Claire Bleakley (R.C Hom (NZ), BSc/ Psyc, Dip Herb)
President of GE Free NZ in Food and Environment

I come to you today to discuss the issue of the safety of genetically engineered organisms and social harmony.

I am proud to say that New Zealand is still free of genetically engineered organisms in the open environment and commercial agriculture. I wish it was everywhere, but New Zealand society has been active in prohibiting GE until the risks are better identified. There is a social harmony in the agreement that around 70% of New Zealanders said they wanted our environment and commercial agriculture to be GE Free. It is our hope and conviction that we can keep this technology out of our environment and food. These are strong drivers in our ability to fight to preserve our GE Free status.

I would like to explain my terminology –When I refer to GE/GM or cisgenics, I am talking about the laboratory insertion of foreign or same species genes attached to viral and bacterial vectors to create a synthetic cassette. This cassette is then introduced into a host cells DNA to produce a protein of interest. It also applies to the progeny of these plants/animals whose parent line has been subject to this transgenic in-vivo or in vitro technology.

I do not believe that GEO's on the Market today are safe for agriculture, the environment, the flora and fauna and human consumption. The push to force them on society will not breed social harmony. I also feel there is actually no room for compromise as GMO's are living Organisms recognised by the Cartagena Protocol and there fore infiltrate and alter materially the fabric of the species diversity that has evolved over the millennia. The long term effects are unknown and potentially devastating.

Maori: Treaty of Waitangi.

New Zealand has an Indigenous race, Maori, who came to New Zealand over 1000 years ago. The Treaty of Waitangi is considered a founding document between the English Crown and Maori. Regardless of this Maori have suffered badly since colonization. They lost their language, customs and even the ability to use their healing plants (Rongoa).

Some of the strongest opposition to GE came from Maori. Dr Jessica Hutchings and Dr. Paul Reynolds thesis "The Obfuscation of Tikanga Maori in the GM Debate" highlights some of the interpretations

The Ministry for the Environment policy analyst Nicci Gibbs understood the basis of Maori concerns over GM, as

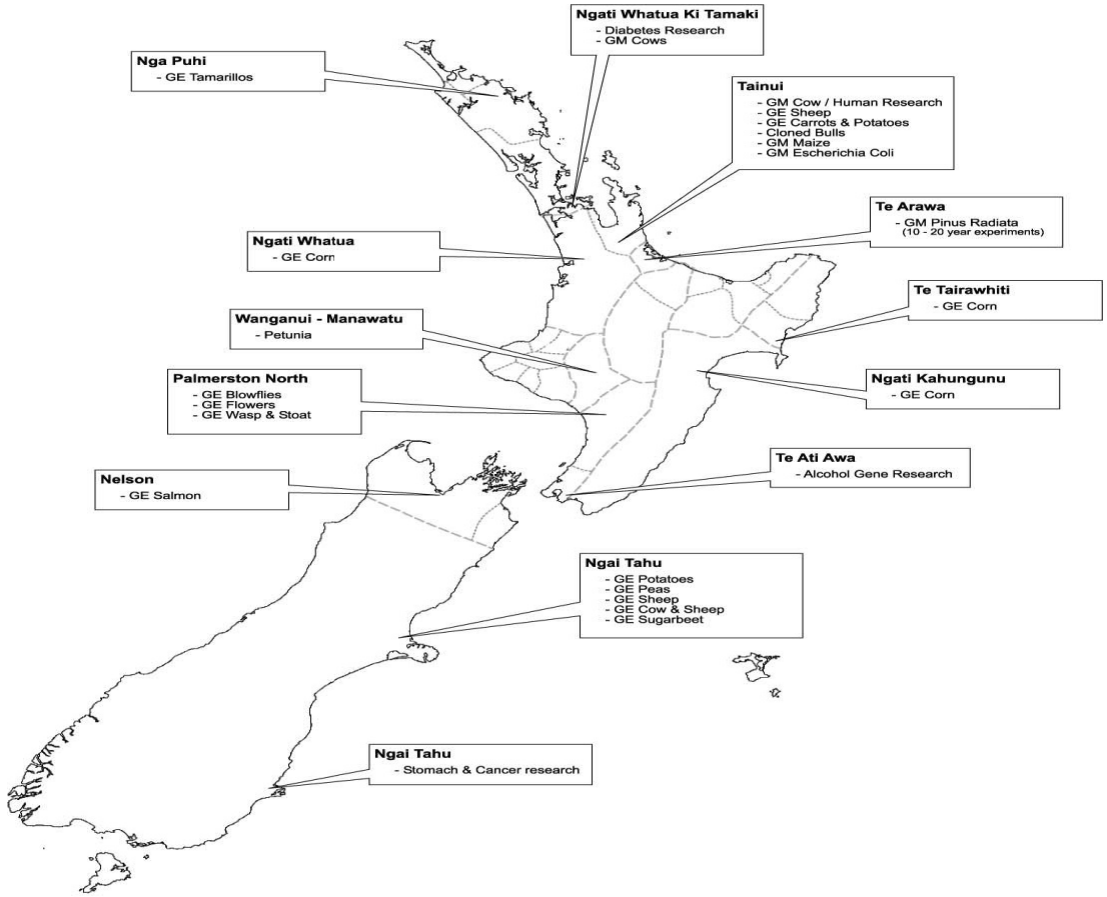
> *All elements of the natural and divine worlds, including humans and genetic material, are related and are linked by the possession of mauri – the life force; It is the responsibility of the present generation, as kaitiaki, to protect the mauri of genetic material from defilement or abuse; Genetic manipulation may be seen to interfere with the integrity of species, and, therefore, may interfere with the mauri of the affected species; Kaitiakitanga is part of the exercising of rangatiratanga, and the ability to effectively exercise both affects the mana of an iwi or hapu; and The Treaty guaranteed Maori rangatiratanga over their taonga. Genetic resources could be considered to be taonga, and control over genetic resources may therefore be part of this guarantee".* (Hutchings, p.7)

