Organic and Genetically Modified Food

Edited by Justin Healey
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Organic and Genetically Modified Food is Volume 405 in the ‘Issues in Society’ series of educational resource books. The aim of this series is to offer current, diverse information about important issues in our world, from an Australian perspective.

KEY ISSUES IN THIS TOPIC
Increasingly, Australians are caring more about the origins and values of the foods they consume. This book addresses two often misunderstood agricultural production methods – organic farming and genetic modification. Organic food is grown and produced without using synthetic chemicals such as pesticides and artificial fertilisers; so what are the actual ethical, environmental and nutritional differences between organic and conventionally-produced food? Are organics healthier? Genetic modification is a science-driven crop and animal breeding method which has attracted controversy and confusion in recent years. Which foods are GM, how are they labelled and regulated in Australia, and are there any proven environmental or health-related side-effects? This book serves you up an abundance of information with which to make more informed food choices.

SOURCES OF INFORMATION
Titles in the ‘Issues in Society’ series are individual resource books which provide an overview on a specific subject comprised of facts and opinions. The information in this resource book is not from any single author, publication or organisation. The unique value of the ‘Issues in Society’ series lies in its diversity of content and perspectives.

The content comes from a wide variety of sources and includes:
- Newspaper reports and opinion pieces
- Website fact sheets
- Magazine and journal articles
- Statistics and surveys
- Government reports
- Literature from special interest groups

CRITICAL EVALUATION
As the information reproduced in this book is from a number of different sources, readers should always be aware of the origin of the text and whether or not the source is likely to be expressing a particular bias or agenda. It is hoped that, as you read about the many aspects of the issues explored in this book, you will critically evaluate the information presented. In some cases, it is important that you decide whether you are being presented with facts or opinions. Does the writer give a biased or an unbiased report? If an opinion is being expressed, do you agree with the writer?

EXPLORING ISSUES
The ‘Exploring issues’ section at the back of this book features a range of ready-to-use worksheets relating to the articles and issues raised in this book. The activities and exercises in these worksheets are suitable for use by students at middle secondary school level and beyond.

FURTHER RESEARCH
This title offers a useful starting point for those who need convenient access to information about the issues involved. However, it is only a starting point. The ‘Web links’ section at the back of this book contains a list of useful websites which you can access for more reading on the topic.
WHAT IS ORGANIC FARMING?

Organics is about health management and disease prevention – with no synthetic chemicals, according to this extract from a guide produced by certifier Australian Organic

Organic and biodynamic farming means farming in a way which cares for the environment, without relying upon synthetic chemicals and other unnatural interventionist approaches. Hence, organic food comes from organic farms utilising the best of both traditional agriculture and modern techniques, using nature and natural processes as its bedrock.

Rather than using synthetic pesticides to kill pests, farmers prevent pests by planting a diverse range of crops, by rotating crops, using natural biological and environmentally friendly inputs, and conserving natural ecosystems. This means no artificial pesticides, no synthetic herbicides, no hormones and no growth promotants which otherwise have a questionable place in our aim to maintain healthy bodies as well as healthy farms.

The same logic of natural and preventative health management (rather than reactive disease management) is applied to GMOs or genetically modified organisms which the organic industry prohibits from use in production of organic foods. With many safe and proven forms of farming already available, the organic farmer believes it is important to allow Mother Nature to provide us food the way nature intended. Also the organic industry believes that not enough is understood about GMOs, and while there also is a sceptical marketplace of consumers regarding this technology in the food industry, the organic industry believes it is best to be precautionary in its approach to such new, untested, and at this point yet to be established as necessary, technologies.

So what is the fundamental difference between organic farm practices and ‘conventional’ or non-organic? Organic farming has a total focus on soil health. By focusing on soil health first, the health of the plant follows. This in turn enables the plant to feed animals on a balanced and healthy diet. It is all about health management (not disease control) and preventative techniques. Like with the human body, if you treat your body firstly in terms of (disease) prevention and healthy practices, you are less likely to ever need interventionist medicine. Organic farming aims to achieve the same outcome where prevention of disease and the focus on health ensures a productive farming environment.

Biodiversity in organic farms

Organic farms are required to set aside at least 5% of their farming environment to biodiversity areas where there is no intensive agricultural production. This can include wetlands, native pastures and tree ‘buffers’, which act as excellent harbours for native animals and other plants. This in turn assists in creating a more natural setting and helps protect the environment, while also assisting in farm management through use of ‘functional’ biodiversity to manage pest and diseases.

Chemicals (and GMOs) in the environment

With its prohibition on synthetic pesticide and fungicide treatments, as well as prohibiting GMOs, organics assists in protecting the wider environment as well as farm land where our foods are produced.

Soils and water efficiency

Building healthy soils, increasing soil organic matter...
and soil life assists in the soil being able to retain more moisture. In a water scarce continent this is a very useful farming practice and enables organic farmers through time to be more efficient in their water use and therefore have less water needs. It also assists the farm in getting through periods of extended drought.

**Agriculture and human health**

It is increasingly being recognised that at a fundamental level the health of the soil is inextricably linked with the health of humans. Organic farming is about profoundly changing the way we look at and manage our health. Soils deficient in nutrients, unbalanced and with little life, are unlikely to produce the kinds of healthy plants and food that humans and animals need for optimum nutrition. Many disease and health problems of the modern world may well be prevented or reduced through a greater focus on healthy and health giving farming systems. Organics is part of a movement to profoundly change the way we do produce our foods and the way in which we view health management in our communities.

**Productivity of organic farms?**

The notion of productivity, i.e. a farm producing a certain amount of ‘goods’ is an important issue to look at. Often we measure productivity of a farm one commodity or crop at a time only. This often distracts us from the overall productivity of the farm. For instance, instead of talking about a certain farm producing X tons of wheat in a year, or X tons of carrots, organic farming systems are more oriented to the multiple yields they might deliver – this might be livestock, a number of crops and most importantly the longer term sustainable farming system that can keep on being productive.

Many organic farms are just as productive, and sometimes more so, than conventional farms. How can this be? In conserving soil organic matter, this helps retain moisture, that can assist through a drought period in making the farm more resilient and in the long term more productive. Also a diversification of both cropping and livestock production (something less relied upon than traditionally many years ago) enables the farmer to trade in more than one commodity and hence furthers the resilience of their farming system.

**Good organic farming is about creating the environment for a resilient, productive farming system**

There are certainly however some other ‘externalities’ or external costs of farming that organic farming ‘internalises’. For instance there are no pesticide or herbicide residues found in our waterways from organic farming activities. Everyone in our society bears this cost, including contamination in fish stocks and polluted water that we consume – and it detracts from the true or real picture of productivity in its broader sense. So, organic farming can offer benefits to both the surrounding environment as well as the farmer by working with nature.

**But what about when disease or pests do break out on an organic farm?**

This can still happen, though it still often happens differently for two reasons. One is that if the plants are living in a well balanced soil and healthy, they are far less likely to be attacked so significantly by pests and diseases. Secondly, having a focus on biodiversity, often pests have many ‘enemies’ or predators in the diverse flora and fauna of an organic farming system. This makes it harder for pests to get a foot hold and become such a significant problem.

This is why you will often hear that some organic farmers don’t have the same pest or disease problems as might be expected in non-organic farming systems. There are however a range of natural products available for use by organic farmers as a last resort. These things include natural oils, naturally occurring substances which have pesticidal properties and predatory organisms that can be released which attack a particular pest. Australian Organic maintains a registration program for farm input products and prints this in the Australian Organic Producer magazine. See also [www.austorganic.com](http://www.austorganic.com) for the Organic Product Search which lists both input products, certified organic farms and products generally.

**So does it therefore cost more to farm organically?**

It certainly can, and the major issue is one of labour. This is for two reasons. One is that in a preventative
very good science is needed.

understanding of nature. To have this understanding, is being recognised that organics is about an involved simple traditional methods work, but increasingly it is being recognised that organics is about an involved understanding of nature. To have this understanding, very good science is needed.

There is simply a lot more work to do in the area of organic science. The industry is currently working on establishing a centre for organic systems research. The process of establishing this centre is certainly proving that successful organic farming systems are based on only the best science and are indeed part of a change in our scientific understanding of and interaction with the natural world.

What is the difference between organic and biodynamic?

Biodynamic farming is an enhanced or alternative method of organic farming. Biodynamic utilises traditional farming techniques and a prescribed list of biological or natural ‘preparations’, whilst acknowledging and working with universal or cosmic forces that are at play in the farming environment. Many organic farmers practice biodynamic methods and the Australian Organic’s certification program Australian Certified Organic covers both Biodynamic (or BD) certification as well as organic certification.

Biodynamic farming is regulated under the same standard in Australia as organic. Most countries have regulations for organic that cover both approaches and in this article when we talk organic we are also talking biodynamic.

The Biodynamic movement is typified by Rudolf Steiner who is viewed as the Grandfather of Biodynamics. Steiner outlined an entire philosophy of life, which included prescriptions for the way in which agriculture needed to be performed to ensure that natural life forces were evident in all foods produced. He warned that a lack of focus on cosmic influences and the use of natural approaches to farming and food production would have dire consequences for human society.

The key issue with biodynamics is the proper application of ‘preparations’ which include 500 and 501 as well as a range of compost preparations that assist in the composting process and enable biodynamic processes to work at the soil level within composts.

The ‘preps’ as they are called include the following: 500 is produced using BD cow manure that is packed into cow horns and buried through the winter months (when natural forces are drawing energies into the ground). In spring they are uncovered and to use this prep it is carefully and purposefully stirred with a machine that creates vortexes which further assists in energising the solution. This is then sprayed out on the farm at levels that are homeopathic in their application.

501 is a silica product aimed at assisting light entering the farming system. Some BD farms need more and some less of this depending on their own natural environment. The other preps are compost preps and include ingredients from natural sources to aid in the compost process and to further enhance the biodynamic processes on farm.

What about livestock in organic farms?

While not all organic farms have livestock, animals are a core component of recycling nutrients and assisting in the biodiversity on the farm at both a macro (large) as well as micro (small – all the way to soil microbes) level. Of course livestock is also used for meat production. So what makes an animal organic?

Animals must be fed certified organic feeds, cannot be fed or treated with growth promotants or antibiotics during their lifetime and must be able to roam and graze freely performing their natural behaviours. Organic livestock producers must practice “best environmental management” ensuring biodiversity and land and wildlife conservation. Each animal sold must have a verified lifetime of organic management in accord with the standard and carry clear identification.

Animal welfare is also paramount. Consideration for the natural behaviours of animals is critical in the planning and management of organic livestock farms.

What about processed foods?

For organically processed foods, minimal processing is permitted only, with a limited number of non-agricultural but natural or traditional ingredients only allowed. Hence no unnatural or synthesised dyes, colourings, flavourings or other additives are permitted. This means literally thousands of conventional processed food ingredients are simply not permitted in organic processed foods.

Australian Organic owns and supports the nation’s largest organic certifying group, Australian Certified Organic. The Australian Certified Organic logo appears on the majority of organic products on our shelves and is the most recognised by consumers. Australian Organic started as Biological Farmers of Australia in 1987.

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20 good reasons to buy organic

An extract from a guide produced by Australian Organic, which owns and supports the nation’s largest organic certifying group Australian Certified Organic

1. Reduce chemical runoff and residues in drinking water, waterways and coastal areas.

Runoff is the main cause of diminishing marine life, animals and plants. Over 29,500 tonnes of herbicides, insecticides, fungicides and plant growth regulators are used each year in Australia (Australian Government Department of Sustainability, Environment, Water, Population and Communities, 2006)⁹.

2. Restore soils for productive cropland and secure the future of Australian agriculture.

Approximately 50 million hectares of Australia’s agricultural land (around half the total area) have topsoils that are marginally acidic or worse (Australian Government Department of Sustainability, Environment, Water, Population and Communities, 2006)⁹. Organic farming systems are based on the principle of land and soil regeneration and best environmental practices.

3. Increase the resilience of farms during drought.

In the wake of the 2002/2003 drought, the agricultural sector saw a loss of over 100,000 jobs over a period of five years, from 2002 to 2007, that have yet to be fully restored (AgriFood Skills Australia, 2008). Organic farms have a greater resilience in times of drought. A 21-year trial showed that organic crops saw a margin of 38-196 per cent greater yield than comparable conventional crops (Rodale Institute, 2011).

4. Increase biodiversity and save disappearing native animal habitats.

For decades scientists worldwide have carried out studies with the clear conclusion that organic farming significantly supports biodiversity, with up to 50% more plant, insect and bird life found on organic farms (Soil Association, 2011).

5. Eliminate use of growth hormones, antibiotics and genetically engineered drugs and feeds in livestock.

Resistant bacteria such as vancomycin-resistant enterococci (VRE) are known to spread via the food chain from the use of hormone growth promotants (HGPs). A recent ban on the use of HGPs by the European Union resulted in a reduction of VRE in animals and its effects on the general public (World Health Organization, 2011). In Australia around 40 per cent of cattle are raised using HGPs, with a total of 6.56 million HGP doses used on farms and in the feedlot industry in the period from 2006 to 2007 (Meat & Livestock Australia, 2008).

6. Ensure humane treatment of animals.

Scientific evidence indicates that practices such as battery hen farming, and the use of sow stalls, inflict continuous intense suffering on animals throughout their confinement leading to acute physical and behavioural problems (RSPCA). Organic livestock is grown in a way that conforms to natural processes of growth and development.

7. Reduce landfill, which has greenhouse consequences.

With waste generation increasing on an annual basis, approximately 1.6 tonnes of waste were generated for every Australian in 2002-03. Of the 32.4 million tonnes generated, almost half (47 per cent) were food and garden waste from the municipal stream (Productivity Commission, 2006). By recycling and choosing organic methods, Australians can help reduce greenhouse gas emissions and protect precious ecosystems (Department of Environment and Conservation (NSW), 2006).

8. Safeguard the integrity of food.

Certified organic provides a guarantee that product has been grown, handled, packaged and distributed avoiding risk of contamination of the product to the point of sale. Full traceability is maintained along the chain. Help to ameliorate climate change. Agriculture is accused of being responsible for about 30 per cent of
global warming due to CO2 emissions, however conversion to organic agriculture can:

9. Capture CO2 back into the soil in the form of humus.
   A 23-year research project shows that if only 1,000 medium-sized farms converted to organic production, the carbon stored in the soil would be equivalent to taking 117,440 cars off the road each year (The Rodale Institute®, 2003).

10. Reduce greenhouse gas emissions by eliminating synthetic nitrogen fertilisers.
   Agriculture in Australia is the second-highest contributor of greenhouse gases (15.2 per cent in 2008) and accounts for most of the country’s methane and nitrous oxide emissions, which are caused by fertilisers and crop residues (Department of Climate Change, 2010). Organic standards prohibit the use of nitrogen fertilisers, which lowers emissions and provides both economic and environmental benefits (Department of Agriculture, Fisheries and Forestry, 2011).

Research shows that consuming organic means that you can:

11. Eat produce that is better for you.
   A comparison of nearly 100 studies and development of research methods has concluded that the nutritional premium of organic food averages 25%. The differences documented in the study are sufficiently consistent and sizable to justify a new answer to the frequently asked question – “Yes, organic plant-based foods are, on average, more nutritious”.

12. Avoid eating up to two kilograms of food additives every year.
   Many food additives have been linked with symptoms such as allergic reactions, rashes, headaches, asthma, growth retardation and hyperactivity in children (Heaton, 2004).

13. Avoid GMOs.
   Independent testing of the long-term health effects of GMO foods on humans has not been carried out. The many exemptions from GE labelling laws in Australia make it impossible to know which grocery items use GMO-derived ingredients. Certified organic foods are a great way to avoid GMOs (Australian Organic 2009).

14. Lower the incidence of neurodevelopmental problems in children which can be caused or made worse by prenatal and early life exposure to pesticides and chemicals that contaminate our food.
   Three separate United States university studies likened the effects of organophosphate (OP) insecticides exposure during pregnancy to that of high lead exposure, impacting the cognitive development of children (Engel et al., 2011).

15. Virtually eliminate dietary exposures to insecticides known to be developmental neurotoxins.
   Findings were reported in two University of Washington studies involving school-age children (Barr et al., 2006).

16. Reduce hormone disruptors caused by pesticides.
   The European Union says that hormones such as chemical insecticides and herbicides used commonly in food production can interfere with our body’s natural hormones and reproductive organs, which may cause low sperm counts and increase the risk of cancer (Orton et al, 2011) and may cause early onset of puberty among young girls (European Commission, 2007).

17. Give infants the nutrient building blocks they need for a healthy future.
   Ninety per cent of dairy and meat products from organic sources have been shown to increase levels of healthy fatty acids in breast milk (Rist et al., 2007).

18. Reduce the risk of infants’ exposure to pesticides.
   A 1995 Victorian study of breastmilk found that infants are regularly exposed to several pesticides at levels greater than the ‘acceptable daily intake’ (Ahokas et al., 1995).

19. Reduce the risk of cancer.
   On average organic foods contain about one-third more cancer-fighting antioxidants than comparable conventional produce (Benbrook, 2005).

   Many Australians who consume organic products every day do so because they believe that organic tastes best.

For a full list of references and links to peer reviewed research, visit www.whyorganic.com.au

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Organic farmers and food producers grow and produce food without using synthetic chemicals such as pesticides and artificial fertilisers. They do not use genetically modified (GM) components or expose food to irradiation.

Animal welfare and environmental sustainability are important issues for organic farmers. The term ‘organic’ can also cover animal products. For example, eggs certified as organic are free range, rather than from caged (battery) hens.

Types of organic produce available in Australia include fruit and vegetables, dried legumes, grains, meat and meat products, dairy foods, eggs, honey and some processed foods.

### Organic farming

Animals raised using organic methods are treated humanely and with respect. For example, chickens are free range and not kept in cages, and cows are not kept in feed lots. Animals are also not fed any growth-regulating drugs, steroids, hormones or antibiotics. However, the animals may be treated with vaccines to prevent disease.

Organic farming is also concerned with protecting the environment and working in harmony with existing ecosystems, including conserving water, soil and energy, and using renewable resources and natural farming cycles. Traditional farming methods are often used, such as rotating crops to prevent depleting the soil of nutrients.

