Hokia ki te whenua

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Abstract

This thesis aims to produce a distinctive model for the sustainable horticultural development of Māori resources, primarily land. It is inclusive of tikanga Māori and indigenous production systems based on the unique body of knowledge aligned to Māori. The integration of this knowledge with western science is both argued and applied through the model itself. The hypothesis applied was that mātauranga Māori relevant to horticulture and pedology can inform and add value to the future development of Māori land resources. The thesis is built on a unique set of contributing knowledge bases aligned to soils and horticultural management supported by three case studies, identified through their common association i.e. whakapapa links. The format of the thesis intentionally follows science principles in structure and presentation and some assumptions are made regarding base knowledge surrounding Māori cultural factors and the science disciplines relative to soils and horticulture.

The indigenous element, including Māori knowledge, is incorporated into the model using a triadic kosmos/corpus/praxis approach. Where *kosmos* is applied as *Te Ao Māori*, *corpus* as *mātauranga Māori* and *praxis* as *tikanga Māori*, the relationship between each element is clear and the interpretation of the associated knowledge becomes more apparent and can be applied to cultural assessments of resources, including land.

The crux of the cultural assessment model is the quality of information used to assess Māori resources, especially from the cultural perspective. The Māori cultural paradigm, traditional horticulture and pedology, and various decision systems are purposefully accessed to act as contributors to the assessment model and to highlight the diversity and quality of information land managers have at their disposal.

The ability to apply a cultural layer drawn from a body of knowledge not previously included in decision models relative to land utility in New Zealand is the key point of difference of the model. The model is discussed from the perspective of its beneficial role for future use by Māori and how it can be continuously refined to meet the needs of Māori land owners and thus contribute to the rangatiratanga of Māori.

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Kia mihia te mano tini kua mene ki ngā Hawaiiki katoa. Rātou te tutūtanga o te puehu, te whiunga o te kupu i ngā wā takatū ai rātou, tātou te urupā o rātou mā, ngā waihotanga mai e hāpai nei i ō rātou wawata, tūmanako hoki. Kia ora tātou.

It is impossible to individually acknowledge every person who has been involved in this thesis from its conception through to completion. To all the whānau, friends, and colleagues, including my supervisors, who have contributed with positive encouragement and input; ngā mihi atu. I have been especially priviledged to have shared time and knowledge with many kaumātua and kuia around the country and they have in their own way given this thesis its mauri or energy. If the outcome of this work contributes to our future generations' ability to manage our resources as intended then the work will have achieved its aim.

No reira, ngā mihi atu ki a koutou, ngā mihi aroha ki a koutou,
Tēnā ano tātou katoa.

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Ko Papa-tūānuku kei te tuku kai mo ona mokopuna i te ao i te tau, i te tau.
It is Papatūānuku [the Earth Mother] who, every season, provides food for her offspring in the world.
(Best, 1995a:275)

WAIATA ORIORI (extract only)

…… Ko Hakirirangi ka u te uta;	….. It was Hakiri-rangi who reached the shore: *(Hakirirangi came on the Horouta waka and introduced the kūmara)*
Te kowhai ka ngaora, ka ringia te kete	And when the kowhai flowered, poured out her basket
Ko Manawaru, ko Araiteuru	at Manawaru and Araiteuru *(Her plantations near Turanga/Gisborne)*
Ka kitea e te tini, e te mano!	It was seen by the many, the multitude
Ko Makauri anake i mahue atu i waho i Tokahuru	Only Makauri was left behind at Tokahuru
Ko te peka i rere mai ki uta ra hei kura mo Māhaki.	Its branch sped ashore as a treasure for Māhaki
Ko Mangamoteo, ko Uetanguru	There are Mangamoteo and Uetanguru
Ko te koiwi ko Rongo-rapua	And the essence is Rongo-rapua *(the name of the belt in which she brought the kūmara here)*
Waiho me tiki ake ki te kūmara i a Rangi!	Let it be fetched from the kūmara of Rangi!
Ko Pekehawani ka noho i a Rehua	Pekehawani will live with Rehua
Ko Ruhiterangi ka tau kei raro:	And Ruhi-te-rangi come down below *(all stars that signal the onset of harvest time)*
Te Ngahuru tikotiko-iere	The autumn, time of heavy crops and singing;
Ko Poututerangi	Poututerangi *(The tenth month or harvest time)*
Te matahi o te tau, te putunga o te hinu, e tama e!	The eleventh month of the year, the abundance of rich food, my boy.

This extract is from an oriori or lullaby that originates from Te Aitanga ā Māhaki tribe near Gisborne and is concerning the origin of kūmara in their district and the rituals and events which are associated with the seasonal cycle ending each year with the harvest. It reminds us of the importance of horticulture to Māori, especially the subsistence culture that existed prior to European colonisation of Aotearoa/ New Zealand and the introduction of new economic opportunities. The traditional knowledge that surrounds traditional horticulture and associated activities is extensive and this thesis will serve only as an introduction to that store of knowledge.

Introduction

This thesis is researched and written using kaupapa Māori principles and as such relies on personal experience and knowledge as much as that drawn from academic research processes to achieve a critical analysis of the topic. As a descendant of Awanuiārangi it is imperative that an understanding of the mātauranga or customary knowledge aligned to the descendants of Awanuiārangi is shown in any contemporary work. Put simply, it is whakapapa that determines the cultural context in which we are nurtured and which we apply to all activities in our lives. For those descendants of Awanuiārangi, nurtured within Te Ātiawa in Taranaki, the tribal group who align to Awanuiārangi, whakapapa is the commonality and the thread which binds us as a people over all the generations – either previous, present or to the future. The generations which have gone before us provide us with our customs and much of the mātauranga or knowledge which we apply as part of our cultural identity. The practices and knowledge handed down intergenerationally are not done so they can be justified in a non-Māori situation: they are given to strengthen the cultural identity of the descendants and to provide them with the skills to promote and maintain the cultural environment.

Te Ātiawa, also referred to traditionally as Ātiawa nui tonu, is defined in contemporary terms as a tribe within Māori society, within New Zealand. In Māori terms it is an iwi whose common denominator is descent from the eponymous ancestor Awanuiārangi, a male ancestor or tupuna. The whakapapa or genealogical representation of the descent from Awanuiārangi is encapsulated within iwi traditions and some aspects of that knowledge will be presented here to provide the basis of cultural application to the research.

Awanuiārangi was born to Rongoueroa between 30 and 40 generations ago after her liaison with Tamarau-te-heketanga-ā-rangi. Rongoueroa was the daughter-in-law of Toi-te-Huatahi, a prominent man in the whakapapa of many iwi around Aotearoa. The late Kaumatua Sonny Waru related the story to us that Toi-te-Huatahi's grandson Whatonga was swept out to sea while watching a race in the Pikopiko-whiti lagoon in Hawaiiki. In

searching for him Toi-te-Huatahi eventually came to Aotearoa and settled at Kapū-te-rangi, a small pa overlooking the present township of Whakatane in the Bay of Plenty. At a later time Whatonga made it back to Hawaiiki and was told of his grandfathers' quest for him and so eventually he too found his way to Aotearoa and joined him.

Toi-te-Huatahi was the father of Ruarangi who was married to Rongoueroa. From their union they had Whatonga and another son prominent in many iwi whakapapa; Rauru. When Rauru was a baby, Rongoueroa was stripped off and bathing him at the river when she was noticed by a whatakura or celestial being called Tamarau-te-heketanga-ā-rangi. He was captivated by her beauty and watched her for some time. He approached her quite closely without being seen but she saw his reflection in the water. Rongoueroa gazed at the reflection for a long time and eventually turned around to see this man. They embraced and before he returned to the heavens Tamarau-te-heketanga-ā-rangi said "if you have a male child name him Te Awa-nui-ā-rangi after the river to which I descended from the heavens".

Tamarau-te-heketanga-ā-rangi was a direct descendant of Ranginui and Papatūānuku and is believed to have dwelt in the tenth heaven. The celestial or spiritual origin of Tamarau-te-heketanga-ā-rangi is a salient point for Ātiawa of Taranaki and is remembered in the whakatauāki – Te Ātiawa o runga o te rangi (Ātiawa of the heavens above). Keenan (1994) describes it as the 'celestial genesis' of the Ātiawa iwi and also notes this is the transition from the cosmic realm – Ira Atua – to the mortal realm – Ira Tangata. The following whakapapa or genealogical table shows his descent from the primæval parents:

RANGINUI = PAPATŪĀNUKU
- KAHUI AO
- AO POURI
- AO RARANGI
- AO WHETU MĀ
- AO TĀTAI
- TAMARAU TE HEKETANGA-Ā-RANGI
  - AWANUIĀRANGI

Awanuiārangi married Tahu-ao-ariki, a woman of the Te Tini ō Taitawaro people of the Waitara district, a tribal group who resided in the north Taranaki region for many generations prior to the arrival of the Tokomaru waka in the 14th Century.

The following waiata tawhito celebrates the union of Tamarau-te-heketanga-ā-rangi and Rongoueroa and is retained by Ātiawa. Waiata contribute to our whakapapa and help to cement and consolidate the transmission of knowledge relayed to successive generations and to promote and maintain whakapapa.

Tamarau no runga i te rangi	Tamarau from the heavens above
Heke iho ki raro ki te whakamarimari te tatari ai	Came down to make love and waited
Ki te hurahanga i te tapora o Rongoueroa	Until he could have Rongoueroa to wife
Taku kuia e! taku kuia e!	She is our kuia! She is our kuia!
Te ara o taku tupuna o tohia ai au	This is the consecrated pathway of our ancestors
Ko te Ātiawa no runga i te rangi	Te Ātiawa from the heavens above
Ko te toki te tangatanga e te ra	The adze which can remove the very
Taringa mango ko kete nge	sun from its axis[1]
Ue ha! Ue ha!	

Te Kūmaranui ā Tonga

'*Te kūmaranui ā tonga*' is an old and important whakatauāki or proverb for Ngāti Rahiri ki Taranaki[2]. It refers to the cultivated crops for which they were renowned and emphasises the bounty of their crops. Translated it means 'the great kūmara crops of the south'. Kūmara is a crop better suited to the warmer northern regions of New Zealand yet Ngāti Rahiri had a reputation for the production of this crop in the cooler Taranaki region. This

[1] Translation as provided in 2000 by Ātiawa kaumatua Hemi Bailey, Motunui (since deceased)
[2] Personal communication, Mrs Wharemawhai (Mina) Timutimu, Kuia o Ngāti Rahiri, & others

recognises their skills as horticulturists and managers of the land resource. In all, this relationship to the whenua was a continuation of whakapapa, knowledge and experience, from the past to the present – down the generations.

Within the history of Ngāti Rahiri there lie many references to the whenua; the land to which they identify, to which they hold mana-whenua (primary status over the land) and to which their survival is inextricably linked. Although the size and population of this hapū is relatively small in comparison to other iwi and hapū, they none-the-less retain an identity with the whenua, the moana and the ngahere – their landscape, papakāinga or residence, 'playground' for communal activities and history – which is recognised and accepted by other tribes around New Zealand.

Tukuna mai he kapunga oneone ki a au hai tangi[3]
Send me a handful of soil so that I may weep over it (an expression of affection for ones native soil)

The link between the people and the land for Māori is expressed in the whakatauāki above and simply explained in the term 'tangata whenua' liberally used to identify the indigenous relationship between the people and the land, not just the genealogical connection but the provider of sustenance. In this instance, the whenua or land component can be interpreted as Papatūānuku or the wider natural resources.

As 'tangata whenua' and more specifically as 'Uri o Rahiri Pakarara', the history and traditions of the Ngāti Rahiri tribe and the resources aligned to them are a part of the upbringing of successive generations of the people. Māori are raised in the knowledge of their tūpuna or ancestors; where they lived, cultivated, fought, worked, played and where they interred their deceased. This is therefore whakapapa, the history of the people including the genealogical process. For the most part, Māori have been raised secure in the knowledge that the land or whenua (along with other resources) had sustained each generation throughout the seasons, provided material for their shelter, weapons, tools and clothing and most importantly, ensured the continuity of whakapapa for the tribe, from their

[3] Mead, H. M. & Grove, N., 2001: *Ngā pēpeha a ngā tīpuna*, Victoria University Press, Wellington. 448pp.

origins to the present time. This now includes the political relationship of generations of people promoting and maintaining the resource and vice versa, especially post-colonisation, also contributing to the whakapapa of the people.

Ngāti Rahiri ki Taranaki are a small iwi or tribe relative to other iwi. They align as a key hapū or sub-grouping to Ātiawa nui tonu ki Taranaki, however they hold a whakapapa and internal kinship independent of Ātiawa and one which is acknowledged by other tribes around Aotearoa-New Zealand. In common with the other tribes of Taranaki, Ngāti Rahiri whakapapa directly to the maunga or mountain known as Taranaki (syn. Egmont) (Plate 1).