The depth of feeling was further expressed by Nga Wahine Tiaki o Te Ao Marama (Maori Women guardians of the World of Light) as stated in their submission to the Royal Commission on Genetic Modification

> *Aotearoa is Maori land, and therefore any organism grown from it is subject to tikanga Maori which provides a collective basis from which to properly care for the environment and distribute resources. Anything created in Aotearoa will be subject to claims for ownership as katiaki, furthermore we will continue to exercise our rights as Maori and prevent the introduction of GM and GMO experimentation in Aotearoa. We expressly do not give permission for our intellectual property to be used for the purposes of GM and GMO experimentation. Maori women have specific roles as kaitiaki (guardians) in regard to their tangata (people). In particular Maori women hold key roles in protecting whakapapa (genealogy), mauri (Life force), ira and tapu (sacred space)*". (Hutchings, 2004, p. 12)

This indigenous voice has however has been overlooked, when considering how this view has been honored the land sites of GE experimental research has been based predominantly on Maori land as Fig 1 identifies -

Figure1 Iwi Rohe Map Identifying GM research on Maori Land



Terminology –
Mauri - the life force present in all elements of the natural world
Whakapapa – Genealogy; the interconnectedness of all elements of the natural world;
Kaitiakitanga - the responsibilities of present generations to maintain the integrity of the natural world for future generations.
Rangatiratanga - Maori sovereignty over all things Maori
Tapu – sacredness
Taonga – sacred treasures.
Tikanga – Customs and beliefs
Tangata – The people.

History of GE in NZ-

The Green Party leader, Jeanette Fitzsimons, who had concerns around the long-term safety and risks to the environment, initially raised the Genetic Engineering issue. This prompted the government of the day to write comprehensive legislation around the risk management of genetically modified organisms called the Hazardous Substances and New Organisms Act (HSNO)

The New Zealand Hazardous Substances and New Organisms Act (HSNO) legislation was enacted in 1996 and regulates all GMO applications for approval. It is enacted in a staged process with checks and balances looking at the risks of the organism at each stage. The process allows public submissions on all GE field trials and some development trials outdoor if it is considered of public significance.

Unfortunately the public's submissions have been sidelined in the regulatory decision making process as only the concerns need to be "taken into account" not necessarily acted on. This has prompted 4 challenges in the High Court.

In 1999 NZ had a Royal Commission on GM who said the New Zealand should 'proceed with caution". Three main groups sprung up to protest GMO introduction – Maori groups, Greenpeace, Mother against Genetic engineering (MAdGE), GE Free NZ in Food and Environment.

In 2000, 20,000 people marched down the main street of Auckland to protect New Zealand status as GE Free. This rally forced the Government to place a voluntary moratorium on the open trials of GMO's whilst the findings of the Royal Commission were implemented.

In 2004 the moratorium was lifted and the public of New Zealand launched a "Peoples Moratorium Party" this party was set up to educate and keep the commercial environment free of GMO's, run by the public citizen not government.

It has been the untiring work of these dedicated people who have kept GE out of the larger environment.

