The Adoption and Use of Technology in Food Production:
Maori Experiences and Perspectives

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Introduction

Traditional Maori practices, values and spiritual beliefs associated with “tikanga Maori”\(^1\) have been revisited and reviewed by both Maori and non-Maori researchers as a result of relative submissions made by Maori, to the Royal Commission's inquiry into Genetic Modification in 2000 and more so in response to recommendations made and reported by the Commission in 2001.

Since that time, research into aspects of “tikanga Maori” has been undertaken by various Crown institutions involved with scientific research, as part of a strategy employed by these institutions to develop politically correct working relationships with Maori in a way that amalgamates cultural protocols that are highly esteemed by Maori. Some Maori groups have embraced these opportunities as a possible means of capitalising on the offers to work with these institutions and/or a means to ensure that Maori protocols are being maintained and respected.

This report is a literature review that explores the adoption and use of technology in food production, Maori experiences and perspectives and associated issues. It has been written as a summer studentship project jointly funded by FRST projects “Sustainable Decision Making for Future Foods” and “Te Hau Mihi Ata: Matauranga Maori and Science”.

The report is divided into 5 sections. Sections 1 and 2 propose; 1) an overview of Maori food production in a historical context, relative to; 2) historical progression of Maori adoption and adaptation of new technologies in production.

Sections 3, 4 and 5 of the report explore; 3) examples of Maori contemporary involvement with food production and new technologies; 4) Maori perspectives on biotechnology and; 5) Maori perceptions of future food production and the use of biotechnology or nanotechnology.

This report observes five key points regarding historical and contemporary perspectives relative to the cultural values associated with Maori food production and adoption of new technologies:

1) Maori were able to subsist without European introduced technology within the framework of their own developed social systems, governed by their own cultural belief systems. The successful governance of traditional Maori society was attributed to the stronghold of Maori spiritual beliefs. These spiritual beliefs subsequently influenced cultural strategies and methods of prehistoric Maori food production.

2) Historically the expense of change and adaptation in general, for Maori, resulted in the forsaking of many of their former traditions in order to initially adapt to a changed society, and/or capitalise on potential economical benefits post European colonisation of New Zealand. Since the dissolution of traditional Maori societies and eventual integration of Maori with Europeans into a bicultural social system, Maori from the late 19\(^{th}\) and 20\(^{th}\)

centuries proved themselves to be not only resilient, but have also demonstrated that they successfully adapted and adopted a vast array of food technologies into their way of life.

3) Historical cultural perspectives and sentiments of “loss” associated with traditional cultural values concerning primary food production appear to be balanced against the adoption of socioeconomic values and perceived “gain” which resulted in many former cultural practices being replaced for Maori to economically benefit from the new technologies employed for food production.

4) Two questions for further research;
a) What were the precepts historically, which determined cultural revolution within Maori society, regarding tikanga Maori and how traditional spiritual beliefs, were applied or modified with the adaptation and adoption of introduced technologies?

b) Considering historic adaptation and adoption of new technologies for food production by Maori and subsequent changes in cultural values, are contemporary representations of traditional spiritual beliefs concerning the use of biotechnology and nanotechnology in food production accurate?

5) There is great difficulty trying to accurately link historical perceptions of cultural values with contemporary values when considering the two questions raised in point 4) and the observation that contemporary Maori perspectives concerning the applications of biotechnology and nanotechnology are diverse and have not been thoroughly researched in relation to food production.
1. Historical context

1.1 Te ao Maori and Maori food production

Cultural protocols practiced by Maori were observed and studied by some early European explorers and settlers to New Zealand, which consequently contributed to the publication of much classic literature in the late 19th and early 20th centuries. Much of this classic literature has been and still is largely used to substantiate or align contemporary representations of traditional Maori culture and values. It is evident, when reading through a wide range of classic and contemporary literature, that the spiritual and cultural principles concerned with historic food production prior to European colonisation, were basically part of an integral system that encompassed and governed Maori culture as a whole.


This report contains a wealth of researched information significant to prehistoric Maori society and its governing values which is presented in 3 parts;

1. Traditional Maori concepts and customary law or tikanga
2. Eight case studies
3. A collection of behaviours, philosophies, emotions and cultural influences

The report effectively denotes key aspects of “Te Ao Maori” and describes the intertwined characteristics of the spiritual and natural belief systems that Maori embraced as an elemental feature of their traditional culture. The composition of the report aptly echoes the logic that “tikanga, values, principles, and group dynamics need to be carefully examined in order to gain an understanding as to why such importance was bestowed on these values by Maori”.

“To understand a society, one must look inside its thought concepts, philosophy and underlying values and avoid interpretation from an outward appearance. It is the values that establish the cultural norms of a society. Also it is upon these values that the integrity, harmony and balance of a society is based. Values may represent ideals not necessarily achievable but rather something to which we collectively aspire”.

(MoJ: 2001: Appendix 2)

There have been further analytical explications of the cultural concepts generally described in MoJ (2001), published by other authors at a later date in the course of their

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2 Traditional Maori concepts, examines the dominant social controls governing Maori life. These include korero tawhito (ancient traditions/Maori world view), whakapapa, whenua, tapu, mana, and utu. The aim of this section is to provide an understanding of these key concepts.

3 Contains eight case studies of dispute resolution. It presents illustrations or manifestations of the concepts identified in Part One, as they applied in traditional and contemporary Maori society. The case studies begin with an oral account given by kaumatua of a specific event that resulted in a resolution. An analysis of the dispute or offence follows, ending with a list of principles or values which emerged from each case. They clearly show how the applications of the key concepts have been used in resolving disputes.

4 Aims to examine traditional behaviours, philosophies, emotions and cultural influences positive and negative. Many of these have never been written down before. These are a collaboration of behaviours and emotions that are reflected in everyday life, and they also illustrate the Maori psyche.
own research, an appropriate example is demonstrated in Joseph (2008). This publication is to be considered as a functional resource for the purpose of reviewing historic Maori food production within a cultural governance, for the most part because it is well referenced and cross referenced for quick deduction of concepts pertaining to complex features of traditional cultural beliefs as they were applied to practical characteristics of Maori life, or “the Maori way of doing things”.


Mead proposes that this book provides a scholarly background concerning tikanga Maori which he deems necessary for good relations concerning Maori and the land in which they live. The publication contains extensive description and portrayals of tikanga Maori providing an in-depth contemporary conception of the principles involved. Mead’s bibliography contains an extensive list of literature cited throughout his work, which includes nine of Eldon Best’s publications, Peter Buck (Te Rangi Hiroa) and the Ministry of Justice report (2001).

1.2 Prehistoric Maori food production


Colenso recites a detailed account into the Maori world, a world he seemed to understand and yet studied attentively in an effort to present a comprehensive record of Maori vegetable production together with an extensive botanic taxonomy of plants cultivated or procured by Maori for food supply. His work has formatted the basis of many latter publications concerning aspects of Maori food procurement, processing and production. Colenso qualified his knowledge on this topic in part, because of his prior long term residency in New Zealand and firsthand involvement with Maori. His writings often reflect this experience as he writes about various methodologies he has observed concerning Maori food production which does portray relative cultural behaviours of Maori within the era of which he reports in this paper. The following excerpt illustrates how Colenso describes such observations:

“In those plantations all worked alike: the chief, the lady and the slave; and all, while so engaged, were under a rigid law of minute ceremonial restrictions, or taboo, which were invariably observed. Fortunately for them, the modern unnecessary and expensive indulgence, or evil, of tobacco was wholly unknown! And there was nothing of a similar time-consuming nature known to them to have taken its place. It was a pretty sight to see a chief and his followers at work in preparing the ground for the planting of the kumara. They worked together, naked, (save a small mat or fragment of one about their loins), in a regular line or band, each armed with a long-handed narrow wooden spade (koo), and like ourselves in performing spade labour, worked backwards, keeping rank and time in all their movements, often enlivening their labour with a suitable chant or song, in the chorus of which all joined.” (Colenso, 1880: p.9)

Best (1925) and (1941) provide extensive detailed descriptions of procedures practiced by Maori relative to agricultural food production, and food procurement from the natural environment. Best (1916) more proficiently than Colenso, describes in comprehensive detail, methods of food processing and storage relative to the vast range of food procured, processed and consumed by Maori. Descriptions and illustrations of storage facilities are also included revealing the extent of which the culture embraced spiritual and cultural values influenced practical necessities. Colenso and Best appear to incorporate as much as was understood by them from an ethnological perspective, significant interpretation of the associated traditional ritual attached to various aspects of food production. Both authors write extensively about kumara production however Best (1925) exceeds Colenso in his depiction of this particular aspect of Maori food production.

