
20. Novel and Gourmet Foods

New Zealand has a remarkable diversity in its food production and increasingly notable gourmet foods are being identified and grown for New Zealand and world markets. The following examples illustrate this diversity.

- Avocado – with production now in excess of 13,000 tonnes and exports of \$27m (fob)
- Avocado Oil – extracted by a ‘cold press’ technology that results in ‘extra virgin’ quality and from which the industry has gain over \$1m in fruit recovery form produce not suitable for export. UK-based celebrity chef Jamie Oliver has been quoted as describing olive oil as the next ‘it’ ingredient.
- Kumara – where a Dargaville based growers cooperative is producing top quality frozen hash browns, croquettes, rosti and baby kumera.
- Olive Oil – where planted area is now estimated at 2,730 hectares and equating the area of all berryfruits (2,754 hectares).
- Saffron – the most precious and most expensive spice in the world. Saffron grown in Central Otago yields up to twice that obtained in traditional saffron producing countries
- Truffles- the highly prized and priced ingredient in gourmet cooking described as “the undisputed sovereign of all gourmet foods food of the gods”, Périgord black truffles were first grown experimentally in New Zealand in 1993. Work is underway to determine how this prized crop can be produced commercially.
- Vegetable seeds industry - that has grown 20 fold in twenty years to now has export values of \$27m (fob vale, 2004).
- Huge diversity in fruit crops with examples being: Banana (lady finger variety); Blackcurrant; Blueberry; Citrus (orange, lemon, lime grapefruit orange, mandarin, and others); Feijoa; Figs; Gooseberry; Guava; Pepino and Pomegranate.



Science inputs

The New Zealand culinary oil industry aims to increase export earnings 20-fold by 2010. New Zealand’s olive and avocado oil producers are keen to protect their premium positioning by creating a new ‘elite’ category of oil above the current ‘extra virgin’ certification. HortResearch’s work is designed to help position the industry in the top one percent of the elite culinary oil market.

To underpin this objective, HortResearch will use sensory analysis to create flavour profiles that will help define the new category and differentiate New Zealand oils. It will also help identify ethnic taste preferences to help the industry tailor products to specific markets.

Crop & Food Research's Food Development Centre food technologists, microbiologists, and specialists in rheology, extrusion, extraction, flavour, shelflife, packaging and sensory evaluation are developing Innovative value-added food products in partnership with manufacturers.

Both CRIs are playing an increasing role in assisting Maori develop value from their land and traditional foods. Crop & Food Research, for example, have research projects underway on the Maori potato, Taewa, and advised on flavours for the recently-released Taa Kawa ale.

Avocado

- The avocado was recognised by the Aztecs as a health enhancing fruit, for its nutritious food qualities and as a skin care treatment.
- NZ avocado industry is expanding rapidly from 1500 hectares and 7,200 tonnes production in 1999, to 4000 ha and 13,258 tonnes in 2004.
- Crop value has increased from \$31.9 million in 1999 and increased to \$40.9 million in 2004 of which exports were \$27m (fob). Many trees are yet to reach full production growth.



Avocado Oil

- Avocado oil is an outstanding example of New Zealand ingenuity.
- The volume of fruit that does not reach export standards is increasing as avocado production increases and the NZ market remains of limited size.
- Export 'over runs' are used for processing to extract the oil for culinary purposes. Because of the cost of obtaining high quality raw material, avocado oil as a food has primarily been produced only in small quantities and has not had a high profile.
- Avocado oil's distinguishing features include a high smoke point, making it suitable for quick searing of food, and 75 percent mono-unsaturated cholesterol-reducing properties.
- Avocado oil produced overseas (Mexico, South Africa and Israel) is normally solvent-extracted from poor quality waste fruit that has already begun to deteriorate. The oil is then refined, bleached and de-odorised and used mainly for the manufacture of cosmetics.
- In New Zealand however, avocado oil is produced using 'cold press' (less than 45°C) technology. Ingenuity is the ability to innovate and create "break through" products.
- Using 'cold press' extraction technology, oil of 'extra virgin' quality can be obtained, as little if any deterioration/oxidation occurs in the process.
- In the 2000-2001 season 1,200 tonnes of export over-run avocados were processed from which 160 tonnes of oil was produced.
- Since processing of avocados commenced the industry has benefitted by about \$1 million.
- Extra virgin avocado oil is very stable and has a higher smoke point (255°C compared to about 200°C for olive oil) than extra virgin olive oil so is popular for baking, for barbeques and for pan frying fish, poultry and venison.
- Avocado is an ideal alternative for olive oil in the healthy "Mediterranean diet" because of its high beneficial monosaturated fatty acids and its low polysaturated fatty acids.
- Avocado oil is now being manufactured containing various infusions including addition of peppers, garlic or limes.
- Avocado appears to have a dietary affect; avocado in a smoothie seemed to reduce desire for between-meal snacks.
- Celebrity chef Jamie Oliver was quoted in *ABC Delicious* magazine saying, "avocado oil is the next 'it' ingredient".
- The avocado is the only other commercially significant tree crop with an oil content similar to olives. New Zealand company *Olivado* is the first in the world to develop an extra virgin avocado oil, which could rival and perhaps surpass olive oil for its health-giving and culinary qualities.

