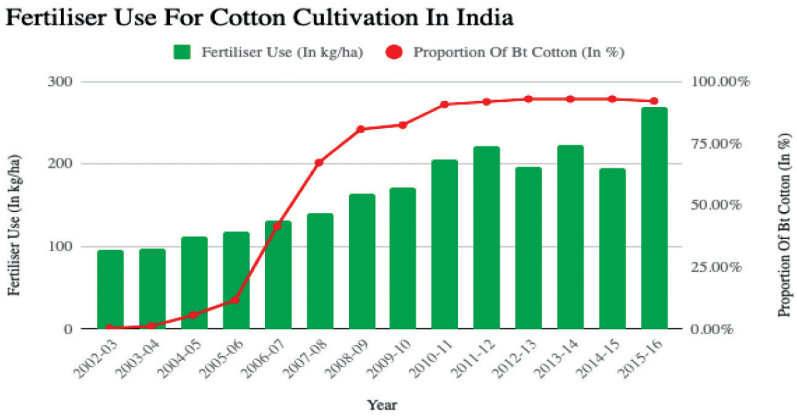
In 2019, CCI concluded in its findings that Mahyco Monsanto Biotech Ltd (MMBL) has abused its dominant position in the market for Bt Cotton technology by charging unfair licence fee and entering into pricing agreements directly aimed at overcharging farmers who use Bt Cotton seeds.

Farmers deaths in Vidharba have resulted from Monsanto collecting illegal royalty and trapping farmers in debt, pushing them to suicide, establishing monopoly, selling Bt Cotton with the false claim that it will control pests.

[20]Shiva, V. et. al. 2018. Origin: The Corporate War on Nature and Culture. Nataraj Publishers;

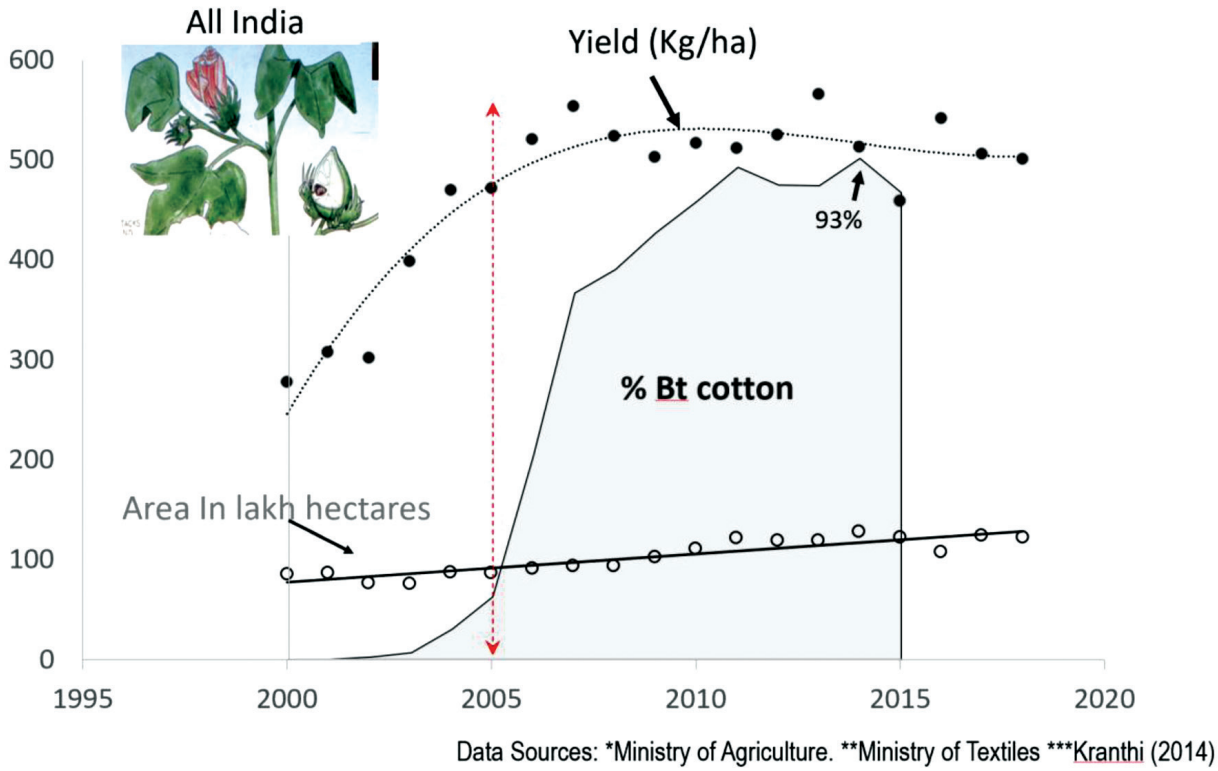


Fertiliser use for cotton rose 128% from 118 kg/ha in 2005-06--when Bt Cotton's proportion in overall cotton was 11.7%--to 270 kg/ha in 2015-16 (latest year for which data are available), when Bt Cotton accounted for 83.33% of India's cotton.



Source: Cotton Association of India Weekly Publication (December 2016), EANDS, News reports from Reuters, Financial Express (minor differences in data in different publications)

* Fertilizer usage for 2014 is based on average estimate from Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Govt of India



Source: Press Briefing GMO Bt cotton has failed transition to climate resilient Agroecology is the Imperative: For India's present & future biosecurity, 6th September 2019 by Aruna Rodrigues and Dr Vandana Shiva

Monsanto's highest crime is robbing Indian farmers of their lives by pushing them to commit suicides through a combination of factors including fraudulent claims, and debt resulting from collection of illegal royalties for seeds even though patents on seeds are not allowed in India under Section 3(h) and Section 3(j) of India's Patent Act.

Farmers Suicides in India 1995-2016

Year	Yearly total for All India Suicides
1998	16,015
1999	16,082
2000	16,603
2001	16,415
2002	17,971
2003	17,164
2004	18,241
2005	17,131

2006	17,060
2007	16,632
2008	16,196
2009	17,368
2010	15,964
2011	14,027
2012	13,754
2013	11,772
2014*	5,660*
2015**	8,007**
2016(P)	1130

** Total 1995-2014 = 3,02,126, ** Total 1995-2015 = 3,10,133,*

(P) Provisional

** The actual figure for 2014 is 12,360, as NCRB did not include agricultural labourers and the actual figure for 1995-2014 is 3,08,126.*

*** The actual figure for 2015 is 12,602 as NCRB did not include agricultural labourers and the actual figure 1995-2015 is 3,20,728,.*

Thus, the actual figure for farmers in 2016 is 3,32,098.

Since 2016 the data on farmer's suicides is not available.

Farmers Suicides in Maharashtra from 1995-2016

Year	Farmers Suicide in Maharashtra
1995	1,083
1996	1,981
1997	1,917
1998	2,409
1999	2,423
2000	3,022
2001	3,536
2002	3,695
2003	3,836

2004	4,147
2005	3,925
2006	4,453
2007	4,238
2008	3,802
2009	2,872
2010	3,141
2011	3,337
2012	3,786
2013	3,146
2014	4,004
2015	4,291
2016	3,661
Total	**72,705**

In the last few decades Maharashtra has witnessed 84,700 farmers suicides. 11, 995 farmers' suicides have taken place in the last three years.