### Pesticides and other chemicals in organic food

Organic foods are not necessarily completely chemical free. They may be grown on land not previously used for organic food production and, therefore, might contain chemical residues. However, the pesticide residues in organic food are considerably lower than those found in foods produced with synthetic chemicals.

Certain naturally occurring pesticides, including pyrethrin, light oils, copper and sulphur, and biological substances such as Bacillus thuringiensis, are permitted for use in organic farming.

### Organic food is a growing industry

The Australian organic food industry is booming. It is currently worth around $200-250 million per year domestically and a further $50-80 million per year in exports, with an expected annual growth of up to 60 per cent. In 2010, the retail value of the organic market was estimated to be at least $1 billion.

Consumer demand for organic food is growing at a rate of 20-30 per cent per year, with retail sales increasing 670 per cent between 1990 and 2001-02. It is estimated that more than six out of every ten Australian households now buy organic foods on occasion.

### Reasons to buy organic food

Most people buy organically-grown food products because they are concerned about pesticides, additives, antibiotics or other chemical residues. Although pesticide residues in fruit and vegetables are monitored in Australia, many people believe organic food is healthier.

### Organic food and nutrition content

Several studies have compared the nutritional content of organic and conventionally grown plants, and most have shown no significant differences in key vitamin and mineral content.

However, although the differences are small, research has shown that some organic food has:

- Lower nitrate levels
- Higher vitamin C levels
- Higher levels of selenium.

### Organic food and ethics

Organic foods promote more humane treatment of animals, as well as providing meat that is free from hormones and antibiotics. Also, some people worry about the long-term health, economic and environmental consequences of GM foods and choose organic foods in support of an industry that does not use GM techniques.

### Organic food is better for the environment

Organic foods promote healthier and more sustainable use of natural resources. Modern farming methods, including excessive use of chemicals, have led to a decline in soil fertility, and an increase in salinity and blue-green algae in waterways over many years. Organic farmers try to minimise damage to the environment by using physical weed control, and animal and green manure.

### Organic food outlets

You can buy organic food from:

- Some supermarkets
- Some green grocers
- Health food shops
- Some fresh food markets
- The internet
- Certified organic retailers.

Organic food is often more expensive than conventionally-produced food. This is because organic farming generally operates on a smaller scale, production is more labour intensive and, without herbicides, pesticides and other chemicals, yields are generally smaller.

### Organic food certification

Organic farms are only certified after they have been operating according to organic principles for three years.
However, the use of the word ‘organic’ is not regulated in Australia, so it is important to make sure that products you buy come from certified growers and producers.

Before 2009, a standard (guidelines and rules) did not exist for domestic and imported organic foods. This led to a misrepresentation of the word ‘organic’ in the Australian domestic food market.

Two key standards now govern the production, processing and labelling of organic food in Australia. These are:

- The National Standard for Organic and Biodynamic Produce (for exported foods)
- The Australian Standard for Organic and Biodynamic Products (for domestic and imported foods).

These standards provide an agreed set of procedures to be followed in organic food production. This helps to ensure the integrity and traceability of an organic food product from ‘paddock to plate’. The standards include requirements for production, preparation, transportation, marketing and labelling of organic products in Australia.

While it is mandatory for exported organic produce to be certified and meet the National Standard for Organic and Biodynamic Produce, the Australian standard (for domestic and imported foods) is not mandated, and certification is voluntary. Its purpose is to assist the Australian Competition and Consumer Commission (ACCC – the national consumer regulatory authority) to ensure that claims made about organic and biodynamic products are not false or misleading.

‘Organic-certified produce’ means the food was grown, harvested, stored and transported without the use of synthetic chemicals, irradiation or fumigants.

**How to identify food certified as organic**

Suggestions for making sure the food you are buying is organically grown include:

- If you are buying from an organic retailer, check for the Organic Retailers’ and Growers’ Association of Australia (ORGAA) notice, which should be prominently displayed
- Choose foods with the label ‘certified organic’ from one of the Department of Agriculture and Water Resources (DAWR) accredited certifying organisations
- Check packaging for the grower’s name and certification number
- Do not be fooled by packaging that claims the produce is ‘natural’ or ‘chemical-free’ if the proper certification labelling is not displayed.

**Accredited certifying organisations**

Seven organisations are classified by DAWR as organic certifiers:

Types of organic produce available in Australia include fruit and vegetables, dried legumes, grains, meat and meat products, dairy foods, eggs, honey and some processed foods.
Most people buy organically-grown food products because they are concerned about pesticides, additives, antibiotics or other chemical residues. Although pesticide residues in fruit and vegetables are monitored in Australia, many people believe organic food is healthier.

- AUS-QUAL Limited (AUSQUAL)
- Australian Certified Organic (ACO)
- Bio-Dynamic Research Institute (BDRI)
- National Association for Sustainable Agriculture Australia Certified Organic (NASAA Certified Organic)
- Organic Food Chain (OFC)
- Safe Food Production Queensland (SFQ)
- Tasmanian Organic-Dynamic Producers (TOP).

Some of the certifying organisations have their own standards in addition to the National Standard.

**Biodynamic food**

Biodynamic farming is a type of organic farming pioneered by Austrian philosopher Rudolf Steiner, which places strong emphasis on ecological harmony and environmental sustainability. Biodynamic food is grown with particular composts, preparations and natural activating substances.

**Where to get help**

- Some supermarkets
- Some greengrocers
- Organic food retailers.

**Things to remember**

- Organic farming is the production of food without the use of synthetic chemicals or genetically modified components.
- Organic foods are not necessarily completely chemical-free, but the pesticide residues will be considerably lower than those found in produce manufactured with synthetic chemicals.
- Choose foods labelled ‘certified organic’ by one of the seven DAWR-accredited certifying organisations.
- Organic farming is better for the environment and more sustainable.

This fact sheet was produced in consultation with, and approved by Deakin University – School of Exercise and Nutrition Sciences.

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Principles of organic agriculture

According to this guide from IFOAM Organics International, organic agriculture is based on the principles of health, ecology, fairness and care.

These principles are the roots from which organic agriculture grows and develops. They express the contribution that organic agriculture can make to the world, and a vision to improve all agriculture in a global context.

Agriculture is one of humankind’s most basic activities because all people need to nourish themselves daily. History, culture and community values are embedded in agriculture. The principles apply to agriculture in the broadest sense, including the way people tend soils, water, plants and animals in order to produce, prepare and distribute food and other goods. They concern the way people interact with living landscapes, relate to one another and shape the legacy of future generations.

The Principles of Organic Agriculture serve to inspire the organic movement in its full diversity. They guide IFOAM’s development of positions, programs and standards. Furthermore, they are presented with a vision of their worldwide adoption.

Organic agriculture is based on:

- The principle of health
- The principle of ecology
- The principle of fairness
- The principle of care.

Each principle is articulated through a statement followed by an explanation. The principles are to be used as a whole. They are composed as ethical principles to inspire action.

These principles are the roots from which organic agriculture grows and develops. They express the contribution that organic agriculture can make to the world, and a vision to improve all agriculture in a global context.

**PRINCIPLE OF HEALTH**

Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.

This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems – healthy soils produce healthy crops that foster the health of animals and people.

Health is the wholeness and integrity of living systems. It is not simply the absence of illness, but the maintenance of physical, mental, social and ecological wellbeing. Immunity, resilience and regeneration are key characteristics of health.

The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings. In particular, organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and wellbeing. In view of this it should avoid the use of fertilisers, pesticides, animal drugs and food additives that may have adverse health effects.

**PRINCIPLE OF ECOLOGY**

Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and wellbeing are achieved through the ecology of the specific production environment. For example, in the case of crops this is the living soil; for animals it is the farm ecosystem; for fish and marine organisms, the aquatic environment.

Organic farming, pastoral and wild harvest systems should fit the cycles and ecological balances in nature. These cycles are universal but their operation is site-specific. Organic management must be adapted to local conditions, ecology, culture and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to maintain and improve
Environmental quality and conserve resources.

Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

**PRINCIPLE OF FAIRNESS**

Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.

Fairness is characterised by equity, respect, justice and stewardship of the shared world, both among people and in their relations to other living beings.

This principle emphasises that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties – farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved with a good quality of life, and contribute to food sovereignty and reduction of poverty. It aims to produce a sufficient supply of good quality food and other products.

This principle insists that animals should be provided with the conditions and opportunities of life that accord with their physiology, natural behaviour and wellbeing.

Natural and environmental resources that are used for production and consumption should be managed in a way that is socially and ecologically just and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

**PRINCIPLE OF CARE**

Organic agriculture should be managed in a precautionary and responsible manner to protect the health and wellbeing of current and future generations and the environment.

Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk of jeopardising health and wellbeing. Consequently, new technologies need to be assessed and existing methods reviewed. Given the incomplete understanding of ecosystems and agriculture, care must be taken.

This principle states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture. Science is necessary to ensure that organic agriculture is healthy, safe and ecologically sound. However, scientific knowledge alone is not sufficient. Practical experience, accumulated wisdom and traditional and indigenous knowledge offer valid solutions, tested by time. Organic agriculture should prevent significant risks by adopting appropriate technologies and rejecting unpredictable ones, such as genetic engineering. Decisions should reflect the values and needs of all who might be affected, through transparent and participatory processes.

Australia’s appetite for organics at record levels

The latest *Australian Organic Market Report* reveals the nation’s organic industry is worth $1.72 billion, up by 35% since 2012 and growing by over 15% each year.

The Australian Organic Market Report is a highly respected biennial publication commissioned by Australian Organic. It tracks industry and consumer trends in the Australian organic marketplace based on research by the Mobium Group, Swinburne University of Technology and ABS statistics. The 2014 report shows consumption of certified organic food, cosmetics and household products are at a record high in Australia. Dairy and beef are the fastest growing organic sectors.

The 2014 report has some interesting industry statistics including:

- Dairy is the fastest growing organic sector, worth $113m
- Beef is the second fastest growing organic sector, worth $198m
- Wine grape production increased by a staggering 120% between 2011 and 2014
- There’s 18% annual growth in certified organic skincare and cosmetics
- Exports of organic products have more than doubled from 2012 to 2014.

Plus information about organic shoppers:

- Organic purchases by those who are not categorised as green or sustainable shoppers increases from 24% in 2012 to 40% in 2014
- The Australian Certified Organic logo is by far the most recognised organic certification mark
- One-third of shoppers say they would only buy a product labeled as ‘organic’ if it is certified organic
- 69% of primary food shoppers claim to have bought at least one certified organic product in the past 12 months
- The *Australian Organic Market Report* 2014 also asks for the first time why shoppers started buying organic.

The Australian Organic Market Report is funded by Horticulture Australia Ltd using voluntary contributions from Australian Organic Ltd and matched funds from the Australian Government.

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The Australian Organic Market Report 2014 estimates the total value of the Australian certified organic industry to be $1.72bn. This performance yields a compound annual growth rate (CAGR) between 2009 and 2014 of 15.4%, demonstrating the sustained growth of the organic industry over the five years to 2014.

The Australian organic market has continued to significantly outperform most equivalent conventional sectors with another period of strong growth through 2012-2014.

Australia’s organic industry is worth $1.72bn and growing 15% each year.

The organic industry is one of Australia’s fastest-growing industries – against the backdrop of only 3.4% CAGR for Australia’s total value in equivalent conventional categories through 2012-14.

The emergence of numerous larger capital raisings is indicative of the organic industry’s coming of age. The past year has seen R.M. Williams Agricultural Holdings collapse, with its organic component repurchased by private capital. Similarly, Kailis Organic Olive Groves has been refinanced by new owners, with its organic status maintained. Other milestones are the ASX listing of Bellamy’s Organic and multinational PZ Cussons’ buyout of five:am – both at significant multiples, reflecting bullish expectations about both the organic marketplace growth, as well as the excellent positionings and marketing of these companies.

Australia has also performed better than most other organic markets in the Asia-Pacific region in the five years to 2014. The Asia-Pacific organic region comprises Australia, China, India, Indonesia, Japan, New Zealand, Singapore, South Korea, Taiwan and Thailand.

The Asia-Pacific organic market has a total value of $5.47bn in 2014, an increase of $2.45bn from $3.02bn in 2009, representing an overall CAGR of 12.6% between 2009 and 2014. The Asia-Pacific organic food market is

<table>
<thead>
<tr>
<th>Year</th>
<th>Value $M</th>
<th>CAGR %</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>2014</td>
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Value of Asia-Pacific organic industry

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<th>CAGR %</th>
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<tr>
<td>2014</td>
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<td>18.0</td>
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Value of Australian organic industry

Comparison of global forecast values of organic food market share

<table>
<thead>
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<th>Region</th>
<th>2015</th>
<th>2016</th>
<th>2014-16 CAGR</th>
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<td>2,145.23</td>
<td>12.5</td>
</tr>
<tr>
<td>ASIA-PACIFIC</td>
<td>5,913.95</td>
<td>6,385.99</td>
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</tr>
<tr>
<td>GLOBAL</td>
<td>96,608.56</td>
<td>102,308.47</td>
<td>5.9</td>
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</table>

Global organic food market share 2014

<table>
<thead>
<tr>
<th>Region</th>
<th>North America</th>
<th>Europe</th>
<th>Middle East and Africa</th>
<th>Asia-Pacific</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALUE $M</td>
<td>44,997</td>
<td>35,742</td>
<td>333</td>
<td>5,070</td>
<td>1,728</td>
</tr>
<tr>
<td>% SHARE</td>
<td>52.2</td>
<td>41.5</td>
<td>0.4</td>
<td>5.9</td>
<td>2.3</td>
</tr>
</tbody>
</table>
forecast to reach $6.38bn in 2016, with an anticipated CAGR of 8% between 2014 and 2016.

Worldwide, there has been ongoing compound growth in organics but at a lower rate than Australia’s growth. The CAGR of the organic sector worldwide is at 7.7% between 2009 and 2014. The global organic marketplace is valued at $91bn in 2014, an increase of $28bn since 2009. It's forecast to reach $102bn in 2016, with an anticipated CAGR of 5.9% between 2014 and 2016.

The world’s largest organic food markets are North America (valued at $44bn) and Europe ($35bn).

In Europe, organic farming accounts for 2.5% of the total agricultural area and 5.4% in the European Union (MarketLine, 2014c). European organic food sales experienced significant double-digit growth to exceed $36bn in sales in 2014.

**RECESSION-PROOF GROWTH**

While most conventional food and beverage industries suffered declines during the global financial crisis, on the whole the global recession had no serious impact on the organic food and beverage sectors. Global sales of organics experienced double-digit growth between 2006 and 2008. During the global recession in 2008 and 2009, organic growth dropped to 7.1%. Between 2011 and 2012, it returned to a strong 9%.

Between 2014 and 2016, global sales of organic food and beverages are expected to continue showing higher growth than their conventional counterparts. Global organic food markets are projected to remain strong with an overall growth rate of 5.1-5.9%. Conventional food globally is forecast to decline as a result of the aftermath of the global financial crisis and the recession in North America and Europe.

Global sales of organic products for babies and children are amongst the most recession proof. Food safety and chemical contamination is a major concern in many overseas markets, hence organic baby products such as formula and solid foods experienced an average growth of 7% during the decade to 2014 and will continue to remain strong in the next five years.

**ORGANIC LEADS THE WAY WITH EXPORTS**

Despite the rapid growth of organic farming in North America and Europe, production has not increased fast enough to keep up with demand. As a result, North America and Europe are the largest overseas markets for Australian organic food exporters and represent opportunities for further export growth.

**The top five exported products in 2014 are also similar to 2012:**

1. Meat
2. Processed foods
3. Dairy
4. Wine and beverages
5. Fruit and vegetables.

North America and Europe are the largest overseas markets for Australian organic food exporters.

Australia’s reputation for premium quality conventional produce has guaranteed a similar reputation for Australian organic produce globally. Australia’s nationally enforced organic export standards, in place since the 1990s, gives Australia an edge for organic trade globally. The increasing demand for organic commodities for export grows particular organic industries and in turn supports other organic industries. The export value of the Australian organic sector has increased from $126m (9.87% of total organic industry value) in 2012 to $340m (20% of total organic industry value) in 2014.

The export activities of Australian organic commodities such as beef, dairy, baby formula and unprocessed grains have experienced strong growth during the two years to 2014, with some organic commodity suppliers reporting triple-digit growth in their export sales.

Imports of processed organic products have filled shortfalls in domestic production. New Zealand is a key source of organic imported products for Australia, mainly because of its proximity to Australia and its reputable organic certification standards.

All values are in AUD unless otherwise stated. All references in this report to organic are to certified organic products and services.

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ORGANIC AND BIODYNAMIC PRODUCE

THE DEPARTMENT OF AGRICULTURE AND WATER RESOURCES EXPLAINS ITS ROLE IN CERTIFYING ORGANIC AND BIODYNAMIC FOOD IN AUSTRALIA

The Department of Agriculture’s role in the organic and biodynamic food industry

The department’s Agricultural Productivity Division is the contact for issues concerning domestic organic policy matters.

The department is responsible for organic industry export policy matters, including maintaining the National Standard for Organic and Biodynamic Produce and certifying exports of organic food against that standard.

Certification of organic produce in Australia

Domestically marketed organic products are commonly certified by one of Australia’s seven private certifiers who base their certification standards on the National Standard for Organic and Biodynamic Produce Edition 3.4 July 2009 (the export standard which is also referred to as the National Standard) used by the department for export certification.

The voluntary Australian Standard 6000-2009 Organic and Biodynamic Products was released on 9 October 2009. Standards Australia developed this standard through a representative technical committee comprising organic stakeholders, including certifiers, retailers, manufacturers, consumer groups and government agencies.

Labelling of organic and biodynamic produce for Australia’s domestic market

All foods produced or imported for sale in Australia and New Zealand, including organic food, must be labelled in accordance with the Food Standards Code developed by Food Standards Australia New Zealand (FSANZ).

FSANZ protects the health and safety of the people in Australia and New Zealand by maintaining a safe food supply. It is a bi-national independent statutory authority which develops food standards for composition, labelling and contaminants, including microbiological limits. These standards apply to all foods produced or imported for sale in Australia and New Zealand.

The Commonwealth’s Competition and Consumer Act 2010 which replace the Trade Practices Act 1974 and the various state and territories’ fair trading laws protect against fraudulent and misleading practices (including for food labelling).