Plate 1: Maunga Taranaki

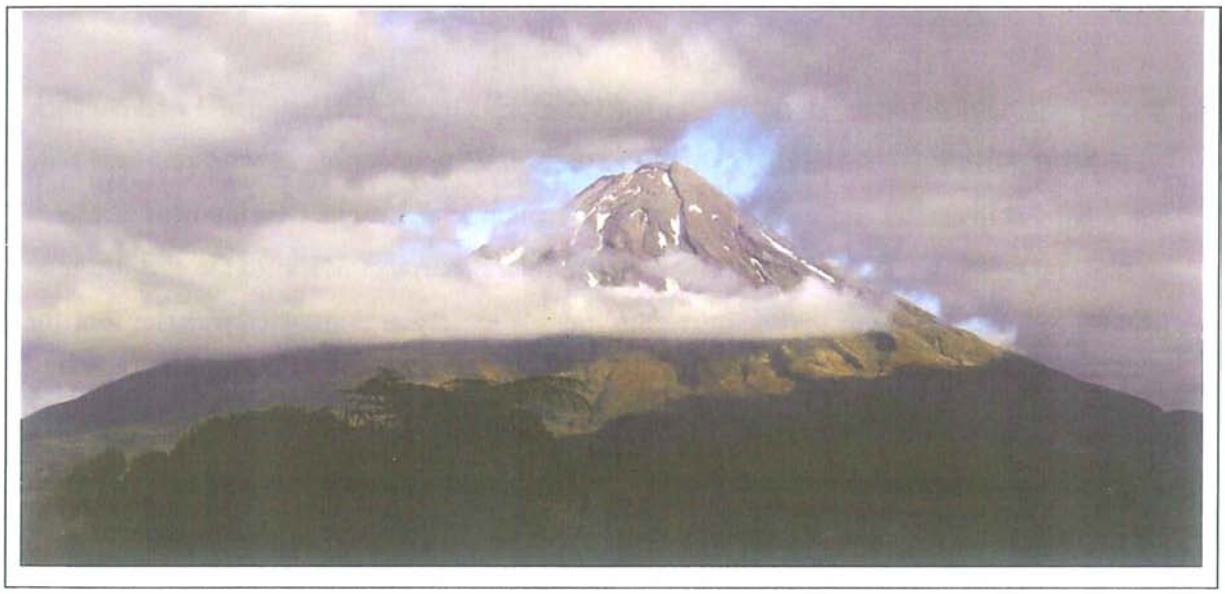


Photo courtesy of Peter Jeffrey, 2007

Over the many generations that Ngāti Rahiri has lived on their lands in North Taranaki, at least five centuries, they have formed and developed a distinct history or whakapapa. Their knowledge of the resources on which they relied for ongoing sustenance was also their strength. In modern terms they were geographers with a thorough understanding of their landscape and role within it. They identified the intricacies of the landscape, applied names to ensure continuity of the knowledge and utilised this information in their daily decisions. They were also ecologists in that they knew the plant and animal makeup within their boundaries and the factors which influenced the populations year-by-year, season-by-

season. As well, they were marine ecologists, marine biologists and oceanographers with their expert knowledge of the oceans, marine resources and living population dependant on them. Ngāti Rahiri were also resource managers in its' purest sense and more importantly, they were horticulturists.

As horticulturists they utilised their knowledge and expertise of the environment and resources – soil, climate, water, seasonal variations and labour – to work the land to produce crops for themselves and for bartering or hospitality purposes. The importance of their knowledge of the soils resource and crops as a food source to compliment the bounty of the forests and oceans cannot be underestimated in pre-colonial times and will be elaborated on in this thesis.

This project will examine the relationship of Māori, specifically iwi, hapū and whānau such as Ngāti Rahiri to the whenua – in particular the soil component of the whenua - and how the relationship can be restored to facilitate the economic and social development of Māori in the 21st Century. The historical and personal relationships of Māori to the soil resource will be examined and put into context with today's society and knowledge. The tool for land utilisation for this particular project will be horticulture or crop production.

Primarily it is the activities of horticulture and soil resource management by Māori that will be examined and from this the opportunity to place the Māori horticulturist from traditional to contemporary production systems will be discussed. The renewal of a relationship between a people and a remnant resource to drive an economic approach to the land is the expected outcome. To achieve this, a close study of the effects of history, politics and culture will also be applied. How do we, as Māori, return to the whenua to not only sustain ourselves, but to create an income for our future? How do we recapture and in some respect, reconstruct our mātauranga Māori and apply it to this process to enhance rather than inhibit the outcomes? These and many other questions are a part of the journey ahead for Ngāti Rahiri and all Māori.[4]

[4] Acknowledgements to Ngāti Rahiri & Ātiawa for their input to this section (Refer Personal Communications, pp241-242)

Chapter 1: General introduction

This thesis aims to produce a distinctive model for the horticultural development of Māori resources, primarily land, inclusive of tikanga Māori and indigenous production systems based on the unique body of knowledge aligned to Māori. The integration of this knowledge with western science will be argued and applied through the model itself.

1.1 Hypothesis

That mātauranga Māori relevant to horticulture and pedology can inform and add value to the future economic development of land resources.

1.2 Background

Through whakapapa, Māori have an inextricable relationship to the land and natural resources, one which identifies their connection to the land and which binds them to all resources in several ways. The land along with the oceans, bush and forest resources, have sustained the survival of the people through their ability to provide food, shelter, spiritual linkages and strength, transport and recreation. The provision of food is one of the most important forms of sustenance because it provides for physical well-being, but all these practices are important because, in Māori terms, the world is holistic and we cannot, and should not, try to separate any one activity from another; they all impinge on each other.

It is well documented that under present conditions, Māori land is under-utilised by its owners (MMOLDC, 1998). The contemporary definition of utilisation differs in some aspects from what Māori perceive as ideal based on their tikanga practices. Utilisation alone is not a basis for determining the value of land use; sustainable practices are now expected to be an integral part of land management systems – including food production systems. The reasons for both under-utilisation and unsustainable management are several and become complex when discussed in relation to Māori land. Primarily they relate to the issue of multiple ownership, lack of investment opportunities, lack of [contemporary]

knowledge about the resource, lack of experience and/or skills and, isolation of blocks or low land use capabilities. (MMOLDC, 1998)

A retrospective view of Māori land use would highlight horticulture as one of the most important activities based on land management skills and providing for the physical and spiritual well-being of the people. Historical [oral] records relate the importance of specific food crops such as taro and kūmara which were introduced to this country through the migratory actions of early Māori. On the arrival of European immigrants to the country, Māori transferred their horticultural skills from subsistence level to commercial levels and began supplying produce to new settlements around the country as well as some export markets. This led to a thriving industry and related investment such as trader vessel ownership until around the time of the 'land wars' which saw their energy transferred to supporting their own people in land retention.

Based on the retrospective view it could also be argued that Māori land use was applied in a sustainable form during the time of European settlement. The combination of a small and dispersed population and tikanga or cultural practices promoted this system of management. With a growing pressure, however, to produce more from the same resource and targeting new consumer groups, the same sustainability is not often seen today.

Horticulture therefore has had an important place in land use by Māori since their settlement of these islands. However, horticulture as an economic activity has become less common for Māori on land owned by them[5]. The 2000 statistics indicate 0.6% of the total land in horticultural production in New Zealand is land in use by Māori owners or businesses (MAF, 2007). What can be done to restore the horticultural relationship between Māori and the land? In response to this question, Māori landowners need to include the opportunities which now exist through the commercial and sustainable use of their land to meet the present-day economic pressures placed on them as a people.

[5] Personal Communication, W Sutton, MAF Māori Policy Unit – 6 July 2001

This thesis aims to answer these questions with a view to facilitating the return of Māori to horticulture as an appropriate use for their land and one which can target the commercial aspirations of Māori, thus acknowledging the economic opportunities for Māori. It is intended that a selection of three case studies be undertaken which can support the hypothesis that horticulture is an economic land use for Māori land. Groups involved in the case studies are identified through their common association i.e. whakapapa links, and will have opportunities to participate in discussion groups concerning the issues surrounding Māori horticulture.

Essentially the project is concerned with the empowerment of Māori as both a process and outcome to utilise their own resource (land) in a fully economic sense. Empowerment will be facilitated through the acknowledgement of *tino rangatiratanga*[6] for all Māori involved and the return of information to participants. Horticulture is simply the tool by which utilisation will occur.

1.3 Case studies

Case studies were undertaken based on the following terms of reference which are drawn from a generic interpretation of the subjective considerations applied to case study theory (Hamel, *et al.* 1993):

- Land owner or group identities based on kaupapa Māori terms
- Land/activities identified which comes under the jurisdiction of the group
- Past developments and interests in horticulture are apparent
- Historical/whakapapa relationship to the land is apparent

Furthermore, an information gathering process, which identifies knowledge necessary to make management decisions relative to the soil resource and horticulture, was undertaken in support of the case studies. Information was sourced both from primary and secondary written sources and from community (predominantly Māori) and industry informants. This means the resources such as soil and climate have to be fully identified in order to support

[6] Literally – chieftainship or self-determination – the ability to make decisions regarding ones own future.

the nature of the study. An awareness of the logistical, time and skill constraints to achieving a full return to horticultural production by any group under study is acknowledged.

Three case studies were undertaken and are focussed on the following:

1.3.1 Wakatu Incorporation (Contact: Richard Brown)

Located in Te Tau Ihu or the Nelson region of the South Island, Wakatu Inc. is a major incorporation involved in the management of multiply-owned Māori land. Their business includes horticulture, forestry and seafood. Horticulture is based primarily around Motueka and includes kiwifruit and apple production, marketing and export. This is a successful Māori incorporation providing annual dividends to its shareholders.

1.3.2 Parewahawaha hapū/Parewahawaha Marae, Bulls (Contact: Pita Richardson)

Several blocks of land are associated with Parewahawaha hapū and Marae in Bulls in the Rangitikei district. There is a history of horticultural land use however this has been less common in recent decades. Since 2003, one block has been returned to production of several vegetable crops including taewa, kamokamo, corn and pumpkins to provide for the marae itself. The block is whānau owned but managed by marae trustees in accordance with tikanga.

1.3.3 Tahuri Whenua Incorporated Society

Tahuri Whenua is a national collective of Māori vegetable growers including supporters, kaumātua and kuia and non-Māori members who wish to be involved. The collective aims firstly, to improve the presence and involvement of Māori in the vegetable sector, and horticulture secondly. Currently (2007) there are over 200 members who participate in forum and hui (meetings) throughout the year including education initiatives and support programmes for general Māori economic development. The mātauranga or traditional knowledge aligned to horticulture and land is an important basis on which Tahuri Whenua functions.

1.4 Research objectives

The key objectives identified of this thesis are to:

1. Describe the philosophical and cultural foundations for land utilisation by Māori.
2. Identify key factors of tikanga Māori relative to horticulture and soils
3. Identify cultural indicators for Māori land utilisation
4. Identify the 'qualities' of the Māori land resources under study
5. Develop a model framework based on tikanga Māori and science values for horticultural utility of Māori land.
6. Recognize the rangatiratanga of Māori land owners

This thesis is built on a unique set of contributing knowledge bases aligned to soils and horticultural management. The format of the thesis intentionally follows science principles in structure and presentation and some assumptions are made regarding base knowledge surrounding Māori cultural factors and the science disciplines relative to soils and horticulture.

1.5 Chapters

The thesis is presented in independent chapters, each of which contributes to a discussion relative to the knowledge systems which provide the basis for the argument of the thesis. The presentation takes the following order and approach:

The introduction and chapter one provide the general introduction to the topic including the hypothesis, some background information to the development of the topic and the key objectives of the study.

Chapter two looks at the methodology used in this project which was purposefully drawn from several distinct methodologies to respond to the mixed disciplines under study and also to seek recognition from two clearly divergent communities under study; Māori and 'Western' Science. This research was undertaken primarily using 'Kaupapa Māori Research (KMR)' methodology supported by aspects of participatory, ethnopedological

framework, social scientific theory and case study methodologies. At all times the methodology was used to ensure the rangatiratanga of Māori as a people.

Chapter three gives a very brief snapshot of the traditional practice of Māori horticulture from its origins to the 21st Century and the potential it now offers for the future economic development of Māori resources and the Māori community.

This is then supported by chapters four, five and six which focus on the mātauranga or traditional knowledge aligned to the soils resource and horticulture. The historical basis for the perception of land is looked at through the traditional body of knowledge held within the Māori community that is applicable to both soil science and soil management. In modern scientific terms this knowledge can be interpreted as a form of ethnopedology.

This is supported by a review of the type of horticultural activities undertaken in traditional and contemporary Māori society and how those activities have contributed to the Māori economy and subsistence needs. There is a wide diversity of crops which were managed under various levels of intensity; some in their natural environment and others in a wholly cultivated environment. These crops are introduced in chapter six which reviews the important horticultural plants that featured in traditional Māori society. They provide the basis for a body of knowledge or mātauranga aligned to traditional horticulture and which is available within the Māori community for reference and/or application in contemporary times.

Chapter seven reviews decision systems based primarily on horticultural land use. Decision systems are a pertinent component of the techniques land and soil managers might apply to their assessment processes in the management of resources. This chapter introduces both traditional Māori and contemporary decision systems used in the horticultural and soil management fields. A single case study is also used to indicate how a traditional Māori decision system would have been applied to a crop production system which contributed to the subsistence of a community.