1.3 Maori cultural beliefs and kumara production

In weighing up early Maori cultural beliefs and kumara production, it is conceivable why especially kumara, as a food source, was also esteemed by Maori for sacramental reasons. The coexistence of primary subsistence strategy concerning, 1) physical methods of sustainable food production and 2) applicable spiritual principles such as whakapapa$^6$ and mauri$^7$, could be distinguished as the principal cultural feature of Maori belief systems which contributed to the sustained production of tuberous staple crops introduced by ancient Maori ancestors, such as the kumara which could only be propagated vegetatively. This example illustrates a key element of Maori spiritual culture when combined with prudent methodology in the physical world, having successfully enabled the preservation of an ancient food resource. Colenso and Best write extensively concerning the ceremonial aspects involved with kumara production and storage. These described ceremonial processes combined with systematic preservation of seed tubers, enabled Maori to sustain species of plant foods eaten by their ancestors in other lands prior to migration.


Buck also presents expositions of similar context to Colenso (1880) and Best (1925) pertinent to Maori food production and traditionally related protocols, in fact he cites them both in the course of this publication. Buck indicates his preference to rely upon

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$^6$Royal (1992) describes whakapapa, or genealogy as, “the foundation of Maori society”. From a Maori perspective, an appreciation of whakapapa is central to human connections with the environment and links the different parts of the natural world. A number of values or principles stem from whakapapa, guiding the way in which Maori see and treat the land and other resources (Roskrug, 2006). A traditional Maori worldview is based on whakapapa and represents a means for describing and relating aspects of the world we live in (McFarlane, 2007: 11).

$^7$“Mauri is the life principle and wairua is the spirit. The mauri of a thing is to be respected. People cannot alter or fundamentally change the character of things without the appropriate karakia to the associated kawai tipuna. Further, they have to provide evidence that the change is necessary for the wellbeing of the related people. If the mauri is not respected, or if people assume to assert some dominance over a thing, it will lose its mauri, i.e., its vitality and force, and those who depend on it would ultimately suffer” (Ministry of Justice, 2001).
material evidence such as the detailed studies of museum pieces and excavated artefacts, in order to facilitate a substantiated portrayal of pre and post colonial cultural history of Maori. Buck, like former authors, including Colenso and Best explicates the imperfections pertaining to oral accounts which represented the only Maori source of pre-colonial knowledge concerning prehistoric Maori traditions and culture.


Shawcross represents a more practical and direct context of Maori food production, citing Colenso (1880) and Best (1925) omitting much of the ceremonial aspects described by both authors, in an effort to suggest that the primary vegetable staple consumed by Maori was fern-root (Pteris esculenta) and that horticultural produce would have been a secondary. Shawcross includes a useful table representative of an annual calendar typifying Maori food procurement/production activities in accordance with seasonal planting, harvesting times, hunting, fishing and other food gathering processes. The information in the table highlights another practical and yet critical aspect of Maori food production to consider, which was, the need for strategic organisation and appropriate delegation of the various tasks according to Maori protocols, within the collective groups, in order to successfully achieve adequate food supply for survival of the people. Seasonal availability of cultivated foods is well depicted in Shawcross and justifies her rationale in context.

It is widely accepted that prehistoric Maori had adapted to environmental changes concerning the colder climate upon migration to Aoteroa New Zealand. Limited availability of crops from introduced cultigens which they bought with them, due to cooler climatic conditions, saw the necessary adoption of the fern root into the Maori diet and no doubt many other different types of foods.


Lambert comments on the seasonal aspects of Maori subsistence and then the success of Maori introducing the kumara to New Zealand. Lambert cites the following:

“Archaeological evidence and Maori oral history point to the seasonality of Maori subsistence which by the time of contact was an intimate and highly adapted eco-cultural resilience that had evolved from the island-dwelling geohistory of East Polynesia.”

Lambert provides an archetypal exemplar of the “innovative survival characteristics” of ancient Maori and how they contributed to aspects of successful food production, in the following comment:

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“An example is the hard-won success of introducing the tropical kumara that required a two-fold adaptation: the first was to Aotearoa/New Zealand’s temperate climes; the second was a series of innovations in storage and protection of plants and tubers from extremes of temperature and post-harvest degradation.”

Lambert also reviews theories of significant historical context relative to assumptions previously made by former authors concerning the adoption of European innovations by Maori and relative social dynamics. (2.2.1. Colonisation: the Maori adoption of European innovations; pp. 16-36)
1.4 Responsibility of ensuring food supply/subsistence

A social hierarchy governed Maori society. An obligation to ensure food supply sufficient for subsistence fell upon the chiefly representatives within this hierarchy and "mana" an imperative characteristic of Maori chieftainship, was enhanced or diminished according to failure or success of this major task. It would be therefore, reasonable in the practical sense, to consider that accessible food supply and the continuation of adequate food supply for the primary subsistence of Maori would have been predominant features which subsequently could have influenced or changed features of spiritual ordinances that impinged upon efficient food production.

1.5 Evolutionary phases of belief processes applicable changes in Maori food production

Within classic and contemporary literature there is contained extensive recitation of Maori cultural tradition and spiritual beliefs, however there must have existed evolutionary phases of these belief processes applicable to the practical changes in food production as Maori adopted and adapted new technologies. Which leads to the question; how did Maori mythological genus, the heart of “Te ao Maori – the Maori world” evolve accordingly to encapsulate these physical adaptations and adoptions of new technologies? This question also proposes fallibility issues concerning contemporary perspectives relative to the preservation of Maori traditional and spiritual beliefs and how they are applied in context to the introduction of new food production technologies.

1.6 Limitations, ambiguity and alignment of traditional cultural/spiritual values relative to adaptation and adoption of new technologies


Williams attempt to represent a Maori perspective on resource management principles practiced by pre-contact Maori. Williams describes various limitations he experienced during the course of his research concerning accessing and representing Maori traditional knowledge from Maori sources. He writes:

"The main limitations imposed .... A number of Maori people are not ready to release their knowledge to the world, and others are not prepared to be identified as sources of cultural knowledge. Some would not agree to follow University ethics procedures on the grounds that they are inconsistent with Maori attitudes to knowledge.... the writer was denied permission by kaitiaki to use oral and written material, or restricted in his use of it....... I was denied permission to quote from ancestral

11 "A social hierarchy governed Maori society, which determined the rank and standing of an individual and how notions of justice would affect them. The rangatira, tutua and tohunga class were based on seniority of descent. Notions of collective responsibility also played a role in how the individual functioned within the wider group and observed their responsibilities in relation to the wider group (Ministry of Justice, 2001)"

12 Author’s * note: The existence or non existence of Maori philosophy concerning the evolutionary phases described needs to be further researched because it may be useful when consulting with Maori about future development of food technologies and Maori cultural/spiritual beliefs.

13 * See comments by Holman (2007) later reviewed in report

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documents and, in one important case, to copy from a significant map of mahika kai sites.... Kaitiaki groups did not wish details to be widely available lest their rights to those resources be contested by other Maori or Government agencies. Similarly, some interviewees chose not to be identified or quoted in the text. Accordingly, several “personal communication” references must be left vague. The use of oral information introduces a further limitation. Due to the pervasive effects of colonisation, very few folk now living have a thorough knowledge of the philosophy that underpins some traditional concepts. My “why” questions often elicited the answer “it was the old-people’s way”, leaving me to infer reasons. This may sometimes have been because the informant was concerned about misuse of the information. Nevertheless, although the researcher may not be told actual reasons, parallels can be drawn with other practices or other cultures. Inference can provide pieces of the jigsaw if they link to concrete evidence, and will be clearly signalled in the text.” (Williams, 2004: p.11)

Williams being of Maori descent himself, indicatively attempts to represent a somewhat Maori adaptation of historic Maori resource management, however due to the limitations he mentions, it appears throughout the dissertation that he relies upon evidence documented predominantly by former European authors or institutions to substantiate his hypothesis. This paper does however; contain some useful and significant depictions of the South island areas that were historically used by early Maori for food resources along with lengthy explications pertinent to cultural values associated with kaitiaki and land resource management.

Maori food production in the historical context is largely represented and influenced by anthropological rationales and archaeological evidence. There is an abundance of literature available, with many authors referring to or citing the few classic authors reviewed in this part of the report concerning Maori food production, particularly Eldon Best.


Eldon Best is suggested by Holman, to have influenced contemporary representations with his extensive list of publications concerning Maori culture as a whole which is portrayed throughout Holman’s 482 page thesis. He makes the following comments in the introduction concerning Eldon Best:

“His biographical influences, both Pakeha and Maori are also examined, and the ways they combined in his aims, to produce an overriding literary image: the mythopoetic Maori. The study charts the transformation of Best from a pioneering ethnographic fieldworker to the great white tohunga of the Dominion Museum in Wellington. Best is revealed as the most important of the early New Zealand ethnographers and the father of received versions of Maori culture.”