Organic industry contact

The Organic Federation of Australia is the peak body for the organic industry in Australia.

Information released under the FOI Act


In response, one document was released to the applicant on 6 December 2013: Report from Organic Produce Advisory Committee Meeting 22 November 1991.

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WHAT IS BIODYNAMICS?

- Biodynamic agriculture is a method of organic farming originally developed by Rudolf Steiner that employs an holistic understanding of agricultural processes.
- Biodynamics is one of the first sustainable agriculture movements; it treats soil fertility, plant growth, and livestock care as ecologically interrelated tasks, emphasising spiritual and mystical perspectives.
- Biodynamics has much in common with other organic farming approaches, as it emphasises the use of manures and composts and excludes the use of artificial chemicals on soil and plants.
- Methods unique to the biodynamic approach include its treatment of animals, crops, and soil as a single system; an emphasis from its beginnings on local production and distribution systems; its use of traditional and development of new local breeds and varieties; and the use of an astrological sowing and planting calendar.
- Biodynamic agriculture uses various herbal and mineral additives for compost additives and field sprays; these are sometimes prepared by controversial methods, such as burying ground quartz stuffed into the horn of a cow, which are said to harvest cosmic forces in the soil.

Sources: Biodynamic Agriculture Australia Ltd, What is Biodynamics?; Wikipedia, Biodynamic agriculture.
Why are there 7 different logos for organic certification in Australia?

BEN LOVITT FROM BELLAMY’S ORGANICS EXPLAINS WHY DIFFERENT PRODUCTS HAVE DIFFERENT ORGANIC CERTIFICATION

We often look to logos on product packaging for a quick indication of their contents concerning origin, health benefit, quality etc., but when it comes to organic certification in Australia, what do all the different logos mean?

Have you ever wondered why different products have different organic certification? We thought we should look at the different certified logos you can find in Australian supermarkets and find out what they represent!

Who accredits the different organic certifiers?

In Australia, organic certification is performed by several organisations that are accredited by the Department of Agriculture and Water Resources (DAWR), formerly the Australian Quarantine and Inspection Service (AQIS) under the National Standard for Organic and Biodynamic Produce. Currently there are 7 registered DAWR accredited certifying bodies.*

The DAWR accredited certifying bodies and their logos:

- NASAA Certified Organic
  www.nasaa.com.au

- Organic Food Chain
  www.organicfoodchain.com.au

- AUS-QUAL
  www.ausqual.com.au

- Australian Certified Organic (ACO)
  www.aco.net.au

- Bio-Dynamic Research Institute (BDRI)
  www.demeter.org.au

- Safe Food Production Queensland (SFQ)
  www.safefood.qld.gov.au

- The Tasmanian Organic Producers (TOP)
  www.tasorganicdynamic.com.au

What is the difference between these logos?

All certifying organisations belonging to these logos must ensure that their members comply with the national standard. Each certifying organisation has variations of this standard, however these are generally extra requirements as the National Standard for Organic and Biodynamic Produce is a minimum standard.

DAWR will not accredit an organisation that allows a system that is less stringent that the minimum standard. If you are interested in the varying requirements for accreditation from an individual organic certifier, visit their webpage above for explanation.

For further information contact the manufacturer and producer and enquire why they selected a particular body for certification.

Do these organic certifiers include place of origin requirements in their individual standards?

No, although many of the certifier titles include geographic descriptors in their titles, there is no requirement within the varying standards that certify place of origin.

For consumers to be sure that a product is Australian made for example, they will need to look for other cues on the packaging beyond an organic certification logo.

Why does Bellamy’s Organic choose NASAA?

I have previously quoted Amanda our Bellamy’s Organic Quality & Compliance Specialist, I believe she sums it up best: “We choose NASAA certified organic as not only were they the first organic certifying body in Australia but NASAA’s integrity and ethical interpretation in applying various standards, is held in the highest regard.”

* There are two certification bodies that work domestically and are not controlled by DAWR. These are Organic Growers of Australia who is accredited by the International Organic Accreditation Service and SAI Global which is accredited by the Joint Accreditation System of Australia and New Zealand (JASANZ).

CONVENTIONAL AND ORGANIC FARMING

THIS FACT SHEET ADVICE FROM SUSTAINABLE TABLE EXPLAINS THE DIFFERENCE BETWEEN CONVENTIONAL AND ORGANIC FARMING

There is a common misconception that organics is a new fad or something reserved for left-wing hippies, greenies or the well-to-do. What people forget is that organic farming is actually the traditional way of farming. Conventional farming became the new norm for industrialised countries after the ‘green-revolution’ of the 1950s and ’60s. This period saw the development of new seed varieties, and mass use of fertiliser and irrigation to produce higher yields.

The big difference between organic and conventional farming is that conventional farming relies on chemical inputs and a highly mechanised approach, whereas organics is about farming the natural way. Although, it is important to note that some large-scale organic farms still use conventional approaches such as mono-crops and some conventional farms also adhere to organic principles, using limited amounts of chemical inputs.

For ease, we have used the traditional definitions of ‘conventional’ and ‘organic’ farming when explaining the differences, however, an alternative approach to industrial farming which is gaining support is ‘agro-ecological farming’. This is a way of growing food that builds, rather than destroys ecosystems. Instead of spraying chemicals to get rid of pests, it is about growing plants that attract beneficial insects. Instead of applying fossil-fuel-based fertilisers to the soil, which destroys the soil’s capacity to regenerate, a technique is to lace the fields with legumes, which naturally help to fix nitrogen in the soil. This approach shows promise for the future of food.

The big difference between organic and conventional farming is that conventional farming relies on chemical inputs and a highly mechanised approach, whereas organics is about farming the natural way.

SOIL

Conventional farming uses chemical fertilisers made from fossil fuel derivatives that are used to add nutrients to the soil.

Organic farming controls invasive species through a mixture of companion planting, crop rotation, use of cover crops, natural pest control, hand weeding and animal grazing.

SEEDS

Conventional farming may include the use of genetically modified (GM) seeds. GM seeds have had their genetic makeup changed in a lab to create foods that have certain desirable characteristics such as vegetables that take longer to go brown or are pest-resistant. The use of GM seeds is a contentious issue because we are toying with nature. The health and environmental impacts of GM are difficult to predict and without appropriate monitoring systems in place, there may be issues we are not yet aware of.

The potential environmental issues of using GM crops:

- Insect-resistant crops are formulated to produce a toxin that kills pest insects. These crops may kill other non-target organisms, which may have a destabilising impact on the local ecosystem.
- The use of GM crops threatens the biodiversity of food varieties grown.
- Herbicide-tolerant crops are produced so that when sprayed all other weeds are killed other than the crop. This promotes the use of chemicals in farming which leads to soil and water pollution.
- Another contentious issue associated with GM seeds is the ability for large agribusinesses, driven by profit, to own patents over nature and have increasing control over our food supply. The more that GM seeds are used, the more our health and the environment is in the hands of large corporations.
- Farmers using GM seeds are not permitted to save their seed and if they are caught doing this they may be sued by the agribusiness that makes the seed. This approach ensures regular annual income for the agribusiness, as farmers must purchase new seed each season. The production and distribution of new seed is much more energy and resource intensive than saving seeds already on the farmers’ land.

Organic farming does not allow GM seeds and requires seeds to be organically grown. Organic farmers will often save seeds from previous crops and use rare and heirloom seed varieties, preserving the biodiversity of our food.

ANIMALS

Conventional animal farming allows the use of antibiotics and hormones, residues of which end up being consumed by humans. Conventional farming also allows factory farming and practices that compromise animal welfare.

Organic animal farming uses organic feed for the animals and does not allow the use of antibiotics or hormones. Organic certification also includes strict animal welfare regulations.

Eating organic food significantly lowers pesticide exposure: study

Eating an organic diet for a week can dramatically reduce pesticide levels, writes Dinny Navaratnam, in this article from The Conversation.

Dr Liza Oates found participants’ urinary dialkylphosphates (DAPs) measurements were 89% lower when they ate organic food for seven days compared to a conventional diet for the same amount of time. DAPs make up 70% to 80% of organophosphate pesticides.

Dr Oates said having the same people experience a large drop in organophosphate pesticide levels when consuming organic foods as opposed to conventional foods suggested most of these pesticides come from food consumption. However, she recognised it could come from other sources.

“The people in the organic phase of the study still did have some exposure, so there are obviously some alternate routes of exposure,” she said.

This idea was supported by University of Adelaide toxicologist Dr Ian Musgrave.

“We’re exposed to pesticide residues in a number of ways,” he said.

“The study is quite good in the way they exposed food exposure, but the possibility is there are other explanations for why they’re seeing this.”

Dr Musgrave said people who lived outside of urban areas often had higher exposures to pesticide, despite the fact that they were less likely to be consuming vast quantities of pesticide-contaminated food.

Dr Oates said people can be exposed to pesticides through inhalation and skin absorption.

“There is some emerging research suggesting some links between chronic low-dose exposure to OPs and some issues with the nervous system and that’s not surprising because the activities of these agents is they are toxic to the nervous system to humans,” she said.

“A lot of these agents were initially developed as nerve gases for chemical warfare, so we do know they have toxic effects on the nervous system at high doses. What’s less clear is at what dose they’re considered to be completely safe and that’s probably very different for different individuals depending on other factors like their ability to eliminate and detoxify these chemicals.”

Dr Musgrave said pesticide exposure was not a concern for many Australians.

“More than half of these people had no detectable pesticides in them or no quantifiable pesticides so the risk is already fairly low.

“The levels we see in urinary excretions from a variety of Australian populations suggests that the vast majority of people who are not working in industrial occupations that involve spaying of OPs are exposed to well below this no-effect level.”

University of New South Wales visiting fellow and nutritionist Rosemary Stanton said the study may indicate organic food is a healthier option.

“It could if repeated in a much larger sample with more details,” she said.

“Evidence is being published to support organic food production.”

Dr Oates said the participants’ diets were rigorously kept in check.

“We had a fairly detailed diet diary which we had previously piloted on another group of people. “We asked people if their sources were certified organic or ‘likely organic’.

“During the organic phase the participants consumed, on average, 93% organic food. That includes certified and ‘likely organic’ sources.”

Dr Oates said 83% of the participants’ organic diets were made up of certified organic food, meaning only 10% was ‘likely organic’ food.

Dinny Navaratnam is an editor at The Conversation.
ORIGIN FOOD NO BETTER FOR YOU: STUDY

Studies find organic food is no better for you, but it is 30% less likely to be contaminated with pesticides, according to this report from 'The Conversation' by Charis Palmer

Organic food may come with less pesticides but there's little evidence it's better for you, say researchers from Stanford University.

In a study published today in Annals of Internal Medicine, Dena Bravata from Stanford's Centre for Health Policy argues there isn't much difference between organic and conventional foods if consumers are making a decision based solely on their health.

The researchers analysed 237 papers including studies of populations consuming organic and conventional diets, and studies that compared either the nutrient levels or the bacterial, fungal or pesticide contamination of various vegetables and meats grown organically and conventionally.

"Some believe that organic food is always healthier and more nutritious," said study author Crystal Smith-Spangler, who is an instructor of medicine at Stanford. "We were a little surprised that we didn't find that."

Based on their review of the health outcomes, nutrition and safety of organic and conventional foods, the study authors argued there is limited evidence for the superiority of organic foods.

"The evidence does not suggest marked health benefits from consuming organic versus conventional foods," they wrote in the report.

The study did however find that organic produce is 30% less likely to be contaminated with pesticides than conventional fruits and vegetables.

"Our research shows consumers are more interested in what's not in their food – such as pesticides and antibiotics – than what is," said Liza Oates, who is currently researching the health effects of organic diets at RMIT University.

"This review has confirmed that organic foods have lower levels of pesticide residues and antibiotic-resistant bacteria. The fact that they failed to find strong evidence that organic foods have more nutrients is relatively predictable," Ms Oates said.

She added that research in the US has shown eating organic food has a dramatic effect on pesticide residues in children.

"Substituting non-organic fruits and vegetables with organics for five days resulted in an almost complete reduction in organophosphate pesticide residues."

However Tim Crowe, associate professor of nutrition at Deakin University, said pesticide levels are always checked in Australia and found to be within safe limits.

"The biggest health problems facing Australians are to do with over consumption of food, not inadequate consumption of fruit and vegetables," Professor Crowe said.

"If you get a feel good health effect from eating organic fruit and vegetables, by all means eat them, but I'd be more worried about eating five serves of fruit and veg a day rather than eating organic food."

But taste, environmental benefits, and animal welfare issues are other important aspects of organically grown food said Rosemary Stanton, nutritionist and visiting fellow at University of New South Wales.

"Animal welfare is a major issue for many people and reducing use of pesticides is always wise. Many permissible pesticide residue limits have been reduced over time," Dr Stanton said.

She said taste is another factor with some studies showing better taste from organically produced foods, although added this is a difficult area and may also reflect the varieties of crops grown in large commercial conventional farming versus the varieties that may be grown by smaller organic farmers.

"I think in home, school and community gardens, organically grown produce is definitely to be preferred since exposure of growers to chemical substances can be problematic and the general public has no training in appropriate use of pesticides."

Charis Palmer is Deputy Business Editor at The Conversation.

Do consumers really know what they are getting when they buy organic food?

Promoters of organic foods exaggerate the perceived risks associated with conventional agricultural systems, according to this article by Mick Keogh, Executive Director of the Australian Farm Institute.

It seems that at present, anyone in Australia with even the slightest ambition of becoming a foodie assumes that as a matter of course, the only good food is organic food. Exactly why organic food has gained such popularity is a complete mystery, as there is no evidence of either nutritional or environmental benefits for consumers.

Discussing the relative merits of conventional and organic farming systems (which are the source of organic foods) is one of those subjects that seems to attract a fair degree of vitriol and passion, so it is necessary to start any discussion with the observation that there is nothing inherently wrong with either organic or conventional farming systems.

In fact, a large proportion of Australian farms – especially in the pastoral zone – meet organic standards, even if they haven’t bothered to become accredited. And most Australian farm production systems are much closer to meeting the definition of organic than the majority of farms in north America or Europe, simply because Australian agriculture has evolved as a relatively ‘low input’ farming system.

That said, part of the reason organic foods seem to have become the flavour of the month for professional foodies (despite the 10-30% price premium) is the belief that organic foods are safer and more nutritious, and that organic farming systems are kinder to the environment. Neither of these beliefs are supported by objective evidence.

Part of the reason organic foods seem to have become the flavour of the month for professional foodies (despite the 10-30% price premium) is the belief that organic foods are safer and more nutritious, and that organic farming systems are kinder to the environment. Neither of these beliefs are supported by objective evidence.

One difference that does emerge in these studies between organic and conventional foods was a slightly increased risk of pesticide residues on conventional foods. As the report noted:

While researchers found that organic produce had a 30 per cent lower risk of pesticide contamination than conventional fruits and vegetables, organic foods are not...
The appeal of organic foods lies in the fact they are promoted as being better and safer than non-organic foods, and the greater the perceived risks associated with conventional foods, the greater the attraction (and price premium) associated with organics. This creates a strong incentive for promoters of organic foods to exaggerate the perceived risks associated with conventional agricultural systems.

necessarily 100 per cent free of pesticides. What’s more, as the researchers noted, the pesticide levels of all foods generally fell within the allowable safety limits.

This is perhaps not surprising – in fact it would be surprising if that was not the case. The critical question is whether or not the presence of pesticide residues associated with either organic or conventional foods presents any risk to consumers.

Government authorities have been at pains to reinforce that the residue standards that are applied to inputs used in either organic or conventional farming are extremely conservative, with a wide margin of safety. In fact the testing regime that governments apply to farm inputs before they can be used in farming has become more and more stringent over time, as has the level of scrutiny that is applied to agricultural products after they leave the farm gate.

Even though there are very occasional instances where these processes seem to have failed (as the recent ABC 4 Corners episode alleged) industry surveillance programs such as the National Residue Survey regularly confirm extremely high levels of compliance with pesticide and chemical residue standards, and that such incidents can arise in the case of either organic or conventional farming systems.

Despite this, there seems to be a belief that any pesticide residue risk is a danger to human health, and presumably this is a key factor in the popularity of organic foods.

The lure of the organic label seems to have now spread well beyond just foods, with supermarket aisles now laden with organic deodorants, cleaning products, hair shampoos and moisturising creams. The organic label has become so pervasive that recently the Australian Competition and Consumer Commission (ACCC) issued an order requiring the removal of the word ‘organic’ from labels on bottles of mineral water, on the basis that water cannot be organic, based on the accepted definition of that term.

In an ideal world, organic and conventional farming should be able to co-exist, leaving it up to consumers to make a choice, irrespective of what science says about the differences between products of the two systems.

While this is often the case on the ground, things are not that simple when it comes to the minds of consumers. The appeal of organic foods lies in the fact they are promoted as being better and safer than non-organic foods, and the greater the perceived risks associated with conventional foods, the greater the attraction (and price premium) associated with organics. This creates a strong incentive for promoters of organic foods to exaggerate the perceived risks associated with conventional agricultural systems.

The risk this creates for conventional agriculture is that safe, productivity-enhancing technologies and inputs will be prohibited, based more on consumer and public sentiment, rather than actual science. Ultimately, this will reduce the international competitiveness of Australian agriculture.

Of course, the more this happens, the more conventional agriculture will resemble organic agriculture, and the harder it will ultimately be for organic products to sustain premium prices. It would be the ultimate irony if the current populism associated with organic foods ultimately contributed to their demise!

ORGANIC CERTIFICATION – WHAT IS THE COST OF CLEAN PRODUCTION?

Mainstream supermarkets have embraced the ever-increasing demand for certified organic products, farmers markets are popping up all over the country, and home delivery services are available for those too busy to join the checkout queue. Access to premium quality, certified organic produce has never been easier.

The health and environmental benefits of organic farming have also been well documented. Organic production prohibits the use of pesticides and pharmaceuticals (antibiotics) ensuring the sustainability of the land over the long term, and eliminating the presence of synthetic chemicals in food.

It all sounds fantastic, but what are the realities for a food manufacturer in gaining a certified organic status? Do you need certification to make an organic claim? How do producers tackle seasonality in supply? And importantly, how do food companies communicate the higher cost to consumers, who in the end, bear the premium price burden?