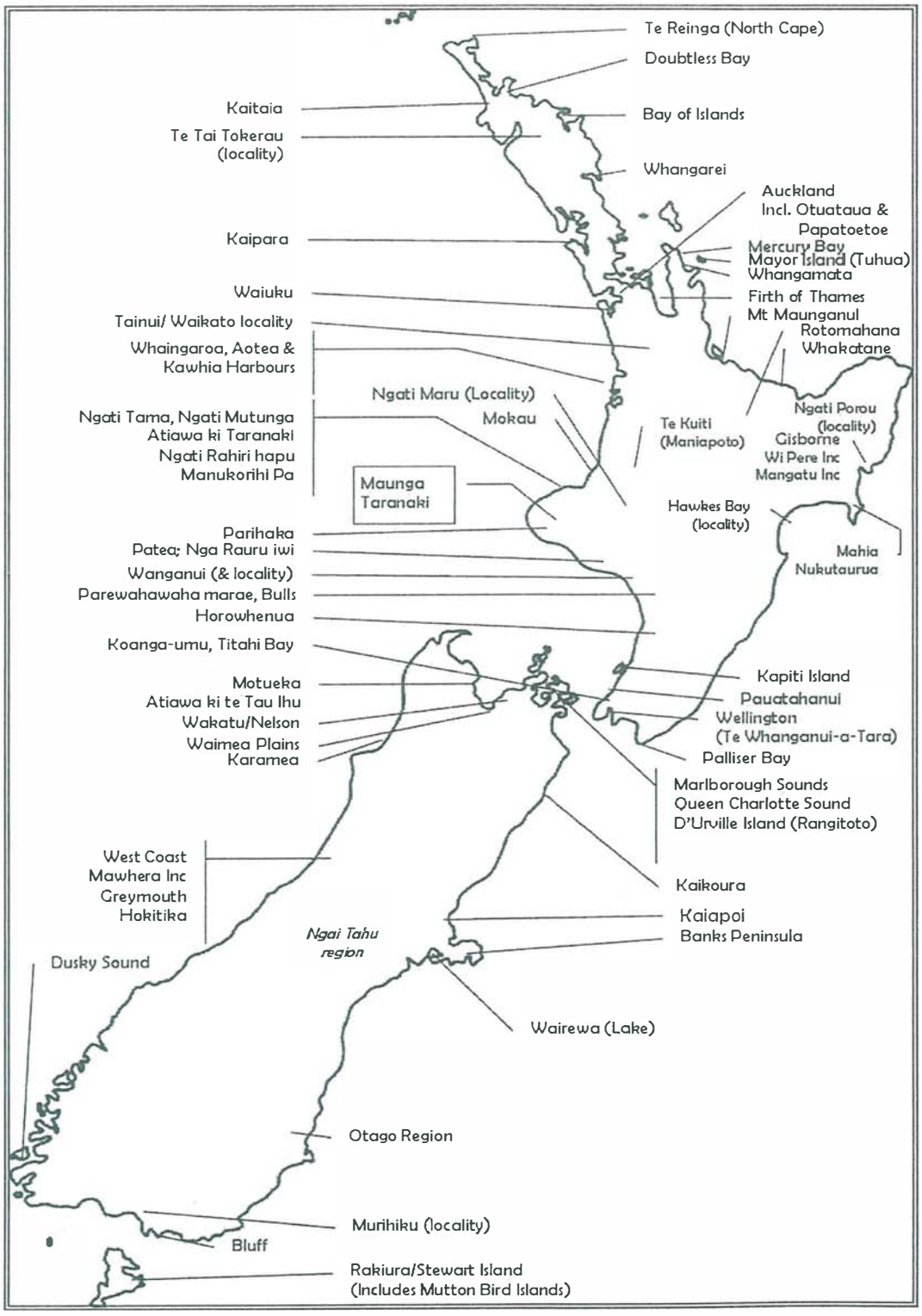
Chapter eight covers the three case studies already introduced. Each case study targets a different land management entity and helps Māori land owners to exploit the role of cultural tools in soils assessment and horticulture supported by their application in real scenarios. Each case study looks at the application of a cultural layer to the assessment of Māori land for a potential change of land use to commercial production of taewa, inclusive of cultural management inputs.

Chapter nine introduces the proposed framework/model for the assessment of Māori land resources based on the Māori knowledge introduced in the preceding chapters and science principles. This is followed by a discussion on the model and the contribution of mātauranga Māori and contemporary knowledge to the assessment approach. The ability to apply a cultural layer drawn from a body of knowledge not previously included in decision models relative to land utility in New Zealand is the key point of difference with the model. The model is also discussed from the perspective of its beneficial role for future use by Māori and how it can be continuously refined to meet the needs of Māori land owners.

This is then followed by a conclusion to the thesis and full list of references and communications relevant to the study.

The map presented on the following page (Figure 1.1) gives an indication of the location of sites, tribal areas and settlements mentioned in this thesis and is provided for reference purposes.

Figure 1.1: Map of Aotearoa New Zealand indicating places and localities introduced in the text of the thesis



Chapter 2: Methodology

E kore e piri te uku ki te rino, ka whitia e te ra
Clay will not cling to iron when the sun shines[7]
(Te Whiti o Rongomai, Parihaka, 1872)

2.1 Introduction

Researchers are held accountable for the processes and procedures used in the pursuit of their findings. The 'research design' will ensure accountability, repeatability and unbiased results (Krippendorff, 1980). It accounts for the way that data were obtained, how it was managed, analysed and interpreted, and the instructions in order for the results to be replicated (*ibid.*).

The overall or homogenous methodology used in this project was purposefully drawn from several distinct methodologies to respond to the mixed disciplines under study and also to seek recognition from two clearly divergent communities under study; Māori and 'Western' Science. This research was undertaken primarily using 'Kaupapa Māori Research (KMR)' methodology supported by aspects of participatory, ethnopedology framework, social scientific theory and case study methodologies. At all times the homogenous methodology was used to ensure the rangatiratanga[8] of Māori as people and as iwi/hapū/whānau was maintained and that the information gained was treated in the appropriate manner.

Where Māori values and science come together for the 'creation of knowledge' or practise of scientific processes, these disciplines do not normally meet the expectations from a cultural perspective. That is, they do not necessarily incorporate the values or epistemology of Māori – as a people or culture - into the methodology. Depending on the expected outcome or process of research, this may have an important effect on the whole project. The main concerns Māori have with a solely Western scientific research approach include the following:

[7] This whakatauāki spoken by Te Whiti is metaphorical, meaning that Māori (clay) and Pākehā (iron) require a common bond which is ostensibly the money focussed society (moisture); without it the bonds would evaporate! – alternatively; 'the old cannot hold with the new without a common link'.
[8] Rangatiratanga – literally 'chieftainship' or generally 'self-determination'

- Concerns regarding the impact of research on their lives. These concerns focus on the locus of power and control over research issues such as initiation, benefits, representation, legitimation and accountability (Bishop, 1996).
- The Western scientific approach to research has distanced Māori participants from participation in the construction, validation and legitimation of knowledge. As a result, Māori have become increasingly concerned about who will directly gain from the research. Traditionally Western research has utilised an approach where the research has served to advance their own interests, concerns and methods, with other benefits being of lesser concern (Durie, A, 1998; Durie, M, 1998; Bevan-Brown, 1998; Henry, 2000).

Dr Michael Walker (1994) of Auckland University, in defending the role of Māori knowledge in science disciplines, quoted the Oxford definition of science as a branch of study concerned either with a connected body of demonstrated truths or with observed facts systematically classified and more or less connected by being brought under general laws and which includes trustworthy methods for the discovery of new truth within its own domain. He determined therefore that Māori science does fit a definition of science and should be seen as such. Indigenous knowledge in the form of mātauranga Māori informs Māori values and culture and therefore provides much of the basis for Māori centred research.

2.2 Scientific theory

Science is about checking the formulation of concepts and testing the possible linkages between them through observable phenomena. These concepts are the basis of variables that form the hypothesis underlying scientific studies (Hoover & Donovan, 2001). The process of creating reliable variables from concepts and constructing the hypothesis from them is a key aspect of science, especially social science; from the hypothesis a suitable methodology can be promoted (Hamel, *et al*, 1993).

Research based on observable evidence contributes to reality, but much of science is based on theory. The point of science is to develop a set of theories to explain events within a range of observations (Hoover & Donovan, 2001). In science, theory achieves several things including a pattern for interpreting data, linkages between studies, frameworks and wider interpretations (*ibid.*). There are two general modes in which theory is engaged in research: inductive or built through accumulation and summation of a number of enquiries and, deductive or using the logic of theories to generate propositions which can then be tested. Induction is more reflective and likely to incorporate or identify values which can impose on the research whereas deduction is reductionist and generally applied to western scientific behaviour in the course of enquiry.

2.3 Applied science

Western Science has become the dominant science approach throughout the world. It is based on investigation, originality, discussion and accessibility. Chalmers (1999) states that scientific knowledge is proven knowledge, derived from rigorous observation and experiment, and based on what we can see, hear and touch. Some theorists distinguish between science and technology arguing that technology is derived from the theoretical sciences. Science is however, inclusive of technology because this is primarily just a more practical interpretation of theoretical practices (Lindberg, 1992).

The belief that '(Western) scientific' knowledge is the only valid form of knowledge is called positivism (Burns 2000) and is a widely held view. The use of hypotheses to prove scientific theories as right or wrong is also widely undertaken and forms one of the basics of research science. Western science is believed to be undertaken without any bias or preconceived expectations and the methods used have to be repeatable and acceptable to the science community.

The Western scientific process has boundaries which must be adhered to, must also be repeatable and must therefore be undertaken using a methodology which meets all these parameters. The methodology used is always aligned to the hypothesis or expected outcome(s) in science. In Western science, research often favours the researcher in the first

instance and then favours other groups or participants as secondary outcomes. Commonly it is what is known as a quantitative methodology based on the process and results being quantifiable through accepted processes e.g., statistically or treatment differences.

The application of western science methodologies in isolation of indigenous conceptual approaches in disciplines aligned to ethnopedology, ethnoecology or similar studies would be inappropriate, especially if the projects are focussed on obtaining indigenous knowledge. Some value exists however for the credibility which can be drawn from the boundaries and repeatability of western science and for the recognition these factors of research may bring to any project. Thus a homogenic or all-inclusive approach is needed which can be tailored toward the specific project under study.

2.4 Kaupapa Māori methodology

Kaupapa Māori research methodology is based on a growing consensus that research involving Māori knowledge and people needs to be conducted in culturally appropriate ways. These ways must fit Māori cultural preferences, practices and aspirations in order to develop and acknowledge existing culturally appropriate approaches in the method, practice and organisation of research (Durie, A, 1998; Durie, M, 1998; Bevan-Brown, 1998; Henry, 2000). This research process covers a myriad of research approaches with varying orientations and emphases but with a common thread relative to Māori development (Bevan-Brown, 1998).

Kaupapa Māori research should be undertaken by people with the necessary cultural skills, involve the Māori community of interest throughout, be accountable to that community, and eventually the research findings should be shared in a way that is culturally appropriate and will contribute to their empowerment (*ibid.*). This last expectation by the community requires Māori centred research to contribute to progress and development and creates an expectation not generally applied to other research approaches (Durie, A, 1998). Publicly funded research, e.g. that funded in New Zealand by FRST (Foundation for Research, Science and Technology) may build a similar outcome relative to progress and development and thus may be becoming more responsive to some needs of communities

such as Māori. There is now a requirement in many research programmes funded through the public purse to be inclusive of Māori objectives which are responsive to Māori needs and aspirations as a community.

Kaupapa Māori methodology challenges the dominance of traditional, individualistic Western research that primarily benefits the researcher. In contrast, Kaupapa Māori research is collectivistic and is oriented toward benefiting all the research participants and their collectively determined agendas (Bishop, 1996). Henry (2000:21) adds that kaupapa Māori centred research challenges the status quo in the academic community in New Zealand and calls for (among other things) '*power-sharing in the process of knowledge construction, its dissemination and the consequent ownership and uses of the knowledge produced*', a role in the de-colonisation of Māori and a space for the ongoing growth of Māori scholarship.

Three principles are particularly applicable to a Kaupapa Māori centred approach to research. The first principle is enablement including enhancement, or empowerment of the community involved. Any research activity should aim to enhance the people. Integration is the second principle, and it recognises the holistic view of life Māori have. The third principle, Māori control, places importance over research which involves Māori as subjects or which investigates aspects of Māori society, culture or knowledge. Inherent in this principle are the issues surrounding intellectual property rights, guardianship (of things Māori by Māori), and exploitation (of Māori by unscrupulous researchers) (Durie, M, 1998). Joint ownership of research programmes has been recommended so full participation of groups can occur. Table 2.1 introduces the key components of a kaupapa Māori type approach to research.

If an inappropriate research approach is adopted when working with Māori, serious problems can arise. This includes the reluctance of Māori to divulge information in the future if they believe the knowledge they have shared has been misused or benefited the researchers [solely] instead of themselves. This problem of misuse of indigenous knowledge is prevalent with many indigenous peoples overseas, where for example, grain

crops that they have cultivated for thousands of years have recently been patented by Western scientists (Benjamin, 1997). The question of cultural ethics has also been raised as part of the kaupapa Māori approach to research. Primarily these ethics are based on tikanga or good cultural practice including, aroha ki te tangata (respect), kanohi kitea (face to face interactions), titiro, whakarongo, kōrero (look, listen, speak), manaaki ki te tangata (generosity) and more (Powick, 2002).

Table 2.1: A Māori Centred Research Framework

Purpose of research	1. Gains for Māori, 2. As Māori 3. To advance positive Māori development
Practice of research	1. Active Māori participation 2. Multiple methodologies 3. Measures relevant to Māori
The Practitioner	1. Māori researchers 2. Interim solutions 3. Competencies
The Politics	1. Treaty of Waitangi 2. Māori and iwi 3. Funding

Adapted from Durie, M, 1996a

Also, Māori may not be able to understand properly if the research approach is too technical, and it would be an improvement if the researchers use language that both parties can grasp, in order to obtain the correct information. Conversation-like, informal interviews may obtain significantly more useful information than rigid, formal interviews (Royal, 1993).

In recent years there has been a move to a more integrative approach to research where Māori are involved, especially in the social science disciplines, with a more acceptable relationship between the researcher(s) and researched and also shared outcomes. In the science based disciplines an integrative approach has yet to be fully embraced. This issue is slowly being addressed and the science community is starting to seek answers in an integrative approach to projects with a clear Māori interest and there is potential in the future for this to flow through to other science disciplines.

2.5 Participatory research approaches

The 'participatory' or 'participant-observer' methodology is described by Adams & Schvaneveldt (1991) as the methodology best applied in anthropological research, though their experience does not include researching with Māori as a cultural unit. They define the 'observer' in this methodology as implying the researcher is located in an intimate relationship with the [research] subjects. Wuest *et al.* (1999) describe the end-user participation in participatory research as that of an 'intellectual partner', involved in establishing objectives, selecting methodologies and interpreting results. Kessler (2007) considers that participatory research tools on their own tend to be driven in a top-down approach and do not allow full control by the community under study. Ryder (2003) concluded that a participatory approach to research was particularly relevant in soil science and ethnopedology due to their localised applications.