Holman’s work contains extensive review of historic authors who were influenced by and cited Best in their own works. Of particular interest concerning evolutionary spiritual concepts is the following extract (Holman, 2007:333):
“In part (b), the examination of Best’s work on mauri in the post-mortem literature (1931 onwards) focuses on the link between mauri and the supreme being Io in Best, and later in modern Maori theology (atuatanga), as a vital element in an evolving spiritual identity. Special attention will be paid to the writing of post-1970 authors such as Maori Marsden, Cleve Barlow and Hirini Moko Mead, as shaping influences on modern day concepts of tikanga Maori and kaupapa Maori.”

Whilst the focus of this report (Raskin, 2009) does not aim to analyse the validity of historic literature, Holman’s work does substantiate the potential requirement to reconsider the substance in which contemporary Maori have based certain cultural perceptions and values and perhaps realign these perspectives relative to historic events of change such as the adoption of new technologies in food production. Even Mead, who writes about tikanga Maori (Mead, 2003) cites from nine of Best’s published works.


Roberts et al. furthermore suggest that latent ethnocentrism reawakened by colonialism remains deeply imbedded in European societies and states:

“There is a latent unwillingness to consider indigenous paradigms from the inside out, rather than evaluating them in western terms. And secondly, there is sometimes manifest an overt hostility when confronted with indigenous ways” particularly if these conflict with the western paradigm. However, some of these efforts at accommodation with indigenous perspectives whilst commendable in principle, fall victim to several inherent dangers. Perhaps the least innocuous is the propensity to romanticize indigenous knowledge, by falsely assuming that these belief systems contain long lost wisdoms universal to peoples of all cultures. More serious are the problems which can arise through efforts to assimilate or integrate the two world views into a single new system...”

1.7 Evolution of Maori spiritual perceptions concerning the adoption of new technologies

We have limited Maori representation when trying to establish an unambiguous “Maori” mandate concerning the application of spiritual principles to European introduced technologies. Limitations are frequently raised during the course of many classic and contemporary authors’ attempts to perfectly report upon the spiritual aspects of traditional Maori culture due largely to ‘the Maori way’ of maintaining such knowledge, much of which was preserved and passed down through the generations orally.

Therefore it is reasonable to consider that contemporary perspectives of Maori food production relative to new technologies can be only partially aligned to traditional cultural belief systems particularly when considering the obvious progression of adoption and adaptation of new technologies through history as portrayed in the following section of this report. It is also reasonable to suggest that, historically the expense of change and adaptation for Maori consequentially resulted in the forsaking of many of their former traditions in order to effectively survive, or capitalise on potential economical benefit
within the changing times and society that evolved post European colonisation of New Zealand.

Schaniel argues that “the introduction of European technology to the New Zealand Maori prior to colonization in 1840 did not result in the collapse of their culture. New technologies were adopted in the context of their traditional valuing. Iron tools, white potatoes, agricultural technology and firearms were all integrated into Maori livelihood, and resulted in change in Maori society and economy. The change, though, was not preordained by the new technologies. New technologies led to new alternatives, but the adopted technologies were adapted by the Maori to their social processes.” (Schaniel, 2001: abstract)

Schaniel presents a reasonably generalised surmise concerning relative spiritual perceptions, by citing Earl,

“The Maori believed that the Europeans likewise had a multiplicity of gods which were similar to their gods, and that were responsible for the performance of European technology. When confronted with European gods whose origins and operations were known, the Maori “were inclined to attach a sacred appellation to most things they could not understand.”

and later stating himself:

“The Maori believed that western technologies were controlled by spirits which, in turn, were controlled by the European tribes.”


Petrie portrays that the failure of Maori industry in the eighteen sixties had more to do with changing technology and insufficient labour force to compete with the amount of colonists arriving rather than with the Maori themselves. The book describes how Maori tribes adapted and, for a time, thrived, in early nineteenth century colonial society. Whilst still maintaining their communal culture, the Maori were able as a collective, to build and run flour mills in New Zealand as well as owning and running merchant ships. Petrie also proposed that despite efforts of missionaries to make Maori take on board European culture, the Maori were able to create entrepreneurial ventures without giving up their own belief system.

Whilst Maori traditional values and principles are indisputably fundamental to understanding respective functionality within traditional Maori culture, the social and economic influences that coincided with historic events of Maori adopting technology do seem to be predominantly propelled by an insightful and strategic fortitude to surmount oppressive or challenging circumstances and/or limited resources in a practical way, despite initial precautionary behaviours or perceived cultural conflicts. This insightful and strategic characteristic could also be relatively aligned to the innovative survival characteristic of ancient Maori settlers in the prehistoric era pertaining to adaptation as similarly described by Lambert (2008).
2: Examples of adoption of new technologies in food production

2.1 The adoption of the potato (Solanum) into Maori food production

There is a wide range of literature classic and contemporary14, concerning the European introduction of the potato in the latter 18th century, prior to European colonisation, and subsequent adoption of the potato by Maori for food production. This in itself highlights that the adoption of the potato by Maori for food production and economic benefit, was an important historical event. Whilst the potato was initially merited by Maori for its white appearance, its ability to grow easily nationally eventually rapidly changed the face of Maori horticulture and instigated the development of a new economic resource for Maori. It is commonly accepted that the potato was a new food that was esteemed by Maori as a food source. Best writes:

“The Maori certainly appreciated the potato and it is at the present time his most favoured food supply. When he found that it not only suited his palate, but was also most prolific and was capable of being cultivated to advantage at all altitudes and at all places occupied by the native people, he recognised its great superiority over the kumara, which requires much more care in its cultivation”. (1925: p.284)

The impact that this introduction had on Maori society was recorded by Firth (1929), who wrote:

“The results of the introduction of the potato bring out with clarity, the manner in which new culture items affected the economic life and even the environment of the native. The potato is of such hardy nature that it can be grown in all districts and moreover it is prolific, yielding a plentiful return for the labour expended. Hence it was speedily introduced into districts which like Tuhoe had formerly possessed no cultivated foods and also tended to replace the kumara among other tribes. Again it effectively supplanted” (1929: p.488).


Harris writes about the introduction of the potato (Solanum), his paper provides detailed information along with extensive literature review of classic literature. Harris presents a table similar to the reproduced version (Figure 1) which illustrates a summary of reported

14 Examples include:
introductions of potatoes to New Zealand in the late eighteenth century between 1769 and 1793.

Table 1: Eighteenth-century introductions of potatoes to New Zealand, as reported by Leach 1984, Best 1925, Elder, 1932.

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Location of reported introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1769</td>
<td>de Surville</td>
<td>Doubtless Bay, Far North</td>
</tr>
<tr>
<td>1769</td>
<td>James Cook</td>
<td>Mercury Bay, Whitianga</td>
</tr>
<tr>
<td>1772</td>
<td>Marion du Fresne</td>
<td>Moturua Island, Bay of Islands</td>
</tr>
<tr>
<td>1773</td>
<td>James Cook</td>
<td>Marlborough Sounds and Dusky Sound, Fiordland.</td>
</tr>
<tr>
<td>1793</td>
<td>Lt Governor King</td>
<td>Bay of Islands</td>
</tr>
</tbody>
</table>

Sources: Leach, 1984; Best, 1925; Elder, 1932 (cited in Harris, 1999: p 140).

Harris (1999: p.14) alludes to an interesting point concerning some Maori maintaining that potatoes were introduced to New Zealand by their own ancestors along with the kumara, although there is no firm evidence that this was so. Best demonstrates perhaps a reflection of vacillation relating to the traditional Maori method of oral recounts within the following example which portrays diverse accounts pertaining to the introduction of the potato in Maori food production:

“In the Bay of Plenty district it is a popular belief that the araro and rokoroko varieties of the potato (Solanum) were cultivated there prior to the arrival of Europeans, but old Tutakangahau of Maunga-pohatu stated that they were obtained during the early years of intercourse with Europeans”. (Best, 1925: p. 284)

Harris furthermore states:

“While claims of pre-European potatoes persist, and there is some anecdotal evidence as to their existence, some facts that indicate Maori were unlikely to have possessed potatoes prior to their introduction from Europe include:
1. The introduction of the potato from Europe in the late eighteenth century had an immediate and profound effect on Maori society (see ‘Adoption of the potato by Maori’).
2. There is no scientific evidence (such as pollen records or the discovery of remnants of early carbonised potato tubers) to indicate pre-European potatoes.
3. Early European explorers, whose expeditions included competent botanists who kept detailed records, found no evidence of pre-European potatoes.
4. Other plants introduced by Maori, including kumara Ipomoea batatas, taro Colocasia esculenta, yam Dioscorea alata, hue Lagenaria siceraria and aute Broussonetia papyrifera were from the warm, humid tropics. The potato, however, although of tropical origin, was a high altitude plant which would not have grown successfully in the warm humid conditions of tropical Polynesia.” (Harris, 1999: p16)

Much of the following information concerning the adoption of the potato into Maori food production is included in Harris (1999: pp. 18-26) who, as mentioned earlier, provides an extensive literature review on the topic:

Leach, in referring to new plant introductions including the potato, noted that by the nineteenth century Maori were using the new plants to great advantage and that the new plants and tools were slotted into place within the traditional systems. She described Maori gardening of the time as "a robust and adaptable tradition" (p.109).