Olive Oil

With significant production, the New Zealand olive oil industry is also burgeoning. With the intensity of the fruit flavours that are found in the country's Sauvignon Blanc, the taste of New Zealand's olive oil is unmistakably different to that of its European counterparts.

Planted area in olives in 2002 was estimated at 2,730 hectares which equates to a similar area as all berryfruits (2,754 hectares).

Profile: Olivado

Avocado oil maker Olivado upgraded its Kerikeri plant and also set up a new, \$6 million purpose-built factory in Queensland to meet year-round demand for its products.

"The seasons in each country are the exact opposite so we have all-year-round supply, and by having production in two countries we minimise risks should one be affected by horticultural events," managing director Chris Nathan says, "and we can make more oil, because the Australian crop is larger than New Zealand's".

British supermarket chain Sainsbury's has recently added the company's chili and bellpepper-infused avocado oil to its product line. Large food chains in the United States also stock Olivado's products. Asia provided key export markets, with buyers there more familiar with avocados.

Olivado says sales could quadruple to \$10 million following its expansion.

Olivado has won several food and marketing awards since it established its first New Zealand plant in 2000. They include the Massey University premier food award in 2002 and the category prize for best gourmet food in the same year. Award judges said processing of the product was revolutionary, because the company took active involvement in equipment design.

"Basically, it's better processing techniques and it all comes down to better research into what affects avocados," says Mr Nathan. "We have ongoing programmes."

Science expertise

Culinary oils

The New Zealand culinary oil industry aims to increase export earnings of about \$ 2 million a year 20-fold by 2010. HortResearch's work is designed to help position the industry in the top one percent of the elite culinary oil market.

New Zealand's olive and avocado oil producers are keen to establish scientific proof of the health benefits of their oils and to protect their premium positioning by creating a new 'elite' category of oil above the current 'extra virgin' certification.

To underpin this objective, HortResearch will use sensory analysis to create flavour profiles that will help define the new category and differentiate New Zealand oils. It will also help identify ethnic taste preferences to help the industry tailor products to specific markets.

Other Foods

Innovative value-added food products are being developed in partnership with manufacturers through Crop & Food Research's Food Development Centre.

Crop & Food Research has food technologists, microbiologists, and specialists in rheology, extrusion, extraction, flavour, shelflife, packaging and sensory evaluation. Product reformulation staff are experienced in adjusting ingredients to meet marketing and label requirements without changing the taste, texture and consistency of a product.

Crop & Food Research are keen to play an increasing role in assisting Maori develop value from their land and traditional foods. They have research projects underway on the Maori potato, Taewa, and advised on flavours for the recently-released Taa Kawa ale.

Kumara

A Dargaville growers' co-operative, Delta Produce, is adding value to kumara by developing top quality, frozen hash browns, croquettes, rosti and baby kumara. The new frozen kumara products are sold under the *Kauri Coast Kumara* label.

Andre de Bruin, R&D manager at Delta Produce, says, *"We'd still be thinking about our vision if it hadn't been for the assistance we received research funds from TechNZ and Agmardt."*

Together, scientists at Crop & Food Research and Massey University developed a system to produce semi-processed kumara with consistent colour, taste and texture. This work provided the kumara ingredient being used in the manufacture of Kauri Coast's frozen kumara products.

"The work on raw produce variation was outstanding, giving us a much better understanding of kumara. It provided the platform to produce consistency in processing," Mr de Bruin says.

Crop & Food Research Dr Steve Lewthwaite led research on controlling raw product variation, while Palmerston North colleague, Allan Hardacre, led work on control in processing kumara.

Purple Kumara

A new variety breed to have unique characteristics to improve end product attributes and function (e.g. high dry matter, low sugar content and high antioxidant content).