In the context of researching under a kaupapa Māori methodology, this is a key factor in the successful outcome of the research and it is expected that a strong relationship between parties will develop over time. It will contribute through processes recognised as *whakawhiti kōrero* (exchanges of dialogue), *whakawhanaungatanga* (ongoing relationships), and *kanohi kitea* (visibility) by the Māori community (Durie, A, 1998; Bevan-Brown, 1998). A weakness of the participant-observer method is the tendency to err toward subjectivity and sympathy in any interpretation due to the personal involvement of the researcher (Adams & Schvaneveldt, 1991).

Data collected under the participant-observer method is often classified as unobtrusive data. The process is recognised as a prolonged period of intense social interaction between researcher and the subject, in the milieu of the latter, during which time data (often in the form of field notes) may be unobtrusively and systematically collected (Adams & Schvaneveldt, 1991). The primary tools applied consist of watching, asking questions and listening. The interpretation of the data would necessarily be undertaken in a cultural context with the assistance of cultural experts where appropriate.

The Participatory Action Research model (PAR) [or its variants] has also been applied to the mix of methodologies in this project. Whyte (1991) defines PAR as a methodology in which the community involved in the study actively participate with the researcher throughout the process, from the initial design to the presentation of results and discussion of their action implications. PAR contrasts sharply with the most common type of applied research in which researchers serve as experts, designing the project, gathering the data, interpreting the findings and recommending action to the community. Okali *et al.* (1994:41) elaborate further stating:

> *'... underpinning participatory research is a distinction between quantitative and qualitative approaches in applied science. The debate on methods is often reduced to a dichotomy between quantitative versus qualitative studies and techniques, and statistical versus non-statistical approaches. The objective of these discussions is to break the link between what is understood as 'research' and 'positivist science', and they argue for a rejection of any assumption of the neutrality of the scientific method.'*

Variants of PAR include Farmer Participatory Research (FPR) which revolves around three key parts; the distinction between qualitative and quantitative techniques and approaches, the engagement of a participatory process concerned with enhancing self awareness and analytical skill for the community and an emphasis on community participation and control (Okali *et al.* 1994). Participatory Rural Appraisal (PRA) as a methodology is intended to help communities mobilise their human and natural resources to define problems, consider successes, evaluate local capacities, prioritise opportunities and create a means for community self-help initiatives. It is better suited to third-world type communities than indigenous groups (such as Māori) because of the assumptions built in regarding the low level of skill and development each community holds (Frankenberger & Coyle, 1993). Chalmers (1992) describes PRA as a family of approaches to enable rural people to share, enhance and analyse their knowledge of life and conditions.

2.6 Ethnopedology framework

This research has its foundation in traditional Māori horticultural practices and values; thus it has an ethno-botanical, ethno-pedological or ethno-horticultural base. This then contributes to a largely applied science approach using the information gained. Berlin

(1992) states that ethnobiological research, his own discipline, is by its very nature collaborative research and is not undertaken in isolation. Ethnobiology is seen to be a discipline which combines the intuitions, skills and biases of both the anthropologist and biologist (*ibid.* p3). Utilitarian versus intellectual arguments in ethnobiology form part of the dichotomy in anthropological theory (*ibid*, p11) and can be identified as cultural particularism and relativism versus cross-cultural generalisation and comparison; essentially a focus on one culture in contrast to a generic approach.

Berlin (1992) claims that:

> *'... human beings everywhere are constrained in essentially the same ways – by nature's basic plan – in their conceptual recognition of the biological diversity of their natural environment. In contrast, social organisation, ritual, religious beliefs... are constructed by human society.'* (pg 8).

The relativist view in interpretivist and post-modernist approaches to anthropology adopts a non-scientific position that cultures are different in manifold, if not innumerable ways. The relativist person will look to show how the ethnobiological knowledge of a particular society contributes to the complex socio-cultural variation of that society.

In contrast – the comparativist, while recognising the broad range of inter/intra-cultural variation in society, seeks to discover and document general features of cross-cultural similarities that are widely shared. This aligns better to the systematists among us who hold that biological species are real, regardless of classification (Berlin, 1992).

Researchers in the discipline of ethnobotany identify their role as targeting at least one of three ideals (Given & Harris, 1994:9):

1. Rescue missions – aligned to a culture near extinction. This includes the systematic recording of ethnobotanic knowledge.
2. Industry investigations – the relationship between plants and commerce, and
3. Cultural enhancement – aligning science and culture where possible.

By their very nature, ethnobiology, ethnobotany and ethnopedology must be participatory at the very least as they involve both ecology and living cultures. Their science is a combination of studies around people, plants and land: each unique in its own way.

A conceptual approach to ethnoecology and ethnopedology was originally presented by Toledo (1992) and refined in 2000 (Toledo, 2002). It is based on three components as a framework for working with indigenous peoples and knowledge. These are: *Kosmos*, the peoples worldview, perceptions and beliefs, including their symbols; *Corpus*, the representation of symbols and signs, primarily 'local' or indigenous knowledge, and *Praxis*, the practical implementation of the corpus of knowledge (Toledo, 1992). Critical to all three are the linkages between them, i.e. the kosmos informs the corpus that guides the praxis (WinklerPrins, 2001). Up to this time, most research of this nature has focussed on the corpus of knowledge, with few studies linking the corpus with praxis and even fewer to the kosmos; therefore often neglecting the consideration of the indigenous body of knowledge (*ibid.*).

2.7 Case study methodology

Yin (2003) defines the case study as: *an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and the context are not clearly evident* (p12). Furthermore, he notes that multiple case studies can be undertaken and used to compare the similarities and differences between cases (Yin, 1994) and that evidence drawn from multiple case studies is often considered more compelling and the overall study may therefore be considered more robust (*ibid.*).

The use of a case study has become an accepted qualitative method in certain research disciplines. Hamel *et al.* (1993) argue that the case study is an approach rather than a method and that as an approach it employs various methods including interviews, participant observation and field studies. In an anthropological study it allows the researcher to undertake a monographic study from which generalised conclusions can be drawn and discussed (*ibid.*). The Chicago School in Sociology further created a distinctive

approach to case studies which surfaced in the 1930's forming a more inductive approach to the research favouring on-site observations, open-ended interviews and the collection of documents to accomplish their goal (Hamel *et al.* (1993).

The use of case studies has now become an exploratory investigation giving rise to processes that can validate or eliminate a theory or general model. The approach draws criticism from some researchers for its lack of representation of the issue or social phenomenon under study and its lack of rigour in the collection, construction or analyses of empirical materials, potentially introducing bias to the process (Hamel, *et al.*, 1993). The value of this representation needs to be defined in the objectives of the study to ensure it is signalled from the start.

With reference to the perceived lack of rigour, this perception often results from the subjective nature of the research based on observations, thoughts, or cultural world-views of both informants and researcher. However, these components of the field studies along with documented data allow the researcher to remain somewhat aloof and remain focused on the hypothesis. Chapoulie (1987:276) noted that the comparative approach to case studies by researchers:

> *'not only permits field researchers to take an objective point of view toward their activities and thus exercise certain control over them, it also allows them to avoid established representations of the subjects they study, especially those associated with their familiar everyday points of view.'*

The case study therefore is an in-depth study or investigation based on a wealth of empirical materials primarily of a broad variety. It has particular value where it is constructed to meet the objectives of an explicit study and can contribute an inherently sociological approach to the object of study.

2.8 Data collection

Yin (2003) identified six sources of evidence usually presented in a case study; documentation, archival records, interviews, direct observations, participant observation and physical artefacts. A mix of sources has been applied to the data collection process in

the case studies for this thesis. Primarily, informal interviews with various Māori informants supported by observation, either direct or as participants, have been undertaken to assist in determining the perceived and cultural alignment of the Māori community to horticulture. A significant amount of the knowledge drawn on has been proffered formally and informally to the author or associates over many years of interactions at hui or traditional gatherings and other occasions where contact has occurred. Where possible they have been referenced as personal communications but often they have been given under the consensus of several people rather than one alone. Culturally, Māori have a strong belief in an intergenerational transmission of knowledge, acknowledging that no single process of learning will provide all the answers for each individual in our community (Pere, 2000). Historical (archival) data or 'documents of the past' (Adams & Schvaneveldt, 1991) from both primary (e.g. diaries) and secondary (e.g. collated statistics or newspaper articles) sources have also been drawn from to provide further insight into Māori horticultural and pedological practices and expectations. The process of undertaking soil testing procedures and environmental assessments can be generally described as using 'physical artefacts' as a data collection process. Thus all six sources of data identified by Yin (2003) have been utilised in these case studies.

A practical approach and application to the discipline of traditional Māori horticulture and ethnopedology has also been applied as part of the data collection for this thesis. The nature of working within a cultural group based in their traditional knowledge and seeking in part to restore and revive that knowledge in an academic context is a daunting objective in itself. During the process of pulling together the contributing parties to this thesis an identifiable group became apparent through their continued interest and input to the project and to their desire to take the outcomes back to their various communities as the project evolved. This group was formalised in 2004 as Tahuri Whenua Incorporated Society and continues to meet twice a year at hui designed to showcase Māori horticulture, both traditional and contemporary (Tahuri Whenua, 2005).

2.9 Māori knowledge and Māori science

The term Māori science is a misnomer and seeks to compare Māori knowledge and knowledge creation to that of other cultures. Science for Māori is a holistic concept that still works with and creates knowledge but has a much wider dimension to it. In a traditional context, Māori knowledge or *mātauranga Māori* was retained as an oral tradition supervised under tribal or familial processes or tikanga (Royal, 1993). In contemporary times there are issues with the maintenance of the oral tradition through the competency of younger generations in the application of traditional knowledge and also the conflict between different media by which knowledge is transmitted (*ibid.*). In reference to these traditional processes, Royal states: *'oral literature was recited continuously until it was carved into the house of the mind'* (p21).

The major difference between the Māori and western approaches to 'science' is the inclusion by Māori of a worldview based on spiritual origins in their understanding of knowledge. There are four dimensions within which Māori perceive themselves and all resources; tinana, wairua, hinengaro and whanaungatanga – physical, spiritual, intellectual and social or cultural. Through these dimensions it is apparent that Māori science is more than just knowledge but it contributes to the culture in several ways and carries other responsibilities such as whakapapa – a continuation of people.

In attempting to define mātauranga Māori, Royal (2004:2) offers the following:

> *'Mātauranga Māori includes a range of concepts which can be considered as views or perspectives on the nature of knowledge and knowing. These views are presented as an introduction to an epistemology of mātauranga Māori and they range from explicit knowledge codified primarily through the use of literacy (mātauranga) through to experiences whereby a notion of explicit knowledge is no longer employed...'*

Durie, M (1996) argues that the relationship between Māori knowledge and Western science is one of the main contentious issues for scientists. The understanding of Māori views, beliefs, relationships and spirituality bound together is holism and forms the basis of Māori science. It is the joining of the past with the present, physical and metaphysical, people and the environment. Durie then states that while these points may seem to

highlight differences between the science practitioners there are several striking similarities as well; the effects of unseen forces, for example *tapu*, in Māori science or the various forces in physics such as gravity or torque; the processes of deduction used to reach conclusions and; the development of systems to retain and retrieve the knowledge.

Marsden (1992) identified the religious, philosophical and metaphysical attitudes inherent in Māori culture as contributors to understanding Māoritanga (and mātauranga) as a whole. He correctly recognises that, for Māori having been brought up in the culture, their values and attitudes are drawn from those experiences. While the experiences lack objectivity and therefore recognition in an academic forum, Marsden continues, objectivity from his cultural position is a form of abstraction or model and not the same as reality. Māori knowledge he concludes, is a thing of experience and existence within a cultural milieu.

It is becoming increasingly clear that the polarisation of indigenous and scientific knowledge is untenable and there is a greater sympathy for the view that indigenous knowledge represents a complementary not competing set of knowledge, and that somehow it represents a sense of additionality (Reij *et al,* quoted in Briggs *et al,* 1998). Roman *et al.* (1992) stated that while the importance of indigenous knowledge is receiving attention, most of the information about indigenous knowledge is oral patrimony from generation to generation and is variable between tribes and regions. There is also prejudice in some quarters that indigenous knowledge is against development (Hayashi & Wakatsuki, 2002).

Western science has its origins in the Babylonian, Egyptian and Greek cultures from as far back as 3000 BC (Lindberg, 1992). These cultures were also based on cosmology and cosmological speculation with a strong emphasis on astronomy and the power of unseen forces – not unlike Māori beliefs and values still held today. Western science has evolved from this time to the structured practice that it is today.

Modern 'Western' scientists are often quick to disregard other cultural sciences because they do not understand them fully, yet the Western world, and in particular commercial entities, are equally quick to attempt to access other sciences if they feel there is some gain

to be made from it. This is clearly seen in medical science when scientists seek knowledge about the properties of indigenous plants for cures and medicines. This situation shows a contradiction in the acceptance of an indigenous science such as that of Māori by Western scientists, yet it indicates that to other cultures there is some acceptance of the credibility of knowledge held by the indigenous people(s).

Accepting that there is a body of knowledge associated with a culture which is an overall science, this research looks at what aspects of this science are specific or peculiar to that body of knowledge. As a result of colonisation, Māori have had to undertake a process of understanding the practice of science from another cultural context. Cultural values are very much part of the body of Māori science and contribute to the differences between peoples understanding of what is and isn't Western and Māori science. The process of science crossing a social and cultural divide can be long and slow. The differences in language, history and social practice are not easily understood, but therein lies the value of education.