Gaining organic certification poses many barriers for producers and manufacturers, namely availability of supply, time and cost. Organic produce attracts a higher price point, but along with a premium product, the costs of production also demand higher overheads.

So there the question lies, how do food manufacturers weigh up the costs and benefits associated with organic certification? What exactly is involved in achieving a certified organic status and does it pay off at the checkout?

Organic certification bodies in Australia

Australia’s peak body for the Australian organic sector, the Organic Federation of Australia, lists a number of Australian organic certifying bodies on its website including NASAA Certified Organic, The Organic Food Chain, AUS-QUAL, The Bio-Dynamic Research Institute, Safe Food Production Queensland, The Tasmanian Organic Producers and Australian Certified Organic.

Australian Certified Organic is the largest of the certification bodies and is the nation’s premier auditing, certifying and licensing company of both organic and biodynamic operators.

The organic certification process

The Department of Environment and Primary Industries states that the certification process differs depending on whether the application is for primary producers, manufacturing and distribution or the retail trade. In reality, the process to gain organic certification is far more involved for primary producers than it is for food manufacturers.

The idea behind certification is that it provides a guarantee that the integrity of organic food is maintained from the farm gate all the way to the end user. According to NASAA, organic certification within the processing and manufacturing sector is complementary to existing environmental, quality assurance and HACCP based food quality standards.

The certification essentially ensures that the ingredients, associated inputs, processing activities and transportation of goods all conform to the stipulated standards set out under the National Standard for Organic and Bio-Dynamic Produce 2008.

Manufacturing and distribution operations can achieve certification following an inspection of the processing site and an examination of associated documents, all of which must display a clear and auditable paper trail to verify all organic claims.

For a product to hold a ‘certified organic’ label, 100 per cent of the ingredient list must be certified, with exceptions for salt and water.

Food manufacturers are also subject to routine annual audits once certification is granted to ensure that businesses and farms are meeting the organic standards stipulated in their contract.

Does a product have to be certified organic to make an organic claim?

According to the Australian Competition and Consumer Commission (ACCC), an organic claim is any claim that describes a product as organic, or containing organic ingredients. For example food manufacturers may choose to use the terms ‘made using organic ingredients’ or ‘100 per cent organic’.

Current organic product standards are governed under a voluntary Australian standard for growers and manufacturers who wish to label their products as ‘organic’ and ‘biodynamic’ (AS 6000-2009).

A food manufacturer does not need certification to make an organic claim, however Australia’s main supermarket chains, Coles and Woolworths, will not stock products with organic claims unless they’re backed by a recognised organic certification body.

A false claim can lead to heavy fines and legal action if it’s found to not comply with national standards and another point to mention is that by law, if food manufacturers plan to export out of the country with an organic claim, the product must be fully certified.

Outgoing CEO for Australian Organic, Andrew Monk, said that although producers making organic claims without certification has been problematic in the past, today it’s a different story.
Organic and Genetically Modified Food

How do food manufacturers weigh up the costs and benefits associated with organic certification? What exactly is involved in achieving a certified organic status and does it pay off at the checkout?

Creating the balance between cost and benefit

The argument to go organic is two-fold. The certification not only provides an official confirmation of sustainable farming and processing practices, but it also acts as a powerful marketing tool, offering consumers a measure of trust and in turn, attracting a higher price tag.

However, supply has increased over recent years and we are finding that farmers are moving to what’s called ‘in-conversion’ so they’re looking at the organic supply, her customers demonstrate a high loyalty to the Whole Kids brand, and understand that products are available,” Meldrum told Food Magazine.

“Organics, despite strong growth in recent years, still remains a niche market and as such, securing consistent supply in raw ingredients can be a challenge.

Monica Meldrum, founder of certified organic snack food company, Whole Kids, said when starting her company eight years ago, it was initially quite difficult to source certified organic suppliers.

“Our product development is largely driven by availability of supply, because it’s very much a growing industry in Australia, so sometimes we just simply have to hold back product sales because the supply is not available,” Meldrum told Food Magazine.

“However, supply has increased over recent years and we are finding that farmers are moving to what’s called ‘in-conversion’ so they’re looking at the organic space and converting their farms.”

Meldrum says that despite the occasional hiccup in supply, her customers demonstrate a high loyalty to the Whole Kids brand, and understand that products are not necessarily available all year round.

Meldrum agrees that gaining certification is a rigorous process, and encourages businesses to only invest in organics if they are prepared to make a commitment to the industry long term. She stresses that good supplier relationships are imperative to the success of her business.

“We have to be certified right throughout our supply chain and in terms of managing supply, we actually have really good relationships with all the growers. We work directly with them,” she said.

“Although we are not growers ourselves, we still go through a pretty rigorous process to ensure that there is no contamination of ingredients at any point along the supply chain. Australian Certified Organic even goes so far as to test some of the soils in adjacent properties to some of our growers, just to test that there is no possible contamination, and everything through to production, warehouse and storage and distribution is also audited.

“People who are getting into organics need to understand that it is a long process and they need to be in it for the long haul. Sometimes there is this assumption that you can make a quick buck because you can charge a premium, but I think that with organics, you really need to work with growers and suppliers throughout the supply chain. But the customers really appreciate it and they are very, very loyal.”

The time and cost associated with gaining certification is far more expensive for farmers than food manufacturers. The main concerns for food manufacturers in making the organic switch is more in line with processing compliance issues, which ACO’s Andrew Monk claims are not unlike those of HACCP.

“Almost every processor in the country by now should have had a HACCP system implemented and independently certified. And it is fundamentally no different than that really,” Monk told Food Magazine.

“The first point of difference is more that there is a production standard that you will need to comply with, which goes a bit more into detail than the food safety standard does. But all those same principles are there. You apply and have an auditor come out and cross check that what you are claiming to be doing is exactly what you are doing.”

Chief executive of Aussie Farmers Direct, Braeden Lord, agrees that the certification process is not as complicated as many make it out to be.

“Organic certification is a simple process providing you follow the bouncing ball,” he said.

Aussie Farmers Direct recently went into a joint venture with Organic Dairy Farmers to build an organic butter plant attached to the side of Aussie Farmers Direct’s conventional dairy. In order to achieve organic certification for the new plant, the companies had to build a complete separation between the conventional milk and organic milk lines.

“It was only really a process of the certifiers coming through and viewing the factory and making sure that everything was in its place. And making sure that we have a way that we can separate out finished products so there is no confusion,” said Lord.

“We have a system called SCARDA which is a very sophisticated dairy management production system, so it literally monitors the milk from the time it
arrives, to the time it enters into the silo, to the time it enters a bottle.

“The system is able to batch control, so we can show the certifiers that we are managing the milk as it comes through the processing, which of course they are thoroughly excited about.”

**The realities of supply and certification**

While growers and food manufacturers generally see the value in organics, some argue that with particular crops, certification is either simply not viable, or something they’re simply not interested in.

Bruce McPherson, co-owner of Bundaberg strawberry company, Tinaberries, says that although he applies a holistic approach to his farming practices, it is simply not viable for him to grow strawberries organically.

“We employ so many organic practices. Things like companion planting, we don’t fumigate our soils, we introduce microbes into our soil and we regularly sap test our plants,” McPherson told *Food Magazine*.

“We use a lot of things like kelp or seaweed, and we use amino acids. So when we say we don’t spray, of course we spray, but we seldom use so-called agrichemicals. Having said that, we are not going to throw the baby out with the bathwater, if we really get a problem, we will move into that.”

McPherson had previously looked at going organic, but after a trip to Spain, one of the world’s largest strawberry producers, he changed his mind.

“What we found [in Spain] was that there was no price advantage for organic strawberries for the grower, and the quality of the strawberry wasn’t as good as the sustainably grown [not organic] varieties,” he said.

“[Furthermore] It’s very hard to grow a strawberry organically, especially to grow in one volume and for it to be economical. It’s been proven around the world that they are just one of the hardest things to grow. And once you get a disease or pest pressure, it’s very hard to deal with it effectively.

“I have no problem with organics, but I’m not convinced by the masses that it is as big an issue as what certain parts of the consumer base thinks it is. For us to be here next year we’ve got to make money out of it, we’ve got to be commercially viable.”

New Zealand based peanut butter producer, Pic Picot, owner of Pic’s Really Good Peanut Butter, said that if he could source good quality organic peanuts, he would consider an organic line. However, he’s yet to find organic peanuts that are up to his standard.

“Of the nuts that we have tried, and we have tried all the nuts that we could get our hands on, the only organic nuts that we could find were not up to scratch,” Picot said.

“I would be happy to buy organic nuts if we could find some that tasted good, but our concern is to make the best peanut butter that we can, and not have it as a purely certification sort of thing.”

According to Picot, the only organic peanuts with a steady supply come from China, and to a lesser extent Argentina and America. Picot explains that the Chinese nuts have a tendency to go rancid very quickly and deliver a metallic after-taste, whereas the Argentinean nuts don’t have the right “depth of flavour.”

Picot says that his supplier, the Peanut Company of Australia (PCA), completed trial crops of organic peanuts, however they have only been able to successfully produce around one-sixth of the size of a standard conventional crop.

“It used to be in Australia that all Australian peanut growers used a hell of a lot of sprays ... The PCA has had a massive seed development program, so they have spent a hell of a lot on adapting Australian peanuts to require less and less chemicals.

“If we did find really good organic peanuts – Australian organic peanuts – at a price that we could afford to make peanut butter out of, then I would consider it.”

**Is it worth it?**

The organics industry really does boast a myriad positive attributes including clean and green production, loyal consumer bases, freedom from synthetic chemicals and, of course, a premium price advantage. The decision to enter the organic space predominantly depends on the market in which a company chooses to operate.

Organics is in no way a quick or an easy way to justify a price premium. Extensive research and preparation needs to be undertaken in order to create a sustainable, profitable and long-term business model.

Having said that, organic certification truly stands as a reputable confirmation of sustainable farming practices, equating to premium quality, healthy food. Conventional operations can still maintain clean and green production methods without an organic certification, however they don’t have the same authority to market their point of difference, and of course they’re unable to back up their claims in the way that a certified organic producer can.
Is growing organically just a fad or is it the future of farming?

That was the topic of the Great Debate at the Ausveg 2015 National Horticulture Convention on the Gold Coast recently.

Organic produce might be gaining popularity, but it still only accounts for less than 1 per cent of Australia’s horticulture production.

Nonetheless, in a time when consumers are demanding to know more about how their food is produced and the chemicals used in the process, is going organic the way for farmers to win them over?

Bang for buck

The number one criticism of organic produce is that it is too expensive, according to Dr Ian Musgrave, senior lecturer in farm ecology at the University of Adelaide.

“The major barrier to people eating fresh fruit and vegetables is cost and organics cost more,” he said.

“You get more bang for your buck from buying conventional vegetables which will have more health benefits.”

But central Victoria organic fruit grower, Katie Finlay, disagreed and said there are ways to buy and eat organic food in a way that won’t break the bank.

“If you buy seasonally from an organic grower you’re often paying the same, or less as you’d pay for conventional product in a supermarket, so shop around,” she said.

Size and appearance

Organic produce is often criticised for being small and less pretty than its conventionally farmed counterparts, but Ms Finlay argues that is just another misconception.

“As a fruit grower we take a lot of pride in the look of our produce, so we maintain you can grow very good produce in organic systems,” she said.

“Having said that I also think we need to not be so fussed with what our produce looks like and we need to be more concerned about what’s in it.”

Dr Musgrave agrees consumers need to get over their obsession for buying good looking fruit, but disagrees that organically grown fruit and vegetables are the same size as conventionally farmed ones.

I think farmers should be listening to consumers and consumers are saying loud and clear that what they want is organic.

Katie Finlay, central Victoria organic fruit grower

“From my purchasing in the organic isle at the Adelaide markets the produce does tend to be smaller,” he said.

“So in order to get your two serves of fruit and five serves of vegetable a day [I think] conventional food for the same price will give you far more of these serves of fruit and vegetables.”

The cost of organic certification

Becoming a certified organic grower can be an expensive and long process, which is a prohibiting factor for many farmers wanting to make the move.

However, Ms Finlay argued the cost of certification will drop as more growers get on board.

“Organics is still a relatively young industry in Australia so those issues will resolve themselves as more growers turn to organics,” she said.

“Our input costs are lower, so yes we do have a cost for certification, but it’s lower than people think and there are certifying bodies that cater specifically for...
small growers to keep costs as low as possible.

“When you balance that against the fact that we’re not paying for any artificial fertilisers or chemicals we come out ahead.”

**Chemical usage**

Dr Musgrave said there was a lot of rhetoric around the ‘chemical-free’ argument that organic growers often cite, and consumers need to understand what is actually involved in the growing process.

“When you say that there is no chemicals, [organic growers actually] use chemicals all the time,” he said.

“What they mean is they’re not using synthetic chemicals.

Chemical usage

Dr Ian Musgrave, senior lecturer in farm ecology, University of Adelaide

“Synthetic chemicals are quite often better for the land than the organic certified chemicals.

“So people use copper sulphate, which is a chemical, as an anti-fungicide, which is far more toxic to earthworms and things like that than is the equivalent synthetic chemicals.

“The synthetic chemicals are quite often better for the land than the organic certified chemicals.”

Ms Finlay challenges the notion that synthetic chemicals are better for soil health.

“I would dispute that, because if your aim is to have a healthy soil food web with lots of bacteria, fungi, worms, arthropods, and even nematodes and protozoa in your soil, then those synthetic chemicals and artificial fertilisers are killing them.”

**Growth of organic industry**

One aspect of the organic debate that both sides could agree on is that Australian demand for organic fruit and vegetables is rising dramatically, and suppliers cannot keep up.

“But the issue with that is supply and demand, because at the moment there isn’t enough organic growers, so farmers need to be listening to that demand and responding.”

Dr Musgrave also sees a strong future in organics, provided consumers understand how food labelled as organic is grown.

“In a free democracy people can grow what they want and if people want to choose organics that is absolutely fine,” he said.

“But what they need to be aware of is there are a lot of misconceptions about what is involved in organics and the entire ‘chemical-free’ issue is a diversion.

“But both of us agree that you need to eat more fruit and vegetables!”

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Genetically modified (GM) foods

A FACT SHEET OVERVIEW FROM BETTER HEALTH CHANNEL

Foods genetically modified using biotechnology are known as GM foods. Genetic material is altered using non-traditional, laboratory-based methods; this is known as genetic engineering. Individual genes with specific desirable traits are transferred from one organism to another.

Traditional breeding can achieve similar effects, but works over a much longer time span and is not as targeted as GM. In addition, traditional breeding cannot transfer genes from unrelated species as is possible with GM foods.

Genetic modification of plants and animals

Genetic modification of food is not new. Humans have been altering food crops and animals through selective breeding for many centuries. However, while genes can be transferred during selective breeding, the scope for exchanging genetic material is much wider using genetic engineering.

In theory, genetic engineering allows genetic material to be transferred between any two organisms, including between plants and animals. For example, the gene from a fish that lives in very cold seas has been inserted into a strawberry, allowing the fruit to be frost-tolerant. However, this has not yet been done for currently available commercial food crops.

Concerns about climate change may lead to increased development and use of drought-tolerant GM food crops.

Existing GM crops

Some foods and fibre crops have been modified to make them resistant to insects and viruses and more able to tolerate herbicides. The major crops that have been modified for these purposes, with approval from the relevant authorities, are:

- Maize (corn)
- Wheat
- Rice
- Oilseed rape (canola)
- Chicory
- Squash
- Potato
- Soybean
- Alfalfa
- Cotton.

GM products in food

Modified genes are being used in whole foods such as wheat, soybeans, maize and tomatoes. These GM whole foods are not presently available in Australia. GM food ingredients are, however, present in some Australian foods. For example, soy flour in bread may have come from imported GM soybeans.

Modified genes may have been used in an early stage of the food chain, but may or may not be present in the end product. Nevertheless, gene products – for example, phytochemicals (plant chemicals that contain compounds which may prevent disease) – may remain in the food chain. The implications for human health are unknown.

Organic foods are not genetically modified

Foods certified as organic or biodynamic should not contain any GM ingredients, according to industry guidelines.

Benefits of GM foods

Inexpensive, safe and nutritious foods are needed to feed the world’s growing population. Genetic modification may provide:

- Sturdy plants able to withstand weather extremes
- Drought-tolerant and salt-tolerant crops
- Better-quality food crops
- Higher nutritional yields
- Inexpensive and nutritious food, such as carrots with more antioxidants
- Foods with a longer shelf life, like tomatoes that...
• Food with medicinal (nutraceutical) benefits, such as edible vaccines – for example, bananas with bacterial or rotavirus antigens
• Disease- and insect-resistant crops that require less pesticide and herbicide – for example, GM canola.

Environmental benefits of GM foods
GM advocates argue that GM foods are better for the environment. By using GM crops that are resistant to attack by pests or disease, farmers can reduce their use of pesticides and herbicides and the residual levels of these chemicals in the environment. However, development of resistance can undermine and even reverse this benefit.

GM and nutritional enhancement
Genetic engineering can be used to increase amounts of particular nutrients (like vitamins) in food crops. Research into this technique, sometimes called nutritional enhancement, is now at an advanced stage.

GM golden rice is a white rice crop modified by the insertion of the vitamin A gene from a daffodil plant. This changes the colour and the vitamin level of the rice and is of benefit in countries where vitamin A deficiency is prevalent.

GM researchers are focusing on major health problems like iron deficiency. The removal of the proteins that cause allergies from nuts (such as peanuts and brazil nuts) is also being studied.

The risks of GM crops
Concerns about genetic modification of food raised by scientists, community groups and members of the public include:
• New allergens could be inadvertently created – known allergens could be transferred from traditional foods into GM foods. For instance, during laboratory testing, a gene from the brazil nut was introduced into soybeans. It was found that people with allergies to brazil nuts could also be allergic to soybeans that had been genetically modified in this way and so the project was ceased. No allergic effects have been found with currently approved GM foods.
• Antibiotic resistance may develop – bioengineers sometimes insert a marker gene to help them identify whether a new gene has been successfully introduced to the host DNA. One such marker gene is for resistance to particular antibiotics. If genes coded for antibiotic resistance enter the food chain and are taken up by human gut microflora, the effectiveness of antibiotics could be reduced and human infectious disease risk increased. Research has shown that the risk is very low; however, there is general agreement that use of these markers should be phased out.