In writing of Maori acceptance of new crops in Polynesia Leach wrote:

"Forty years after the Maoris’ [sic] first exposure in Northland to European plants, the five pre-European food plants were still grown but had been joined in Maori gardens by two other root crops, potatoes and turnips, by a green crop cabbage and by the tall maize. The most successful introduction of all was the potato..." (Leach, 1983, p.145)

According to Harris (1999) "by the early 1800s Maori were growing large crops of potatoes, and an area of 50 hectares in potato production was not uncommon. An article titled 'Historical records of New Zealand South,' in the Sydney Gazette, September 1813, records the visit that year of a flax dresser, named Williams, to the Bluff. Best (1925:p285) quotes this article when he says: “The natives attend to cultivation of the potato with as much diligence and care as I have ever seen. A field of considerably more than 100 acres presented one well cultivated bed, filled with rising crops of various age, some of which were ready for digging, while others had been newly planted. Dried fish and potatoes form their chief support.” (Harris 1999: p.26)

Shawcross (1967, p.333) proposed that it was not until after 1820 that introduced food crops displaced fern-root (Pteris esculenta) as the principal staple food item in the diet of the Maori. Hargreaves (1963, p.104) considered that by the 1830s the potato was the basic food crop of New Zealand, “preferred by the Maoris [sic] above all their traditional crops”.

2.1 Adoption of technology, Maori food production and economic trade

Colenso (1880) in writes of Maori horticultural production of introduced crops and trade in the late 19th century as he observed it, in the following excerpt:

“... I would briefly observe, that this estimable trait in the character of the Maori,—of passionate attachment to cultivation, descended and remained with him down to modern times,—to times long after the foundation of the Colony. For many years, however, prior to that event, the chief harbours of New Zealand (North Island) were thronged with ships—whalers and others—which called in to get supplies, mainly of vegetables,—potatoes, kumara (both small and large, the latter newly introduced), pumpkins, onions, maize, melons, cabbages, etc.; these were all raised by Maoris [sic], who often received but a very small return in barter, especially if sold by them to the intermediate men, the
storekeepers and ships' husbands on shore. A writer on New Zealand in 1884 (who for some years previous had been a resident in the Bay of Islands) says,— “Vast numbers of whaling vessels touch at the various harbours on the eastern coast, for supplies of potatoes and pork and other fresh provision, the produce of the country. In the Bay of Islands there have been at anchor, at one time, as many as twenty-seven vessels, most of them upwards of three hundred tons burthen, all of which have been supplied, by the industry of the inhabitants, with a sufficient stock of fresh provisions for a long whaling cruise.” And a similar testimony I can also bear for the time (ten years) that I resided there. I have seen 400 seamen on shore at one time from those ships! and when the great and increasing number of the shore residents, including the several mission stations, the large number of their dependent natives at school, etc., and the sawyers in the neighbouring forests, are duly considered, the quantity of potatoes, etc., raised for all seems really astonishing! and all, too, done by manual labour, together with their bringing their produce many miles by land and by water—on their backs and in their canoes—to the market. And it must not be forgotten that the Maoris [sic] had now double labour in their cultivating,—in having to fence against the incursions of the pig, everywhere abounding; and, also, through their non-using of manure, as has been already shown. Such, indeed, was the strong, the passionate attachment of the young Maoris [sic] of those days to the cultivation of the soil, that we were obliged to allow the young men residing with us,—whether as servants, boatmen, or scholars,—to return to their several homes for that purpose every year in the planting season.

And just so it was here in Hawke's Bay for several years; in 1845 the Maoris [sic] (south side) first sowed and reaped wheat (the seed of which I had obtained from Auckland); and in succeeding years they raised enough of wheat and maize (exclusive of potatoes and scraped New Zealand flax), to load annually several small vessels; and all the produce of hand labour! Truly the Maoris [sic] of to-day, with all their civilization and riches, may take for a proper motto Funimus!” (Colenso, 1880: pp.33-34).


Coleman et al. present a depiction of Maori economic development from 1840 through to contemporary time in an effort to present an overview of Maori economic and social development as described in the following abstract:

“This draft book chapter provides an overview of Maori economic development during the past 150 years, drawing on readily available statistical and historical sources. The path of Maori economic development that we have traced through statistical evidence is one of ongoing change and adaptation, as well as one of substantial increase in material standards of living, albeit with periods of significant setback.”

and concerning Maori adoption of technology:

“It is quite clear that Maori rapidly adopted much European technology, including new crops and farming techniques, new food processing equipment including flour mills, and new transport equipment including quite large ships. Maori groups produced food and forest products for European immigrants, and exported to Australia (Coleman et al, 2006: 3.2: p.13)”.
This report seemingly lacks direct links to statistical data for early historic records of Maori food production and economic trade; however the document does provide a relevant synopsis of the new food production technologies embraced by Maori during the late 19th and early 20th centuries.


McNab considered that Maori agriculture was becoming commercialised and losing its "completely subsistence nature" (p.108).


Hargreaves wrote that:

"Maori-grown produce played a significant part in feeding the European population of Auckland Province and provided an important contribution to exports. Watson and Paterson (1985, p.525) recorded that in the Wellington region in 1847 'Maoris [sic] dominated the market for pigs, potatoes and sea food.' Maori-grown produce from all over the region was transported to Wellington, and in 1841 pigs and potatoes from inland Wanganui were canoed down river then shipped to Wellington" (p.61)

Historical recounts denote that new methods of food production particularly horticultural and agricultural were adopted by Maori along with a vast array of new methods employed for food processing and storage.

**2.3 Social impact on cultural values associated with traditional Maori food production.**

Undoubtedly European colonisation and the eventual society that developed after the signing of the Treaty saw the progressive disintegration of tribal culture as Maori strove to adapt to European culture. The loss of cultural systems that once governed Maori society prior to the mid 19th century was by and large, consequential to the emergence of the new bicultural society that followed the signing of the Treaty in 1840. It is feasible why some contemporary Maori view “adoption and adaptation of introduced technologies” as one of many elemental occurrences that contributed to the disintegration of traditional Maori culture. Whilst this viewpoint conceives the sentiment of “loss” concerning aspects of Maori culture, the adaptation and adoption of new technologies by Maori also demonstrates an approval concerning the “socioeconomic necessity” or “gain” recognised by early Maori, who in the historical context, did effectively embrace and adopt new types and methods of food production.

Whether Maori were forced to forsake tradition methods of food production and embrace new technologies as a subsequence of European governance, could be intertwined within the parameters of various ongoing issues that exist in modern society, concerning governmental obligations to Maori as outlined in the Treaty of Waitangi. Nevertheless, it is conceivable that the upheaval experienced by Maori during the disintegration process of...
its’ traditional society would have undoubtedly impacted on all persons within those tribal collectives. Trade and production benefits most likely appealed to entrepreneurial chiefs and individuals alike as did eventually other European techniques of agriculture. It is well documented that potatoes became an important article of trade, not only within Maori communities but for European colonists and for supplying European ships by the beginning of the nineteenth century.

Historic and contemporary literature depicts the rapid adoption by Maori of introduced food technologies from the late 19th century onwards, following the dissolution of traditional Maori societies and upon integration with European settlement and a newly developed bicultural social system. This is predominantly evident in contemporary Maori communities relative to the types of foods consumed by the Maori populace in general.
3. Maori involvement in food production in contemporary society

 Concerning the overall economic contribution of Maori: “The Maori economy- that is, total Maori value added – accounts for 1.4 % of New Zealand’s economy” (NZIER, 2003, p. 9).

 Concerning agriculture: “Agriculture: the value of Maori agricultural output is estimated to be approximately $700 million, representing about 7.4% of the New Zealand’s total agricultural output” (NZIER, 2003, p. 10).

 Concerning Maori fisheries: “Fishing: Maori are estimated to control up to 37% of New Zealand’s domestic fishing quota, thus providing the means to generate approximately $299 million in fishing revenue” (NZIER, 2003, p.10).