2.10 Chapter summary

The methodology applied to this research is a homogenous mix of kaupapa Māori, case study, social scientific theory and participatory methodologies inclusive of an ethnopedological framework centred on a *kosmos-corpus-praxis* triad. The research is inclusive of variants of indigenous knowledge including mātauranga Māori where it is aligned to Māori. The case studies are undertaken to introduce and support the discussion on the role of cultural factors in the assessment and utility of Māori land resources. All three case studies are undertaken using an established process and utilised the six sources of data generally recognised as contributing to case study research. The outcome of the case studies then provide a basis to discuss and justify a template for the utility of Māori land resources in horticulture informed from traditional knowledge, contemporary scientific methods and experience.

Chapter 3: Māori and horticulture

3.1 Introduction

This chapter gives a very brief overview or snapshot of the evolution of Māori horticulture from its origins to the 21st Century. It is not easy to compare today to the past with regard to horticulture but our understanding of the role of horticulture in Māori society and the potential it now offers for the future economic (and sustainable) development of Māori resources and the Māori community is imperative.

3.2 Māori and horticulture

Horticulture is not just the production of crops but also the handling of plant products, storage, seed retention, planting and so on; all the related activities which contribute to the produce quality prior to consumption or utility. In Māori society, crops that were sourced from the bush or uncultivated sites were still aligned to horticulture through the management of the sites to allow for the wild plants to grow, access for harvest, the handling of any harvested plant parts, and storage of produce.

For Māori there is, as with all indigenous cultures, a holistic[9] approach to resources and a very personal relationship between the people and the same resources. The *whenua* (land) is the resource which sustains our crops and therefore sustains the people as well. Our link to this resource is through *whakapapa* which is encapsulated in history. Whakapapa links mankind to all resources through the primal parents – Ranginui and Papatūānuku – who created the physical world that we live in and had many offspring – all *atua* or gods – each responsible for different resources and phenomena. In the case of the whenua, it is represented by Papatūānuku – the Earth Mother – who nourishes and nurtures the young. Her sons Haumia-tiketike and Rongo-marae-roa (sometimes known as Rongo-mā-tane) are responsible for uncultivated and cultivated crops respectively. Another son Tane-mahuta is the parent of the first mortal being and therefore the parent of us as humans. This *whānau* (family/familial) relationship binds us to the resources and establishes a range of conceptual approaches to resource utility and management. The spiritual relationship (wairuatanga),

[9] Based on the (w)holism concept where the sum or value of the 'whole' is greater than that of the parts.

hospitality (manaakitanga), the physical relationship and whānaungatanga, the social relationship are all aspects of the management and use of resources and define the principles behind crop or food production.

The philosophical base from which traditional or indigenous gardens stem can be encapsulated in whakapapa and tātai (layered or tiered knowledge). Through whakapapa and the relationships of the offspring of Ranginui and Papatūānuku we can understand the interactions between organisms, resources and phenomena. The interactions consolidate the place of all these things – tangible and intangible within Te Ao Māori[10]. Tātai refers to the orderliness of the world, which exists for a purpose and can be seen, for example, through whakapapa and its ordered approach. This collective knowledge was retained and taught by experts or tohunga in generations past. Buck [Te Rangihiroa] (1954:271) states: '[this] *teaching was referred to as the kauae-runga (upper jaw), in contrast to knowledge of things terrestrial termed kauae-raro (lower jaw)'.*

The tools of management for Māori horticulture are somewhat broader than those used in other systems. The primary tool is whakapapa, i.e. the relationship to the resource including the spiritual association. Second to this is tikanga – protocols or practices – literally *the right way(s)* of undertaking a task. These are followed by the physical tools such as the wooden and stone implements of old or the modern metal tools and beasts of burden introduced by the settlers during colonisation.

The Māori world is often called a holistic world because of the intertwining of all the activities and resources. Each action will ultimately impinge on the resources that provide, sustain and support the people. Therefore all actions need to consider their consequences and while the resources sustain us as a people they also need to be sustained by the people. What results is a range of processes that provide input to the activity of gardening. These include: karakia (prayers and incantations), tuhonotanga (joining together), ohu (working together) kaitiakitanga (guardianship) & tikanga; all of which will be further elaborated on.

[10] Te Ao Māori, - literally 'the Māori world'

In addition, the concept of mauri or the natural energy or life force is important to all activities which affect our resources. It is a concept which binds and inter-relates all resources to every other element in the natural order, including people – and to the spiritual realm as well. Any activity that impinges on the health of a resource is said to be affecting the mauri of the same resource and ultimately the health of those reliant on interactions with the resource.

Durie's '*whare tapawhā*' model (1994) introduces four distinct realms or planes which exist for Māori – they apply to all things, living and inanimate, tangible and intangible. He compares these realms to the four walls of a whare, each wall representing a different dimension: taha wairua (the spiritual side); taha hinengaro (thoughts and feelings); taha tinana (the physical side); and taha whānau (family). All four dimensions are necessary for strength and symmetry and all influence and support the others.

They are:

Te Taha Wairua (spiritual well-being, including religious associations)

Te Taha Tinana (physical well-being)

Te Taha Hinengaro (intellectual, mental and emotional well-being)

Te Taha Whānaunga (social well-being)

Horticulture therefore is not just the activity of planting and growing crops; it is a process that draws from other aspects of Māori life including:

- Manaakitanga – hospitality
- Wairuatanga – spirituality
- Whānaungatanga – social relationships
- Kotahitanga – unity
- Whakapapa – relationships/genealogy
- Kaitiakitanga – guardianship
- Turangawaewae – a place to stand and call ones own

3.3 Whakapapa

All cultures and groups within cultures have their own way of seeing the world – they have their own 'worldview' or 'paradigm'. To articulate the worldview of a culture is difficult as within any group there will be changes and variations (NZIER, 2003). The way that communities of people view the world informs the way they behave towards each other and their environment, the values they hold, their customs and traditions. The paradigm in science informs and organises theory and inquiry (Hoover & Donovan, 1981).

> *'The word [paradigm] comes from the Greek word paradeigma which translates literally as 'pattern'. It is used in social science to describe an entire way of looking at the world. It relates to a particular set of philosophical assumptions about what the world is made of and how it works...The point about paradigms is that they provide the landscape in which individual theories can flourish. Those theories, within the paradigm, are subsumed under broader generalisations about what the world is made up of, how it works, and how we can know about it.' (Davidson & Tolich, 2003)*

A traditional Māori worldview is based on whakapapa, or genealogy. Within a Māori paradigm, whakapapa is how we know what we know about the world. As Kawharu (1998) stated:

> *'Proof in Māori terms of gods and ancestors is denoted through whakapapa, a genealogical recital connecting humans, their ancestors and the gods before them. The whole universe is thus ordered in a systematic fashion.'*

In non-Māori terms, whakapapa is generally defined in English as 'genealogy' (A line of descent traced continuously from an ancestor; an account or exposition of this; the study and investigation of lines of descent, The Concise Oxford Dictionary, [Allen (Ed.) 1990]). The definition of genealogy does not embrace the essence of the concept and application of whakapapa in a Māori world. For Māori, whakapapa is specifically about who we are and how we fit into and participate in the environment in which we live. It is a major task to review the construct of the term whakapapa and its' application in a non-Māori context. Regardless it is important to consider the cultural implications of the term. In Māori the term incorporates all the perceptions people have of whakapapa as a concept which has a retinue of relationships to all the emotions, behaviours, beliefs and history – conceptual or otherwise – which Māori as a people have.

Kapiti hono, he tātai hono

That which is joined together becomes an unbroken line

In general, whakapapa is considered to be the genealogical record of Māori history and as such the link between Māori and the natural resource. In reality whakapapa is much more. Keenan (1994) describes whakapapa as intellectual infrastructure. Conventional whakapapa or genealogy, argues Keenan, is:

> *'a critical element in advancing tribal histories as mediations of tribal narrative is the definition of the process and framework, necessarily customary, through which this [Māori intellectual process] was achieved. The key to such processes and frameworks was the continuing value to the tribes of whakapapa as intellectual infrastructure. Such histories were achieved, it is suggested, by tribes making use of conventional whakapapa. Whakapapa is here advanced as providing the critical infrastructure for all knowledge organisation. It was especially the most customary method and pattern of arranging tribal narratives of the past.*
>
> *The process of re-arranging tribal narrative into tribal histories would then have logically followed the sequential framework of conventional whakapapa, given that conventional whakapapa was one of its primary sources.'* (Pg 23)

Best (1995) also aligns whakapapa as a basis for religion and mythology in Māori society. He maintains that Māori have their allegorical myths contained within a cosmogonic system to explain evolution. These myths are presented within a process of whakapapa and contribute to society's theological thought as well as their relationships to other members of society and the surrounding resources. Whakapapa, Best maintained, is bound to at least three sciences; cosmogony, theogony and anthropogeny. This view is supported by many, including Roberts *et al.* (2004), who continue to identify commonalities between the Māori cosmogonical whakapapa and that of various other Pacific cultures including the Hawaiians, Tahitians and Cook Islanders.

Roberts *et al.* (2004) summarised whakapapa as a Māori mental construct essentially meaning 'to place in layers' and applied to recording human descent lines and relationships as a genealogical construct connecting each *papa* or layer. Whakapapa is viewed as an "epistemological framework in which perceived patterns and relationships in nature are located". Pere (1982) adds that whakapapa contributes to a process of social stratification which depended on seniority of descent both vertically and collaterally. Debate continues

regarding the similarity between processes other cultures use to classify components of the world around them such as plants and animals and the Māori cultural process aligned to whakapapa.

Whakapapa is therefore much more than just a genealogy; it is the receptacle of knowledge for tribal histories and Māori intellectual basis. Several terms in te reo Māori consolidate this understanding. Within Te Ātiawa, whakapapa is also referred to synonymously as 'tātai'. This word refers to the order of the knowledge within the whakapapa, sequential as is expected within any genealogy system and also elaborative as is expected within any receptacle of history. Barlow (2002:173) differentiates whakapapa from tātai stating the latter as *'signifying the order and structure of various domains' and when it relates to humans, as referring to 'the actual recital of genealogies rather than the system of descent...'* whereas whakapapa is the *'basis for the organisation of knowledge in respect of the creation and development of all things'*.

It is the concept of whakapapa we are concerned with. In the beginning the creation of the universe as we know it was defined by Māori through whakapapa. Walker (1996) states that the world-view of Māori is encapsulated in whakapapa; the description of the phenomenological world in the form of a genealogical recital. He further states that implicit in the meaning of whakapapa are ideas of orderliness, sequence, evolution and progress... embodied in the sequence of myths, traditions and tribal histories. Roberts *et al.* (2004) identify whakapapa as a mental construct or framework which creates patterns and relationships in both human and non-human environments. The narratives which accompany the whakapapa provide information, meaning and explanations for the people and often explain why things are what they are and how behaviours such as tikanga (customs or practices) have come about.

Inherent in the whakapapa relationship between Māori and the land (and other resources) is the practice of naming places or contributing names to pēpeha or whakatauāki (proverbs or sayings). The names are remembered in whakapapa and are often synonymous with relationships and other important aspects of historical interest (Forbes, 1996). It is common practice to apply names to sites of particular utility, including cultivation sites. Treasured

items, often including the products of cultivation e.g. hue (Newman, 1903) were also given names as were special trees and plants and important occasions including feasts.

Whakapapa is but one of the modes of transmitting history in Māori society. Māori processes applied to recording history are primarily oral and usually undertaken by narrative, prose, song (waiata), proverb (whakatauāki) and whakapapa (Binney, 1987). Roberts *et al.* (2004) note that the Polynesian oral traditions reveal a sophisticated understanding of the world and their place in it. The oral process gives a purpose in Māori society by providing a meaning for events and a validation for the whānau and hapū claim to mana and knowledge or mātauranga (Binney, 1987). It also endows a responsibility for whānau members to retain, record and relate the history to future generations.

3.4 I te timatanga (in the beginning)

There were three periods about which the universe was created. The first was *Te Kore* in all its various names; the vast emptiness. This was followed by *Te Pō* – again in all its names; the long night. Both these periods have no specified time period. The third period is *Te Ao Mārama;* the world of light and the one in which we now live. Within *Te Pō* the whakapapa culminates in the acknowledgement of a primæval being; Ranginui who later begat Papatūānuku from within himself and then took to be his wife (Broughton, 1979). Ranginui is personified as 'the Sky Father' and Papatūānuku as 'the Earth Mother'. It is from their close coupling that the cause of darkness was understood. Ranginui and Papatūānuku were responsible for two main things: darkness through their coupling and, light through their separation as undertaken by their own offspring. The union of Ranginui and Papatūānuku was procreative and from it they produced 70 offspring. When they were finally separated the world of light became a reality. Papatūānuku said to her offspring that she would provide sustenance for them. From this promise comes the reasoning why Māori continue to dig into the earth to gain their sustenance, primarily aruhe and kūmara, but also crops such as taewa and other root crops.

Each child of Ranginui and Papatūānuku was assigned to a resource or department in nature (Broughton, 1979) and their offspring and unions subsequently accounted for all other resources. An example is Tane's union with Hine-tupari-maunga which resulted in

Parawhenuamea, the parent of fresh water and whose son, Rakahore, became responsible for stones and rocks. Rongo-marae-roa (syn. Rongo-ma-Tane) and his brothers Tane-te-hokahoka and Tangai-waho were appointed as preservers and caretakers of the fertility and welfare of forests and plant life. Rongo-marae-roa held the status over all agriculture and cultivation (not of harvest though, just of the preceding activities) and also with the practice of peacemaking and the expression of hospitality, generosity and manaaki tangata. Another brother Haumia-tiketike held the same status over uncultivated food/crops.