Genetic modification of food is not new. Humans have been altering food crops and animals through selective breeding for many centuries. However, while genes can be transferred during selective breeding, the scope for exchanging genetic material is much wider using genetic engineering.

• Cross-breeding – GM crops can cross-breed with surrounding vegetation, including weeds, transferring undesired characteristics. The introduction of glyphosate-resistant soybeans in 1996 has produced glyphosate-tolerant weeds that have driven even greater use of herbicides.
• Pesticide-resistant insects – the genetic modification of some crops to produce the natural biopesticide Bacillus thuringiensis (Bt) toxin could encourage the evolution of Bt-resistant insects, rendering the spray ineffective.
• **Biodiversity** – growing GM crops on a large scale may affect the balance of wildlife and the environment. Since bees cannot distinguish GM from non-GM crops, GM crops can affect non-GM and organically-farmed crops through cross-pollination.

• **Cross-contamination** – plants bioengineered to produce pharmaceuticals (such as medicines) may contaminate food crops.

• **Health effects** – minimal research has been conducted into the potential acute or chronic health risks of using GM foods.

**Social and ethical concerns about GM**

Concerns about the social and ethical issues surrounding genetic modification include:

• The possible monopolisation of the world food market by large multinational companies that control the distribution of GM seeds

• Concerns related to using genes from animals in plant foods. For example, eating traces of genetic material from pork is problematic for certain religious and cultural groups

• Animal welfare could be adversely affected. For example, cows given more potent GM growth hormones could suffer from health problems related to growth or metabolism

• New GM organisms could be patented so that life itself could become commercial property.

**Regulation of GM foods**

In Australia, GM foods are regulated by the *Food Standards Australia New Zealand (FSANZ) Code under Standard 1.5.2 – Food produced using Gene Technology*. GM foods receive individual pre-market safety assessments prior to use in foods for human consumption.

A GM food will only be approved for sale if it is assessed as being safe and as nutritious as its conventional counterparts.

The assessment investigates:

• Nutritional content

• Toxicity (using similar methods to those used for conventional foods)

• Tendency to provoke any allergic reaction

• Stability of the inserted gene

• Whether there is any nutritional deficit or change in the GM food

• Any other unintended effects of the gene insertion.

The safety of GM foods is still being debated, as it is impossible to predict all of the potential effects on human health and the environment. Consequently, some public health experts advocate caution, believing that we do not know whether GM foods are safe.

**GM labelling**

Since December 2002, Australia law has required that food labels must show if food has been genetically modified or contains GM ingredients, or whether GM additives or processing aids remain in the final food product. The label on the package must include the statement ‘genetically modified’ in conjunction with the name of the food or ingredient or processing aid.

GM foods are labelled to help consumers make informed decisions about the food they buy, not for safety reasons. Special labels are not required for:

• ‘Highly refined’ foods that no longer contain the altered DNA or protein (for example, oil from modified corn)

• GM food additives or processing aids (unless the new DNA remains in the food to which it is added)

• GM flavours constituting less than 0.1 per cent of the food by weight

• Food prepared at point of sale (takeaway and restaurant food does not have to be labelled).

Labels may be required if:

• Genetic modification has altered the food so that its composition or nutritional value is outside the normal range of similar non-GM goods (for example, high omega-3 soybeans)

• Food contains toxins which are significantly different to those in similar non-GM foods

• The food produced using GM technology contains a new factor which can cause allergic reactions in some people

• Genetic modification raises significant ethical, cultural and religious concerns regarding the origin of the genetic material used.

**GM food on the shelves**

Many foods on supermarket shelves contain imported GM ingredients. GM foods have also been approved for production in Australia, including corn, soybeans, potatoes, canola and rice.

Other GM foods are still undergoing field trials approved by the Office of the Gene Technology Regulator, although the moratorium by state governments (lifted...
in Victoria and NSW in early 2008) stopped some trials. Imported food products are subject to the same regulations as domestically manufactured foods.

Around 20 GM foods, additives, flavourings, growth hormone (bovine somatotropin) and enzymes (like rennet, used to make cheese) are currently approved in Europe. More than 40 GM foods are approved for sale in the USA.

The main sources of GM foods in Australia are:

- **Soya imported from the United States** – the soya has been genetically modified to be resistant to a herbicide. It can be found in a wide range of foods, such as chocolates, potato chips, margarine, mayonnaise, biscuits and bread.
- **Cottonseed oil made from GM cotton** – this oil, made from cotton resistant to a pesticide, is used in Australia for frying (by the food industry) and in mayonnaise and salad dressings.
- **Imported GM corn** – this is mainly used as cattle feed at present and has not been approved for farming in Australia. However, GM corn may have entered the Australian market through imported foods like breakfast cereal, bread, corn chips and gravy mixes. If so, it is now required to be labelled.
- **GM ingredients in imported foods** – including GM potatoes, canola oil, rice, sugar beet, yeast, cauliflower and coffee.

**Finding GM-free food**

Due to consumer demand, some food manufacturers in Australia provide GM-free food. These products may be labelled as GM-free, and non-GM claims such as 'contains no genetically modified ingredients' are made by food manufacturers.

Enquiries about GM matters people can be directed to the Office of the Gene Technology Regulator.

**Where to get help**

- Food Standards Australia New Zealand (FSANZ)
  Tel. (02) 6271 2222
- TechNyoo (formerly the Gene and NanoTechnology Information Service)
  Tel. 1800 631 276
- Office of the Gene Technology Regulator
  Tel. 1800 181 030

**Things to remember**

- The benefits, risks and ethical concerns regarding GM foods are still being researched and debated.
- The health risks associated with consuming GM foods or ingredients have not been unequivocally established.
- No current evidence suggests that GM foods are harmful to health.
- GM foods sold in Australia, or foods containing GM ingredients, are required to be labelled.

This fact sheet was produced in consultation with, and approved by Deakin University – School of Exercise and Nutrition Sciences.

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COMMERCIALISED GM CROPS

An overview of the current extent of commercialised genetically modified crops, courtesy of the Agricultural Biotechnology Council of Australia

GM cotton has been grown commercially in Australia since 1996. GM cotton (either insect-resistant, herbicide-tolerant or a combination of the two) now accounts for more than 99 per cent of production and has reduced pesticide use by around 85 per cent when compared to previously grown conventional varieties.\(^\text{25, 26}\)

GM herbicide-tolerant canola has been grown commercially in New South Wales and Victoria since 2008 and in Western Australia since 2010. Australia-wide, it’s estimated that 349,000 hectares of GM canola were planted in 2014, or 14 per cent of total canola plantings.\(^\text{27}\)

GM carnations are commercially available in Australia, exhibiting colours from almost black, to blue-purple, through to light violet. The Australian carnation industry produces approximately 140 million flowers annually across Victoria, South Australia, Western Australia and New South Wales.

GM carnations are the first, and to date the only, GM organism to be listed on the OGTR’s ‘GM register’. This means they can now be sold as plants to home gardeners, and there are no conditions imposed on the cut flower industry as far as containment, inspections and the other regulatory processes previously required.

Crops in the pipeline
Licences have been granted for a number of field trials in Australia for genetically modified food and pasture crops. A map showing their locations is maintained on the OGTR website, [www.ogtr.gov.au](http://www.ogtr.gov.au).

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Gene technology regulation in Australia

Australia has a nationally consistent legislative scheme for gene technology, comprised of the Commonwealth Gene Technology Act 2000 and corresponding state and territory legislation, according to the Agricultural Biotechnology Council of Australia.

FEDERAL REGULATION

The federal laws were enacted to protect the health and safety of people, and to protect the environment, by identifying risks posed by, or as a result of, gene technology, and by managing those risks through regulating certain dealings with GMOs.

The Act defines a GMO as (among other things) “an organism that has been modified by gene technology”.

The Act defines a GM product as a thing derived or produced from a GMO – for example, corn chips produced from GM corn.

The Act also defines what is not a GMO – plants produced as a result of conventional breeding techniques, such as mutagenesis and irradiation, do not have to undergo the same rigorous testing as GM crops.

The Act is administered by the Regulator, who is responsible for making decisions on whether to approve field trials and the commercial release of GM crops.

The Act, however, does not take into account trade or marketing considerations, which is at the discretion of the states.

GM PRODUCTS

GM products are regulated by a number of authorities with specific areas of responsibility in addition to the OGTR:

- The Therapeutic Goods Administration ensures the quality, safety and efficacy of medicines, medical devices, blood and tissues in Australia.

OGTR PROCESS FOR ASSESSING APPLICATIONS

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>RISK ASSESSMENT</th>
<th>EXPERT AND PUBLIC INPUT</th>
<th>RISK MANAGEMENT</th>
<th>EXPERT AND PUBLIC INPUT</th>
<th>APPROVAL</th>
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| The body (university, research institute or company) seeking a licence for a new GM crop submits an application to the OGTR containing all necessary data on the crop, its safety and how it behaves in the environment. | - What could go wrong? (Identify risk)  
- How likely is it? (Assess the likelihood)  
- How serious is it? (Assess the consequences)  
- Does it need to be managed? (Evaluate the level of risk) | Exchange of information, ideas and views between the Australian people, governments and interest groups about regulating GMOs. | - Does anything need to be done about any identified risk?  
- What could/should be done?  
- Will action create any new problems?  
- How can the actions be monitored? | Exchange of information, ideas and views between the Australian people, governments and interest groups about regulating GMOs. | - Risk management plan released.  
- Licence granted. |

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includes GM and GM-derived therapeutic products.

- Food Standards Australia New Zealand (FSANZ) is responsible for setting the standards for the safety, content and labelling of food.
- The Australian Pesticides and Veterinary Medicines Authority (APVMA) is responsible for the registration, quality assurance and compliance of all pesticides and veterinary medicines up to the point of sale. This includes regulation of pesticides created by, or used on, GM crops.
- The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) assesses new and existing industrial chemicals, including genetically modified products, for their effects on human health and the environment.

The OGTR website contains a complete list of approvals from the other relevant regulatory organisations to provide the community with ready access to information about GMOs and genetically modified products being researched or used in Australia.

**ASSESSMENT OF GM CROPS AND FOODS**

In terms of GM crops and the food produced from them, the OGTR, FSANZ and APVMA are the three main bodies responsible for assessment, licensing and approvals in Australia.

The OGTR carries out risk analysis to identify and manage any risks posed by new GM crops before allowing field trials and before seeds can be commercially produced and sold to farmers.

If a new GM crop poses risks that the Regulator determines cannot be adequately managed, then a licence will not be granted.

Before a licence is granted, the Regulator prepares a risk assessment and risk management plan. This includes:

- Identifying if a new characteristic of a GM crop may cause harm, compared to its conventional counterpart – what may go wrong and how serious might it be?
- Developing a management plan, on a case-by-case basis, to protect people and the environment – what actions might be needed, what are the consequences of those actions, and how can they be monitored?
- Asking for input and feedback on the risk assessment and management plan – from experts and the public, on ethical as well as technical issues.

FSANZ has a rigorous and transparent process for assessing the safety of genetically modified foods, based on internationally established scientific principles and guidelines. New products are assessed on a case-by-case basis, because the questions to be asked may depend on the type of food and the genetic modification.

Each genetically modified food is compared to an appropriate conventional (non-GM) food to determine if there are any differences from a molecular, toxicological and compositional point of view, and any differences then considered for safety and nutrition.

The goal is to make sure the genetically modified food has all the benefits and no more risks than those normally associated with conventional food.

If the risks associated with any food assessed by FSANZ are too great to be managed, FSANZ will not grant approval for that food to be sold or consumed in Australia.

**LABELLING**

Labelling of GM foods and food ingredients allows consumers to make an informed choice about the foods they buy.

Australia has some of the most stringent food labelling requirements in the world, and any foods containing more than a negligible amount (one percent) of GM ingredients must be clearly labelled. There
is zero tolerance for the presence of an unapproved GM food or food ingredient. These requirements are overseen by FSANZ.

There are some pragmatic exemptions to the mandatory labelling requirement, which include:

- Highly refined foods (such as sugars and vegetable oils) where genetic material is removed during the refining process
- Flavours containing novel DNA or protein in a concentration of no more than 0.1 per cent
- Instances where there is no more than one per cent (per ingredient) of an approved genetically modified food unintentionally present as an ingredient or processing aid in a non-genetically modified food
- Foods prepared for immediate consumption, such as restaurant and takeaway food, and catered meals.

The strength of the current Australian legislation is the link between labelling and the presence of genetically modified DNA or protein in the final product. Labelling is not necessary if the final food has negligible levels of genetically modified DNA or protein, such as highly refined oils and sugars, because the food derived from the genetically modified source is identical on a molecular level to its non-genetically modified counterpart.

Labelling of genetically modified food has nothing to do with the health or safety of the food. All approved genetically modified foods have been rigorously assessed and found to be safe by the Australian regulator.

The global hectarage of biotech crops have increased more than 100-fold from 1.7 million hectares in 1996 to over 181.5 million hectares in 2014 – this makes biotech crops the fastest adopted crop technology in recent history.

![CURRENT POSITION OF EACH STATE AND TERRITORY ON GM CROPS](image_url)

**NORTHERN TERRITORY**
- Gene Technology Act 2004
  - No GM crop moratorium
  - No commercial cultivation of GM crops

**QUEENSLAND**
- Gene Technology Act 2001
  - No GM crop moratorium
  - Large-scale commercial cultivation of GM cotton

**NEW SOUTH WALES**
- Gene Technology (GM Crop Moratorium) Act 2003
  - Moratorium on commercial cultivation of GM food crops
  - GM cotton exempt from moratorium and commercially cultivated
  - Exemption for commercial cultivation of GM canola granted in 2008

**AUSTRALIAN CAPITAL TERRITORY**
- Gene Technology (GM Crop Moratorium) Act 2004
  - Moratorium on commercial cultivation of all GM crops
  - Exemptions permitted for trials under specific conditions

**VICTORIA**
- Gene Technology Act 2001
- Control of GM Crops Act 2004
  - No current orders in place
  - Commercial cultivation of GM canola since 2008

**TASMANIA**
- Gene Technology (Tasmania) Act 2012
- Genetically Modified Organisms Control Act 2004
  - Moratorium on commercial cultivation of all GM crops
  - Whole of state designated GM-free area

**WESTERN AUSTRALIA**
- Gene Technology Act 2006
- Genetically Modified Crop Free Areas Act 2003
  - Moratorium on commercial cultivation of all GM crops
  - Whole of state designated GM-free area
  - Exemptions for commercial production of approved GM cotton since 2008 and GM canola since 2010

**SOUTH AUSTRALIA**
- Gene Technology Act 2001
- Genetically Modified Crops Management Act 2004
  - Moratorium on commercial cultivation and transport of GM food crops and/or seed
  - Whole of state designated GM-free area
  - Exemptions granted for field trials under specific conditions

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Organic and Genetically Modified Food
STATE REGULATION
Economic and social considerations, such as risks to trade and marketing, may be taken into account by the states and territories. This means that even when GM crops are approved by the AGTR, each state or territory can decide whether or not production is allowed within its borders.

In 2003, licences were issued for the commercial release of two types of GM canola. All state and territory governments, except Queensland and the Northern Territory, subsequently established GMO-free zones to delay the release until marketing considerations had been addressed.21, 22

ENDNOTES

GM FOOD LABELLING

Food Standards Australia New Zealand explains genetically modified food labelling requirements in this information aimed at consumers

Do GM foods have to be labelled?

GM foods, ingredients, additives, or processing aids that contain novel DNA or protein must be labelled with the words ‘genetically modified’. Novel DNA or protein is defined in the Food Standards Code as DNA or a protein which, as a result of the use of gene technology, is different in chemical sequence or structure from DNA or protein present in counterpart food, which has not been produced using gene technology.

Labeling is also required when genetic modification results in an altered characteristic in a food, e.g. soy beans with changed nutritional characteristics such as an increase in their oleic acid content.

GM labeling is not about safety. It is about helping consumers make an informed choice about the food they buy.

All GM foods and ingredients must undergo a safety assessment and be approved before they can be sold in Australia and New Zealand.

The decision on how GM foods are labelled was made by the ministers responsible for food regulation in 2001. In January 2011, recommendation 29 of an independent review of food labelling recommended that the existing labelling provisions for GM foods should remain. In December 2011, ministers agreed that the existing labelling provisions were appropriate.

Where will I find GM on the label?

You will find the statement ‘genetically modified’ on the label either next to the name of the food, e.g. genetically modified soy beans, or in association with the specific ingredient in the ingredient list, e.g. soy flour (genetically modified). If the food is unpackaged, then the information must be displayed close to the food at the point of sale, for example genetically modified soy beans on a container of loose dried soy beans.

Exemptions from GM labelling

GM foods that do not contain any novel DNA or protein or altered characteristics do not require labelling. A decision not to label these foods was made because the composition and characteristics of these foods is exactly the same as the non-GM food. These foods are typically highly refined foods, such as sugars and oils, where processing has removed DNA and protein from the food, including novel DNA and novel protein.

Flavours containing novel DNA or protein in a concentration of no more than 0.1% are also exempt from labelling.

Labelling is also not required when there is no more than 1% (per ingredient) of an approved GM food unintentionally present as an ingredient or processing aid in a non-GM food. This means labelling is not required when a manufacturer genuinely orders non-GM ingredients but finds that up to 1% of an approved GM ingredient is accidentally mixed in non-GM ingredient.

None of the above exemptions apply if the GM food has altered characteristics.

What about food I buy in restaurants?

Food prepared and sold from food premises and vending vehicles (e.g. restaurants, takeaway food outlets, caterers) is also exempt from GM food labelling requirements. In these cases the food business must supply consumers with information about the product which is not misleading or untruthful.

‘GM-free’ and ‘non-GM’ claims

‘GM-free’ and ‘non-GM’ claims are made voluntarily by food manufacturers and are subject to relevant fair trading laws in Australia and New Zealand which prohibit representations about food that are, or likely to be, false, misleading or deceptive. More information on fair trade legislation is available from the Australian Competition and Consumer Commission and New Zealand Commerce Commission websites.

Is there a list of GM foods?