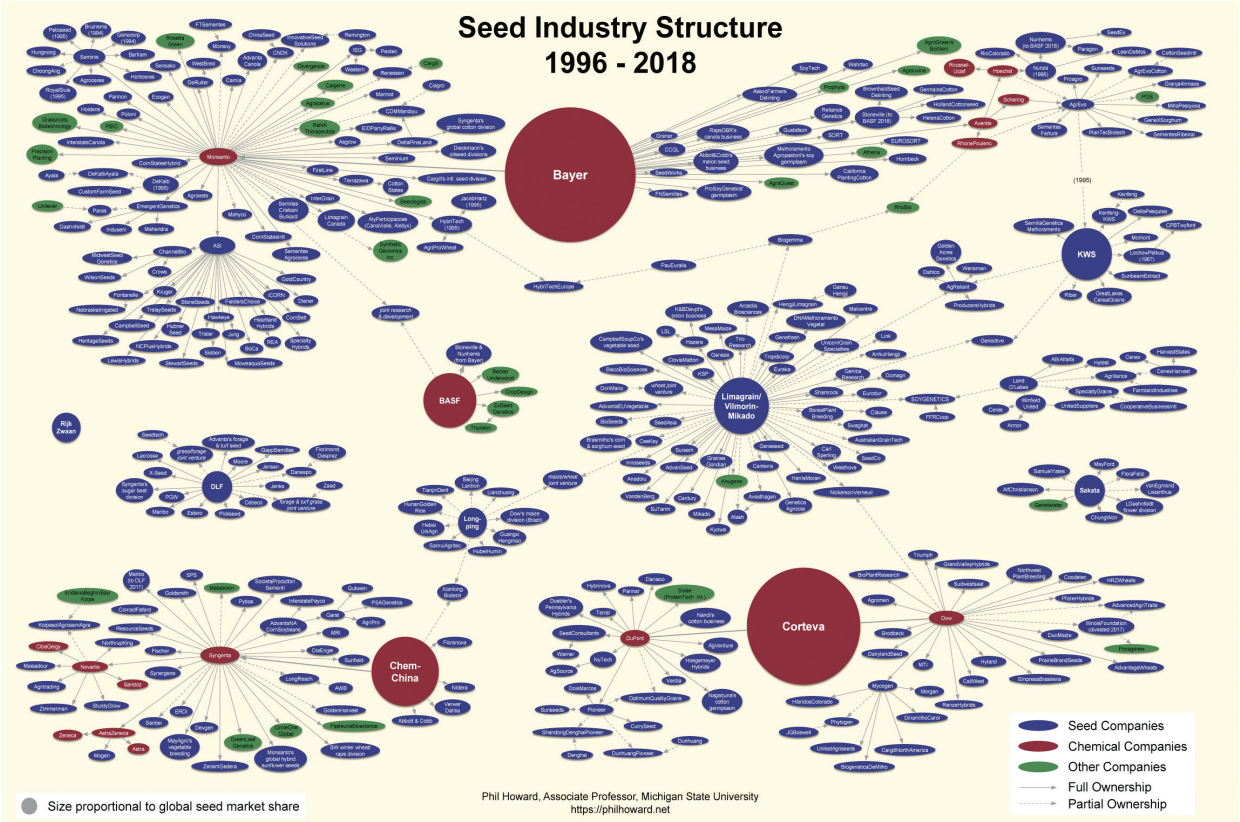
In 2017, Monsanto was caught illegally spreading Roundup Ready Bt Cotton in Vidharba without commercial approval, adding the disaster of Roundup to the Bt cotton disaster. Roundup is a probable carcinogen according to WHO. In the US thousands of cancer victims are suing Monsanto.

Roundup Ready GMOs have led to an explosion of the use of Roundup, a known carcinogen. It has also led to a kidney failure, and destruction of gut bacteria, affecting the healthy functioning of the second brain, and negatively affecting neurological functions of the brain.

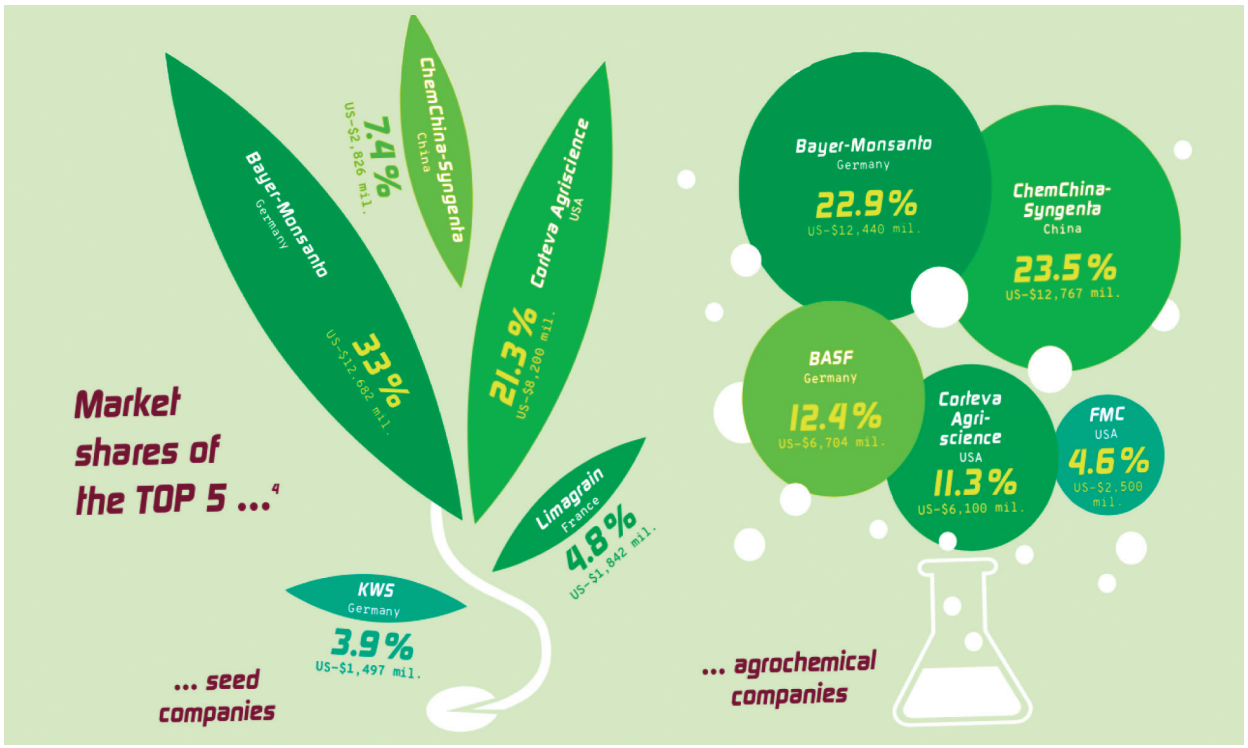
This is not a food production system . It is a disease producing system.