 Concerning the adoption of new technology: “We have documented evidence that traditional Maori were both innovative and fast adopters of new innovations” … “For the adoption flexibility, we can start with the history of the Maori after arrival in New Zealand. The previous tropical agricultural capacity associated with the islands they had come from was not easy to adapt to the New Zealand climate and soils”… “Perhaps better documented, but also clearly extremely compressed in time, we have the impact of European contact, and the accompanying positive Maori response. It was a story of quick and flexible adoption of totally new technologies.”… “It included the growing iwi capacity to organise to become successful agriculturalists, with introduced crops like wheat and extended through to the construction and operation of mills to produce flour that was in quick demand from the growing settlers.” (NZIER, 2003, pp.70-71)

 NZIER (2003) furthermore states the following

 “Maori land trusts and incorporations have most of their assets tied up in the primary production export sector, especially in farming and fisheries. In order to meet overseas demands for high value foods, a number of leading Maori businesses have developed innovative new products. These products can also draw on distinctive branding based on Maori culture.” (NZIER, 2003, p. 73)

 Listed below are three examples of Maori involvement in food production in contemporary society as reported in NZIER (2003: pp. 73-74):

 **Tohu Wines:** This is a joint venture between Wakatu Incorporation, Wi Pere trust and Ngati Rarua Atiawa Iwi Trust. Tohu wines launched its first wine in September 1998. During 2000 Tohu wines produced just over 5600 cases of sauvignon blanc, chardonnay, pinot noir and reserve chardonnay. Tohu wines were favourably...
reviewed by the United Kingdom wine media during 2000, and enjoyed high sales in that market. In late 2001 the company purchased 202 hectares in the Waihopai and Awatere valleys in Marlborough, to meet demand for premium wine production. Over the next ten years it plans to expand production to 50,000 cases and develop other products under the Tohu brand (e.g. chilled crayfish, kiwifruit).

**Outlands Export Ltd:** This Hamilton-based business is a Maori based company exporting natural low fat beef (96 - 98% fat free) to the United States. It targets the high-value California health foods market. It also exports to Singapore and South Korea, and aims to extend its markets to Japan. The company has been operating since late 1999, and now has two major Maori trusts who each have a 50% shareholding in the company and also supplying over half the stock requirements.

**Ngai Tahu Fisheries:** This company owns three processing facilities, in Murihiku, Christchurch and Dunedin. These factories employ advanced processing and packaging technology to ensure maximum quality and flavour for the company’s seafood products. The company has recently had a major success with new mussel chowder for the American market, and is also developing a range of nutraceuticals.

Values that underpin the organisations listed above are denoted within the following excerpts have been extracted from the enterprises' associated websites:

**For Tohu Wines**

-Wakatu Incorporation - “Wakatu Incorporation comprises of 3,200 Maori shareholders, direct descendants of the chiefs and families that occupied the Nelson and Marlborough region. Investing in the future is imperative for the on-going success of Wakatu, for this reason Wakatu offers an array of scholarships to its Whanau (family) including education. It is hoped that the skills gained by its scholarship recipients will one day be utilised within Wakatu Incorporation”

-Wi Pere Trust – “Wi Pere’s vision was to nurture and develop the land of the Trust for the benefit of future generations. His descendants still follow his founding philosophy, administering approximately $30 million worth of land and assets for its beneficiaries. Today the trust is involved in commercial property, land leases, viticulture, citrus, sheep and beef farming.”

-Ngati Rarua Atiawa Iwi Trust (NRAIT) – “NRAIT’s vision statement – “To advance the cause of our people in every way possible and to preserve and promote our culture for posterity.”

-Tohu Wines - further states – “Today Maori comprises approximately 15% of New Zealand’s population. Preserving Maori culture is vital to New Zealand’s national identity. Producing quality wines and utilising indigenous resources, Tohu Wines is a vehicle to promote Maori culture to the world.”

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16 www.tohuwines.co.nz: Maori Culture downloaded 9th February, 2009
17 The Wi Pere Trust was formed in April 1899, by Wi Pere, a chief of Te Aitanga a Mahaki and Rongowhakaata tribes near Gisborne. His wide range of knowledge in Maori traditions, customs and language made him a well received representative for his people. Wi Pere worked tirelessly for the rights of his community with specific reference to land ownership.
For Outlands Export Ltd:
Outland Export Ltd has a web site\textsuperscript{18} which is limited to advertising information pertaining to aspects of the health benefits of its products and organic practices. The company is however listed with Federation of Maori Authorities (FOMA), who state their objects as follows:

“Objectives are designed to advance the following roles played by all Maori organisations:

- \textit{Kaitiaki} - Guardian of the taonga: protect taonga, develop taonga;
- \textit{Kaiwhakahaere} - Representative of the beneficial owners: communicate, optimise benefits;
- \textit{Rangatira} - Leader of the business: lead with vision, secure best business performance;
- \textit{Kaiwerowero} - Challenger of the external environments: know environments, obtain advantages, and overcome constraints.”\textsuperscript{19}

Ngai Tahu Fisheries:
This enterprise is part of Ngai Tahu Holdings Corporation Limited which manages commercial activities of Te Rūnanga o Ngai Tahu. The “Vision” as stated by them\textsuperscript{20}

“\textit{Mo tatou, a, mo ka uri a muri ake nei - for us and our children after us}”

And the “Mission statement” and “Values” as stated by them are:

\textit{Mission:} Te Rūnanga o Ngai Tahu works on behalf of the iwi to manage the collective assets of Ngai Tahu whanui and to promote and ensure the interests and aspirations of Ngai Tahu whanui. Te Rūnanga o Ngai Tahu will also work to ensure that these interests and aspirations are met in terms of our rights as members of New Zealand and global society aligning with our vision of Tino Rangatiratanga Mō tatou, a, mo ka uri a muri ake nei by contributing to the following outcomes that enfold the essential components of the vision:

- Ngai Tahu whanui are culturally enriched
- Ngai Tahu whanui live long and live well
- Ngai Tahu whanui lead the future

\textit{Values:} Our organisation reflects the values of Ngai Tahu in everything we do. Those values are:

\textit{Whanaungatanga} - Ma te tuakana e tika ai te teina, ma te teina e tika ai te tuakana. (Through relationships and respect we can find the way forward)
\textit{Manakakitanga} - Whakana ki o manuhiri i to kainga. (Mana is upheld through fulfilling roles and responsibilities)

\textsuperscript{18} \url{www.outlands.co.nz}
\textsuperscript{19} \url{www.foma.co.nz}
\textsuperscript{20} \url{www.ngaitahu.iwi.nz:About-Ngai-Tahu: downloaded 9\textsuperscript{th} February 2009}
Tohungatanga - Ma te mohio ka marama, ma te marama ka matau. (By discussion comes understanding, through understanding comes wisdom)
Kaitiakitanga - Kai Tahu, titi a-kai, titi a-manawa. (Ngai Tahu, gatherers of resources, resources of lasting endurance)
Tikanga – Aoraki matatu. (Holding firm to what defines Ngai Tahu)
Rangatiratanga - Ko te amorangi ki mua; ko te hapai o ki muri. (For leadership there must be support).  

Two other examples of Maori involvement in food production in contemporary society feature below; “Te Waka Kai Ora” and “Tahuri Whenua Incorporated Society”

Te Waka Kai Ora:
Te Waka Kai Ora is a nationally recognised Maori Organics Authority of Aotearoa (New Zealand). Te Waka Kai Ora promotes itself as “an organisation committed to environmental and cultural sustainability that recognises the unique qualities of our native foods and medicines that come from our rich indigenous flora and fauna”. Te Waka Kai Ora also claim that “These taonga or treasures are an integral part of our traditions and as kaitiaki (guardians) our vision is to ensure that their mauri (essence) and integrity is maintained for future generations”.

The mission statement for the organisation is:

“Te Waka Kai Ora is committed to promoting Hua Whenua, Hua Maori and Hua Kaiora as initiatives that promote the use of traditional Maori values and ethics of organic food production. Ecological and cultural sustainability are central to our mission. Te Waka Kai Ora are committed to responsible economic development in a manner that is consistent with these guiding principles: Mauri; Rangatiratanga; Oritetanga; Wairua; Tikanga.”