FSANZ is responsible for approving GM foods and food ingredients for use in the food supply in Australia. These permissions can be found in the GM standard. We do not maintain a list of food products in the marketplace which contain GM foods, ingredients or processing aids. Retailers or manufacturers may be able to provide this information.
Making a meal of GM food labelling

In this article first published by The Conversation, Heather Bray and Rachel Ankeny explore the murky world of food labelling.

In all countries in which genetically modified (GM) food is sold, such as Australia and the US, the issue of food labelling has been hotly debated.

While consumer and anti-GM groups call for better labelling of GM foods, the food industry’s position is that our labelling system is good enough to allow people to choose whether to eat GM foods.

Meanwhile, consumers are confused and frustrated. So what is needed?

According to Food Standards Australia New Zealand (FSANZ), food must be labelled as genetically modified or containing GM ingredients if it or its contents have been produced using gene technology as permitted under the Commonwealth Gene Technology Act.

But there are some exceptions:

• Highly refined food where the modified DNA, or proteins resulting from it, is removed during processing
• Processing aids or food additives, where no modified DNA or protein resulting from it remain in the final food
• Flavours where the concentration in the final food is less than 0.1%
• Unintentional presence, where the ingredient is less than 1% of the food
• Any foods consumed at the point of sale.

So canola oil from GM canola, imported GM soy products eaten in cafes and restaurants and beer made using adjuncts such as syrup from GM corn (where no modified DNA is present in the final product) are not labelled as GM foods.

Industry groups support this approach to labelling, saying that if a product does not contain modified DNA or protein resulting from modified DNA, then it shouldn’t be labelled as a GM food. According to them, it about what’s in the food, not how it is produced.

This product versus process distinction is at core of labelling issues. Although highly refined products made using gene technology are not different in substance from their non-GM competitors, consumers who don’t wish to support this technology can’t identify those products which align with their values.

This idea is at the core of campaigns such as the True Food Guide, where food producers are given a ‘green light’ if they can declare that they use no GM at any stage of production.

According to FSANZ, food must be labelled as genetically modified or containing GM ingredients if it or its contents have been produced using gene technology as permitted under the Commonwealth Gene Technology Act. But there are some exceptions...

What do consumers look for, then?

While foods produced using gene technology on our supermarket shelves have been approved as safe to eat by FSANZ, we know that people do not choose their food based primarily on science, if at all. Our food choices are a reflection of our experiences, broader society, religion, traditions and culture among other factors.

Nowadays, many of us in western societies are being asked to consider the impact of our food choices on the environment and other people. Celebrity chefs and others encourage us to buy local, sustainable, organic, animal welfare-friendly and often GM-free products, without ever really explaining why. These labels have become a proxy for quality; shorthand for ‘good food’ in a busy world.
These so-called ‘ethical’ labels are largely unregulated by the government (country-of-origin labelling is an exception), ‘GM-free’ along with ‘sustainable’ and ‘organic’ are claims that can be made on foods without requiring products to meet any particular standards of evidence set by the government.

In the case of organic, only producers who meet certain criteria can display an accreditation logo, one of which is no use of GM products or processes in any stage of production. ABC’s The Checkout describes it nicely in a video which can be found online at: www.youtube.com/watch?v=jlqk8oVtFVI

The primary means of enforcement of food labelling is via the Australian Competition and Consumer Commission (ACCC), which then appeals to whether labels fulfil what the average consumer would expect from a product with that label.

Interestingly, one case brought to the ACCC suggests that ‘GM-free’ refers to the use of GM in production, as well as the product itself, for most consumers. But ‘GM-free’ labels can also be found on foods unlikely to contain any GM ingredients, including those made from products where there is no GM counterpart to its main ingredient.

This complex situation is highly confusing for consumers. Our current labelling regime assumes that consumers can make ‘informed’ decisions on whether to eat or avoid GM food based on their own understandings of a label that may be present or absent, legislated or unregulated.

Research has shown that people tend to develop simple binaries (such as good/bad, natural/artificial) when choosing foods in the face of confusing information, and adapt the new information on the label to fit within decision frameworks which are more familiar to them.

Our preliminary research suggests that consumers see GM as an additive, and hence avoid processed foods or purchase organic foods, to avoid GM.

Although the current labelling regime is insufficient to fulfil some consumers’ demands, questions remain about what information should be mandated, and in what form, to allow consumers to make the decisions that they wish to make as well as consideration of whose interests such labels would serve.

What is clear is that more dialogue and transparency are necessary if consumers are to actively participate in food labelling debates.

Heather Bray is Senior Research Associate, University of Adelaide.
Rachel A. Ankeny is Professor of History, University of Adelaide.

HOW TO SHOP GM-FREE
A guide from MADGE Australia Inc, an advocacy group which researches the food system to allow people to choose food that is good for those who eat it, grow it, produce and sell it

FIRST THE GOOD NEWS ...
Fruit and vegies grown in Australia are GM-free (see more in the Now the Bad News section below). Most cereal crops grown in Australia are GM-free. We have wonderful delicious locally produced food and it’s worth celebrating. The only Australian crops to be wary of are GM cotton and GM canola.

• If you buy food labelled ‘Product of Australia’ the ‘significant ingredients’ will be sourced from Australia and (except for cotton and canola) should be GM-free.
• GM cotton is eaten as: cottonseed oil and cotton linters (may be in bulking agent 460), although the left over pesticide producing cotton trash has been fed to animals.
• Find out what your chips are cooked in. ‘Formula 40’ is GM cottonseed oil – most other brands will be GM as well.
• GM canola oil is used in many processed food products including bread, dips, margarine, chips and bakery products like cakes and muffins.

However customer pressure can stop the use of GM canola and other ingredients. It happened in Europe and it will happen here. Some supermarkets already avoid the use of GM in their home brand lines.

NOW, THE BAD NEWS ...
There is a lot of imported GM food coming into our country, mostly from the Americas. It is in Australian made and imported products on our supermarket shelves, and unfortunately is being fed to our animals from time to time.

The main international GM crops are:
• Soy
• Corn
• Canola
• Cotton
• Sugar – for the first time in 2008 GM sugar beet was grown in the US
• Alfalfa in the US. This is a livestock feed and its approval has been fought in court.

If you avoid ingredients from these crops, and products from animals fed on these crops, you and your family can avoid GM food, with a few small exceptions. However there are many ways that GM ingredients can creep into our food. The full list follows.

OILS
Be careful of the oils you use. Vegetable oil can contain cottonseed oil (GM). Soy, corn and canola may be derived from GM crops and will not need to be labelled as GM.

Oils such as olive, coconut, sunflower, flaxseed, peanut, sesame, macadamia, avocado, hempseed or rice bran oil are not GM and can be used instead.

PROCESSED FOOD
GM ingredients are estimated to be in 70% of processed items on the shelves. This is where knowing and trusting who makes your food is important.

It can also be good to brush up on your cooking skills:
• A handful of soy flour or soy lecithin is thrown into almost every processed item on the supermarket shelves, so this cuts out a lot of your consumer choice.
• GM corn can be in your food under many names – maize starch/syrup, corn starch/syrup, glucose syrup (corn) – think laterally. Also look at the list of hidden GM foods.
• Many producers have declared themselves GM-free. A list of some of them has been released in October 2015 at www.gmfreeaustralia.org.au. The True Food Guide is a similar list but has not been recently updated.
• Ring the information numbers on food packaging. You have to ask the question “Were any of the ingredients derived from a genetically modified crop?” and persist until you get a direct answer.

**Milk, Meat, Eggs, Fish and Honey**

The four main GM crops are also used as animal feed. There is no way to recognise animal products fed on GM – milk, meat, eggs, fish, honey – labelling at all ends is grossly inadequate – ask your butcher or local producer. Until things improve, buying grass-fed meat and organic dairy and poultry is the only way to be sure.

More farmers are showing that they know the customer cares about how animals are raised:

- **Environmeat** – “Beef that won’t cost the earth.”
- **Large Black Pigs** – A traditional heritage breed, delicious and sunburn-resistant so they can graze outside in the hot Australian sun.
- **Lyndale Park** – “Producing nutrient-dense, flavoursome lean lamb for you to enjoy.”
- **Savannah Farm** – “Savannah Lamb is naturally grown and raised in free range expansive paddocks using stress free stock management principles and humane and ethical animal philosophies. The lambs run in a natural environment, free of preservatives, growth hormones or chemicals.”
- **Taranaki Farm** – “Beyond Organic Grass Fed and Pasture Raised.”
- **Jonai Farms** – “Uncommonly delicious ethical pork and beef.”

**Fruit and Vegetables**

**USA**

Very few fresh fruits and vegetables for sale in the US are GM. Small amounts of zucchini, yellow crookneck squash and sweet corn may be GM. The only commercialised GM fruit is papaya from Hawaii.

GM pineapple has been approved by the USDA. It is apparently not yet in commercial distribution but is still in a ‘testing phase’.

In 2015 the US Food and Drug Administration approved GM arctic apples (Granny Smith and Golden Delicious varieties) and GM Innate potatoes (Ranger Russet, Russet Burbank and Atlantic varieties).

These were created by using RNAi to silence genes. Understanding of how RNA works is limited and there is concern that it is inadequate to assess the safety of these foods.

As yet GM Arctic apples and GM Innate potatoes have not been approved by FSANZ but in the absence of testing and monitoring it is possible they could be imported, perhaps in the form of processed food.

**China**

China has commercialised GM tomato, papaya, capsicum and GM seed garlic is reported to be on sale.

These have not yet been approved by FSANZ and so should not be on sale in Australia. However in the absence of GM testing, monitoring and certifying of imported produce Australian consumers cannot be certain that these products are not being imported in some form. Fruit and vegetables that could potentially be GM from the USA and Thailand should be treated with the same caution.

**Thailand**

GM papaya appears to be growing illegally in Thailand.

**Alcohol**

There used to be a True Food Alcohol Guide. It is no longer on the net but it contained the following information. MADGE has no idea whether this information is still correct. We are leaving it here as an indication of the questions that could be useful to ask companies about their ingredients.

- **Beer** – may contain maize/corn products that could be GM.
- **Wine** – processing aids may have come from GM.
- **Spirits, liqueurs and pre-mixed drinks** – may have a base of GM maize/corn or soy may be the base used for distilling.

Some of the GM-free brands are:

- **Beer brands** – Toohey’s, Hahn, Heineken, and James Squire.
- **Wines** – De Bortoli, Tyrrell’s and Yellowtail.
- **Spirits** – Bacardi.

Ones who may be using GM include: Absolut, Cascade, Cooper’s, Crown, Foster’s, VB and Strongbow.

*Note the mention above that this information came from a guide no longer available and so may not be correct.*
CONTAMINATION

GM research and field trials have created contamination of ordinary crops even though the GM crop has never been commercially released.

There is a GM Contamination Register showing recorded incidents.

Europe has a Rapid Alert System for Food and Feed. It has a searchable database known as the RASFF Portal. You need to enter a date “Notified between” “and”. Then under “Hazard” select “GMO/novel food” and then “Get Results”. It will show you what unauthorised GM food, feed and novel foods have been detected, where they came from, and what country they were found in. Australia has no comparable system of detection.

Crops which been contaminated include:

**Corn**

Bt10 corn – Syngenta, a GM seed and chemical company, supplied Bt10 GM corn seed to US farmers for four years. This GM seed had not been approved. Syngenta said they thought they were supplying the approved Bt11 variety.

The EU and Japan ruled that US corn feed imports must be tested and certified free of Bt10. FSANZ instead approved the variety.

**Flax**

GM flax ‘Triffid’ was developed and approved but never commercially grown in Canada. It was made illegal to sell in 2001. In 2009 it was found to have contaminated exports to Europe. This resulted in lost markets in Europe and farmer losses.

**Rice**

Bt63 rice – Chinese exports were contaminated by Bt63 GM rice. There are concerns that this rice may be allergenic.

The EU and New Zealand instigated strict testing to ensure this rice was not imported. The Australian regulator (FSANZ) has taken no action to avoid the import of this unapproved rice. The EU is toughening checks on rice from China due to repeated GM contamination.

Searches of the RASFF Portal shows that rice and rice products from countries such as India, Pakistan and Hong Kong have been detected as containing GM contamination. This highlights the need for Australia to instigate testing.

**Wheat**

GM contamination of wheat has been found in Oregon. This led to the cancellation of wheat imports by Japan.

CONTINUAL UPDATES

We have tried to provide the best information possible but applications and approvals are continually occurring.

In Australia Food Standards Australia New Zealand is responsible for recommending the approval of GM foods.


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In a world with a ballooning population and deteriorating environment, we will need to use every trick in the book to stave off mass starvation, disease and political chaos.

According the Food and Agriculture Organization of the United Nations, there are 795 million people (more than 10% of the world population) who are chronically undernourished. This includes 161 million children, of which 3.1 million die from hunger each year.

We need to double food production, with less land and less water, and prevent further environmental degradation. One of the most promising approaches is genetically modified (GM) animals to produce more food with less, and improve animal health and welfare.

**GM MENAGERIE**

The first genetically modified animal has at last been approved by the FDA for the marketplace. The GM AquAdvantage salmon is a strain of Atlantic salmon that was derived by adding a growth hormone gene from another salmon species. It grows much faster and more efficiently and therefore can feed more people for the same resource inputs.

There are several other animal strains already developed that grow faster and more efficiently, produce less waste, are resistant to disease or produce novel products of benefit to humans. These include breeds engineered to solve specific problems in developing countries.

For instance, there are cattle that cannot get or transmit mad-cow disease; pigs that produce less phosphorous pollution; pigs that develop more and leaner muscle; pigs resistant to African swine fever; and goats that produce milk containing an enzyme that could prevent deadly diarrhoea in a million children per year in developing countries.

Some of these strains have been ready to go for more than 10 years but they are still not being used to alleviate problems of malnutrition and disease. Much of this is due to opposition to GM foods.

**OPPOSING CONCERNS**

Opposition to GM has come largely from the affluent West, although opponents are being recruited in India and China.

But concerns about safety have proved to be illusory, for the most part being more a product of ignorance about how genes work rather than being based on any evidence.

Nobody has ever died, or even got sick, from eating GM food. Safety regulations around GM foods are stricter than those that protect us from poisons or bad food. And GM foods are the most extensively monitored and regulated for safety in the history of the world.

Another fear is of the possible escape of inserted genes into the environment. These concerns have been met by stringent containment requirements; for instance, AquAdvantage salmon must be grown in onshore tanks.

Some existing companies are concerned about the effect of GM animals on their business. Issues around price, market share (e.g. salmon fisherman) and acceptability in European markets are real, but comparatively minor.

It is unlikely that the availability of GM animals would restrict the choice of animal breeds. Beef cattle are very distributed, with many breeds and producers,
and pigs and chickens are already controlled by a small number of breeders.

Animal welfare is unlikely to be an issue because only changes that make animals more healthy and productive will be commercially viable.

Any new technology – think vaccinations, microwave ovens, even the provision of internal doors in houses – has initially been fiercely resisted. This usually resolves with time and experience.

Ideology is perhaps the most insidious force. There remains a quaint idea that we should not “tamper with nature”, despite the thousands of years of civilisation during which we have been doing just that by conventional, selective breeding.

KILLING INNOVATION

Approval of GM salmon was not exactly a rush decision; it has been more than 20 years since the first application for approval. Nor will it provide a cheap and available source of protein since it is subject to onerous regulations, and the means of production is limited.

The worldwide regulatory dysfunction around the breeding of GM animals to produce food for human consumption has effectively limited advancement in this field. Expensive delays and uncertainties have stopped work and limited capacity building in virtually all the developed countries that were first to develop this technology (Australia, Canada, Germany, New Zealand, the United Kingdom and the United States).

At present, there appears to be little corporate support for using GM animals in agriculture. In the face of steep regulatory costs and long timeframes, even removing the roadblocks to approval may not be sufficient to renew commercial interest.

New laboratories undertaking the creation of GM livestock for use in agriculture are almost exclusively limited to Brazil, Argentina and China, where new breeds with extra muscling are already available.

A real impact, and the one that may seriously affect Australia, is how rapidly economies such as China and India will now move forward. China has put more resources into developing GM farm animals than the rest of the world combined over the past decade, and India is also now moving to establish laboratories in this area.

Will the West – including Australia – be left behind, or will sanity return and allow the new technologies to be applied?

THE FUTURE OF GM ANIMAL BREEDING

The newest technology for improving food plants and animals – gene editing – does not use genetic engineering techniques to insert or replace bits of DNA. Instead, there are genetic tricks for simply tweaking the genetic code in known ways.

Why wait for a cosmic ray or a replication accident to make a favourable change in the genetic code? This can take many years because most natural mutations are bad. Now geneticists can alter the code in known ways to improve the growth, environmental tolerance, disease resistance or nutritional value of the organism.

This technology is already being used to create new animal breeds, such as micropigs developed in China as pets. It seems bizarre that GM breeds are readily available as exotic pets but not to alleviate hunger in developing countries.

Gene editing is extremely efficient, and leaves no trace. So a new strain will be indistinguishable from a random mutant. This may make stringent regulation unnecessary, or even impossible.

GM technology and gene editing have the potential to produce a historic advance in food availability. In the absence of serious safety or welfare concerns, we must question the ethics of comfortable, affluent Westerners imposing their lifestyle choices on millions of undernourished people.
What is Greenpeace’s position on genetic modification?

Greenpeace is opposed to the release of genetically modified (GM) crops into the environment. They have been released without adequate knowledge about their effects on ecology, wildlife and human health. Greenpeace does not campaign against the contained use of GM organisms, such as for medical applications. Greenpeace is opposed to the patenting of life. Living organisms like plants and animals, but also parts of them, so organs, cells, substances and genes are a product of nature, not of corporations and therefore belongs to us all.

What is genetic modification?

Genetic modification is a radical new technology that allows scientists to move genes between different species. Using laboratory techniques scientists can create life-forms that could not occur in nature.

Genes are small lengths of DNA, the living blueprint of life found in the cells of all living things. Genetic engineers use viruses, bacteria and a device called a gene gun to randomly move genes from one organism into another. These techniques are used to make plants grow differently. For example, a gene from an arctic flounder fish was added to the DNA of tomatoes in order to make the tomatoes resist the cold. Clearly, this would never happen through natural evolution.