Seed Monopoly of the Poison Cartel

Inspite of our laws, the competition commission is still unable to stop the seed companies who are also the pesticide companies, from consolidating and creating even more unequal markets.



Source: www.philhoward.net



Source: Pat Mooney, ETC Group. (2018). Blocking the chain: Industrial food chain concentration, Big Data platforms and food sovereignty solutions.

As Dan Barber, put it recently in a New York Times article:

"Just 50 years ago, some 1,000 small and family-owned seed companies were producing and distributing seeds in the United States; by 2009, there were fewer than 100. Thanks to a series of mergers and acquisitions over the last few years, four multinational agrochemical firms — Corteva, ChemChina, Bayer and BASF — now control over 60 percent of global seed sales."[21] He adds, "The same seed companies that now control more than 60 percent of seed sales also sell more than 60 percent of the pesticides."[22]

He sums it up aptly when he says that real problem with these seed corporations (the Poison Cartel) is that "they are failing to deliver what growers need to grow and what we want to eat".[23]

Seeds of Surveillance: Ag Tech & the Third "Green Revolution"

The third green revolution is the colonization of our seeds and agriculture through digitalization and seeds of surveillance. This is the surveillance capitalism entering agriculture.

First chemicals.

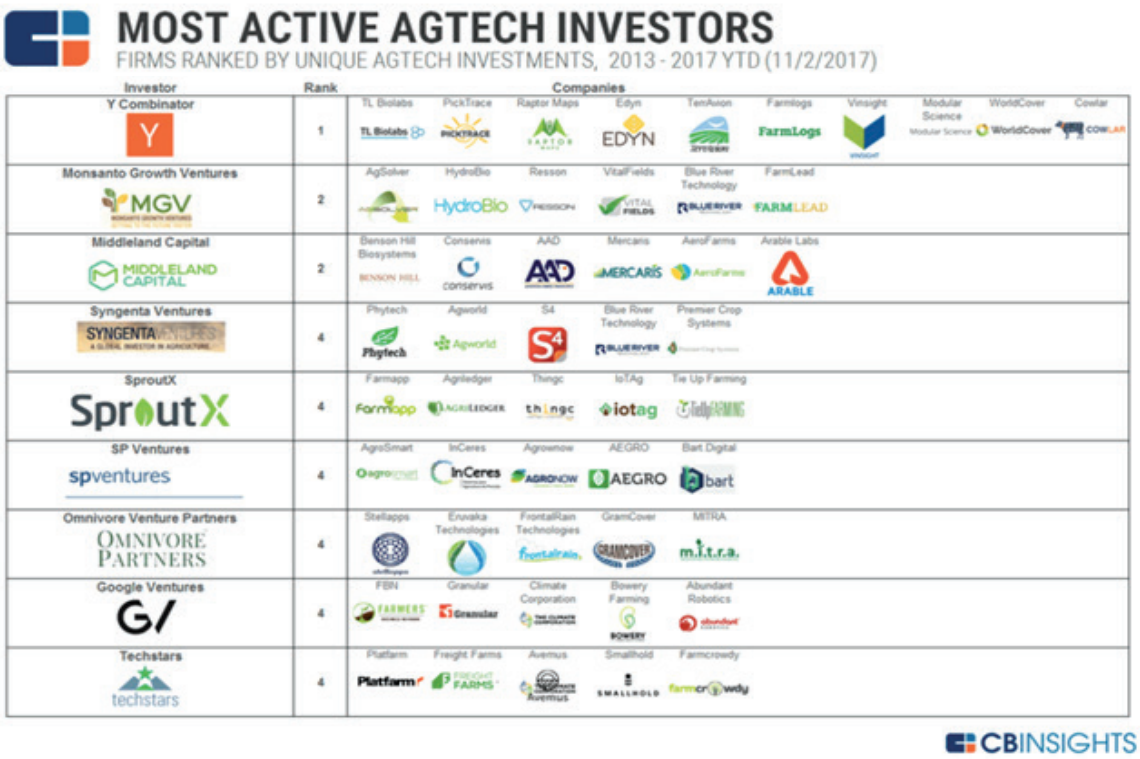
Then GMOs.

Now we are being told 'Big Data' or 'surveillance' will feed us.

Henry Kissinger in his infamous speech during the Vietnam War said: "food can be used as a weapon". Vandana Shiva has said: "Seed is the new weapon". This has never been more true.

The new colonisation of seed and agriculture by Gates and the Poison Cartel

The next step of the seed slavery is being planned by the poison cartel, the surveillance capitalists, including billionaires like Bill Gates, through the imposition of digital and surveillance technology. The most active investors in "Agtech" which is another name for surveillance capitalism in agriculture are given in the table below:



Source: CBinsights. 2017. The Most Active Investors In Ag Tech. Available at: https://www.cbinsights.com/research/agriculture-tech-top-investors/. Accessed on 28th august 2019.

[21]Barber, Dan. 2019. "Save Our Food. Free The Seed". New York Times. Available at: https://www.nytimes.com/interactive/2019/06/07/opinion/sunday/dan-barber-seed-companies.html. Accessed on 19th August 2019.

[22]Ibid.

[23]Ibid.

As written in the book on surveillance capitalism by Shoshana Zuboff, a Professor Emerita at Harvard Business School:

"Surveillance capitalism is not a technology; it is a logic that imbues technology and commands it into action."[24]

It is a tool of control.

And as John Hamer, managing director of Monsanto Growth Ventures (Monsanto's venture capital arm) says:

"if you think about it, there are only two people on earth that need to know a lot about remote sensing technology – Monsanto and the CIA."[25]

One sees here similar forces at play as in the days of the first colonialism: imposing the colonisers' religion on the "barbarians" was central to the "civilising mission". Today, imposing the colonisers' religion of digital technology on our diverse food systems, and the diverse knowledges and technologies on which they are based, is central to the "civilising mission" in today's digital colonisation.[26]

When technology is no longer seen as a tool to be assessed, chosen, adopted or rejected, but as a religion, as a civilizing mission, to be forced undemocratically on people, and when means for money making are elevated to human ends, beyond ethical, social, ecological and democratic assessment, we have Re-colonisation in a modern garb. But then, as now, exterminating the diversity of life, of cultures, of knowledges, of economies, sovereignties, democracies through violence, for economic and political power is the objective.[27]

Zuboff reiterates this in in her book when she says "Surveillance capitalism is a rogue force driven by novel economic imperatives that disregard social norms and nullify the elemental rights associated with individual autonomy that are essential to the very possibility of a democratic society."[28]

The propaganda for surveillance capitalism is exactly the same that was used in the failed green revolution: "To feed the 9.7 billion people in the world in 2050, agriculture efficiency must increase by 35% – 70% and technology is the key. India's rich mix of farming practices and small landholdings provide a massive data set to inform our models."[29] Smallholders and their farming practices have been reduced to a "data set" for surveillance capitalism that will "provide valuable insights for the agri industry, financial institutions, growers and policy makers."[30]

The plan is designed by the poison cartel, the billionaires and the "start-ups" they fund. The invasion of surveillance is on a worldwide scale. However, partnerships with states make the surveillance capitalists and poison cartel invisible.