Saffron

- Saffron is the most precious and most expensive spice in the world. Saffron has been used for many centuries and was known to the ancient Syrians, Egyptians and Cretans and in the Babylonian Empire. First recorded use was by Dioscoride, a Greek doctor, in the first century AD. In Mesopotamia saffron was used for curative purposes; the Phoenicians used saffron to dye clothes; in ancient Rome it was used both as a treatment and a dye as well as for perfumes and oils.
- During Middle Ages and following centuries trading of saffron was subjected to very drastic rules because of its great 'rarity' and consequent demand. It was the cause of the "Saffron War" in 1374. Saffron is now cultivated widely in Mediterranean countries as well as India and Iran.

- Saffron filaments, or threads, are actually the dried stigmas of the saffron flower *Crocus sativus*, a perennial bulb that originated in southern Europe and Asia Minor. Each flower contains only three stigmas. These threads must be picked by hand from each flower. More than 50,000 of these stigmas are needed to produce just 100 grams of red Saffron.
- Because of saffron's strong colouring power and intense flavour, it can be used sparingly. It is used both for its bright orange-yellow colour and for its strong, intense flavour and aroma.
- Saffron contains crocin (a carotenoid), the source of its strong coloring property, picrocrocetin (or bitter-crocetin), which provides the distinctive aroma and taste together with crocetin and essential oils that are responsible for its therapeutic properties.
- Because of being triploid, saffron is necessarily sterile, and its beautiful flowers cannot produce any seeds. Propagation is possible only via corms.
- Saffron has been grown in Central Otago, with an average yield from established crops of 3.7 g/m³ that corresponds to 24.3 kg/ha, up to twice that obtained in traditional saffron producing countries. Saffron is also being grown in other New Zealand provinces including Nelson and Canterbury.
- Although the total amount harvested may sound meagre, saffron is the world's most expensive spice and retails for around NZ\$24,000 a kilogram (0.25g = \$5.99 retail NZ).
- At the above yield for the levels attained in Central Otago, this equates to over NZ\$580,000 per hectare when priced for retail consumer packages.
- Saffron contains two important vitamins: riboflavin with values ranging from 56-138 µg/g, the highest concentration found in any food; thiamine with concentrations ranging from 0.7-4.0 µg/g, an average value for many foods. The value for health purposes is low however because of the amount of saffron that would have to be ingested.
- The compound crocetin is one of the most important ingredients in saffron. It is a carotenoid but has no provitamin properties. Pure saffron consists of red crystals that create a yellow colour when dissolved.
- Saffron has aroused much interest because of its pharmacological properties. It modifies gastro-intestinal function, stimulating appetite; preventing gastro-intestinal atony and can cause wind. Saffron is useful in treating respiratory system, mostly chronic bronchitis and it sedates coughing.
- Some of the most remarkable effects of saffron have been attributed to crocetin that increases the speed of oxygen transport and diffusivity in the body. Crocetin acts in a range of situations such as arteriosclerosis; increase in pulmonary oxygenation, haemorrhages, fermentation, cell reproduction, arthritis and tumours. These health beneficial effects have been found in animal studies and have not yet been confirmed on humans.



Truffles

History and folklore surrounding the fascinating world of the Périgord black truffle the delicate, mutually beneficial relationship that forms between this fungus and its host tree.

A potential export earner, this highly prized and priced ingredient in gourmet cooking, truffles have been described as "the food of the gods" and "the undisputed sovereign of all gourmet foods". They have a distinctive taste ranging from strong mushrooms through to rum and liquorice.

Périgord truffles were first grown experimentally in New Zealand in 1993 - the first in the Southern Hemisphere - and Crop & Food Research scientists are well advanced in determining the important factors in managing a truffle plantation, including climatic and soil requirements, and cultivating and harvesting black truffles.

Crop & Food Research have also researched edible mycorrhizal mushrooms and their cultivation.

Vegetable seed industry

- New Zealand's exports of vegetable seeds have increased more than 20 fold in the past 20 years;
 - 1980: \$1.2m
 - 2004 \$27.5m (fob)¹²
- Contract hybrids seed production by European companies; much in brassicas and carrots.
- Seed is a quality product of high value with a low moisture content.
- Canterbury grows 50% of the world's radish seed.

The diversity of food types that New Zealand can grow is huge. On the following pages we have reproduced descriptions of 44 different fruit category crops that are available from just one New Zealand nursery. The diversity of vegetable crops available is also increasingly diverse.

¹ Source: NZ Horticulture Facts & Figures 2004; Statistics NZ

² In 2004 NZ fresh vegetable exports were \$218.5m (fob) with a further \$265.5m in processed form (frozen, canned, etc.)