I would like to outline certain legislation we have in New Zealand –

The Hazardous Substances and New Organisms Act (HSNO)
This Act combines the regulation of New Organisms including GMO's and pesticides. The guiding objectives and aims and goals are outlined in sections 4, 5, 6.

4. Purpose of Act

The purpose of this Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

The principles that guide this are found in section 5

5. Principles relevant to purpose of Act

All persons exercising functions, powers, and duties under this Act shall, to achieve the purpose of this Act, recognise and provide for the following principles:

(a) the safeguarding of the life-supporting capacity of air, water, soil, and ecosystems:

(b) the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social, and cultural well-being and for the reasonably foreseeable needs of future generations.

6. Matters relevant to purpose of Act

All persons exercising functions, powers, and duties under this Act shall, to achieve the purpose of this Act, take into account the following matters:

(a) the sustainability of all native and valued introduced flora and fauna:

(b) the intrinsic value of ecosystems:

(c) public health:

(d) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga:

(e) the economic and related benefits and costs of using a particular hazardous substance or new organism:

(f) New Zealand's international obligations.

It does appear with each year we are getting further and further away from the perceived unknown risks of GMO's and starting to confirm that they are now becoming a serious risk to the environment, ecosystems and animals health. In time we will know if these effects are reflected in the human population. However we still lack the diagnostic tools to pursue any effects to confirm or deny if they are related to GMO ingestion. To this end ERMA is still taking a precautionary approach and "proceeding with caution". What concerns us is the final clause in both the HSNO Act and the CRI Act that must obey "International Obligations" this takes away all rights of a sovereign nation to decide objectively, as well as heed its public voice.

Crown Research Institutes (CRI)

The Government created four Crown Research Institutes (CRI) that have been trialing GE, these CRI's have overseas commercial partners who include / have included Monsanto/Seminis, ArborGen, Genzyme, Pharming NV, Syngenta.

These CRI's are governed by Crown Research Institute Act 1992 (CRI Act, 1992). The are charge to operate under the principles of –

(1) Every Crown Research Institute shall, in fulfilling its purpose, operate in accordance with the following principles:

a. that research undertaken by a Crown Research Institute should be undertaken for the benefit of New Zealand:

b. that a Crown Research Institute should pursue excellence in all its activities:

c. *that in carrying out its activities a Crown Research Institute should comply with any applicable ethical standards:*
d. *that a Crown Research Institute should promote and facilitate the application of—*
(i) the results of research; and
(ii) technological developments:

This gives the CRI's autonomy in their partnerships and work they carry out. However a true conflict of interest comes about as the Minister who is the major shareholder has the ability to dictate what and how research should be conducted.

Powers of shareholding Ministers

- *(1) Notwithstanding any other provision of this Act or the constitution of any Crown Research Institute,—*
(a) the shareholding Ministers may from time to time, by written notice to the board, direct the board of a Crown Research Institute to include in, or omit from, a statement of corporate intent for that Crown Research Institute any provision or provisions of a kind referred to in paragraphs (a) to (h) of section 16(2); and

(c) the shareholding Ministers may from time to time, on the advice of the Minister of External Relations and Trade, by written notice to the board, direct the board of a Crown Research Institute to include in the statement of corporate intent for that Crown Research Institute such provision as the Minister considers necessary—
  - *(i) to enable the fulfillment (in whole or in part) of any obligation or undertaking arising from any international convention or international agreement or international arrangement to which the Government of New Zealand, or any department, agency, or other instrument of the Government of New Zealand, is a party; or*
  - (*ii) to implement (in whole or in part) any policy of the Government of New Zealand in respect of the Government's international relations,—*

and any board to whom such a notice is given shall comply with the notice.

It has been shown that certain research is now being conducted on behalf of overseas partners. This research holds no benefit to New Zealand except for the "scientific knowledge" gained from carry out these experiments.

The Food Standards Australia New Zealand (FSANZ) is a Trans- Tasman body that is legislated to follow the Food Standards Australia New Zealand Act, they are charged to evaluate food safety approvals around GMO's novel foods.

Food Standards Australia New Zealand (FSANZ) legal requirements as stated in their mission statement are:

- *To protect, in collaboration with others, the health and safety of people in Australia and New Zealand through the maintenance of a safe food supply.*

FSANZ Values are*:*
- *To be impartial, open and accountable;*
- *To use the best available sciences and evidence to guide decision-making;*
- *To seek, respect and be responsive to the issues raised by others;*

FSANZ Responsibilities are

- *Provide information to consumers to enable better consumer choice*
- *Undertake dietary exposure modeling and scientific risk assessments*
- *Provide risk assessment advice on imported food*

When an application is received FSANZ notifies the public in two rounds of consultation. The agency staff then evaluate the submissions and application and recommend to the Ministerial Council, a body of the eight Ministers of Food Safety in each Australian state and New Zealand for final approval. To date none have been turned down. Yet again it appears that Trade obligations play a major part in the approvals.