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[24]Zuboff, S. (2019). The age of surveillance capitalism: The fight for a human future at the new frontier of power. Profile Books. Pg. 15.

[25]Trotter, Greg. (2016). Monsanto venture capital group brings tech-world approach to agribusiness. Chicago Tribune. Available at: http://www.startribune.com/monsanto-venture-capital-group-brings-tech-world-approach-to-agribusiness/407653476/ as cited in Shiva, K and Shiva, V. 2018. Oneness vs 1%: shattering illusions, seeding freedom. Pg. 79.

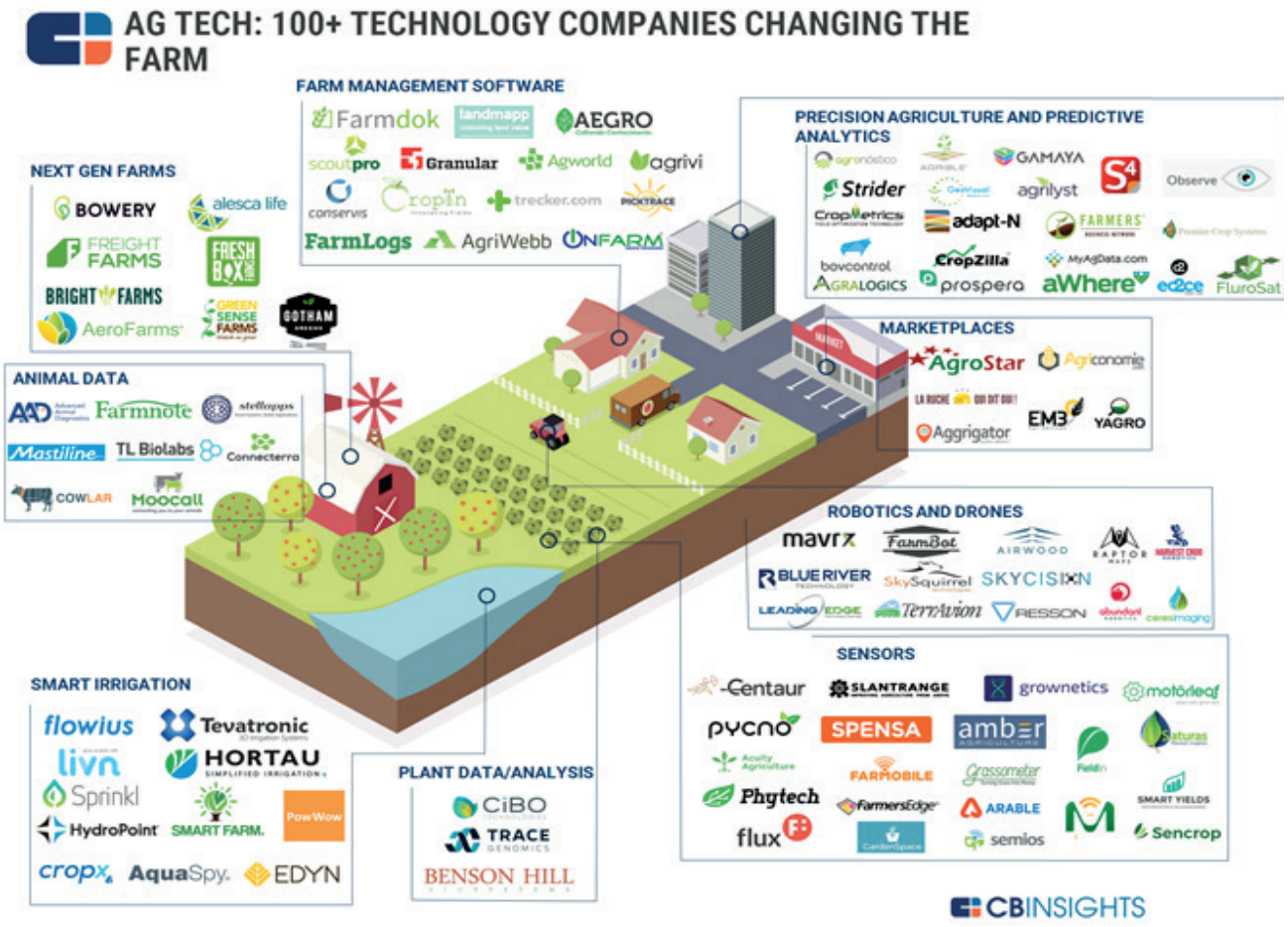
[26]Shiva, V and Shiva, K. (2018). The Future of our daily bread: Regeneration or Collapse. Navdanya International / Research foundation for science, technology and ecology.

[27]Ibid.

[28]Zuboff, S. (2019). The age of surveillance capitalism: The fight for a human future at the new frontier of power. Profile Books. Pg. 11.

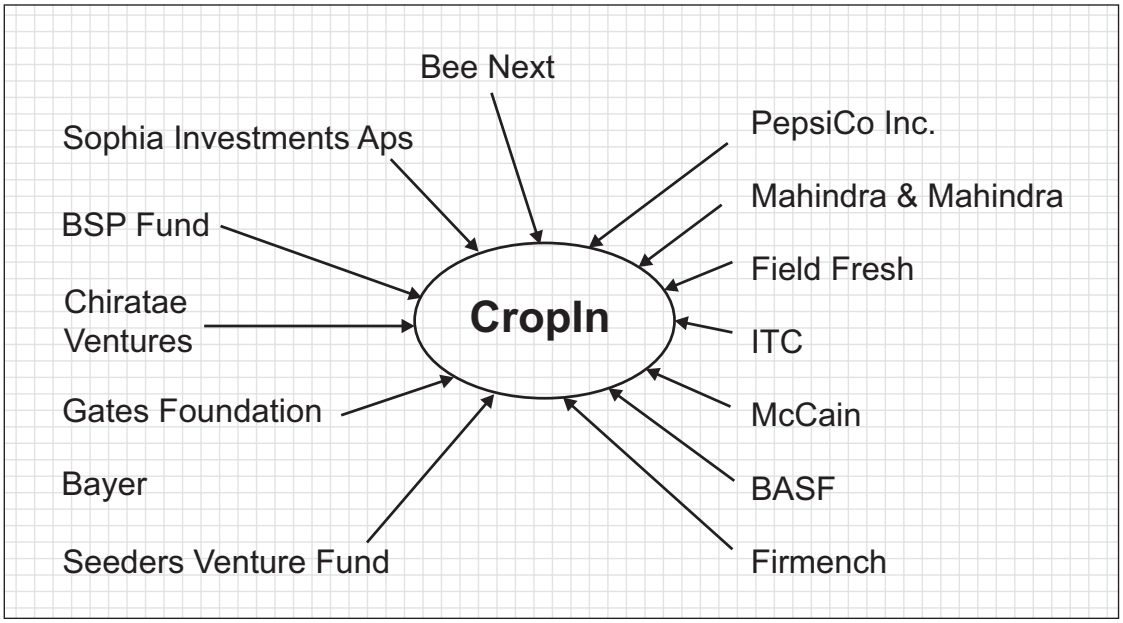
[29]Ahuja, A .2018. CropIn Technology raises $8 million from Chiratae Ventures, Gates Foundation. Livemint. Available at: https://www.livemint.com/Companies/X5TRE10YbgUlqgvhN2IDBL/CropIn-Technology-raises-8-million-from-Chiratae-Ventures.html. Accessed on 20 August 2019.