Genetic engineering (GE) is sometimes called genetic manipulation or genetic modification (GM). The resulting life-forms are often known as genetically modified organisms (GMOs).

Genetic engineering is often described as a form of biotechnology. However, biotechnology is a term that also encompasses a wide range of traditional practices such as cheese-making and brewing – practices that are not in any way like genetic engineering. Gene technology is a broad term that includes techniques such as cloning and gene therapy. These are also different from genetic engineering because they do not necessarily involve moving genes between species.

Is genetic modification different to traditional crossbreeding?

Genetic modification is completely different from traditional crossbreeding. Whereas in traditional breeding methods organisms are bred within the same species, in genetic engineering genes are forced to move across species. This sort of manipulation has resulted in such things as toad genes inserted in potatoes, scorpion genes in corns and even human genes forced into pigs and into rice. By inventing new life-forms in this way chemical companies hope to find new and profitable uses for living things – to alter nature to better suit the needs of industry.

What’s wrong with genetically modified foods?

Genetic modification is highly unpredictable. Contrary to industry claims, the techniques used in genetic engineering are random and imprecise. Because scientists still understand very little about how genes work, genetic engineers frequently find unexpected side effects when they move genes across species, or even within the same species.

These unexpected effects of genetic engineering, sometimes called ‘pleitropic’ or ‘secondary’ effects, can include the production of new or ‘novel’ proteins. These new proteins can potentially cause allergies or have toxic effects. They can significantly change the plant in ways such as making it weak, or changing its colour. Scientists do not know what unexpected results to look for in their experiments. Further, genetic engineering companies are keen to avoid testing for unexpected effects. Thus these effects only emerge after the crops have been released. For example, Monsanto’s GE soy plants with extra lignin (the woody part of a stem), began to crack when exposed to heat – but nobody knew why. A GE bacteria, Klebsellia Planticola, was found to produce so much alcohol that it killed soil life.

We cannot know what further problems with genetic modification, lie undiscovered. There are many examples of technologies that have gone badly wrong, such as nuclear power and chemical pesticides. However, genetic modification represents a different threat due to their living nature. Once GM organisms have been released into the environment and the food-chain, they cannot be recalled. The living genetically modified organism will replicate forever.

Which companies are behind genetically modified foods?

Three multinational chemical companies control the market in genetically engineered crops: Monsanto, Bayer (formerly Aventis) and Syngenta. Monsanto is an American-based chemical company that produces genetically engineered soy, corn, cotton and canola. Monsanto’s high profile products include aspartame (or Nutrasweet, which has been linked with brain seizures) and a broadspectrum weed killer called Roundup, which kills almost all plant life – except...
Monsanto's own genetically engineered crops.

Monsanto has a long history of producing highly toxic chemicals. Many of these chemicals are now banned or restricted, including dangerous industrial chemicals called PCBs and the notorious pesticide Agent Orange.

BayerCropscience is a European-based chemical company who has bought the biotech company Aventis Cropscience. Like Monsanto, Bayer produces a powerful weedkiller (called Liberty/Basta) that kills all plant life except the crops that are genetically engineered to resist it.

Aventis also produced Starlink, a GE corn believed to cause allergies. In 2001 Starlink contaminated the entire US corn supply and had to be recalled at a cost of over a billion US dollars.

Bayer wants to grow its commercial GE canola all over Australia, but has already failed to comply with the rules for growing trial crops. Syngenta was formed when two other chemical companies, Astra Zeneca and Novartis decided to dispose of their genetic modification divisions and merge them into a new company.

Syngenta is based in Switzerland and produces a genetically engineered corn banned in several European countries.

Who else promotes or supports genetic modification?

Here in Australia there are also a few bodies that speak on behalf of the genetic modification companies. These include: The Life Sciences Network, Avcare (the peak body of the agricultural chemicals industry) and Agrifood Awareness. The Australian Food and Grocery Council which represents big food companies has also consistently supported GE foods. Three government-funded agencies also actively promote the genetic modification of food. They are Biotechnology Australia who promote public support for GM foods, ANZFA (Australian New Zealand Food Authority) whose job is to regulate individual GE foods but who also regularly defend GM foods as a whole and also some parts of CSIRO who undertake research to develop new GM foods in partnership with the grains industry.

How does genetic modification affect the environment?

Unlike previous pollution genetically engineered crops are living organisms, they can reproduce and spread. This poses an ongoing threat to the environment. If something goes wrong this GM pollution cannot simply be recalled or cleaned up. Ecologists believe that the release of these unpredictable organisms could have far reaching consequences in much the same way that non-native species such as the cane toad have become pests. Such effects may only emerge after a few generations. Persistent GM crops may cross with related weeds to become ‘superweeds’ – particularly vigorous weeds that outcompete other plants and destroy natural plant ecosystems.

GM crops produce seed and pollen which can contaminate other crops and also soil. Soil is extremely complex and there is already some evidence that GM crops have affected the fertility of soil.

One type of GM crops designed to produce their own insecticide have been shown to be harmful to the larvae of butterflies, to ladybirds and other important insects. Beekeepers are concerned that such crops may also be harmful to bees who ingest pollen. The real impact of GM crops on the many types of insect and wildlife found in the environment has not yet been checked.

So far most of the GM crops that are grown are designed to be used with powerful weedkillers. When the ‘Roundup Ready canola’ is sprayed with roundup weed-killer the plant lives but all other plants die, taking away shelter and food for many insects and birds depending on these wild plants. This too threatens natural systems.

How does genetic modification affect our health?

Several groups, including the Public Health Association of Australia and the British Medical Association, have raised concerns about the safety of GM foods. There are many reasons for concern, such as the use of antibiotic-resistance genes in GM plants. These genes are added to GM foods merely as markers but could transfer into bacteria and render existing antibiotics useless. Another concern is our potential exposure to unfamiliar or unexpected proteins, toxins and allergens through eating GM food. Overseas, a soy bean that was genetically modified with a brazil nut gene caused problems in people with nut allergies, and a genetically modified corn, called Starlink, was suspected of causing similar problems.

GM agriculture may also mean more pesticides in our food. The allowable residue level for Roundup weedkiller in food was recently (Nov 2003) increased 100-fold. Monsanto's genetically modified ‘Roundup Ready’ crops can now be sprayed with more Roundup. In California, where there is mandatory monitoring of pesticides, Roundup is the cause of more reported illnesses than any other chemical.

Current safety testing of GM foods is minimal. Tests are done by employees or companies paid by GM companies and the results are rarely published for...
scientific review. In Australia, ANZFA is the sole body to assess these company documents. An independent review of reports published by ANZFA has concluded that tests are inadequate, that GM foods have never been tested on humans and that some GM foods have not even been tested on animals.

**Are genetically modified crops good for farmers?**

In the USA and Canada, where GM crops have now been grown for 5 years, a coalition of 33 farm and agriculture groups recently issued a warning that, “Genetic engineering in agriculture has significantly increased the economic uncertainty of family farmers throughout the US and the world.”

The agrochemical companies that produce GM seeds require farmers to sign legal agreements specifying how to farm and promising not to save seed. They also expect farmers to pay royalties. Companies such as Monsanto then aggressively sue farmers who they believe are using their seeds without signing such agreements. Unfortunately due to contamination many farmers are finding they have GM crops on their land whether they asked for it or not.

In Canada, Monsanto sued a canola grower called Percy Schmeiser because GM canola was growing on his land as a result of contamination. Even though Schmeiser did not want the contamination Monsanto argued successfully that he owed them money anyway. Conventional growers are discovering that GM crops from neighbouring fields have become weeds that cannot be sprayed off with herbicides because they have inbuilt resistance. The Royal Society of Canada has warned that most of the country’s prairie land is now contaminated with herbicide-resistant canola weeds, the removal of which raises farm costs.

At the end of harvest US and Canadian farmers are discovering a further problem of GM crops – that export markets won’t buy them. Following the introduction of GM canola in Canada, sales to Europe dried up. The same is true of US corn which is no longer sold to Europe and has lost important markets in Asia.

**Will genetically engineered foods feed the world?**

There is no simple solution to end world hunger. Genetic modification is not the answer, just as pesticides weren’t the answer. Even increasing food production is not the answer.

World hunger will only end when the underlying causes of poverty are addressed. Poverty prevents people from securing their basic right to food – either because they have no means to purchase food or they have no access to the farmland and natural resources necessary to meet basic food needs. Genetically modified crops does nothing to address the poverty that causes hunger – in fact it threatens to make it worse.

In developing countries, straightforward solutions that empower the poverty-stricken are among the most effective ways to reduce hunger and secure sustainable livelihoods. High tech agricultural technical packages, in contrast, are expensive and often make inequalities worse, contributing to landlessness and food insecurity. The monopolisation of the seed market and the way in which GM companies’ deny farmers their ancient right to save, exchange and replant seeds go against the best interests of the poor.

Ending world hunger also requires confronting bad land stewardship practices which lead to permanent degradation of the environment. Genetically modified crops which tie farmers to using chemicals promise to make this situation worse, not better, in addition to posing new environmental risks.

It is a myth that world hunger is caused by a lack of sufficient food supplies. Rather than food shortages, the world is experiencing a food glut. Over recent decades, both Europe and the United States have spent billions of tax dollars in programs to get farmers to grow less food, and to subsidise the export of food surpluses on the world market. The Food and Agriculture Organisation suggests there is in fact one and a half times the amount of food than is needed to feed the world.

At Farming Solutions Greenpeace, Oxfam and other groups concerned with real solutions to hunger have documented the ways that poor communities already feed themselves without using GE crops and without damaging the environment.

**Are genetically modified foods labelled?**

GM ingredients appear as hidden ingredients in processed foods, and in the meat, eggs and milk produced from animals fed on GM grains. Ninety two per cent of all Australians want comprehensive labelling of GM foods. But under Australian labelling laws, only foods where GM proteins can be detected need to be labelled.

All the following types of food are exempt:

- Foods where ingredients are made from animals fed with GM feed (e.g. meat, milk, eggs, honey)
- Food where GM ingredients are highly refined
Under current Australian labelling laws, meat, milk and eggs derived from animals fed on GE crops, *don’t* have to be labelled. Most Australian chickens’ diets are thought to contain genetically modified soy. But if you bought the eggs or meat from that chicken, you would have no way of knowing this.

Many food companies don’t even know the source of ingredients such as whey powder, which is produced from cow’s milk. Ask food companies whether the animals used in the production of their food product, were fed on GE feed. Demand that their food production guarantees there is no GE used anywhere in the supply chain.

**Will Golden Rice be beneficial?**

The genetic modification (GM) industry claims vitamin A rice could save thousands of children from blindness and millions of malnourished people from vitamin A deficiency (VAD) related diseases.

However, a simple calculation based on the product developers’ own figures show an adult would have to eat at least 12 times the normal intake of 300 grams to get the daily recommended amount of provitamin A.

Greenpeace calculations show that an adult would have to eat at least 3.7 kilograms of dry weight rice, which results in about 9 kilograms of cooked rice, to satisfy their daily need of vitamin A from Golden Rice.

This means a normal daily intake of 300 grams of rice would, at best, provide 8 per cent of the vitamin A needed daily. A breast feeding woman would have to eat at least 6.3 kilograms in dry weight, converting to nearly 18 kilograms of cooked rice per day.

A main sponsor of Golden Rice, the Rockefeller Foundation, has told Greenpeace that the GE industry has “gone too far” in its promotion of the product. While upholding its principal support for the project, Rockefeller Foundation President Gordon Conway said to Greenpeace in a letter: “The public relations uses of Golden Rice have gone too far. The industry’s advertisements and the media in general seem to forget that it is a research product that needs considerable further development before it will be available to farmers and consumers.”

GM rice does not address the underlying causes of vitamin A deficiency (VAD), which is mainly poverty and lack of access to a more diverse diet. For the short-term, measures such as supplementation (such as pills) and food fortification are cheap and effective.

Promoting the use and the access to food naturally rich in provitamin A, such as red palm oil, will also help addressing the VAD-related sufferings. The only long-term solution is to work on the root causes of poverty and to ensure access to a diverse and healthy diet.

**ENDNOTE**


COMMON QUESTIONS ABOUT AG BIOTECH

THE AGRICULTURAL BIOTECHNOLOGY COUNCIL OF AUSTRALIA ANSWERS SOME QUESTIONS ON GENETICALLY MODIFIED FOODS

Q: Do farmers have to buy new seed every year?

All GM plants commercialised so far are as fertile as their conventional counterparts. The requirement to buy seed each year can arise from biological and/or contractual reasons.

From a biological perspective, hybrid varieties of crops – which can be produced through both conventional breeding and GM methods and are permitted in organic agriculture – have been used by farmers for many years and are a normal part of modern farming systems. However, first generation hybrids do not breed true to type, meaning that the seed they set may not grow into crops that are identical to the parents. This can result in variations in yield and quality; therefore many farmers prefer to buy new seed each year in order to maintain the improved yields and crop vigour offered by the pure hybrid varieties.

While some companies provide free access to their technology, particularly for humanitarian use in developing countries, as with the Golden Rice project, most operate on a commercial basis.

In most countries, growers who choose to grow GM crops enter into an agreement with the technology providers to buy new seed each year. As well as the agronomic advantages this provides, these contracts are vital for funding ongoing research and development. It takes around 13 years and costs US $136 million to bring a new GM crop to market, most of which goes towards gathering the data required by the regulatory system. This scale of private investment would simply not occur without the opportunity for commercial return provided by these contracts with growers.

Farmers would also be reluctant to enter into these contracts unless the technology was providing proven long term benefits. There has been continued and rapid growth in the adoption of GM crops around the world, with the latest figures showing 18 million farmers were growing them in 2014. The economic benefits for 2013 are estimated at US $16.1 billion and just over half of those gains went to farmers in developing countries.

Q: Is food with genetically modified ingredients different to other foods?

GM food crops are just as ‘natural’ as conventional crops. The only way to breed new varieties of crops is to modify genes in some way or another, whether through selective breeding or modern technologies such as genetic modification.

In many cases, processes using genetic modification are simply speeding up what could be done through conventional methods. This is because genetic modification is much quicker and more targeted than traditional breeding – it involves the precise introduction of a single gene, or even taking a certain gene that’s already present and turning the ‘volume’ up or down or turning it ‘on’ or ‘off’. In fact, genetic modification is more precise than the use of conventional technologies such as gamma irradiation or chemical mutagenesis of seeds that are permitted in organic agriculture. These create a lot random mutations, but most have no practical applications in food and agriculture.

Q: What about GM stockfeed?

GM crops are becoming an increasingly important source of feed for farm animals.
Studies into the meat, milk and eggs from animals fed GM crops have found they are as wholesome, safe and nutritious as products derived from animals fed conventional crops.

As animals digest the feed, genetically modified DNA and proteins are entirely broken down. This means the meat, milk and eggs from animals which have eaten GM feed do not contain any genetically modified DNA or proteins.

As a result, there are currently no requirements in any country to label products from animals that have eaten GM feed.41

Q: Are GM crops a cure-all for achieving global food and nutrition security sustainably?

GM crops are by no means the only solution to our global food and nutritional shortages and inequalities. However, they can make a significant contribution through their potential to improve the sustainable use of crop inputs such as water, energy and pesticides, while at the same time increasing yields, using less land, and boosting the nutritional content of staple crops.

For instance, the ISAAA estimates it would have taken an extra 132 million hectares of conventional crops to produce the same tonnage grown using GM crops since their introduction in 1996. This has effectively saved native habitat and forests from clearing for agriculture.44

GM crops have also reduced the global use of pesticides by around 500 million kilograms between 1996 and 2012.45

Farming systems have also changed because of GM crops. There are fewer spray runs and therefore less fuel used. Minimum till practices are also cutting fuel use and increasing soil quality. This has saved an estimated 6,268 million litres of fuel and associated greenhouse gas emissions between 1996 and 2011.46

In the next generation of GM research, scientists are tackling farming challenges such as drought and salinity, and adding micronutrients to traditional sources of food, in order to help alleviate poverty, malnutrition, and the predicted challenges associated with climate change.

Q: Who is carrying out research involving GM crops?

Of the trials currently approved by the OGTR in Australia, more than 60 per cent are being carried out by universities, research councils and public institutions such as the CSIRO. The rest are carried out by private industry.

Due to the cost and time involved in developing new GM crops, public-private partnerships are currently the most effective way to enable the benefits of public research to reach farmers and consumers. These often involve not-for-profit and independent organisations contributing to research programs.

The companies involved in GM crop development and their trial sites are publicly available at www.ogtr.gov.au

ENDNOTES

45. Ibid.


GM crops are by no means the only solution to our global food and nutritional shortages and inequalities. However, they can make a significant contribution through their potential to improve the sustainable use of crop inputs such as water, energy and pesticides, while at the same time increasing yields, using less land, and boosting the nutritional content of staple crops.
GM crops can benefit organic farmers too
LET’S TALK ABOUT GM ORGANICS, ARGUES IAN GODWIN

Have you eaten organic food today? If you have eaten anything, then technically you’ve eaten organic. By definition, all food is organic, it just may not have been grown under industry standards, such as Australian Certified Organic (ACO).

Most people who choose to eat certified organic do so because they believe it is cleaner and greener, or chemical free. But the most modern cultivated plants are genetically modified organisms (GMOs) and so are precluded from being certified organic.

The Australian Organic organisation says that’s because there are no long-term studies on human health.

Prince Charles has warned that the cultivation of genetically modified (GM) crops is the biggest environmental disaster of all time.

The Australian Greens argue that: [...] genetically modified foods have still not been proven safe [...] Crop yields have not increased, but the use of pesticides on our food has. The only ones profiting from GM are the large GM companies.

BUT THE RESEARCH SAYS DIFFERENT

Perhaps the Greens need to brush up on the science behind their claims. In the most comprehensive meta-analysis (of 147 publications) to date, researchers from Goettingen University have concluded that the adoption of GM technology has:

- Reduced pesticide use by 37%
- Increased crop yield by 22%
- Increased farmer profits by 68%

The yield and profit gains are considerably higher in developing countries than in developed countries, and 53% of GM crops are grown in developing countries.

A survey in the United States uncovered great difference in motivation among farmers who adopted GM herbicide-resistant soybean. Farmers like the no-till and low chemical use attributes. Even when it did not increase profitability, they enjoyed the increase in farm safety and particularly the safety of their families when using less herbicide with very low toxicity.