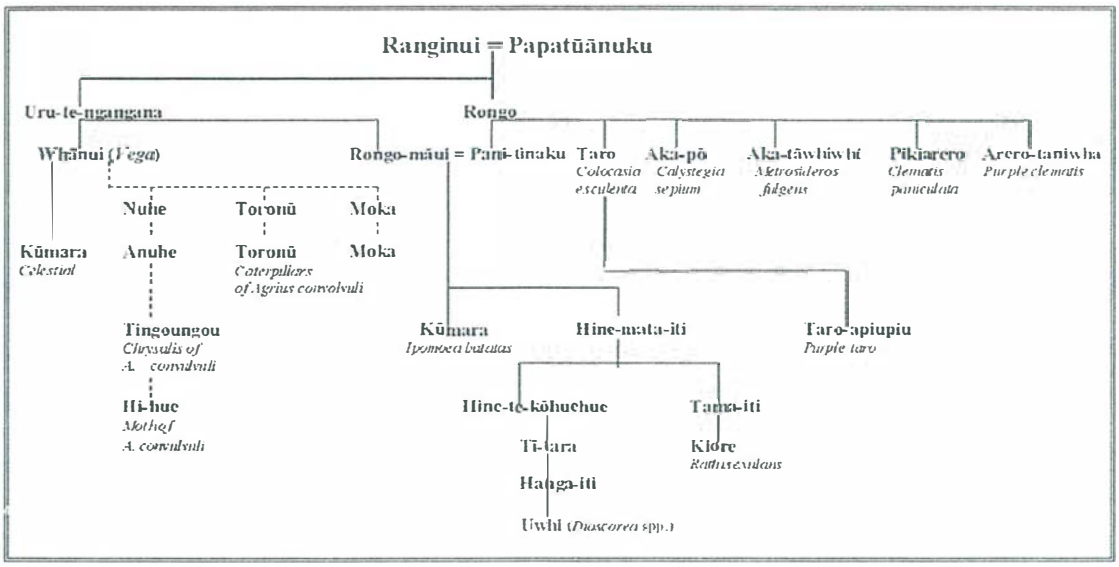


Figure 3.1: Sample whakapapa relative to horticulture *Source: Roberts et al. (2004)*

An example of whakapapa as applied to horticulture can be found in Figure 3.1 (Roberts *et al.* 2004). This composite whakapapa shows how whakapapa creates both order and knowledge and can be found in its various forms within mātauranga held by various iwi, hapū and whānau throughout Aotearoa/ New Zealand.

Ko Rongomaraeroa te putake o te kai, o ngā hua o te whenua.
Rongomaraeroa is the origin of food and of the fruits of the earth

Specific tribal whakapapa identifies the association of atua with various food crops. For example Uru-te-ngangana, Rakataura and Haumia-tiketike are all important in their significance as atua to the kōuka or tii plant. Their significance is broad and ranges from

Uru-te-ngangana's descendants being responsible for many of the qualities of kōuka such as its botanical habits, strength and so on. Rakataura is the son of Rehua, a son of Ranginui and Papatūānuku. Rakataura is the creator of moths which relates to the caterpillars which feed on the leaves of tii. His wife Hine-po-iho and their children are responsible for the qualities of the tii leaves for its various uses. Haumia-tiketike, as the atua responsible for underground food stores, relates to the qualities of the rhizomes of the tii (or cabbage tree) plant which were used for cooking in earlier times (Simpson, 2000). This example highlights the diversity and complexity of the whakapapa relationships in traditional Māori society.

3.4.1 Maru

Maru-tangi-kai[11] – *Maru who cries for food*
[Maru was a very jealous and demanding god]

On the North Island's west coast the atua or deity ***Maru*** had strong associations with crop production systems. Maru is said to have arrived in the Aotea waka as a spirit tendered to by tohunga on the voyage from Hawaiiki (Buck, 1949; Broughton, 1979). Maru was a very strict atua demanding specific behaviour from his adherents; as the local god of war he was called through karakia or prayers and incantations supported by offerings such as cultivated and uncultivated vegetables, fish or bird products. He was also called periodically to save a failing crop through the same process of karakia and offerings.

3.5 Maramataka

Ānō ko te marama kua ngaro, kua ara anō.
Just like the moon that disappears and rises again.[12]

In earlier times Māori were totally reliant on their understanding of the seasons and phases of the sun, moon and stars to guide them through their daily activities. Theirs was a subsistence lifestyle and most activities were undertaken at their most appropriate time to gain the results or products necessary to maintain survival. An example is the fisheries resource which was exploited only during the most appropriate time in the season for each variety of fish. Another example is the activities aligned to specific crops which would

[11] Whakatauāki from Wanganui region
[12] Translation taken from Mead & Grove, 2001

only achieve good results at particular phases in their growth. This means Māori were required to have the intimate knowledge of the resource and its own cycle so that their activities could not create any potential harm to the same resource.

The maramataka Māori (Māori lunar calendar) is one such tool used to create orderliness in the daily lives of Māori and assist decision making and management processes. The calendar is based on the moon and stars and was created through an intimate knowledge of these things. Several versions of the calendar exist and mostly they all carry tribal variations which acknowledge the independent tikanga of these groups[13]. The calendar is used through reference to the moon and should be read as the first day being that directly following the new moon on the Pākehā[14] calendar. It formed the basis of cultural life before colonisation acting as an almanac for the start or cessation of various activities (Roberts, *et al.*, 2006), especially in horticulture. The Māori calendar traditionally begins with the rise of the Pleiades or Matariki constellation in the May/June period and ends after harvest around May the following year (Best, 1986).

In support of the calendar are the concepts of seasons and lunar months (Refer to Table 3.1). These were also based on knowledge of the stars and moon however, they also incorporated knowledge of the environmental responses or phenomena surrounding them which were used as indicators. An example is the terms used to identify each season such as *Mahuru* where the whakatauāki or proverb states '*kia pumahana te whenua, me ngā otaota, me ngā rakau'* in reference to the earth (soil) and covering vegetation warming up following the cold winter months or, the onset of the eighth month (Kohitātea/ January) as *Te weronga o te karaka (the time of the karaka fruit being red-ripe).* Note also that in the Māori version of the seasons, each of the four seasons represents a three-month period on the Pākehā calendar. Māori also recognise the winter solstice which was known as *Hikumutu* and the summer solstice known as *Maruaroa.*

[13] Comments made by several kaumātua & kuia, also, note prepared by Materoa Frew (Maniapoto), 2003 and comments from Makuini Chadwick (Ngāti Hine ki Tai Tokerau), 2006
[14] In this context, 'pākehā' is a generic term meaning 'non-Māori.

An example of tribal maramataka provided by Ātiawa is attached as Appendix 1. It is supported by a selection of notes explaining the role of this particular maramataka in horticultural activities and the basis for the 12 month calendar as it is applied in a Māori context.

Table 3.1: Identification of seasons in Māori calendar[15]

Season	Notes
Takurua/ Hotoke (Winter)	Comprises the months Pipiri, Hōngongoi & Hereturi kōkā (Jun-Jul-Aug) Takurua-waipu and Whaturua – both terms for mid-winter
Kōanga/ Mahuru (Spring)	Comprises Mahuru, Whiringa-ā-nuku & Whiringa-ā-rangi (Sep-Oct-Nov) 'the digging and planting season' Note Kō-anga is in reference to the Kō a traditional digging implement.
Raumati (Summer)	Comprises Hakihea, Kohitātea & Hui tanguru (Dec-Jan-Feb) Hui Tanguru (Feb) – kua tau te waewae o Ruhi kai te whenua (Ruhi's feet rest on the earth). Ruhi refers to Ruhi-te-rangi, the child of Rehua (a star) and Peke-hawai was responsible for all cultivated products and hence this saying means the crops are set.
Ngahuru/ Te Kohi ō Autahi (Autumn) *Sometimes; Matahi-o-Rongo*	Comprises Poututerangi, Paengawhāwhā & Haratua (Mar-Apr-May) Te Kohi ō Autahi signifies the start of the cold period and fish moving from the rivers to the ocean for spawning. Ngahuru also known as Te Ngahuru-tikotiko-iere, meaning when the crops are gathered and food is plentiful Paengawhāwhā (April) is when crops are harvested and is sometimes referred to as Ngahuru-kai-paenga; kua taka kai tonu i te māra (food is prepared at the side of the cultivations)
Hikumutu/ Maruaroa	Terms applied to the winter and summer solstice

In modern times calendars are used not only to record the phases of the moon but also to use as a diary or as a track of time in relation to holidays, anniversaries and so on. For the pre-European Māori the calendar was an important tool in determining their activities and was used in conjunction with a range of other tools to determine what and where activities such as fishing should take place. Other tools included the use of *matakite* (seers), *tohu* (signs/omens) such as the flowering of plants or moulting of birds and other local knowledge (Best, 1986). Daily lives were for the most part orderly and based on the light/sun i.e., rising to work at sunrise followed by a meal mid-morning, rest, more work and a second meal and then retiring in the early evening to sleep. Remember also that this calendar originates in an oral culture, and was memorised and sometimes encapsulated in waiata (songs), pakiwaitara (stories), carvings and other artistic renditions rather than a written or printed document. Therefore, the references to lunar stages of the moon or stars

[15] Based on the Ātiawa maramataka as supplied by ngā kaumātua o Ātiawa nui tonu

were important factors in ensuring the people were keeping to the right decisions. Again, the activities associated with the calendar such as fishing and planting or harvesting are all considered to be tikanga statements derived over generations as the best practice for the particular tribe.

Table 3.2: Vernacular Māori terms for climatic characteristics[16]

Ao	Cloud (aorewa – scud/moving cloud) - also daytime
Whenua-huka; hukarere	Perpetual snow (waihuka – snow water)
Huka-papa	Snowfields (huka-horo – avalanche)
Kopaka; hauhunga	Frost (kopakanui – big frost)
Waiuka; hukapuri	Solid water / thick ice
Huka-maro; pata-huka; ua-whatu; hukākapu	hail
Kotiti	Drizzle
Kōnenehu	Drizzling rain
Marangai; ua	Rain (maroi – type of rain that soddens garments)
Pūroro; ua-pūroro; paroro	Downpour or driving rain
Uāpo	Showery weather
Hau	Wind, air (& various honorific names for winds in regions)
Haukū	Dew, damp
Hauhau	Cool air (currents)
Hātai	Mild weather
Anu, anuanu	Cold (upoko-pāpā – cold winter weather)
Marino, mārinorino	Fine weather, calm/still weather (marino-tukupū – very fine)
Pūnehunehu; pūnehu	Mist (or dust)
Umurangi	Red appearance of sky – considered a good omen
Ka poutumaro te rā	'the sun stands upright as a post' - midday
Awatea; maruao	Daylight
Maruawatea	Broad daylight

3.5.1 Climate

Within the maramataka there is a strong correlation between the understanding of the climatic input or weather upon the environment and horticultural activities. The Māori

[16] Drawn from Shortland, 1856; Beattie, 1949 and ngā kaumātua o Ātiawa nui tonu

language has considerable reference to the climate through a broad range of terms applied to different aspects of it. Table 3.2 lists some of those terms.

3.6 Whenua

The term *whenua* has several meanings. There is a general understanding of the term across all tribes, and possibly a number of regional or tribal variances to the common translation. Williams (1992) records four distinct translations for the term:

1. land, country (noun)
2. ground (noun)
3. placenta, afterbirth (noun)
4. entirely, altogether (adjective)

Ruakere Hond, in his draft Taranaki dictionary (1996), confirms the regional iwi understanding of the term *whenua* within Taranaki as:

1. the placenta of the womb (noun)
2. the earth or a large land mass (noun)

With a consensus across all tribes that *whenua* refers to land in general – aside from other meanings – the application of the word to the whole of the land resource is appropriate. For the purposes of this thesis, whenua is taken to refer to land in all its forms. The basis of the argument relating to the economic utility of the land will be specifically through the knowledge and utility of the physical soil resource. Also included in the argument will be a consideration of the emotional relationship between the people and the land, the tangata whenua, and how whakapapa is a tool for Māori to assist in acknowledging these emotions.

Darcy Nicholas (Te Ātiawa, Ngāiterangi, Taranaki) wrote of his understanding from an Ātiawa perspective of the association between the people and the whenua as:

> *'Even though [they] are learning the Māori language, they forget that nothing dies in the Māori world. Things merely move through different dimensions – the flax, for instance, becomes a cloak of immense beauty. Those we love become part of the beautiful land around us. This is our bond with the land. It is our ancestor and as such, part and parcel of what we are. It has sustained the life of our people for hundreds of years...'* (Nicholas & Kaa, 1986:32)

Returning to the economic aspect of land, the Waitangi Tribunal has stated that: *at 1840 each hapū had rangatiratanga over it's' whenua – that is hapū were political units exercising autonomous resource management* (Pond, 1997:1). They continue, stating that as the economy of each hapū throughout Aotearoa was different, hapū relied on varying resources to gain their livelihood; some marine, some forest, some for cultivated crops and so on.

From an economic perspective, Māori apply a unique and specific set of criteria in their attitudes to land. Ownership is collective or tribal as compared to the individual title favoured by non-Māori in New Zealand. There are several classes of land identified by Māori including *take tupuna* (ancestral), *take tuku* (gifted), *take raupatu* (conquered or through conquest) (Durie, 1998) and *take whenua kite* (discovery) (Forbes, 1996). The land contributes to tribal economic well-being in several ways; fiscally, physically and spiritually (NZIER, 2003) thus contributing to identity and security for future generations.

There is a primary role of the natural resources, specifically the whenua or land in the economic success of the Māori community. Firth (1972) wrote about whether the primary influence on economics was the prevailing environment or the culture and circumstances of the people themselves. His conclusion followed that of many economists, both historical and contemporary. He wrote:

> *'Man himself is not denied all initiative, but emphasis is laid upon what Vidal-Lablache terms 'the sovereign influence of environment'. Ellsworth Huntington, for example, places great stress on climatic conditions as the principle agent.... On the other hand, workers in anthropology are prone to see in the culture-environment relation a drama of mastery of man, not his subjection.'* (pg 56)

This identifies that a geographical relationship of the people to the natural resources can be seen in communities with a tendency for them to congregate near the sources of food supplies. In rugged country Māori communities were limited and small while on the fertile plains there was a greater concentration of people (Firth, 1972). Ethnologists have identified this distribution in pre-European Māori settlement (Shawcross, 1967a).