[30]Economic Times. 2019. SaaS-based agri-tech company CropIn registers 300% growth. Available at: https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/saas-based-agri-tech-company-cropin-registers-300-growth/articleshow/68147881.cms?from=mdr. Accessed on 23 August, 2019.



Source: CBinsights. 2017. The Ag Tech Market Map: 100+ Startups Powering The Future Of Farming And Agribusiness.Available at https://www.cbinsights.com/research/agriculture-tech-market-map-company-list/. Accessed on 28th august 2019.

Seeds of Surveillance: Surveillance Capitalism Enters Indian Agriculture



CropIn Technology Pvt Ltd a Bengaluru-based company has raised $12 million in funding. It is funded by the Poison Cartel, Venture Capital Firms and Agtech companies like Chiratae Ventures, Bill and Gates Foundation Foundation Strategic Investment Fund, Seeders Ventures Fund, Syngenta, Bayer and BASF. Its clientele includes PepsiCo, Mahindra & Mahindra, ITC, Field Fresh and McCain.

The company claims that it would utilise the funding to use its technology and machine-learning platform to control over 10 million acres of land and invade the lives of seven million farmers in India and globally.[31]

It is claimed that CropIn has been founded by Krishna Kumar, Kunal Prasad and Chittaranjan Jena. But it is the money of the poison cartel and billionaires that actually founded it. The technologies being promoted are those of the poison cartel. The "founder" of CropIn talking about its 'SmartRiskTM' solution says: "SmartRiskTM leverages Artificial Intelligence, Machine Learning and Big Data Analytics."[32]

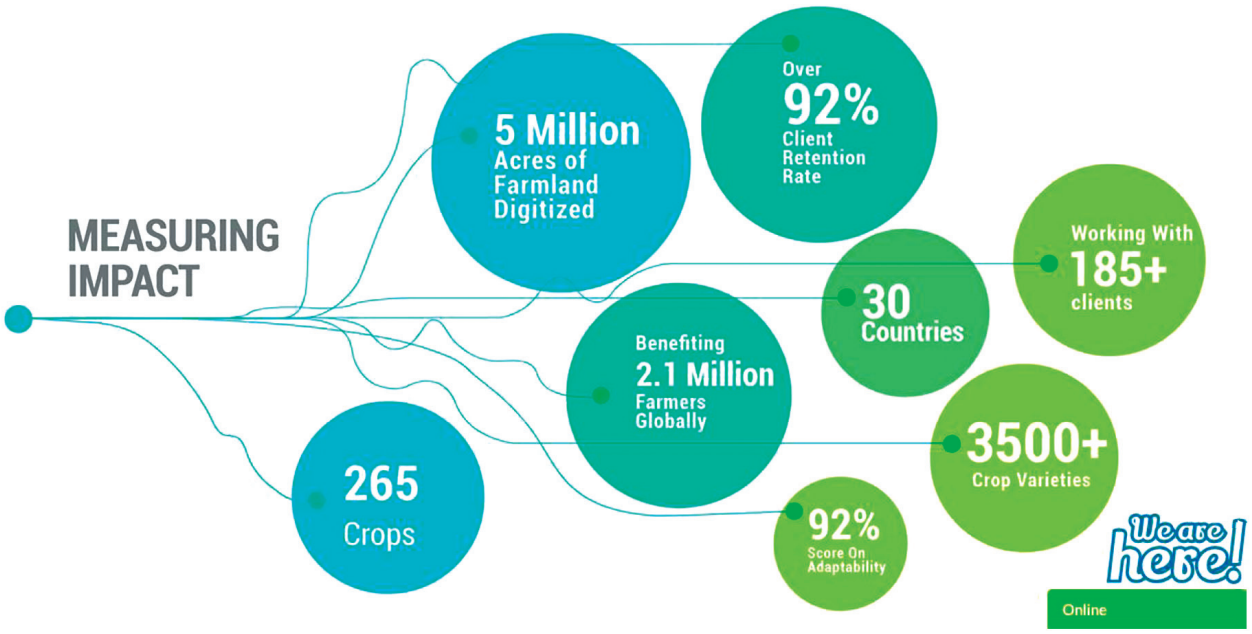
CropIn claims to use Big Data analytics, artificial intelligence and remote sensing to "analyze data" for 265 crops for agriculture processors, distributors, inputs providers, lenders and insurers. The start-up claims to be building an "agri-information dataset" to detect patterns and "predict the future" of a variety of crops.

A nine year old start up, setup in 2010 cannot possibly cover 30 countries in Asia, Europe, Africa, and the Americas and invade the lives of over 2.1 million farmers by digitizing over 5 million acres of farmlands.

In India, CropIn has announced its presence in 70% of the states.

CropIn has a tie-up with the Department of Agriculture (DOA), Government of Karnataka, to "help" farmers create "more value" for their crops. The project aims to "assist" 4.15 lakh farmers across 30 districts of Karnataka in digitising 3.4 lakh acres of farmlands.

In 2017, CropIn started a project in collaboration with the Department of Horticulture (DOH), Andhra Pradesh, to digitize farms under two FPO in the districts of



Source: https://www.cropin.com/

[31]Ahuja, A .2018. CropIn Technology raises $8 million from Chiratae Ventures, Gates Foundation. Livemint. Available at: https://www.livemint.com/Companies/X5TRE10YbgUlqgvhN2IDBL/CropIn-Technology-raises-8-million-from-Chiratae-Ventures.html. Accessed on 19th august 2019.

[32]Economic Times. 2019. SaaS-based agri-tech company CropIn registers 300% growth. Available at: https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/saas-based-agri-tech-company-cropin-registers-300-growth/articleshow/68147881.cms?from=mdr. Accessed on 23 August, 2019.

Chittoor and Krishna. It also works with the Bihar State Government and is part of the Jeevika project that uses "smart technologies" for climate resilient agriculture.[33]

Additionally, the World Bank has chosen CropIn as the technology partner in the public–private partnership project of the Government of India and World Bank.

The Poison Cartel and Ag-tech in India are turning our seeds of freedom into seeds of surveillance is with the Department of Agriculture and Welfare, Government of Punjab to plan the certification and traceability of seed potato. Punjab Agri Export Corporation (PAGREXCO) has been reported to deploy blockchain technology with the help of barcode, QR code and geo-tagging to undertake certification and traceability of seed potato right from nucleus to seed level (harvest) with the help of technology partner CropIn Technology Solutions, the same company funded by Bill Gates.