	Popular name	<i>Botanical name</i>
	Food Value / commentary	
1	Avocado Fuerte	<i>Persea americana</i>
	Rich in oil (mono-unsaturated), protein and Vitamins A and B. Low in sugar and cholesterol.	
2	Avocado Hass	<i>Persea americana</i>
3	Avocado Reed	
4	Banana Mons-Mari	<i>Musa acuminata</i>
	Various selections of "Lady's Finger" types which are quite hardy, have been around for years in NZ gardens.	
5	Berry Delight™	<i>Hybridberry Marahau</i>
	High in antioxidants. Rich in Vitamin C.	
6	Blackberry	
7	Blackcurrant	<i>Ribes Nigrum</i>
8	Blueberry Muffin	<i>Vaccinium corymbosum</i>
	High in antioxidants. Light blue fruit. Crops in December and again in March/ April. Producing heavy crops of medium sized berries.	
9	Blueberry	<i>Vaccinium sp</i>
	Blueberries are classified into 3 major species (i) Highbush blueberry (<i>Vaccinium corymbosum</i>) mostly grown commercially (ii) Lowbush blueberry (<i>Vaccinium angustifolium</i>) very limited in New Zealand, and (iii) Rabbiteye blueberry (<i>Vaccinium ashei</i>) grown for Garden Centres as low chill characteristic.	
10	Boysenberry Bay Suprise	<i>Rubus hybrid</i>
11	Cape Gooseberry	<i>Physalis peruviana</i>
12	Casana	<i>Cyphomandra casana</i>
	Comes from Equador, with sweeter fruit than its close relative, the Tamarillo.	
13	Casimiroa	<i>Casimiroa</i>
	Native of the Mexican highlands; reputed to be one of the heaviest bearing of all fruiting trees; seldom bothered by Pests and diseases; produce orange sized fruit with a flavour described as "rich sweet and musky, resembling a combination of peach, banana and pear with a smooth texture".	
14	Chilean Guava	<i>Ugni molinae (Myrtus ugni)</i>
	Very popular in the 1800's in England	
15	Citrus	<i>Rutacea (citrus fruit family)</i>
	High in Vitamin C; several varieties available, including hybrids from Tangelo, Mandarin and Tangerine	
16	Cocktail Kiwi	<i>Actinidia arguta</i>
	High in Vitamin C and dietary fibre with good levels of Vitamin E and antioxidants. Has been in cultivation in the USA since the early 1900's. Some similarities to traditional kiwifruit – but no hairs so the Cocktail Kiwi can be eaten skin and all like a grape.	
17	Coffee	<i>Coffea arabica</i>
	Coffee cherries start off green and ripen over 6 to 9 months to yellow red and then almost black. Harvest when almost black, dry in the sun, then separate the seed from the cherry by breaking away the husk before roasting.	
18	Cranberry	<i>Vaccinium sp.</i>
	High in anti-oxidents and other natural compounds. Good source of Vitamin A and C	
19	Feijoa	
	Feijoas originally from Central America, plants now used are believed to come from a single collection of material that went back to France with some of the early explorers.	