Tahuri Whenua Incorporated Society:
Tahuri Whenua Incorporated Society is a National Maori Vegetable Growers Collective representing Maori interests in the horticulture sector and state that its' key objectives are to: “Ensure Maori have access to relevant resources in the horticulture industry; Promote an awareness of the Treaty of Waitangi; Facilitate Maori participation in research and development in the horticulture sector; Support Maori Business Development in the

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21 www.ngaitahu.iwi.nz:About-Ngai-Tahu
22 Hua Whenua Land and Forest Use: The organics sector is providing hope to many Maori in rural areas as a means to enable their whanau (families), hapu (sub-tribes) and iwi (tribes) to achieve tino-rangatiratanga and self-determined development. Te Waka Kai Ora is mindful of the Maori organic vision and what it stands for. This includes the restoration of Maori values, knowledge and practices which are an integral element of the traditional economy of Aotearoa (NZ).
23 Hua Maori is Te Waka Kai Ora’s organic certification scheme and labelling system. Members who wish to attain certification must comply with the standards set by this verification process. Hua Maori conforms to internationally recognised organic standards and accepted New Zealand standards but also adopts an indigenous framework that recognises Maori values and approaches to food production. This includes the incorporation of Maori tikanga (protocol) and the spiritual, physical and metaphysical attributes that have guided our traditional organic economies for millennia.
24 Hua Kaiora Community Projects: Te Waka Kai Ora is developing a number of projects to promote sustainable livelihoods that are grounded in tikanga Maori (Maori custom). This community-based focus is essential to developing an ethical framework and long term vision for the organics industry. Organics provides an opportunity to maintain and enhance the vibrancy and health of Maori communities as well as other communities in Aotearoa (NZ). As such, it must be centred on a commitment to the health and wellbeing of whanau (families), communities and whenua (land) and the protection of the integrity of the environment. Te Waka Kai Ora supports community-based projects that promote the following initiatives: Native Housing and Sustainable Energy; Native Forestry and Organic Pest Management; Native Horticulture and Rongoa Maori. Native Fisheries and Water Quality.
25 www.huamaori.com
horticulture sector through provision of advice and information.” Nick Roskrudge, chairman of Tahuri Whenua Inc. Soc, reported “An interim board including a kaumatua body has been established and Tahuri Whenua Inc Soc now have a full board duly elected at their inaugural AGM and the wheels put in motion to firmly and permanently establish the Maori presence in the industry. The kaumatua have, and will ensure we do not compromise our tikanga along the way.” (Roskrudge, 2006)

Globally there continues to be huge concerns with feeding the ever increasing population as the availability of land and water resources for food production decreases. Chrispeels (2000) suggests that biotechnology should be considered essentially as a practical tool; as part of the resolve concerning long term issues of sustainable food production. However it would seem that ethical considerations obstruct the pace of scientific intervention and its application of biotechnology/nanotechnology.


Chrispeels reports that globally 8 million people on earth are poor and malnourished and that forty thousand people die each day of malnutrition, one half of them children. Chrispeels estimates that by 2025 the earth’s population will have grown to 8 billion, and further implies the types of increased yields that farmers will need to produce by the year 2020, on available land and with available water resources, pointing out that these two resources are limiting factors concerning sustainable food production. With the figures presented pertaining to necessary increased food production requirements relative to the unrelenting decrease of natural resources; it seems a rational proposition to consider the economical benefits of producing high yielding crops utilising biotechnological/nanotechnological intervention. However fractions of society that oppose such scientific intervention see other values such as sustaining the natural order of the earth’s environment and human life as a more important issue compared to the proposed economical benefits of genetically modified food production. Upon discussion about obstacles that hinder the employment of biotechnology as a means to address these limitations, Chrispeels considers the weight of the opposing viewpoints by leading readers to ponder the ethical considerations of genetically engineered crops comparative to the ethical consideration of not improving the lives of the poor.

Whilst New Zealand Maori do not have to consider sustainable food resources in the same broad global context as outlined in Chrispeels (2000), there is a similar parallel pertaining to the controversial issue of ethics concerning certain Maori perceptions of cultural/spiritual values, which encompasses the natural order or the environment and human life, compared to Maori perceptions of perceived economical or health benefits; both perceptions being relative to the application of new technologies in food production.


The Royal Commission of Inquiry into Genetic Modification (RCGM) was established in 2000 as a result of mounting public concern about genetic technologies and their possible consequences for New Zealand. Over 68% of the written submissions received by the Royal Commission from the public expressed the view that the use of genetic modification in food production was unacceptable (RCGM, 2001: Chapter 8:21).
The RCGM were also directed to consider the Crown’s responsibilities under the Treaty of Waitangi, and to consult widely with Maori and the public in a way that allowed them to express their views on matters relating to core values pertaining to health of ecosystems, human health, consumer choice, cultural and ethical concerns, and economic factors such as research, primary production and exports. Some of the comments made during submissions reported in Chapter 3 (“Cultural, ethical and spiritual issues”) and Appendix 2: Section 3 by Maori include:

“Angeline Ngahina Greensill (Tainui), a witness for Nga Wahine Tiaki o te Ao [IP64], said: Everything possesses a mauri or life force and is to be respected. Because everything is inter-related and interconnected, any mutilation, modification or unnatural desecration of any part affects the whole.” (Chapter 3: p.35-90)

“Atihaunui-a-Paparangi kuia, 90-year-old Te Manawanui Pauro, at the regional hui at Wanganui said: Ko tenei ahua, e koutou e nga matauranga, kaore e tika ki te hono i toku toto o te tangata ki te kararehe. He kararehe ano te kararehe, he tangata ano te tangata. [It is not right, learned folks, that my blood, the blood of a human, be mixed with the blood of an animal. An animal is an animal, a human is a human.]” (Chapter 3: p.35-91)

“Nga Wahine Tiaki o te Ao [IP64] stated the following: It is within the main principles of mauri, mana and whakapapa that Maori raise their absolute disagreement regarding genetic engineering and modification. If these principles are damaged or tampered with in any way, thus upsetting the holistic world balance, so too will be the mauri, mana and whakapapa of Maori and following generations.” (Appendix 2: Section 3.12: p.209)

“FOMA [IP69] noted that: Maori authorities would benefit from genetic modification advances through improved productivity, product quality and, potentially, the development of new products. The possibility was that Maori in general would benefit from a position of greater economic self-sufficiency.” (Appendix 2: Section 3.12: p.210)

For Maori, the cultural and spiritual values raised in response to transgenics, included mauri, tapu, taonga species, mana, manawhenua, and hara. The commission also acknowledged frequent complaints from Maori that, in the field of genetic modification, Maori were not adequately consulted by scientists and decision makers and basically

27 (NZGM, 2001.3:39) The RCGM referred to Sections 5, 6 and 8 of the Hazardous Substances and New Organisms Act 1996 (HSNO) in context with the Crowns responsibility to consult Maori and the public: “Sections 5, 6 and 8 of the Hazardous Substances and New Organisms Act 1996 (HSNO) also imply certain values when they refer to the economic, social and cultural well-being of both present and future generations, the intrinsic value of ecosystems and the safeguarding thereof, the sustainability of native and valued introduced flora and fauna, the relationship of Maori with taonga, and the Treaty of Waitangi. Later the Act provides for public notification and consultation with regard to some applications.”

28 (NZGM, 2001.Chapter:3.79) A case study transgenic animals: Transgenics is the movement of genes across species boundaries, for instance the insertion of human genes into a mouse. A range of concerns about transgenics were raised with the Commission. It became clear that there were a number of distinctions that had ethical significance to people. People framed the issues in a number of ways, which attached cultural or moral significance to different groups of organisms.

29 (NZGM, 2001.3:67) The difference in the ways Maori and Pakeha arrive at decisions means that there needs to be careful consultation if common ground is to be found. The values and world views do not need to be shared, but need to be understood and respected if a mutual way forward is to be agreed. Time and time again the Commission heard complaints from Maori that, in the field of genetic modification, Maori were not adequately consulted by scientists and decision makers. Bevan Tipene Matua (Ngai Tahu, Ngati Kahungunu), a lecturer in “Maori and Science” at the University of Canterbury, said at the Christchurch hui: “They [the scientists] are unable and don’t want to create or enter into the Maori world or create relationships to ensure that our rights are protected but also the taonga themselves are protected.”
after all submissions were considered, the commission recommended that an independent body was required to deal with issues such as was raised by Maori during the course of the inquiry.  


This literature review contains an abundance of insightful information concerning matauranga Maori, tikanga Maori, and the impact of science on Maori values. Dr Robert Joseph also reviews significant literature on Maori and biotechnology, Maori and genetic engineering, socially and culturally sustainable biotechnology.


This report contains dialogue which illustrates the range of contemporary Maori voices in society particularly with reference to the ongoing controversies that exist within the Maori collective itself regarding a representative Maori view of biotechnology and food production. The aim of research presented in Roberts and Fairweather's report as stated by them, was to obtain an understanding of:

- Maori perceptions concerning the perceived risks and benefits of various forms of biotechnology
- Some of the factors important in influencing those perceptions
- The acceptability or not by Maori of certain biotechnologies, along with
- Culturally appropriate risk assessment frameworks/processes.

The report analyses interviews and focus group data collected, and Roberts suggests that there were two broad observations. *“One is that Maori attitudes concerning biotechnology fall into two overarching categories, one largely pragmatic and the other more subjective, and apparently culturally based.”* (p.74)

Below are various comments concerning responses of participants interviewed by Roberts, when they were asked to consider applications of genetic modification in context of food production. The following extracts are suggestive of the diverse forms of viewpoints raised:

“**Strong preferences were expressed by most for natural alternatives. “Who needs (GMO frost free) strawberries all year round? It isn’t natural”. But most were prepared to consider Golden Rice if it helped cure blindness. Kuia again emphasized “the need to support things that saved lives” (p.8).**

“**Against any GM food entering the food chain; this will “contaminate the body and the wairua”**(p.12).