This is surveillance.

This leads to dispossession.

Furthermore, it has been reported that India's agriculture ministry is working with National Informatics Centre on a 5 crore rupee project which involves rolling out a software which will barcode all seeds. This has been justified on the grounds of making everything "more transparent" and "more traceable" and to "weed out poor quality seeds". The seeds will be "tracked" throughout the supply chain. It has also been reported that there are discussions with the state governments to adopt the same software. What is even more troubling is that 5,000 private seed companies have already come on board with this. The goal of this initiative, within two years, is to know how much of which seed is sold in which area.

Imposing failed GMO technologies through a compulsory seed certification law is seed slavery

We are facing a new attempt by the corporates to attack our sovereignty through a seed law which would replace the Seeds Act, 1966 and will be introduced in the parliament in this year's winter session (2019).[34]

This proposed law is a threat to the sovereignty of our farmers and our anna datas because:

It requires mandatory uniform certification of all seeds in our country. The 1966 Act states: "An Act to provide for regulating the quality of certain seeds for sale..." The new Bill is said to remove the word "certain". And replace this with "all" seeds. All seeds would include farmers' seeds.

The justification of needing this law has been : "Technology has changed, farmers' expectations have changed, even the very definition of what is a seed has changed." Every part of this justification is false.

- "Technology has changed"

Technology is just a tool which we adapt to human needs and human freedom. When humans are coercively adapted to a corporate tool designed to control nature and society it becomes a tool of slavery. Since technologies are tools, they are chosen.

The Failure of the Green Revolution seeds and the GMO Bt cotton seeds is a failure of the Corporate driven technologies for making superprofits through selling poisons and non renewable seeds, and the technological approach of control and ownership .

With the ecological emergency, climate emergency and the food emergency, the technologies that are needed are participatory and evolutionary, breeding for climate resilience, for increasing nutrition, and making agriculture poison free.

Desi, indigenous seeds are the seeds of the future. And farmers' seed sovereignty to evolve, breed and distribute their seeds is at the heart of ecological security and food security.

Corporate technology of producing GMOs through genetic engineering and gene editing has failed. The failure of genetic engineering has been proven again and again through the Bt failure which has led to thousands of farmer suicides. Gene editing has also been proven to be a failure because of how inexact and unpredictable it is. It was found that CRISPR introduced more than 1,500 single-nucleotide

[33]How CropIn is helping the farmer ecosystem. 2018. Available at: http://smartceo.co/cropin-helping-farmer-ecosystem/. Accessed on 28th august 2019.

[34]Jebaraj, P. 2019. Certification o f s eeds to b e m ade mandatory to step u p farm output. T he H indu. Available at: https://www.thehindu.com/business/agri-business/certification-of-seeds-to-be-made-mandatory-to-step-up-farm-output/article28979417.ece. accessed on 25th august 2019.

unintended mutations more than 100 larger deletions and insertions into the genome of mice.[35]

- "farmers' expectations have changed"

The second justification is that farmers' expectations change. Farmers' expectations change only when one assumes that farmers can be manipulated to be subjugated for the new seed slavery. But farmers have experienced failures of genetic engineering and failure of GMO Bt cotton. More and more farmers are becoming conscious of the qualities and the value that that their desi seeds hold for diversity, nutrition and climate resilience. Desi seeds are spreading because they conserve water, are more resilient and have more nutrition and taste.

- "the very definition of what is a seed has changed"

The definition of seed cannot change.

Seed is living. Seed is the source of life. Seed is self organising complexity, constantly adapting to the rapidly changing climate.

For corporations, seed is merely an "intellectual property" and "plant propagating matter". For them, the seed is not renewable and it doesn't multiply. It has lost its freedom. It is the anti-seed.

Compulsory certification creates one uniform standard for the quality of seeds. And this "standard" is created in favour of the corporate made seeds. It furthers the destruction of diversity which our farmers have cultivated. By destroying the renewability and diversity of seed, it makes 'Anti seed' which is anti-life. The proposal for the compulsory certification is a proposal for an anti-seed and anti-life law.

This idea of forcing GMOs and seed surveillance through a compulsory seed certification law serves entities like the Gates Foundation.

It was recently reported that the 18,000-crore seed industry has called for the introduction of a National Agricultural Policy and expedition of the Seed Bill and Biotech Regulatory Authority of India (BRAI) Bill to "ensure policy direction and predictability".[36]

Farmers have knowledge of their seeds. Farmers' seeds are in the commons where the community has the knowledge of the quality, reliability, and the traits of their seeds.

Barcodes, QR codes, geotagging and blockchain technology imposed by these corporations are the tools of corporate slavery.

The paradigm of seeds of surveillance is one of the combination of digital agriculture, data science and genetic engineering creating higher level of integration of abstractions and instrument for control. This is also why we see today that not only is the old toxic cartel recombining as a new one through mergers, it is going beyond the convergence of seeds, pesticides and fertilisers to farm equipment, information technology, climate data, soil data and insurance.[37]

Farmers need Freedom not Slavery

Farmers have knowledge. This is the knowledge being harvested through digitalisation.

But data is not knowledge. It is just another commodity to make the farmer more dependent. The farmer is being told he or she must outsource his or her mind to Monsanto. This is the next step in a dead-end future that ignores the intelligence of seeds, plants, soil organism, our gut bacteria, our farmers, our grandmothers.[38]

Seeds of Surveillance transform the knowledge and knowing from a participatory process of co-creation with the earth, her biodiversity, her soils to take better care of the soil and the seed, based on seed and knowledge sovereignty into "data" for increased control over farming by the Poison Cartel, a continuation of the industrial food system, and the basis of an attempt at epistemic imperialism.[39]

We need to resist these seeds of surveillance.

We need to defend the seeds of freedom.

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[35]Shiva, V and Shiva, K. 2018. The Future of our daily bread: Regeneration or Collapse. Navdanya International / Research foundation for science, technology and ecology.

[36]Kurmanath, KV. (2019). Seed lobby wants govt to do away with MSP, price-control regime. Business Line. Available at: https://www.thehindubusinessline.com/economy/agri-business/seed-lobby-wants-govt-to-do-away-with-msp-price-control-regime/article29189517.ece. Accessed on 23 august 2019.

[37]Shiva, K and Shiva, V. (2018). Oneness vs 1%: shattering illusions, seeding freedom. Pg.62.

[38]Shiva, K and Shiva, V. 2018. Oneness vs 1%: shattering illusions, seeding freedom.

[39]Shiva, V and Shiva, K. 2018. The Future of our daily bread: Regeneration or Collapse. Navdanya International / Research foundation for science, technology and ecology.

The future is based on biodiversity, seed sovereignty and agroecology, not on the illusions sold by the poison cartel: the future is Agroecology, not "Ag tech"

There is an illusion that running faster on the chemical and poison cartel treadmill, now equipped with Artificial Intelligence and Robots will be more effective in producing more food and feeding the hungry. On the contrary, the tools and technologies of the poison cartel have brought the planet and the lives of farmers to the brink with climate havoc, species extinction, water crisis, farmer incomes collapsing to zero and food related diseases killing larger numbers of people.