Aside from the agricultural and horticultural utility of land, the raw materials of industry were supplied by the forests, bush and swamps (Firth, 1972). Mineral resources exploited freely for tools and other uses by Māori included:

- Black *Karā* (basalt), varieties of greywacke used for adze blades, pounders and sinkers (Firth, 1972)
- Basalt and other volcanic stones for hāngi stones
- Obsidian flakes (*whatuaho*) for knife like instruments
- *Pounamu* (greenstone) for superior adze, chisels and also ornaments
- Nelson argillite or *pakohi* for superior adzes, chisels and weapons (Wellman, 1962; Potton, 1986; Petyt, 1999; Hunter, 2003; Mitchell & Mitchell, 2004). Patete (1997) noted 14 recorded quarry sites on D'Urville Island for Nelson argillite.
- Sandstone (*tuahōanga*) for grinding
- Quartzite for drill points, chipping and hammering operations
- Ochreous red earth or *kōkōwai*, used to paint the body and woodwork, also the preparation of bird skins or on human remains (McCulloch & Trotter, 1984). Usually found adjacent to graphite deposits e.g. at Pākawau & Collingwood.
- Blue & white clays – also for painting and personal decoration
- *Pākai* or pitch – a relatively pure type of bitumen – used as a type of chewing gum and as an article of trade (Hunter, 2003)
- The use of pumice materials for manufacturing bowls and plates

3.7 Tikanga

He toa taua, he toa e waia: te toa ahuwhenua, he toa tuturu.
The cultivator of the soil is a greater man than the warrior

Tikanga is a unique cultural approach to management. It includes the conceptual management approaches of kaitiakitanga or guardianship of the resource for future generations, oranga or the health of the people, wairuatanga – the acknowledgement of spiritual input to management and, whanaungatanga – the communal approach to crop production and tasks.

The difference in management systems lies in the relationship of the people to the activity. Māori – as with all indigenous cultures – perceive a very specific relationship with the land and any activities which impinge upon it. Their approach to horticulture or agriculture or any other land-use aims to benefit both themselves and the resource. Therefore their

management activities are based on dual outcomes: continuation of the special relationship with the land or whenua and sustenance of themselves as the people living on the whenua.

Tikanga is the noun that best describes the collective management techniques developed over time and used in producing crops or undertaking any activity such as harvesting. These techniques are the results of experience over time (generations) and are in effect the 'best practice' relevant to the group involved. Some people refer to tikanga as a form of (cultural) lore. Examples of tikanga are: the reciting of karakia (prayers) to acknowledge the gods involved with the activity, the characteristics used to select plant material for regeneration, e.g., kūmara, an ordered approach to harvesting, and the hierarchy of the workers involved in the activity.

A further alignment to the gods is the positioning of taumata atua[17], sometimes as mauri stones. These taumata are a talisman or medium for the god(s) under whose care the crop is placed. They also provided a visible symbol of protection and fertility of the crop.

Tikanga concerned with traditional cropping systems is often generic. It is not common for traditional Māori gardens to be irrigated or watered. There was a system of land rotation with a maximum cycle of three years for crops, tamed seagulls were used to keep pests from the crops, and the burning of kawakawa (*Macropiper excelsum*) was used as a fumigant for some pests and diseases. These are all examples of applied tikanga in traditional horticulture.

Another example of tikanga can be seen in the common practices relating to the planting of taro *(Colocasia esculenta)*. Different versions exist as to the origin of taro in New Zealand. In Taranaki it is believed to have been acquired prior to the migration period from an island known as Wairuangangana[18]. From there it came as cargo on the Aotea waka and because of its specific origin was considered a food of the chiefs (he kai rangatira) (Hammond, 1924). Certain practices or tikanga associated with the planting of taro include:

[17] Taumata atua, conceptually similar to an alter representing the spiritual realm or gods.
[18] Wairuangangana is a name now lost in antiquity referring to an island somewhere in the Eastern Pacific

- Only planting at certain phases of the moon (maramataka Māori)
- Adding gravel to the holes in which the tuber/corms were planted.
- Planting in October (Northland) to November (south to Bay of Plenty & Taranaki)
- Planting in separate gardens from the other crops.
- A lack of tapu associated with the planting procedures
- Pinching out the innermost leaves (rito) to promote tuber size
- Harvest from March (Northland) to April (south) after the main leaves have died off
- Produce stored outside on the open ground

(Best, 1976; Matthews, 1985)

Presumably these practices varied between districts, especially in their timing of application and/or responses to environmental factors. Some actions such as pinching out the rito will have been based on experience gained over many generations.

3.8 Chapter summary

The role of horticulture in traditional Māori society was extremely important as it was an activity crucial to the survival of a people in a subsistence economy. Horticulture provided for the practical elements of Māori society through both food and utility produce. Aside from this aspect, Māori had an intrinsic relationship with the land and other resources on which successful horticulture was dependant. This was expressed through whakapapa, tikanga, maramataka and other actions. These expressions were informed from a base of knowledge now referred to in contemporary times as 'mātauranga Māori' and held within the community as a whole and also by experts known as tohunga. Within the community, the application of mātauranga in horticultural systems was achieved by various tikanga or best practices, often pertinent to the location, wider environment or group.

This specialist knowledge still exists, albeit in a limited group of today's Māori community. The relationship between Māori and the natural resources, including whenua, is also inclusive of a set of cultural values which is present in all Māori functions of today. The knowledge or mātauranga relevant to horticulture and related activities is expressed within a cultural value-set and is the basis for the argument for an inclusive assessment model relevant to Māori in the 21st century. The following chapters will consolidate the type of knowledge specifically associated with the horticulture sector and utiity of Māori land.

Chapter 4: Te Oneone: Ethnopedology

4.1 Introduction

> *'Māori took full advantage of the varying qualities of the soil... in many parts is of exceeding fertility... on the other hand the clays of a part of the Auckland peninsula and the pumice lands of the Taupo plateau do not represent such good soil for agriculture.'* (Firth, 1972:66)

The study of soil genesis as a distinct branch of science is relatively recent. In 1862 the German scientist Fallou introduced the science of 'pedology[19]' which has now become synonymous with soil science and distinct from the then practice of 'agrology' or practical agronomical soil science (Buol *et al.,* 1973). The Concise Oxford Dictionary now defines pedology as: *'the study of soil, especially its formation, nature and classification'*. (Allen, 1990:877).

For much of the last century soil science has been dominated by a technological approach where soil has been considered as an object to study. In recent decades the return to a holistic or broader vision of the soil and its role in the landscape has emerged in what Warkentin (2006) describes as:

> '[the holistic approach is] *the legacy of the ages and shares a direct lineage with early Greek, Islamic and Chinese thought and is primary in indigenous cultures.'*

This chapter will look at the traditional body of knowledge held within the Māori community that is applicable to both soil science and soil management. In modern terms this knowledge can be interpreted as a form of ethnopedology. Ethnopedology is defined by practitioners as the study of 'local' knowledge of soil and land management [pedology] in an ecological perspective (WinklerPrins & Barrera-Bassols, 2004). WinklerPrins (2001) notes that various terms can be used to describe 'local' knowledge such as indigenous, traditional, folk, rural peoples and the prefix 'ethno' and so on; local may be the least contentious. Ethnopedology is considered to be interdisciplinary or a hybrid of natural and social sciences and encompasses all empirical soil and land knowledge systems of rural populations from the most traditional to the modern ones (Barrera-Bassols & Zinck, 2002) including soil-plant relationships (Ettema, 1994).

[19] *Pedology* from the Greek: *pedon*, ground + *logos*, word, discourse or science

Sandor *et al.* (2006) make the point that:

> '*... there are compelling reasons to become aware of the knowledge of soils among non-modern* [indigenous] *cultures. One is that aspects of modern soil science are derived from traditional knowledge. ...indigenous knowledge is at the same time the precursor of modern scientific understanding of soil, and the basis of parallel systems of knowledge about soils in traditional cultures*' (p46)
> They continue, '*... further, cultures' world views can fundamentally differ. This includes viewing soils and land use in different ways, though there are certainly common threads*'. *...local soil knowledge can also provide long-term insights about human responses to environmental change and uncertainties.*' (p47)

There is no doubt that Māori have a body of knowledge aligned to the land and soils and utilised this knowledge in their everyday use and management of these resources. The study of indigenous soil knowledge however has previously focussed on the African, South and Middle American and Asian regions and cultures whereas Europe and the Pacific hardly register in published literature on the discipline (Barrera-Bassols & Zinck, 2002). Whilst indigenous knowledge related to the soils and other resources is both valuable and insightful, it must be remembered that it is derived out of a need for survival and includes internal and external factors such as political and social pressures. For this reason alone, it differs in context to much western science and technology which has often been derived for more commercial or philanthropic reasons. Research has also shown that many indigenous groups now use a blend of modern and traditional methods in their soil management, but the knowledge system is still considered indigenous (Ryder, 2003).

The availability of large areas of fertile land to a relatively small population meant that the management practices of the land resource by pre-European Māori were entirely sustainable. The relationship of the people to the land along with acute observation and the practices of kaitiakitanga (literally; guardianship or stewardship) resulted in a remarkable awareness of the land resource in its entirety and the impact of any activity on components of the same resource e.g., the quality of the water affecting the plants and animals gaining sustenance from it. The role of kaitiaki, determined primarily through whakapapa in a cultural context, refers to the concept of guardianship over all things, including the resources from which gardens are formed. It is said the resources of the earth do not belong to man but man belongs to the earth (Marsden & Henare, 1992).

4.2 Soils - Māori nomenclature

Māori were not generally limited in their access to sufficient land for horticulture. They also had a very keen knowledge of the attributes of the land resource itself. This can be understood by their knowledge of the different soil types expressed in the names and classifications given to the soils. The word *oneone* is the generally accepted Māori term for soil or the soil mantle; aligning to the English definition of soil as:

- The upper layer of the earth in which plants grow, consisting of disintegrated rock usually with an admixture of organic remains (The Concise Oxford Dictionary, [Allen, 1990])
- The mineral, organic and biological matrix that forms the upper layer of a great part of the planet and in which plants grow (Hyams, 1952)
- The natural weathered material in which plants grow and by which they are supported and supplied with both water and mineral foods (Brade-Birks, 1962) and,
- Not just the topsoil or earth that is cultivated but including any subsoil layers extending downward to the mineral rock material from which the soil has developed (McLaren & Cameron, 1994).

The purpose of soil classifications is to assist humankind to understand the evolution of the soils resource and to recognise attributes as they occur in different places. Haskett (1995) argues that the modern scientific soil classification is derived from a system of:

> '... *making observations and determining regularities in nature that are in accord with common sense ...starting with innate recognition of similarity and proceeding by induction.*' (p182)

All soil taxonomy draws on field experience and the assignment of varying levels of importance to key features of the resource; the ongoing inductive process Haskett argues. The following lists (Tables 4.1 and 4.2)[20] give the range of names given to different soils and parent materials by Māori and are by no means exhaustive and recognise the observations which lead to the development of considerable knowledge on soil types and situations available for horticulture:

[20] Beattie, 1949; Hochstetter [1959]; Best [1976]; Roskruge, 1999; Williams [1992]; Hond, 1995; & various other informants

Table 4.1: Māori nomenclature for soils

GENERIC	Oneone; Papa	General terms for soil or earth
	Paioneone	Clod of earth
	Paru, paruparu	Mud, specifically a dark mud
	Ihio	Mud, especially in a swamp or bog
	Papatua	Uncultivated, virgin soil
	Kōkōwai (also Papakura)	Red earth used for Karamea (red ochre) pigment
	Papatūānuku; Papatahuaroa	Honorific term for the whenua (land) including soils
SILTS	Kenepuru; kerepuru	Silt, especially fresh alluvial deposit
	Kerepuru	Silt; earth sodden with water
	Para	Sediment (Marakura – red sediment [Ngāti Mamoe])
	Parakiwai; one parakiwai	Silt; sediment from a flood
	Parahua; oneparahuhu	Alluvium
	Kōtae, kōtao, kōtai (Waikato)	An alluvial silt soil
CLAYS	Hāmoamoa	Clay
	Kere; keretū, onekeretū	Clay (kerengeo/kerepei/kurupei–clod or lump of clay)
	Kerematua; keretā; keretū	Stiff or heavy clay
	Kerewhenua, kerewenua	Yellow clay
	Kōtore	White clay
	Pākeho	White clay, also limestone material
	Keho	White podzol
	Matapaia	A clay, baked hard and used as a stone for cooking
	Uku, oneuku, [Hineuku]	An unctuous type of clay, either white or blue in colour (used for soap)
	Pukepoto	Dark blue earth (clay) used for pigment
	Uku-puia	The clay mud of hot springs, also mud pools
	Taioma; taiama; (m)ōkehu	A white clay type earth used for making pipes
	Oneware	Greasy soil
SANDS	Onepuia; one, tāhuna	Sand; sand dunes (One – generally white calcareous sand)
	Onehunga	Sea sand; mixture of sand and mud
	Onetai, kōtae	Sandy alluvial soil
	Onepunga	A light sandy soil lacking substance
	Onetea	Light coloured sandy, volcanic soil
	Tahuri	Sand, loose earth
	Oneharuru	Sandy loam – considered a very good soil
	Onepū	Black magnetite sand; sea sand
	Makowa	Indurated (hard) sand

LOAM	Onemata, oneware	A dark fertile soil
	Onematua	Loam (sometimes used to refer to alluvium)
	Oneparaumu	A very dark fertile, friable soil
	Paraumu	Black soil, containing a lot of humus
	Onetakataka	A friable soil
	Onewawata	A lumpy soil
	Pūngorungoru	A light, loose soil
PEAT	Rei	Peat; sodden ground
	Onekopuru	An organic soil found in wet situations
VOLCANIC	Pungapunga (also Purupuru)	Pumice; pumice lands[21]
	Tāhoata	Pumice – name used on the East Coast
	Pungawerawera; pungatara	Sulphur - name used in Wanganui/Taranaki district
	Kūpapapa, kūkapapapa	Sulphur - names used at Rotomahana
	Whānāriki; ngāwhāriki	Sulphur - name used on the East Coast
	Onerua	A reddish pumice sand
	Tātāhoata	Pumice sand/gravel
	Pungarehu	Ashes
	Onekura	Poor quality reddish soil
AMENDED SOILS	Onetuatara	A stiff brown soil needing amendment with sand or gravel to suit kūmara
	Kirikiri tuatara; tuatara wawata	Brown friable fertile soil suited to kūmara
	Onekōkopu	Gravel or very gravelly soil
	Onepakirikiri	Soil containing gravel (kirikiri = gravel)
	Kirikirikokopū	A class of gravel, particles consistent in size
	Kirikiri; tuakirikiri	Gravel, shingle (generically)

The classifications are based on a number of physical attributes including soil texture and colour distinguished using the human senses; sight, smell, touch, and taste. These are the most readily observable criteria that land owners and farmers use to differentiate their soils (Ettema, 1994). Furthermore, additional information can be given to these categories based on perceptual qualities and biological indicators such as soil fauna e.g. earthworms and the vegetation found growing on the resource, both as indicators of quality of the soil resource. A list of biological indicators of soil quality identified by indigenous peoples outside of the Pacific is given in Appendix 2 for comparison to Māori indicators.