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30 The New Zealand Government established “Toi Te Taiao”: the Bioethics Council in December 2002. This followed the recommendation by the Royal Commission on Genetic Modification, to meet public concern that decision-making was not adequately addressing the ethical, cultural and spiritual dimensions of genetic modification and biotechnology. Toi te Taiao: the Bioethics Council, states that its purpose is to: enhance New Zealand’s understanding of the cultural, ethical and spiritual aspects of biotechnology; ensure that the use of biotechnology has regard for the values of New Zealanders.

2008/2009 SUMMER STUDENTSHIP PROJECT:
INSTITUTE OF ENVIRONMENTAL SCIENCE AND RESEARCH LTD (ESR)/BELINDA RASKIN.
“Example used was the toad gene in potatoes........ One person who had lived in France and enjoyed eating frog’s legs asked “What is the difference between eating a plate of frog’s legs with potatoes, and eating GM potatoes?” ........ some still felt that because it was “only a copy gene” and because we eat different sorts of DNA all the time from all sorts of plants and animals, they were not overly concerned. They also supported Golden Rice. “Maori have no right to stop other peoples from gaining the benefits of this technology, if that's what they want” (p.13).

“Opposed GM toad/potatoes as, “These have a totally unrelated whakapapa - one is an animal and one a plant. There is also the spiritual aspect of whakapapa in addition to the physical history of an organism, and transgenics conflicts with these aspects. Upsets the equilibrium that nature has created over thousands of years, so totally opposed to this technology as culturally unsafe” (p.17).

“The ‘expert’31 said this technology would also be “open to abuse” by those who could afford it such as big multinational companies. “The main reason for doing this stuff is for greed and dollars.” Scientists also did it “just for ego; they want to win the Nobel Prize.” This person went on to say that in the old days they were paid a salary so their jobs were secure. But now in the CRIs they have to earn money to cover their salaries so they aren’t as concerned as they used to be about morals and ethics. Now they will do anything for the money. Another concern related to this was that the intellectual property rights of Maori and other indigenous peoples was being ignored and/or exploited especially by the multinationals like Monsanto. This company had tried to grow wheat in the South island but Ngai Tahu had opposed them. This is why they (Ngai Tahu) had developed a policy to “make sure these companies didn’t try to get another toe in the door” (p.47).

“If the GM foods were really cheap Maori would buy them because as one person explained “most people eat with their eyes” and don’t think enough about “where the food comes from. That’s important because it tells you which ones are good for you.” Her theory was that “natural or raw foods are best for us, but we don’t know enough about refined foods as to whether they are OK or not.” She saw a decreasing progression in nutritional value from ‘natural’ (or raw foods) to refined foods to GM foods........ After discussing the Golden rice example two people felt that “we can’t decide for others what’s good for them. If it will help save others peoples’ lives they should have the right to choose to eat those things” (p.51).

Within these few viewpoints depicted in Robert’s research results, it becomes apparent that Maori share some common concerns similar to those of the wider public32 regarding genetically modified organisms (GMOs) pertaining to physical health risks and interference with natural biological systems. There were also participants who generally expressed that they suspected that big multinationals were behind this research and it would not benefit New Zealanders, particularly Maori.

31 The wife of one man began discussion on GMOs in general; was well informed on this issue as had helped formulate the Ngai Tahu policy opposing GMO research. 
32 Over 68% of the written submissions received by the Royal Commission from the public expressed the view that the use of genetic modification in food production was unacceptable. Many of the Interested Persons who appeared before the Commission at the formal hearings referred to the widely held public uncertainty about the consumption of genetically modified food. Some of the Interested Persons and many of the people who spoke at the public meetings urged caution, largely because of concerns about safety. (RCGM, 2001:Chapter 8:21)
Another consistent theme presented itself upon analysis of dialogue between Maori participants was that all participants did not necessarily always agree concerning applications of spiritual principles to the topics discussed, which is somewhat demonstrated in the following examples which are only a diminutive representation of such dialogue contained and reported in Roberts’ interviews:

“Maori like anyone else don’t need whanau/hapu/iwi approval to marry and have kids, so why do we need it for approving research that might affect our whakapapa? What right does the iwi have to make these decisions for all Maori in their area? And by implication, for all non-Maori?” (Roberts, 2004: p.24).

“(P1) with lengthy school teaching experience especially in matauranga putaiao (Maori science) who was asked for views on GMOs. Said he had no concerns with them; that younger Maori and anti GMO activists “Didn’t know what they are talking about... All things on earth are genetically modified.” (P1) ...“Decisions need to be based on rationality not on religious beliefs. Anything based on religious beliefs is too unreliable, too diverse. We will never be able to agree on what is right or wrong on those terms. Scientific knowledge is more reliable in determining risks and benefits. The overriding factor in making decisions on new biotechnologies should be the benefits. These must be for the common good of people and the environment.” (Roberts, 2004: p.37)

(P2) also very conversant with GM said “I am anti GE because I am pro Maori. One is the flip side of the other.” Says the two went together because “if you really thought about what it was to be Maori it was about whakapapa, mauri etc. and that all added up to being anti GE” (Roberts, 2004 : p.38).

As previously indicated, these examples only represent a small proportion of the numerous views expressed concerning spiritual or cultural issues raised during interviews conducted and documented by Roberts. The spiritual and cultural issues raised by Maori participants interviewed in the course of this reported research, encompassed a vast array of concepts and principles important to Maori.


Te Momo manages to supply a few interesting comments emphasising perhaps the ambiguous nature of contemporary perspectives in Maori communities. Te Momo surmises that “expecting to find a clear understanding of social, cultural, religious, and spiritual dimensions of biotechnology is similar to looking for a ‘needle in a haystack’” (Te Momo, 2006: p.40).

Te Momo also claims that;

“Biotechnology, Genetic Modification (GM), and Genetic Engineering (GE) are terms that Maori are still examining in their communities. Although the terms are grounded in scientific knowledge the Maori response to addressing the issues is to adopt an
ethical approach that underpins the foundation of scientific research. However, identifying whether biotechnology, GM, or GE is a risk or benefit for the future survival of Maori people are the determining factors that direct decisions whether to support or refuse developments in this area in their communities” (Te Momo, 2006: p.37).

Concerning a precautionary stance perceived by Te Momo she states: “Māori have adopted a precautionary stance whereby they will resist supporting biotechnology initiatives until they are better informed. More importantly Māori seek guarantees that the benefits would be more important than the risks. Adding to this precautionary stance is the debates within Māori communities on the usage of this technology” (Te Momo, 2006: p.9).

Furthermore Te Momo states that “exploring ways to socially and culturally sustain biotechnology in Aotearoa/New Zealand requires a broad approach” (Te Momo, 2006: p.40).


This article is useful to the extent that it proposes that seven diverse groups evolved from analysis of data obtained during the course of the research project reported in Te Momo (2006). For this article the data came from compiling the findings of three stages of the research project in which main themes were highlighted to represent the seven views:

1) **Purist Maori**; the purist Maori view saw biotechnology as being a part of Maori culture. GM and GE were perceived to be consistent with Maori legends.

2) **Religious Maori**; the religious Maori view was supported by many Maori. This view merged together traditional Maori values of religious practice and Western influences of Christianity\(^3^3\).

3) **Anti Maori**; the anti Maori view was a stance taken by Maori who were critical of government and business. Those who shared this view were opposed to any form of GM or GE because they believed that companies promoted these types of experiments to make money, and that economic development superseded social development and education on the current politics of biotechnology in New Zealand.

4) **Pro Maori**; the pro Maori view perceived GM and GE to be positive and valuable for the health of people and the environment. The ability for biotechnology to 'Feed the World', 'Eradicate Diseases', and enable people to 'Live Longer' were common perceptions.

5) **No Maori**; the no Maori view was held by a younger and uninformed Maori audience. The knowledge surrounding biotechnology, GM, and GE was introduced to them through the research.

\(^3^3\) “Also, the religious Maori view was seen to be a catalyst for ensuring ethical conduct, with wairua (spirituality), and tikanga (customs) being the guidelines for people to follow, and breach of these values meant that biotechnology should not proceed” (Te Momo, 2007 p.1182-4; Discussion).
6) *Uncertain Maori*; the uncertain Maori view was a cautious approach taken by Maori with some knowledge about biotechnology that required more information.

7) *Middle Maori views*; the middle Maori view was that of many Maori people from different ages and backgrounds. They could position themselves in one or more of the previous six views. Their view depended on the issues and circumstances that were presented before them when taking a stance. (Te Momo, 2007: p.1182)

It becomes apparent that trying to find a mainstream representation of Maori perceptions on biotechnology and food production will require continued innovative strategies that will proportionately represent not only those “anti GE” viewpoints but also the viewpoints of Maori who perceive possible value for Maori communities at large because of the economical and health benefits that modern technology could offer. In the following section are examples of the types of innovative strategies that Maori and some Crown Institutions have embarked upon in the form of partnerships.
5. Maori perspectives on and involvement in a range of other emerging future food production technologies

Very little literature exists pertaining directly to Maori perspectives on future use of biotechnology and nanotechnology in food production. However, the use of biotechnology has already been deployed by some Maori collectives particularly Ngai Tahu Holdings Ltd, who feature in this final section of the report.