GE Crops Ready Roundup (RR) and Bacillus thuringiensis (Bt) in New Zealand.

Though we have no GE commercial agriculture, we do have 9 GE food lines approved by the food Standards Australia New Zealand Authority (FSANZ), to our human food chain. These contain herbicide tolerant and Insecticide producing traits, some have altered characteristics.

Table 1. GM Foods approved by FSANZ

Food Type	Soybean,	Corn	Canola	Potato	Rice	Wheat	Alfalfa	Cotton	Sugarbeet
Herbicide Resistant	9	6	3		1		1	5	2
Bt Insecticide-producing(I/P)	1	7		3				5	
H/R & I/P Stacked		5						3	
Other	3	3							
Total Lines	13	20	3	3	1	With drawn	1	10	2

Concerns arise from the many different trait modifications, including stacked gene traits. The level of pesticides and novel genes are not understood as never before have these herbicides or Insecticides been integrated into the foods in such a way.

New Zealand has no labeling of GMO's, unless they are over the 1% threshold. However there are many loop holes around the labeling. Fresh food and non-packaged food point of sale things like bread, pastries do not have to be labeled. Yet these invariably contain soy flour, maize meal and cotton, corn or canola oils which are most likely derived from GMO plants.

The major importers of grain, Harvey Grains, Inghams, for pigs and chickens have shown that up to 13% of grains were made up of GE soya. This was taken to the Commerce Commission up by GE Free northland as Inghams chickens were sold as containing

"No…GM ingredients" and *"have no added hormones, GM ingredients or artificial colours"*

Inghams also stated on their website that *"Inghams GM policy is clear. Our poultry contains no GM content and are not genetically modified."*

The Commission engaged Jack Heinemann, Professor of Genetics and Molecular biology at Canterbury University was asked to consider if "animals exposed to feed containing genetically modified material (GM Feed) do in fact contain 'no GM ingredients'.

Professor Heinemann reported,

"*The cumulative strength of the positive detections reviewed …leave me in no reasonable uncertainty that GM plant material can transfer to animals exposed to GM feed in their diets or environment, and that there can be a residual difference in animals or animal-products as a result of exposure to GM feed…*"

The Commerce Commission's Adrian Sparrow upheld the complaint saying

"Many consumers wish to avoid food products that contain GM ingredients and this is why food manufacturers like to position themselves as GM free. However consumers ought to be able to rely on the statements made in advertising," (Commerce Commission, 2009)

However Inghams did not remove the GE from its feed grains instead it dropped its claim to be GE Free.

It is good to read that China has extended its Rice moratorium for a further 4 years.

NZ Farming Environment is GE Free ☺!

In New Zealand sheep and beef farming is a grass fed business. The dairy animals are grass fed. And some supplementary food, mostly corn and some imported palm oil, which has been very controversial, is fed to the dairy cows. Antibiotics are used only in necessary veterinary situations. Bovine LactoFerrin is one of the major economic platforms for Fonterra and the creation of recombinant cows carrying the human LactoFerrin gene caused extreme alarm amongst the co-operative farmer shareholders.

The internal and border biosecurity agency, Ministry of Agriculture and Forestry (MAF) maintains a "zero" tolerance on GMO's in the open environment so NZ has not yet had to confront issues around the deleterious effects of GMO's on milk supply or animal health.

New Zealand Dairy animals are fed on Grass pastures and follow the ISO -9001;2000 standards for Quality Management.

Hormones and rec: Bovine Growth Hormone (rBGH) is prohibited for use. In 2000 MAF released a statement saying

> "*One growth hormone, Bovine Somatotropin (BST) will not be licensed in New Zealand because the European Union (EU), a major trading partner for New Zealand, does not allow BST use. Provisional registration of BST (for trial purposes) however, may be given on condition that the produce from any animal experimental animal, and the animal itself, never enters the food chain. If the European Union BST ban is removed, its licensing in New Zealand may be reconsidered. There are currently no applications to register BST in New Zealand*.(MAF,2000)

This could show that the New Zealand Authorities are not so worried about rBGH and the effects but trade issues around its use. Unfortunately, it is shown that the economics and trade implications around the use of GMO's is arbitrary and dependent on whose Country has the most influence on New Zealand exports at the time.