The tools of the poison cartel have repeatedly failed in agriculture which is about life and its renewal.

Pesticides have failed to control pests.

Bt crops have failed to control pests.

New pesticides deployed faster through the Poison Cartel now using partnerships with "Artificial" Intelligence for algorithms for guessing which molecules can be used for new pesticides will also fail as a pest control technology. It already is failing.

We need to rise up and look past the corporate narrative and the lies being sold to us:

First green revolution	"Chemicals will feed us"
Second green revolution	"GMOs will feed us"
Third green revolution	"Surveillance and big data will feed us"

We are clearly not being fed by these tools.

We have neither bread nor freedom in the poison cartel paradigm.

There is another paradigm that sustains life on earth and feeds people: the paradigm of Agroecology. Agroecology and biodiversity based agriculture produces more food while regenerating the earth and reversing the decline in farmers' incomes.[40]

Which is why we need to reclaim our freedom and sovereignty and return to our roots of farming with nature. The future has to be based on diverse agroecological systems in India and across the world, not the continuation of the rule of the Poison Cartel which will accelerate the current emergency, with more farmers committing suicide, more children dying of hunger and malnutrition, more climate catastrophes, more forest fires and more species extinction.

Our future and our freedoms are based on working with the earth through Agroecology, not engaging in a war with the earth through Ag Tech.

Our sovereignties and the sovereignties of the earth are one. We will defend our future by defending our:

Seed sovereignty (Bija Swaraj).

Food sovereignty (Anna Swaraj).

Land sovereignty (Bhu Swaraj).

Knowledge sovereignty (Gyan Swaraj).

[40]Shiva, V., & Singh, V. (2011). Health Per Acre: Organic Solutions to Hunger & Malnutrition. Navdanya/Research Foundation for Science, Technology & Ecology; Shiva, V., & Singh, V. (2014). Wealth Per Acre: The transition to ecological farming that rejuvenates nature's economy and people's economy seems not only logical but also inevitable. Navdanya/Research Foundation for Science, Technology & Ecology.

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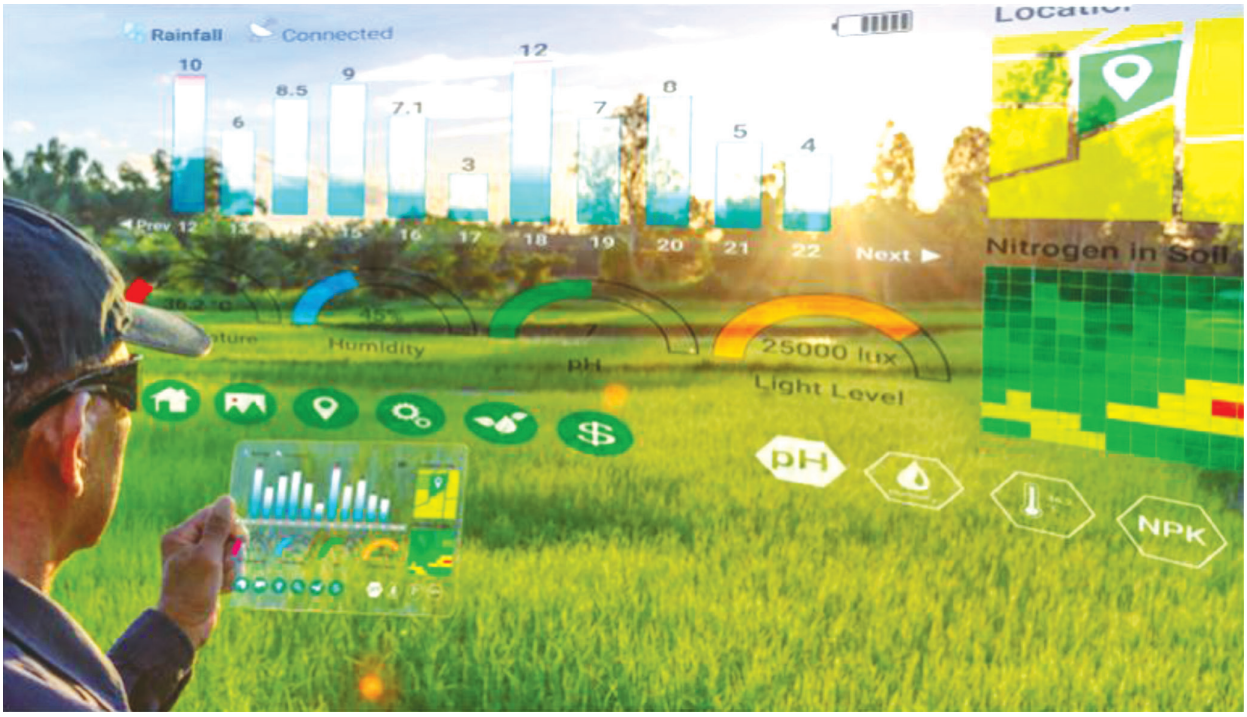

AI, Precision Farming, Geotagging Source: https://www.cropin.com/

Robotics , Drones , Remote Sensing & Precision Agriculture, Source: https://www.cropin.com/

Cropin™

HOME ABOUT US PRODUCT

Challenge

This case is about one of the world's largest producers of potato specialties company based in India. The company leases plots for farming and has 2500+ plots spread across an area of 5200 +acres. Earlier, they used to record farm data manually, thus creating multiple inconsistent entries. A check on practices such as dehaulming & rouging, adoption of right package of practices & the right inputs and visibility of field activities were serious challenges faced by the company. The company was on the lookout for a **complete farm management solution to resolve its various issues.**

Solution

- 2500+ Plots audited and geo tagged to find the actual plot area
- Remote Sensing and Weather Advisory helped in detection of dew point, rainfall, frost, blight and other challenges related to dehaulming
- Gathering Complete information from farmer registration till harvest end
- Scheduling and monitoring farm activities for complete traceability
- Educating farmers on adoption of right package of practices and inputs
- Monitoring Crop health and harvest estimation

CropIn-McCain Source: https://www.cropin.com/

Climate Smart Agriculture Source: https://www.cropin.com/

Plant- Data Analysis, Incubation Source: https://www.cropin.com/

Credits

International Commission on the Future of Food and Agriculture

The International Commission on the Future of Food and Agriculture was created in 2003 in Tuscany, Italy, as a result of an international meeting of leaders in the food and agriculture movement brought together by Claudio Martini, then President of the Regional Government of Tuscany and Dr. Vandana Shiva, President of Navdanya International.

The Commission brings together leading activists, academics, scientists, politicians and farmers from North and South, committed to building more socially and ecologically sustainable food and agriculture systems and active in creative movements for the protection of biodiversity, local food production and consumption, food security, food safety and health, and the rights of consumers and small farmers.