Crown institutions involved in scientific research and technology have already established working partnerships with some Maori groups in an attempt to merge a middle ground representation and respect for Maori protocol in association with scientific applications. The contexts of some of these partnerships are demonstrated in the following example.

The New Zealand Institute for Plant and Food Research Limited (which will trade as Plant & Food Research) has recently been formed as a result of the merger of existing CRIs HortResearch and Crop & Food Research on December 1 2008. Crop & Research have developed a framework “Te Putahi” in which the institute has used and uses to establish partnerships with Maori. Dr Meto Leach, leader for Maori research has worked and continues to work with Crop & Food Research staff to find innovative ways for Maori to participate in and benefit from high level scientific research, promoting the institute’s framework, Te Putahi, for developing partnerships with Maori. Te Putahi encompasses a vision in which Crop & Food Research acknowledges its own strengths in the development and application of science, and also acknowledges that the strength of Maori lies in an understanding of their natural environment and the health and well-being of their people as well as the interrelationship between the two. Maori values are recognised as being centred in the core concepts of tinorangi pathiratanga (rights as indigenous peoples of New Zealand), tikanga (protocol), manaakitanga (hospitality) and kaitiakitanga (guardianship)\(^{34}\).

Four examples depicting Maori partnerships established using the Te Putahi – Crop & Food Research framework include:

1.) Te Rūnanga O Turanganui A Kiwa - worked with Crop & Research in 2005 and looked at novel ways of preparing fermented corn so that it had a more appealing taste.

2) In 2005 Tahuri Whenua Inc also committed as a partner to a project between Crop & Food Ltd (CFR) and Te Pu Hao Rangi Trust targeting the commercialisation of kumara (Chairman’s Report 2007 – Tahuri Whenua Inc. Soc.). Te Pu Hao Rangi Trust are the guardians\(^ {35}\) of the early kumara lines and since their return from Japan in 1988, the kumara lines have been freed of viruses and maintained in tissue culture by Crop & Food Research. Unlike common kumara grown today, little was known about these early cultivars. Research was needed to see how they will survive transplanting and to determine their susceptibility to climate

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\(^{34}\) www.crop.cri.nz/home/company-info/maori-partnership_infosheet.php downloaded 27th December

\(^{35}\) Dell Wihongi was principal claimant for the WAI 262 claim, the Native Flora and Fauna claim; and was Chairperson of Te Pu Hao Rangi Trust.
and disease. The aim is to identify an early kumara line suitable for the market and to establish a successful production system.

2008 Update: “In a programme with Tahuri Whenua (National Maori Growers Collective), Crop & Food Research has now produced virus-free cultivars that have at least doubled yields. Four varieties are now virus free, and the process of eliminating the virus took about 18 months. They are now in the process of bulking up stocks to produce quantities for commercial plantings” (Rural Delivery, April 26, 2008: Maori cropping support: Series 4:www.ruraldelivery.net.nz).

3) Horouta Manuka Company and Crop & Food Research engaged in investigating manuka cultivar breeding to optimise flowering, honey quality and yield. The project brings together a number of Maori landowners who want to improve returns from their land. The research is part-funded by the Ministry of Agriculture and Forestry’s Sustainable Farming Fund.

4) Maori forestry groups Maraeroa C, based in Te Kuiti, and Ngati Whakaue Tribal Lands Trust, based in Rotorua, set about working with Crop & Food Research to establish commercial ginseng crops that begin to yield in good quantities after three years.

In 2005, Ngai Tahu was reported in the following excerpt which illustrates a prime example of a Maori commercial perspective and contemporary involvement with bioprospecting:


“Think Ngai Tahu and you think Big ..........The iwi is investing in nanotechnology “the next great advance for humanity” according to Ngai Tahu Chief Executive Robin Pratt. ..........Pratt’s approach to investment isn’t science fiction, but is rooted in Ngai Tahu’s multi-generational planning. “We’re looking very long term. We need a business with a hundred year perspective. In my view nanotech is going to be one of the next great advances for humanity, and we’ll be working on a scale and complexity we haven’t done before. Ngai Tahu needs to get in there at the ground level right at the beginning, and develop those competencies in the tribe.” With its nanotechnology associate The MacDiarmid Institute, Ngai Tahu is investing in research and development. It is also funding scholarships so that by the time scientific breakthroughs are ready to be developed for commercial purposes, trained Ngai Tahu nanotech talent will be ready to take the technology into the marketplace. Pratt says there has been no iwi resistance to nanotechnology on ethical or spiritual grounds, despite the technology’s broad application to biological systems. “At the moment we don’t see any ethical issues in the principles and concepts of nanotech. There will always be challenges because it’s an unknown field, but we have the principles, framework and system for that, based on the Ngai Tahu set of values.”
Whilst there is more detailed information on NIWA’s website relating to the scientific detail of the research project, this article is more expressive of Ngai Tahu’s perspective as at 2005. Ngai Tahu cultural values have already been represented in earlier sections of this report.


Held at the request of ERMA New Zealand’s Maori National Network, the hui sought to explore the potential impacts, risks, benefits, and applications of new and emerging genetic and nanotechnologies. 140 participants attended the hui. The overarching goal was to consider any implications for tikanga and matauranga Maori [customary practice and knowledge], particularly with regard to the role of kaitiakitanga [guardianship] over native species, the environment and human health.

Some of the key issues raised by iwi/Maori participants were:

- Concerns about the need for researchers to recognise and provide for iwi/Maori intellectual and physical property rights when dealing with traditional knowledge and/or native species.

- Frustration that their tino rangatiratanga and kaitiakitanga rights and responsibilities were marginalised by an inadequate ownership structure and science system.

- Concerns that they were unable to make the most of technological developments that might contribute to the more effective management of native species and ecosystems, or to commercial opportunities of benefit to Maori.

Several Network members expressed a desire to engage with the Ministry for Economic Development and Ministry of Research Science & Technology to discuss these issues further (p.8). In addition the Network members present made it clear that ultimately Maori are extremely pragmatic people, keen to grasp solutions that might address resource and environmental issues. Although maintaining a healthy scepticism – they were also keen to ask questions relating to using technological solutions to address specific issues within their regions. In the end both Network members and researchers were keen to work in partnership to ensure that the development, process and achievement of research outcomes that utilise new technologies were both mutually beneficial and appropriate to all concerned (p.9).
Summary

Historically, Maori were able to subsist without European introduced technology within the framework of their own developed social systems, governed by their own cultural belief systems. The successful governance of traditional Maori society was attributed to the stronghold of Maori spiritual beliefs. These spiritual beliefs subsequently influenced cultural strategies and methods of prehistoric Maori food production.

The adoption of new ways by Maori following European contact seems to have resulted in the forsaking of many traditions, in order to function in a changed society, and/or capitalise on potential economical benefits. In the course of increased integration with Europeans, Maori from the late 19th and 20th centuries proved themselves to be resilient, successfully adapting and adopting a vast array of food technologies into their way of life.

It is considered that Maori were cautious rather than resistant to initial adoptions of European technology. The cautionary stance could have been the direct result of ignorance and fear of the unknown and/or a fear of compromising spiritual values or breaching tikanga. Roberts and Fairweather (2004) and Te Momo (2006) indicate a similar cautionary stance in relation to Maori responses to biotechnology. Contemporary Maori adoption of new technologies in food processing are evident in select cases, for example, Ngai Tahu Holdings Ltd who are exploring involvement with research using biotechnology and nanotechnology. While there is increasing engagement of Maori in the area of science and sustainable food production it has often been in association with Crown institutions to meet mutual as well as differing agendas.

The literature represents two main views concerning Maori perceptions of the use of biotechnology:

1. Maori who seek to protect resources based on traditional cultural and spiritual belief systems and who maintain an “anti GE” stance.

2. Maori collectives who have foreseen economical benefits of utilising new technologies, and maintain this does not compromise cultural values.

The major limiting factor for this project relates to the lack of literature available concerning Maori perceptions specific to the future use of these technologies in food production. Whether this represents a lack of discussion in Maori communities or merely a lack of documentation is unknown. There is, however, a need for further research to present a broader representation of contemporary Maori views on this topic.

Considering both the historical adoption of, and contemporary perspectives on, technology for food production, it appears that choices of this type require a pragmatic weighing of ‘socioeconomic benefits’ versus ‘traditional cultural values’. If Maori act in a manner consistent with historic patterns, Maori will continue to embrace change as they have always done, and make decisions based on what is best for their communities.
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