There is a prospect that there might be an application for the release of GM ryegrass in 2013. We expected an application for field trials of GM rye grass in 2008 -2010 however it was never submitted instead trials are being conducted in Australia. This has engendered public and farmer alarm and this may be the reason it was not trialed here.

The hypothesis is to patent a GE plant that will contain many sought after traits. However it is a costly and risky venture and directly in contravention of existing research on non GM High Sugar Rye (Geminal) and planting traditional mixed legume/ grass pastures to significantly reduce in methane production and increase in milk solid yields that are already available to produce the same outcome (Turner *et al*, 2003, Woodward *et al*, 2004).

The commercialization of any GMO will provoke a massive public outcry, especially if there are trade deals done during the Trans Pacific Partnership (TPPA) deal demanding that we remove the bar to GMO's.

I will outline four main Field Trials, all this information has been taken from the compulsory reporting documents that ERMA NZ requires for accountability.

PPL hAAT sheep trial (GMF92001): 1992 -2002

The first Field trial was conducted on sheep, this trial was supposed to start in Scotland however with the outbreak of BSE it was located in New Zealand as we were free of animal diseases.

The trial was conducted by PPL. The Sheep were engineered with the human alpha anti-Trypsin gene (hAAT) considered to be the gene lacking in cystic fibrosis sufferers.
This trail started in 1993 -2002.

The conventional sheep (East Friesian) were chosen because of their high fecundity (150%). Surrogate sheep were mated with hAAT rams. The birth rate was only 5-7%. After 11 years they only had 3000 ewes however they had mated around 5000 sheep a year. The milk was purified and tested on emphysemic patients who suffered serious breathing difficulties. The trials were pulled 6 months into the 2 ½ year trial. The sheep were all incinerated and the ashes buried.

Brassica Trial (GMF06001): 2006 -2007

The Regulators approved the outdoor trial under stringent conditions that did not allow the plants to flower and all debris at the end of each season was to be cleaned up.

The Bt Cry genes were inserted into cabbages, cauliflowers, broccoli and forage kale to protect them from Cabbage white butterflies and diamond back moth.

This trail was held in a secret location in Lincoln Canterbury. However it was found and kept an eye on.

After 11 months a flowering kale plant that had re-grown was found by members of the public who notified the Authorities and after an extensive investigation the trial was closed down.
The field is still being monitored.

GE Pine Trees with reproductive and herbicide genes(GMF 99001/99005): 2002-2007.

This trail had two genuses of trees GE pine trees and Norway spruce engineered to be herbicide resistant and have altered reproductive qualities. These trials were approved over 22 years in cycles of 8 years at Scion at the Rotorua site.

The Norway Spruce tree trial suffered stunting and weakness and the trial was stopped after 2 years.

The GE pines grew for 5 years. However the facility boundary was badly affected by rabbits digging massive holes under the fence and not maintained appropriately.
One day it was discovered that the trees inside the trial site had been cut down by members of the public who dug under the fence and cut down the trees.

The GM animals (GMF 98001, GMD 02028): 1999-2011 (Cows, Sheep and goats) producing human proteins in their milk

This trial was approved in 1999 and was immediately taken to Court. The appeal was upheld however ERMA still allowed it to go ahead but they forced more stringent risk measures on the trial than initially.

The Cows were engineered to produce three novel traits,
Casein plus – these cows carried an extra casein gene that boosted the levels of the milk protein casein.
Lacto globulin - - they tried to remove the Lactoglobulin gene which they could never achieve.
Myelin Basic Protein cows – These cows produced the human myelin basic protein in ht milk, which was hopefully going to cure multiple sclerosis.

However these animals suffer from horrific metabolic disorders and deformities.

The abortion rate is extreme with a 0-7% success rate of live births.
The extreme suffering that these cows have gone through has led to this being a horrific failure and society is appalled at the animal suffering that has been tolerated by the authorities.

Recent Studies on Effects:

In the US and South America GE crops were commercially released without the farmers aware of the effects. When farmers were told they were a new seed that would allow farmers better weed control and simpler farming shortcuts, as well as GE crops are safe and no adverse effects has been found. It turned out that they were really saying is they had conducted no safety tests so there are no data to say either way.

This is now not true in the last decade many independent studies have been published. Yet the Agrochemical GE companies are still perpetuating the myth and turning a blind eye to the independent studies that are being conducted many years after they were released.