It has published six far-reaching Manifestos on issues of critical importance to the future of the planet: Manifesto on The Future of Food, Manifesto on the Future of Seeds, Manifesto on Climate Change and the Future of Food Security, Manifesto on Future of Knowledge Systems : knowledge sovereignty for a healthy planet, Manifesto called Terra Viva : Our Soil, Our Commons, our Future and Manifesto on Food for Health. The Manifestos have been widely distributed at major international United Nations and Civil Society Conferences and Summits on food security, agriculture, and climate change.

Navdanya International

Navdanya International was founded in Italy in 2011 to support the mission of Navdanya, an organization created by Dr. Vandana Shiva 30 years ago in India, on an international level. Navdanya promotes a new agricultural and economic paradigm, a culture of food for health, where ecological responsibility and economic justice replace the present greed, consumerism and competition which have become dominant in society. Navdanya's research on Biodiversity based Agro-ecological farming has shown how Agroecology can increase nutrition and health, as well as farmers' incomes while rejuvenating soil, water and biodiversity and enhancing climate resilience.

Navdanya International contributes to strengthen Navdanya's global outreach through publications, campaigns, advocacy actions, communication, capacity building and movement building - both on a local level with communities and a national/ international level - in cooperation with communities from all over the world. In October 2012, Navdanya International launched its Global Seed Freedom Campaign to bring to citizens' attention the crucial role of seed in the battle to defend food sovereignty and food safety and help strengthen the movement to save and exchange seeds in response to the growing corporate hijacking of our seeds and our food.

Navdanya International has been at the forefront of showing connections between multiple crises in the global debate in a holistic perspective, focused on the agri-food systems analysis and their close link to soils, biodiversity, climate resilience and social justice.

Starting from the Commission's work, the organization's commitment is to encourage the convergence and the action of movements defending agroecology, food sovereignty, seed conservation, social justice and public health, with the aim of creating a common vision of a sustainable, fair and inclusive development and elaborating global strategies to overcome the industrial agriculture model dominated by giant agrichemical corporations.

Biographical notes of the authors

Vandana Shiva – *Founder of Navdanya International*

Physicist, ecologist, activist, and the founder and director of Navdanya International. In 1982 she founded the Research Foundation for Science, Technology and Ecology (RFSTE). For many years, she has been committed to promoting a paradigm shift in agriculture and food, denouncing issues related to intellectual property, biodiversity, biotechnology, bioethics, genetic engineering, and the globalization of food systems.Author of numerous books, she serves on the board of the International Forum on Globalization, and is member of the executive committee of the World Future Council.

Nadia El-Hage Scialabba – *International food ecology expert*

Specialized in environmental sciences at the University of Charleston, USA, during her 33 years of service at the Food and Agriculture Organization of the United Nations (FAO) in Rome, she created and coordinated the interdisciplinary program for organic farming, in addition to her primary responsibility to integrate

sustainability considerations into agriculture, forestry and fisheries, from guidelines for integrated management of natural resources, to sustainability protocols and full cost accounting methodologies. She is currently an international consultant on sustainability issues, including transformative approaches to food ecology-especially mitigating the impact of the food system on human health.

Salvatore Ceccarelli – *International expert in Agronomy and Plant Genetics*

Expert in participatory and evolutionary genetic improvement, climate change crop adaptation and the connection between biodiversity, food and health. He's been full professor of Agricultural Genetics at the Institute of Genetic Improvement, University of Perugia He also conducted research at ICARDA (the International Center for Agricultural Research in Dry Environments,) based in Aleppo, Syria until 2006, and continued as a consultant until 2014.

Caroline Lockhart – *Vice President of Navdanya International*

After extensive experience working at the United Nations in New York in the economic and social field at the policy making level and with the NGO community, in the 1990s she participated in the UN peacekeeping missions for free and fair elections in Namibia (UNTAG), South Africa (UNOMSA) and East Timor (UNAMET). She moved to Florence in 2003 to join the office of the Governor of the Region of Tuscany to coordinate the international component of the annual San Rossore Summit meetings on globalization issues as well as the activities of the newly formed International Commission on the future of food and agriculture. She joined the Navdanya International team at its formation in 2011 when the new Council of the region of Tuscany was elected.

Ruchi Shroff - *Director of Navdanya International*

She co-ordinates the international programs and campaigns related to Seed Freedom, food sovereignty as well as resistance to GMOs, free trade agreements, seed monopolies and biopiracy. One of her interests lies in investigating the true costs of the industrial food system paradigm and its impacts on agro biodiversity, socio-economic and ecological sustainability. Trained in physics, economics and management, she has worked for over a decade with social movements in the defence and protection of the environment as well as democratic rights of minorities and indigenous communities.

Manlio Masucci - *Journalist*

Photo-journalist specialized in environmental, commer-cial and labour market issues, he worked for the main Italian newspapers and press agencies such as Ansa, Messaggero, Terra Nuova Edizioni, Lifegate, l'Extraterrestre (Il Manifesto) and as a correspondent from New York, Buenos Aires and New Delhi. He also was employed as a journalist in Cisl, one of the main Italian trade unions and as a consultant at ILO, International Labor Organization and in the communication departments of several Italian NGOs.

Jonathan Latham is a molecular biologist and former genetic engineer. He now edits the website Independent Science News.

Philip Ackerman-Leist, farmer, author, and educator, Dean of the School of the New American Farmstead - Sterling College, USA.

Prerna Anilkumar has completed law school and now works at Navdanya, India, as the Research Coordinator. Her interests lie in defending farmers' rights, seed sovereignty and food sovereignty.

Mauricio Alvarez Mora, geographer and Master of Latin American Studies, (UCR) University of Costa Rica.

Nnimmo Bassey, architect, environmental activist, author and poet. He chaired Friends of the Earth International from 2008 through 2012 and was Executive Director of Environmental Rights Action for two decades. He was was named co-winner of the Right Livelihood Award in 2010. He is a member of the Board of Navdanya International and the Director of the Health of Mother Earth Foundation (HOMEF), Nigeria.

Fernando Cabaleiro, Attorney at Law, Naturaleza de Derechos, Argentina.

Koen Hertoge, activist, Board member of PAN (Pesticide Action Network) Europe.

Katharina Hohenstein, journalist and writer, Italy, Switzerland and Austria.

Murilo Mendonça Oliveira de Souza, professor of Geography - State University of Goiás (UEG/ Goiás), Brazil. He is member of the Brazilian Association of Agroecology (Associação Brasileira de Agroecologia - ABA) and has experience in the area of Agrarian Geography, with a focus on the Agrarian issue, particularly the agrarian reform, rural development and land grabbing.

Mary Jacob, former Dean International Affairs, Acting Vice Chancellor of University of California at Santa Barbara. She is now the President of Friends of Navdanya.

Fabian Pacheco Rodríguez, activist and ecological farmer, Master in Environmental Agrobiology. He is the Director of the National Center Specialized in Organic Agriculture of the INA (Instituto Nacional de Aprendizaje), Costa Rica.

Neha Raj Singh is a graduate in zoology and environment and development. She coordinates Navdanya's women programmes and activities, India.


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