- 20 **Figs** *Ficus carica*
Most varieties in New Zealand are believed to have been introduced by various European immigrants in the 19th century. New Zealand selections include: *Brown Turkey* (slightly bronze coloured fruit); *French Sugar* (dark skin with purple stripes when mature); *Vlassoff* (from the group known as "Honey Figs"); *Brunoro Black* (very dark skinned, red flesh: similar to Celeste or Malta); *Mrs Williams* (dark purple red skinned fruit with a deep carmine flesh).
- 21 **Giant Granadilla** *Passiflora quadrangularis*
Good amounts of Vitamin A, protein and carbohydrates.
- 22 **Gooseberry Invicta** *Ribes sp.*
- 23 **Grape Schuyler** *Vitus hybrid*
A sweet black table grape
- 24 **The Guava** *Psidium Guajava*
Rich in Vitamin C. Contrary to its common name - Tropical Guava, The Guava can recover from moderate to severe frosts. Tasty fruit eaten fresh or use for jams, juices or cooking. Guavas are and therefore, ideal for the children's lunch boxes to ward off the common cold.
- 25 **Hybridberry** *Hybridberry Marahau*
High in antioxidants and rich in Vitamin C. Large dark rich red fruit with boysenberry/ loganberry flavour – plant is thornless. Also promoted as 'Berry Delight™'
- 26 **Inga Bean** *Inga edulis*
Known also as The Ice Cream Bean, its fruit pods are like an over grown bean and contain a sweet edible white pulp.
- 27 **Japanese Raisin Tree** *Hovenia dulcis*
Grown widely across China, Japan and the Himalayas; white clusters of flowers in spring are followed by fruit in autumn. The edible part is the swollen stem which holds the seeds.
- 28 **Limequat**
High in Vitamin C; a hybrid between West Indian lime and a Kumquat.
- 29 **Loquat** *Eriobotrya japonica*
A variety of this small tree producing yellow fruit is promoted as 'Loquat Wiki® Gold'
- 30 **Mountain Paw Paw** *Carica pubescens*
- 31 **Naranjilla** *Solanum quitoense*
One of the lost fruits of the Incas. Fruit is medium in size and bright orange when ripe; pulp is green, juicy, slightly acid "resembling a cross between pineapple and strawberry".
- 32 **Olives** *Olea*
Olives for oil production are harvested when black; but for pickling some varieties are picked when changing from green to greenish yellow. Dual purpose varieties include Manzanillo, Barnea and Koroneiki.
- 33 **Orangeberry** *Rubus pentalobus*
From the same family as Strawberries and Raspberries
- 34 **Passiflora antioquiensis** *Passiflora antioquiensis*
Sometimes referred to as the "Red Banana Passionfruit"
- 35 **Passionfruit Black Beauty** *Passiflora edulis*
Good amounts of Vitamin A, protein and carbohydrates
- 36 **Pepino** *Solanum muricatum*
Pepino El Camino: a "recent" discovery from Peru and Chile where often prepared as a vegetable rather than a fruit. Medium to large egg-shape fruit resembles a rock melon in flavour. The potential for improvement by breeding has been explored by HortResearch with a wide range of forms currently under evaluation.
- 37 **Pine Nuts** *Pinus pinea*
Good amounts of protein and carbohydrates. High in monounsaturated fats.

- 38 **Pomegranate** *Punica grantaum*
A native from Iran to the Himalayas in northern India and cultivated since ancient times, has fruit about the size of an apple, but with a leathery, deep red to purplish red hind. High in antioxidant health properties, the juice has become popular in natural and cocktail drinks
- 39 **Raspberry** *Rubus idaeus*
Locally promoted varieties include Raspberry Aspiring and Raspberry Waiau
- 40 **Red Cherry Guava** *Psidium littorale var. longipes*
Rich in Vitamin C, the Red Cherry Guava was popular in the mid 1900's as both a fruit tree and a bird feeding tree (very popular with NZ wood pigeons).
- 41 **Strawberries** *Fragaria hybrids*
The Romans mentioned them as a wild plant, but it was not until the 13th century that strawberries were recorded as growing in gardens. In the early 1700's *Fragaria chiloensis*, which occurs from Alaska to California, and from Peru to Chile was brought into cultivation in France after 5 female plants were brought back to France from Chile. This line of plants eventually crossed with *Fragaria virginiana* from the eastern United States in a French garden in the early 1800's producing a larger fruit which was given the name *Fragaria x ananassa*.
Most plants had been grown from seed and it was not fully understood that some of the species tended to be either male or female plants. Some time before the 1850's the hybrid strawberries lost their gender based breeding habits and became self fertile. Once this occurred the commercial strawberry crop increased rapidly wherever market gardening took place. Disease problems in the 1950's precipitated the breeding of disease resistant forms, so that today healthy plants are produced for home garden trade and commercial growers.
- 42 **Sweet Granadilla** *Passiflora ligularis*
Regarded by some as the most delicious of all passionfruit.
- 43 **Tamarillo** *Cyphomandra betacea*
Good source of vitamins A, B6, C and E and rich in iron and potassium. Low in calories and high in dietary fibre. Local varieties promoted include *Bold Gold*, *Red Beau*, and *Ted's Red*
- 44 **Yellow Cherry Guava** *Psidium littorale var. littorale (P. lucidum)*
Rich in Vitamin C.

Source: Tharfield Nursery Ltd 'Incredible Edibles®' <<http://www.edible.co.nz>>

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This case study is one of a 21-part case study series aimed at demonstrating the value of science and innovation in New Zealand's leading edge bio-science industries... and their significance to New Zealand.

Martech Consulting Group is a strategic consultancy based in New Zealand. The **growingfutures** case study series was in part based upon Martech's extensive work with sector representative groups, science providers and organisations that interact with science providers to achieve consensus on co-ordinated actions, improve governance, develop sector-based strategies and improve innovation processes.

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