India has reported terrible failures of GE crops leading to financial burdens that have lead to suicides. Animals grazing post harvest GE cotton fields have died. China reported that cotton suffered from an infestation of aphids that severely affected the crop.

The recent study, 2010, by Zobiole *et al* on Glyphosate and its effects on microorganisms in rhizosphere of GR soybeans shows that regardless of the GR cultivar glyphosate negatively impacted complex interactions of the microbial groups, biochemical activities and root growth that can have detrimental impacts on plant growth and productivity (Zobiole, 2010, p.118).

Another study following on by Zobiole *et al* on seed composition and glyphosate applications found that there was a significant decrease in linoleic (2.3%) and linolenic acid (9.6%),

essential polyunsaturated fatty acids needed for nutritional health, and a significant (30%) rise in monounsaturated acids.

This was combined with decreased "photosynthetic parameters" and low /altered nutrient availability in glyphosate treated plants. Glyphosate also decreased root and shoot biomass (Zobiole, 2010, p.4520)

They proposed that the phytotoxic breakdown metabolite amino methyl phosphoric acid (AMPA) circulating in the plant was partially associated with the injury.

This concerning fact is highlighted in the recent study by Aris and LeBlanc on Maternal and fetal exposure to pesticides associated to genetically modified foods. In this study it was found that metabolites of glufosinate another herbicide used on GE crops was detected in fetal blood. So was the insecticide gene Cry AB1. No further studies on how this will affect the babies have been carried out.

Seralini *et al* (2011) conducted a meta analysis of 19 animal feeding studies and found that there were statistically significant differences in the adverse effects on the liver and kidneys of the animals. Male rat's livers being more affected than females, where as the kidneys were more affected in females. Other toxic effects of the GE foods were found on blood, immune system and caused sterility, reproductive disorders and stunted growth patterns.

Does Society have a say in GE?

The public with their consumer power and choice to avoid GMO's, if labeled, have a large voice in this.

There is an intrinsic distrust by the public of the Agro Chemical Industry and the lack of environmental, safety and health information on GE. This has caused many questions to be asked. When these questions were answered at the beginning the public were told not to worry as everything was "substantially equivalent'. However, when asked further questions the companies called them "luddites" and "anti science". Yet independent scientific literature has backed up all those who questioned the safety of GMO's and now we can say that our gut feeling was right. We now have evidence of

- Herbicide resistance,
- pest insect resistance but non target insect damage,
- environmental and ecosystem damage,
- new fungal diseases,
- loss of seed saving rights,
- Contamination of traditional heritage seeds.

GMO's are promoting social disharmony in many countries due to the patents and reliance of chemicals to achieve production. This has led to a controlling stake by Multi Corporates on agricultural practices leading to a loss of sovereignty of smaller nations.

Farmers are being sued when they find they have been contaminated with GE seeds they never knew they had. In S. America GE free seed is almost impossible to find.

Many countries have had excessive pressure placed on their trade negotiations and Wiki leaks released papers detailing the pressure that the US had put on negotiators to drop the opposition to GMO's. It is possible that the GMO's "zero" tolerance that NZ has on the planting of commercial crops will be traded away if the Trans Pacific Partnership Agreement (TPPA) is signed.

The close ties with Australia have also placed an undue pressure to accept their foods, up until 2007 Australia had the largest market in GMO Free canola and soya.

In 2009 Western Australia allowed the commercial planting of GE canola.

The GE canola has become an economic loss-making exercise as buyers pay $50 less per tonne than its higher quality GE Free counterpart. On top of this, it appears there are no buyers for GE canola seed.

Western Australian Minister for Agriculture Terry when questioned, replied that Canola yields and quality suffered severely because of weather conditions and he was advised that *"none of this years (2011) GM canola has been sold at this point*..." (Genetically modified food — honey and canola, Hansard, 2011)

This has prompted the contract Grain Traders to ask farmers to go back to growing GE Free canola for their export markets.

The information comes on the back of GE contamination of Australian Organic farms, with cases now reaching Court. Farmers have had a taste of how costly it becomes when neighbors' livelihoods are affected by their farming activities.

The GE Canola was of low oil quality and yield suffering from the drought, we note that the conventional non-GM canola did not suffer this problem and all seed was sold at a premium. (Lisa Roth, 2011).

The poor performance or failure of GE crops has the potential to cause devastating famine in vulnerable changing weather climates. The high cost of seed is causing communities breakdown and has led to high suicide rates in some countries.

However what is worse is the seed is sterile and cannot be planted for the second season. This could allow seed companies to control who gets what seed.