A similar study of the same soybeans in Argentina showed that total productivity increased by 10%, and more than half of the benefit had gone to the consumer.

In 2012, a joint Chinese-French study on GM cotton showed that insecticide usage more than halved, and the survival of beneficial insects had a positive impact on pest control. Since they adopted genetically modified Bt cotton, India has been producing twice as much cotton from the same land area with 65% less insecticide.

Organic farmers will maintain that if you can improve soil health, you can reduce the impact of pests and diseases. In fact, most farmers in Australia will say that, organic or not.

It works for some of the soil-borne problems but, not surprisingly, weeds really like healthy soils too. And fungal spores, plant-eating insects and aphids harbouring pathogenic viruses can and will travel a long way to get a piece of

WHAT DO ORGANIC FARMERS REALLY WANT?

Organic farmers really do care for their land and want to balance their impact on the land with producing healthier foods and improving the health of the soil.

But organic farms use more land and labour to produce the same amount of produce as conventional agriculture. That’s the major reason you pay more for organic products.

Organic farmers will maintain that if you can improve soil health, you can reduce the impact of pests and diseases. In fact, most farmers in Australia will say that, organic or not.

Issues in Society | Volume 405
Organic and Genetically Modified Food

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With all crop production, there is an element of biological warfare. No matter how hard any farmer tries, her crop will often need a little help to fight back.

**ALL FARMERS USE SOME ‘INPUTS’**

So reluctantly, there will come a time when a farmer will have to use chemicals, or allowed ‘inputs’ (remember that organic agriculture is chemical-free). They include things such as copper, rotenone, acetic acid, light petroleum derivatives, sodium chloride, boric acid and sulphur.

Different organic certifiers allow different ‘inputs’. Let’s use the case of the potato, which infamously succumbed to potato blight and precipitated the great Irish diaspora of the 19th century.

Potato blight is still around and organic potatoes succumb just like others, so farmers are allowed to apply copper sprays to control the fungus. After repeated applications, some soils accumulated toxic levels of copper, hence in 2001 the European Union (EU) and Australian organic certifiers limited application to 8kg/ha annually.

In 2006, the EU dropped this to 6kg/ha, and subsequently Germany and Switzerland cut further to 3.4kg/ha while Scandinavian countries banned the use of copper in agriculture, organic or conventional. Organic potato yields remain at 50% that of conventional yields.

In 2011, BASF launched a potato (Fortuna) that was totally resistant to potato late blight, and it could be cultivated without the need for fungicidal sprays, including copper. The potato contained two genes from a wild Mexican potato relative, and except for the fact that it was a GMO, it would be perfect as a clean and green organic potato crop. Sadly, European agriculture rejected Fortuna potatoes.

**REDUCED EMISSIONS**

There can be other benefits in GM crops, beyond yield and resistance. Rice produces 10% of the world’s methane emissions so imagine if somebody could reduce emissions by 90%, and make plants with larger seeds containing more energy.

Chuangxin Sun’s group at Swedish Agricultural University has done precisely that by transferring a single gene from barley to rice.

If all the world’s rice used this technology, it would be the equivalent of closing down 150 coal-fired power stations or removing 120 million cars from the road annually.

With many other plant scientists, I propose that the case-by-case scrutiny of GM crops would allow the organic industry to show it is willing to use the smartest technologies for improving the sustainable productivity of food and fibre production.

Many labs around the world, including those in my building, are full of bright young innovative scientists who want to make the world cleaner and greener.

We have GM crop plants with enhanced nutritional qualities, pest and disease resistance, larger grain sizes and the ability to produce more food with lower fertiliser inputs. Many of these plants have been modified with only a few DNA letters altered from the ‘wild’ genes.

Adoption would massively improve the productivity of organic agriculture, and the productivity boost would help make organic food price competitive. So let’s talk about GM organics.
WORKSHEETS AND ACTIVITIES

The Exploring Issues section comprises a range of ready-to-use worksheets featuring activities which relate to facts and views raised in this book.

The exercises presented in these worksheets are suitable for use by students at middle secondary school level and beyond. Some of the activities may be explored either individually or as a group.

As the information in this book is compiled from a number of different sources, readers are prompted to consider the origin of the text and to critically evaluate the questions presented.

Is the information cited from a primary or secondary source? Are you being presented with facts or opinions?

Is there any evidence of a particular bias or agenda? What are your own views after having explored the issues?

CONTENTS

BRAINSTORM 52
WRITTEN ACTIVITIES 53
DISCUSSION ACTIVITIES 54
MULTIPLE CHOICE 55-56
Brainstorm, individually or as a group, to find out what you know about organic and genetically modified food.

1. What is the difference between biodynamic and organic farming?

2. How does the system of organic certification work in Australia? (Include any relevant standards, organisations and certifying bodies in your answer)

3. What does the term ‘genetically modified’ mean, and what are some common examples of genetically modified crops?

4. In Australia, what laws are in place to govern the labelling of genetically modified (GM) foods?
Complete the following activity on a separate sheet of paper if more space is required.

The big difference between organic and conventional farming is that conventional farming relies on chemical inputs and a highly mechanised approach, whereas organics is about farming the natural way.

Using the space provided below, identify at least three areas in which organic and conventional farming differ. Write a short paragraph explaining each of the areas you have identified, and conclude with your own opinion on which farming practice is preferable and why (include examples).
Complete the following activity on a separate sheet of paper if more space is required.

“In theory, genetic engineering allows genetic material to be transferred between any two organisms, including between plants and animals. For example, the gene from a fish that lives in very cold seas has been inserted into a strawberry, allowing the fruit to be frost-tolerant.”

Better Health Channel, Genetically modified (GM) foods.

Consider the above statement. Do you agree with the use of genetic engineering to modify foods? Form into groups of two or more people to discuss both the pros and cons of producing and consuming GM foods. Use the space provided to create a list of your arguments. Share your ideas with the class.

**PROS**

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Complete the following multiple choice questionnaire by circling or matching your preferred responses. The answers are at the end of the next page.

1. Organic agriculture is based on which of the following principles? (select all that apply)
   a. The principle of health
   b. The principle of barrenness
   c. The principle of science
   d. The principle of care
   e. The principle of biotechnology
   f. The principle of fairness
   g. The principle of ecology

2. In what year did it become required by law in Australia to label foods that have been genetically modified or which contain GM ingredients?
   a. 1992
   b. 1995
   c. 1999
   d. 2002
   e. 2005
   f. 2012
   g. 2015

3. From which of the following was the vitamin A gene derived and fused to give GM Golden Rice its yellow colouring?
   a. Banana
   b. Saffron
   c. Sunflower
   d. Dandelion
   e. Lemon
   f. Grapefruit
   g. Daffodil

4. Which of the following are potential ways that genetic modification could be used to help feed the world’s growing population? (select all that apply)
   a. Insect-resistant crops
   b. More expensive food lines
   c. Extreme weather-resistant plants
   d. Better quality food crops
   e. Food with less nutritional value
   f. Foods with a longer shelf life
   g. Drought-tolerant crops
   h. Food with medicinal benefits
   i. Poorer quality food crops
   j. Salt-tolerant crops
   k. Disease-resistant crops
5. Respond to the following statements by circling either ‘True’ or ‘False’:

a. Biodynamic agriculture uses various herbs and minerals for compost additives, such as burying ground quartz stuffed into the horn of a cow, to harvest cosmic forces in the soil. True / False

b. Organic food is always cheaper than conventionally-produced food. True / False

c. Organic farming avoids artificial chemical fertilisers and pesticides. True / False

d. GM ingredients are not found in any processed items on supermarket shelves in Australia. True / False

e. Highly refined food, which has genetically modified DNA (or proteins resulting from it) removed during processing, does not require labelling. True / False

f. There is no way to recognise whether animal products have been fed on GM crops, such as milk, meat, eggs, fish and honey. True / False

g. GM food labelling requirements must be followed for food that is prepared and sold from food premises such as restaurants and takeaway food outlets. True / False

MULTIPLE CHOICE ANSWERS

Food outlets is exempt from GM food labelling requirements. Where’s e, f, g = T; f = F (organic farming generally operates on a smaller scale, production is more labor-intensive and, without synthetic herbicides, pesticides and farming generally operates on a smaller scale, production is more labor-intensive and, without synthetic herbicides, pesticides and

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Organic farms are required to set aside at least 5% of their farming environment to biodiversity areas where there is no intensive agricultural production (Australian Organic Ltd, *Australian organic guide to: What is organic?*). (p.1)

For organically processed foods, minimal processing is permitted, with a limited number of non agricultural but natural or traditional ingredients only allowed (*ibid*). (p.3)

Over 29,500 tonnes of herbicides, insecticides, fungicides and plant growth regulators are used each year in Australia (Australian Organic Ltd, *Australian organic guide to: What is organic?*). (p.4)

Consumer demand for organic food is growing at a rate of 20-30% per year, with retail sales increasing 670% between 1990 and 2001-02 (Better Health Channel, *Organic food*). (p.6)

A 2014 report shows consumption of certified organic food, cosmetics and household products are at a record high in Australia (Australian Organic Ltd, *Australia’s appetite for organics at record levels*). (p.11)

The world’s largest organic food markets are North America (valued at $44bn) and Europe ($35bn) (Australian Organic Ltd, *Australian Organic Market Report 2014*). (p.13)

Despite the rapid growth of organic farming in North America and Europe, production has not increased fast enough to keep up with demand. As a result, they are the largest overseas markets for Australian organic food exporters (*ibid*). (p.13)

All foods produced or imported for sale in Australia and New Zealand, including organic food, must be labelled in accordance with the *Food Standards Code* developed by FSANZ (Department of Agriculture and Water Resources, *Organic and Biodynamic Produce*). (p.14)

In Australia, organic certification is performed by several organisations that are accredited by the Department of Agriculture under the *National Standard for Organic and Biodynamic Produce*. Currently there are 7 registered accredited certifying bodies (Lovitt, B, *Why are there 7 different logos for organic certification in Australia?*). (p.15)

Conventional farming became the new norm for industrialised countries after the ‘green-revolution’ of the 1950s and 60s. This period saw the development of new seed varieties, and mass use of fertiliser and irrigation to produce higher yields (Sustainable Table, *Organic Sceptics*). (p.16)

Farmers using GM seeds are not permitted to save their seed and if they are caught doing this they may be sued by the agribusiness that makes the seed (*ibid*). (p.16)

A food manufacturer does not need certification to make an organic claim, however Australia’s main supermarket chains, Coles and Woolworths, will not stock products with organic claims unless they’re backed by a recognised organic certification body (Boothroyd, A, *Organic certification – what is the cost of clean production?*). (p.21)

Organic produce might be gaining popularity, but it still only accounts for less than 1% of Australia’s horticulture production (McCarthy, M, *Is growing organically just a fad or is it the future of farming?*). (p.24)

Synthetic chemicals are quite often better for the land than the organic certified chemicals (*ibid*). (p.25)

Humans have been altering food crops and animals through selective breeding for many centuries. However, while genes can be transferred during selective breeding, the scope for exchanging genetic material is much wider using genetic engineering (Better Health Channel, *Genetically modified (GM) foods*). (p.26)

Some foods and fibre crops have been modified to make them resistant to insects and viruses and more able to tolerate herbicides (*ibid*). (p.26)

Modified genes are being used in whole foods such as wheat, soybeans, maize and tomatoes. These GM whole foods are not presently available in Australia (*ibid*). (p.26)

Since December 2002, Australian law has required that food labels must show if food has been genetically modified or contains GM ingredients, or whether GM additives or processing aids remain in the final food product (*ibid*). (p.28)

GM foods approved for production in Australia, include corn, soybeans, potatoes, canola and rice (*ibid*). (p.28)

GM cotton has been grown commercially in Australia since 1996. GM cotton now accounts for more than 99% of production and has reduced pesticide use by around 85% when compared to previously grown conventional varieties (Agricultural Biotechnology Council of Australia, *The Official Australian Reference Guide to Agricultural Biotechnology and GM Crops*). (p.30)

GM herbicide-tolerant canola has been grown commercially in NSW and Victoria since 2008 and in WA since 2010 (*ibid*). (p.30)

The global hectarage of biotech crops have increased more than 100-fold from 1.7 million hectares in 1996 to over 181.5 million hectares in 2014 (*ibid*). (p.33)

GM ingredients are estimated to be in 70% of processed items on the shelves (Madge Australia Inc, *How to shop GM-free*). (p.38)

There is no way to recognise animal products fed on GM – milk, meat, eggs, fish, honey (*ibid*). (p.39)

The first genetically modified animal has been approved by the FDA for the marketplace. The GM AquaAdvantage salmon is a strain of Atlantic salmon that was derived by adding a growth hormone gene from another salmon species (Murray, JD, and Graves, J, *Opposition to genetically modified animals could leave millions hungry*). (p.41)

One type of GM crops designed to produce their own insecticide have been shown to be harmful to the larvae of butterflies, to ladybirds and other important insects (Safe Food Foundation & Institute, *Genetic modification*). (p.44)

GM crops have reduced the global use of pesticides by around 500 million kgs between 1996 and 2012 (Agricultural Biotechnology Council of Australia, *The Official Australian Reference Guide to Agricultural Biotechnology and GM Crops*). (p.48)
Biodynamic agriculture
A method of organic farming originally developed by Rudolf Steiner that employs an holistic understanding of agricultural processes.

Biodynamics
Biodynamics is one of the first sustainable agriculture movements; it treats soil fertility, plant growth, and livestock care as ecologically interrelated tasks, emphasising spiritual and mystical perspectives.

Bioethics
Study of the ethical and moral implications of applications of biomedical research and biotechnology.

Biotechnology
The use of living things (organisms) such as plants, animals and micro-organisms to make or change products or processes. Traditional applications include animal breeding, brewing beer with yeast, and cheese making with bacteria. Recent developments include the use of enzymes or bacteria in a wide range of applications, including waste management, industrial production, food production, drug development, and remediation of contaminated land. Modern biotechnology also includes the use of gene technology, which allows us to move genetic material from one species to another.

Cross-fertilisation
Also known as contamination, cross-pollination or gene transfer, it can occur between conventional crops and GM crops. Pollen, carrying the modified gene from a GM crop, could spread to a related, conventional crop by the wind or insects. Cross-fertilisation cannot occur between GM and conventional crops if they flower at different times. In cases where they do flower at the same time regulations should be put into place to separate the crops and avoid contamination of non-GM crops. Buffer zones are used to separate crops.

Food labelling
Since December 2002, in Australia food labels must by law show if food has been genetically modified or contains GM ingredients, or whether GM additives or processing aids remain in the final food. There are some exceptions: highly refined food where the modified DNA, or proteins resulting from it, is removed during processing; processing aids or food additives, where no modified DNA or protein resulting from it remain in the final food flavours where the concentration in the final food is less than 0.1%; unintentional presence, where the ingredient is less than 1% of the food; and any foods consumed at the point of sale.

Gene editing
The newest technology for improving food plants and animals does not use genetic engineering techniques to insert or replace bits of DNA. Instead, there are genetic tricks for simply tweaking the genetic code in known ways. The code is altered to improve the growth, environmental tolerance, disease resistance or nutritional value of the organism. Gene editing is extremely efficient, and leaves no trace.

Gene technology
Gene technology is a tool of modern biotechnology. It includes a range of techniques used by scientists to switch genes off or copy them and move the copy between species. Using gene technology, scientists introduce, enhance or delete particular characteristics, depending on whether they are desirable or not. Also known as genetic engineering and genetic modification.

Genetic engineering
Sometimes called genetic manipulation or genetic modification (GM). The resulting lifeforms are often known as genetically modified organisms (GMOs).

Genetic modification
GM is any process that alters the genetic material of living organisms. This includes duplicating, deleting or inserting one or more new genes or altering the activities of an existing gene. It can be performed on microbes, plants or animals (humans included). Where this is done in humans, it is gene therapy, and only human genes are used.

Genetically modified food
Genetic modification of food is not new. For centuries, food crops and animals have been altered through selective breeding. While genes can be transferred during selective breeding, the scope for exchanging genetic material is much wider using genetic engineering. Some foods have been modified to make them resistant to insects and viruses and more able to tolerate herbicides. Crops that have been modified for these purposes, with approval in a number of countries, include maize, soybean, oilseed rape (canola), chicory, squash and potato.

Genetically modified organism
A GMO is an organism (plant, animal, bacteria, or virus) that has had its genetic material altered, either by the duplication, insertion or deletion of one or more new genes, or by changing the activities of an existing gene.

Herbicide-tolerant crops
These GM crops can tolerate higher than normal doses of herbicide. In most cases, the herbicide resistance characteristic comes from bacteria. There are a wide variety of herbicide-tolerant crops under development throughout the world. They include canola, cotton, tomatoes, potatoes, corn, sugar beet, rice and lupins. The most dominant GM crop in the world is herbicide-tolerant soybean, which comprises over half of the total area of GM crops.

Organic food
Organic farmers and food producers grow and produce food without using synthetic chemicals such as pesticides and artificial fertilisers. They do not use genetically modified components or expose food to irradiation. Some of the main features of organic farming include: it avoids artificial chemical fertilisers and pesticides; relies on developing a healthy, fertile soil and growing a mixture of crops; organic animals are reared without the routine use of drugs, antibiotics and to high animal welfare standards; and organic farming bans any use of genetically modified organisms.
WEB LINKS

Websites with further information on the topic

Agricultural Biotechnology Council of Australia  www.abca.com.au
Australian Certified Organic  http://aco.net.au
CSIRO  www.csiro.au
Department of Agriculture and Water Resources  www.agriculture.gov.au
Eco Voice  www.ecovoice.com.au
Food Magazine  www.foodmag.com.au
Food Standards Australia New Zealand (FSANZ)  www.foodstandards.gov.au
Gene Ethics  www.geneethics.org
Greenpeace Australia Pacific  www.greenpeace.org.au
IFOAM Organics International  www.ifoam.bio
Madge Australia Inc.  www.madge.org.au
Monsanto  www.monsanto.com.au
National Association for Sustainable Agriculture, Australia (NASAA)  www.nasaa.com.au
Organic Federation of Australia  www.ofa.org.au
Seeds of Deception  www.seedsofdeception.com
Truefood Network  www.truefood.org.au

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