A scenario could occur that if a Country, who has become dependent on imported GE seed whose politics does not agree with the country, finds they cannot obtain seeds for planting. So GE seeds could become an economic control tool for societies thereby breaking down all social harmony.

Unfortunately, the distribution of food is a serious problem. Food is spoiled in storage whilst large companies play the futures market. Regardless of food type, equitable distribution is imperative for feeding the world.

The DEFRA website reports that UK produces approximately 12 million tonnes of food waste per year. Each tonne of food waste sent to landfill produces 4.2 tonnes of CO_2e, whilst each tonne of food waste processed through anaerobic digestion produces only 500kg of CO_2e

This averages out at around 17%/annum of all household food is wasted; this is responsible for 20 million tonnes of CO_2 emissions. The hospitality sector has 600 thousand tonnes of food waste; this created around 300.000 tonnes of CO_2. (DEFRA; Food Statistics pocket book 2011, p.55)

Protecting the right of individuals to save seed and trade locally must be protected in law.

The USDA hold 19,780 different samples corn from around the world. These seeds hold the genes that have accumulated through natural and human selection over hundreds or even thousands of years. (UoG, 2009)

In China more than 20,000 diverse varieties of soybean were cultivated (Carter, 2008). This land race diversity protected plants from diseases as well as each plant was adapted to its climate and regional growing conditions, of these a narrow number of varieties have been selected by commercial breeders. This narrow gene pool and inbreeding, back crossing as is done in GE lines weakens the plants and they then become highly susceptible to disease and climate change causing severe crop losses.

Many traditional "Heirloom" varieties have combinations of traits that make them especially able to grow in local or regional conditions. They are well-suited to particular growing more sustainable organic and biological methods.

At the Planet diversity conference in Bonn, 2008, the presentation by Miguel A. Altieri, President, Sociedad Cientifica LatinoAmericana de Agroecologia (SOCLA) talk report that

"In general, traditional small scale farmers grow a wide variety of cultivars. Many of these plants are landraces grown from seed passed down from generation to generation, more genetically heterogeneous than modern cultivars and thus offering greater defenses against vulnerability and enhancing harvest security in the midst of diseases, pests, droughts and other stresses. In a worldwide survey of crop varietal diversity on farm involving 27 crops, scientists found that considerable crop genetic diversity continues to be maintained on farm in the from of traditional crop varieties, especially of major staple crops. In most cases, farmers maintain diversity as in insurance to meet future environmental change or social and economic needs. Many researchers have concluded that variety richness enhances productivity and reduces yield variability. For example, studies by plant pathologists provide evidence that mixing of crop species and or varieties can delay the onset of diseases by reducing the spread of disease carrying spores, and by modifying environmental conditions so that they are less favorable to the spread of certain pathogens. Recent research in China, where four different mixtures of rice varieties grown by farmers from fifteen different townships over 3000 hectares, suffered 44% less blast incidence and exhibited 89% greater yield than homogeneous fields without the need to use" (Altieri M., 2008, p.3).

It is however very exciting to see that last year, 28 new conventionally bred high yielding seed crops were introduced into the market. Studies show that traditional, biological and organic agriculture is able to sustainably produce healthy crops.

The seed saved by indigenous cultures is now being found to contain drought, saline and flood tolerance properties. It can be grown in water poor areas and produce a superior nutritional content. Also yields from traditional heritage selected seed are able to out perform GE crops.

Biological and Organic farming systems are sustainable, environmentally supportive and are geared toward water conservation, closed system cycling, building soils with a healthy microbial ecosystem. This has been proven to be successful for the millennia and has supported food production and fed the World.

Society is resilient but also intelligent; gene technology has tried to pit science against indigenous spirit. It is exciting to see that science is now supporting the instinctive concerns that challenged the movement of genes across species in transgenics.

New Zealand is proud to be a GE Free Country. We have stood up to and been fore runners of many controversial decisions, which in the long run have proven to be of good judgment making us leaders in safe ethical thinking. Social Harmony is always dependent on good dialogue however in the case of GE I believe that compromise it not a safe option for future generations, the environment and health. Our seed that has been saved and bred for the millennia must be preserved if we are to maintain a safe and nutritious food supply as well as a sustainable environmental footprint.

Thank you for listening,

Claire Bleakley

3/10/2011.

References:

The Obfuscation of Tikanga Maori in the GM Debate, By Dr Jessica Hutchings, Te Mata o Te Tau, Massey University and Dr Paul Reynolds, Nga Pae o Te Maramatanga, Auckland University
http://www.kaupapamaori.com/assets//hutching_renolds/GE_hutchings_reynolds.pdf

Hazardous Substances and New Organisms Act 1996
http://www.legislation.govt.nz/act/public/1996/0030/latest/DLM381222.html

Crown Research Institute Act 1992
http://www.legislation.govt.nz/act/public/1992/0047/latest/DLM265144.html

Food Standards Australia New Zealand Act
http://www.foodsciencetoday.com/Foodstandardanz1991.pdf

GM applications and current status, retrieved 3 October 2011.
http://www.foodstandards.gov.au/consumerinformation/gmfoods/gmcurrentapplication1030.cfm

Inghams warned over GM free chicken claims The Commerce Commission, 2009,
http://www.comcom.govt.nz/media-releases/detail/2009/inghamswarnedovergmfreechickenclai/

ENVIRONMENT: WA hit by GM canola contamination; EU moves toward GM ban, Biological Farmers Association, August 31st 2011
http://www.bfa.com.au/IndustryResources/BFAPublications/OrganicAdvantage/OrganicAdvantageArchives2011/mid/742/newsid742/61.aspx

GENETICALLY MODIFIED FOOD — HONEY AND CANOLA, Extract from Hansard, [COUNCIL — Thursday, 23 June 2011], p4736b-4736b, Hon Lynn MacLaren; Hon Peter Collier,
http://www.lynnmaclaren.org.au/genetically-modified-food-honey-and-canola

GM canola — is anyone buying it? by Lisa Roth of student publication *3rd Degree*, 30th September
http://www.crikey.com.au/2011/09/30/gm-canola-is-anyone-buying-it/

Somatotropins draft licensing policy released, MAF biosecurity, 29 May 2000 http://www.maf.govt.nz/news-resources/news/somatotropins-draft-licensing-policy-released

Fonterra, Quality Assurance http://www.fonterrafoodservices.com/aboutus.php?id=2

Turner S-A, Waghorn GC, Woodward SL, Thomson NA Condensed tannins in birdsfoot trefoil (Lotus corniculatus) affect the detailed composition of milk from dairy cows Proceedings of the New Zealand Society of Animal Production, Volume 65, pp 283-289, Jan 2005

Woodward SL, Waghorn GC, Laboyrie PG Condensed tannins in birdsfoot trefoil (Lotus corniculatus) reduce methane emissions from dairy cows, Proceedings of the New Zealand Society of Animal Production, Volume 64, pp 160-164, Jan 2004

ERMA NZ Annual Reports GMF98001, GMF98009, GMD02028, GMF06001, GMF03001, GMF99001, and GMF99005. http://www.epa.govt.nz/search-databases/Pages/default.aspx

Aris A, Leblanc S. Maternal and fetal exposure to pesticides associated to genetically modified foods in Eastern Townships of Quebec, Canada. Reprod Toxicol (2011), Vol: 31:4, p.528 -533. doi:10.1016/j.reprotox.2011.02.004. http://www.sciencedirect.com/science/article/pii/S0890623811000566

Séralini *et al*.: Genetically modified crops safety assessments: present limits and possible improvements. Environmental Sciences Europe 2011 23:10. doi: 10.1186/2190-4715-23-10 http://www.enveurope.com/content/pdf/2190-4715-23-10.pdf

DEFRA Food Statistics Pocket Book 2011, http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-pocketbook-2011.pdf

Carter T., Drought-Hardy Soybean Lines Show Their Stamina, 2008, The Bio Energy site, http://www.thebioenergysite.com/articles/198/droughthardy-soybean-lines-show-their-stamina

The Maize Project, University of Georgia, 2009 http://maize.uga.edu/index.php?loc=diversity

Vegetables and Fruits; A Guide to Heirloom Varieties and Community-Based Stewardship, 1999, http://www.nal.usda.gov/afsic/AFSIC_pubs/heirloom/heirloom.htm

American Society of Plant Biologists, 2008, Ancient American Maize Varieties: Sequencing Of Ancient Corn Landraces To Ensure Genetic Diversity And Resources, *ScienceDaily*, retrieved October 2 2011, http://www.sciencedaily.com/releases/2008/06/080626075534.htm

Altieri M., Small farms as a planetary ecological asset; Five key reasons why we should support the revitalization of small farms in the global South. 2008, *PlanetDiversity Conference.* http://www.planet-diversity.org/fileadmin/files/planet_diversity/Programme/Plenary_Session/13_05/Altieri_13_5_Latin-America_doc_en.pdf

.