[21] Tainui & Maniapoto dialect. Also as spoken by Hora-ta-te-taniwha of Hauraki in 1852 (Hogg, 1963)

Table 4.2: Māori nomenclature for soil parent materials

Kāmaka; kō(w)hatu, pō(w)hatu	General name for rock materials
Hōhanga; hōanga; tuahōanga	Sandstone (matanui = coarse grained variety & matarehu = fine grained variety)
Kōtare, kōtore	Soft white sandstone (Ohoka – white rock [Ngāti Mamoe])
Tunaeke	Sandy limestone of the upper Wanganui River used as a grinding stone
Koma	Basalt
Matā; tūhua; matātūhua	Obsidian (sometimes refers to flint or quartz used for cutting)
Moa	A bed of rock, pyrite, ironstone
Tangiwai	Bowenite-serpentine
Pounamu	Generic name for greenstone materials
Pakohi; pakohe	Argillite
Wharo	Fossil coal
Ngārahu; ngārehu; konga	Charcoal or, coal dust (also, black pigment)
Kapowai	Petrified wood; charcoal embers
Kurupakarā; kurupaku	Siliceous slate – used for polishing and boring pounamu
Mākoha	Soft slaty rock material
Kupapahi	Pyrites or iron sulphate
Rino; pīaronga; pīauau	iron
Pukepoto	Blue iron ore or iron phosphate (used as blue pigment in Taranaki)
Mana-pōuri; manauri	A type of black stone – (Ngāti Mamoe)
Ngahu; hōrete	Sandstone, marl, especially soft mudstone (sandstone, also onetai)
Pākeho; pākehu	White tabular limestone of Whaingaroa, Aotea & Kawhia harbours, Mokau & Wanganui districts (also generically white clay or limestone)
Karā	Blue-black rock types e.g. basalt of Whaingaroa or argillites of Taupiri
Pungatara	Porous volcanic scoria
Tāhoata; pungapunga	Pumice
Rangitoto	Lava, especially black lava/scoria
One	A white quartz or calcareous sand
Onepū	Black sand consisting of titaniferous magnetite, common in Taranaki
Pākai	Pitch, bitumen (Pākaiahi = fireplace made of clay)
Nehu; pūnehu; pūnehunehu	Dust
Kiripaka	Flint, chert, siliceous slate, jasper – primarily of the quartz varieties
Kirikiri; kerikeri; kiripōhatu	Small stones (<30mm diameter); river stones
Karakatau	Small round stones used as shot
Kongahu	A sharp edged stone
Manapou; manawapou	A reddish or brown colour stone said to have been brought by the kākā (parrot) in its crop from Hawaiiki

An example is the presence of *wīwī* (*Juncus* spp.) growing on open ground, which is an indicator of a wetness limitation, at least for some part of the year, of that site[22].

An added component to the nomenclature lies within the Māori language itself. As an example, the term *'para'* is defined in English as small fragments, sediment, impurity, waste or refuse. The term *parakiwai* used to define alluvial soils can be translated literally as 'sediment carried by water'.

A good example of a name attributed to terminology aligned to soils and alluding to a historical event can be found in the name WAIUKU, currently representing a settlement near Pukekohe in South Auckland. The name recalls the local stream (wai) which had banks of white clay (uku). A girl of high rank was said to have visited the locality to choose a husband. She first met with a chief named Tamakau but he was not impressed with her. His brother Tamakoe who was out in the kūmara plantation was summoned. He scrubbed himself with the uku or white clay, which was used as soap in those times, to make himself presentable and met with her. She became his wife and the name applied to the current settlement commemorates this event (Reed, 2002). Best (1995b) conveyed another example in the naming of an historical event that took place at Pukekaroro pā, Nukutaurua (Mahia) in pre-European times as KAI-UKU. Here the inhabitants of the pā had been held siege by an invading tribe for some length of time. For the want of food they eked out their scant supplies by eating uku or clay until they were at liberty; hence the name Kai-uku (Buchanan, 1973). Similarly, the settlement of Whangamatā near Coromandel is in reference to the *matā* or obsidian pieces washed into the harbour (*whanga*) from nearby Mayor Island, renown as a source of obsidian materials.

There are many other examples of the language terms actually holding more detail and information than a direct translation implies. As with all languages, a direct translation to another language does not take into account the culture and values implicit in the original term or word. An interesting amalgamation of Māori terminology and soil science can be found in relation to the gley podzol soils of the west coast of the South Island from North-

[22] Common belief within Ngāti Rahiri and Ātiawa ki Taranaki.

west Nelson to Fiordland and the Mutton Bird Islands which are known locally as 'pākihi' soils (Aston, 1910; McLaren & Cameron, 1994; Ashwell, 1999).

Molloy (1993:232) defines 'pākihi' soils as:

> *'...a particular type of wetland found on the west coast, generally flat or gently sloping, carries a sedge/fern/restiad/rush/moss vegetation, occurs under a mean annual rainfall of more than 2200mm and is underlain by wet infertile soils.'*

The term 'pākihi' in Māori is generally translated as meaning an opening or clearing from forest and generally of low fertility. These Westland soils are mostly swampy terraces of minimal fertility, carrying vegetation such as wire rushes, tangle fern, sphagnum moss and mānuka and typically difficult to establish in agriculture or forestry use (NZFS, 1959: Prickett & O'Byrne, 1972; Molloy 1993).

Niemeijer & Mazzucato (2003) recognised the relationship of a body of knowledge that informs the actual indigenous taxonomy of soils. This body of knowledge is partly identified as the theories land owners apply to their soil resources concerning formation, degradation, manipulation and management of the resource and can be a valuable addition to soil management tools accessible to managers. They refer to this body of knowledge as the grammar or detailed theories of the taxonomy which in turn is the expression or sentence the knowledge is applied with.

It has been accepted by researchers that some general principles can be applied to traditional taxonomic systems. Firstly, there exists some complex indigenous knowledge about the hierarchical organisation of the soil mantle. This includes the recognition and implementation of morphological attributes for soil classification which are at the same time dynamic, utilitarian and symbolic. There may also be differences in wisdom among people according to age, gender, social status and experience (Barrera-Bassols & Zinck, 2003), literacy and wealth (Oudwater & Martin, 2003) with regard to ethnopedological knowledge.

Barrera-Bassols & Zinck (2002) concluded that in general, four sets of classification criteria are used in ethnic classification of soils;

1. colour and texture – in almost all documented classifications,
2. consistence and soil moisture
3. organic matter, stoniness, topography, land-use and drainage, and
4. fertility, productivity, workability, structure, depth and soil temperatures

They noted that there does not appear to be a clear distinction between soil and land characteristics which are somewhat more generic in nature. Williams (2006) looked at the Aztec culture's soil classification system and identified similar criteria to other cultures in that they focussed on colour, topography, organic matter, fertility and human amendments. Ollier *et al.* (1971) noted that soil knowledge and classification in their field work with the New Guinea Highlanders was clearly influenced by the characteristics that contributed to the usefulness of the soil in their cultural activities i.e. horticultural value or source of pigments. Siderius & deBakker (2003) introduced the historical systems used in the Netherlands to name land, plots or sites and soils. Primarily names were applied holistically on biophysical and soil quality factors and some names are still found in the modern Dutch Soil Classification System as subgroups demonstrating a valuable combination of local and scientific knowledge.

An example of using the senses to distinguish soil qualities can be found in the Ngā Rauru whakatauāki: *Te oneone ī hongia e Turi,* literally, the soil that Turi smelled. The action by Turi, eponymous ancestor for Ngā Rauru, of determining the fertility of the soil by smelling it and thus determining the location of their new settlement near Patea after the migration from Hawaiiki is remembered forever in the proverb for an iwi that still resides in the South Taranaki locality today[23].

4.3 Land characteristics (including Māori nomenclature)

Further classifications relevant to the management of soils by Māori include the following descriptions for land or whenua characteristics pertinent to horticulture (Table 4.3). There is also a perceptual or subjective dimension to indigenous soil classifications (Ettema, 1994). This component of the classification is less easily defined but forms an important set of criteria for the people involved e.g., soil workability, suitability to specific crops or

[23] Personal Communication, Mrs Queenie Gripp, Ngā Rauru. March 2004

Table 4.3: Māori nomenclature for land forms and vegetation[24]

Pīnaki; pīneki	A hill sloping gently
Pīnakitanga	A gentle slope
Parehua; tūāpapa; whakahua	Terrace, platform or ridge
Tiapu; onetaipu	Fertile lands – especially sandy alluvial soils
Reretu	Loamy, alluvial land on the banks of rivers
Tāmata	A new cultivation site
Pātohe	An abandoned cultivation site or fallow site
Titōhea; hūiki; tohetea; hahore	Land barren or exhausted through cultivation
Pākeka	Land exhausted through cultivation
Pūwhenua, taekai	Exhausted lands (*cf* sterile)
Pāhoahoa, akeake	Sterile lands (*cf* exhausted)
Tuakau	Inferior lands, waste lands, bog
Pangahu	Hard clay lands – a class of Pāhoahoa
Whakapara; whakaparapara[25]	Burning woody remains for incorporation as ash; adding compost
Waerenga	Clearing created through whakapara (from waere – to clear)
Pākihi	Open grass country – considered as barren land for cropping
Raorao (Ngāi Tahu iwi dialect)	Level or undulating country, easy for travelling
Manaha; mānahanaha	Open country, clear of scrub, trees, etc.
Mūrea	Cleared of weeds
Waipapa	Overgrown cultivations (or second growth of timber on a site)
Kirea	Land exhausted by frequent cropping
Rake	Bare or barren ground; Whakarake – to make bare
Kūkūwai; onekotai	Wet, swampy land/site
Repo; hūhi [Hine-i-te-hūhi]; rei	Swamp (Hine-i-te-hūhi; maiden of the swamps in Māori mythology)
Ngaere	Bog (powharu = quagmire)
Papatupu; papatipu	Hard ground
Pari; paripari, tūpari	Cliff or precipice (kapiti-kowatu – rocky cliff)
Kūrae; rae; matarae; ngahu	Promontory
Hārua; whārua	Valley
Pāti	Sandy place/mud flat, covered at high tide.
Upane	Terrace of a hill (upanepane *[adj.]* terraced)
Tahora	Uncultivated open country
Toitū	In its natural state, undisturbed or uncultivated

[24] Best, 1976; Roskruge, 1999; Williams, [1992]; Hond, 1995; Coffin, 2007, and various other informants
[25] Taranaki iwi and dialect

uses, sensitivity to specific problems (e.g. erosion or degradation), or historical basis for land management decisions. The value of soils as a direct or indirect dietary source of micronutrients necessary for human survival has also been identified and an example of this as applied by Māori would be the consumption of uku (clay) in lean times (refer page 47).

In comparing the indigenous classifications (including Māori) to western classifications, they appear to be based primarily on functional applications and surface horizons whereas western classifications determine a taxonomy or hierarchy using pedogenesis as a basis and three dimensional units i.e. horizons (Ettema, 1994; Niemeijer, 1995).

Examples of Māori knowledge surrounding the diverse utility other than horticulture that soils provided are common place. Taranaki iwi were well practised in consigning taonga or treasures to the care of Hine-i-te-hūhi (their 'god' of the swamps) through the burial of treasured items including wooden carvings in specific swamps (sometimes classified as wetlands) to cure and/or preserve them but also commonly to conceal them from invading and marauding tribes (Phillips *et al., 2002;* Allen *et al.,* 2002; Wilmshurst *et al.*, 2004)[26]. This indicates they were aware of the chemical and physical composition of different swamps to be able to utilise them in this way. Similarly, practitioners of weaving used different types of mud, sometimes known as *paru* as dyes in their flaxwork. The sites containing the muds were protected and managed by successive generations to ensure their dyeing quality was retained[27].

4.4 Site selection

Site selection for Māori horticulturists was important for a successful crop season and the selection process was adapted to the locality under consideration. Jones (1986 & 1989) looked at the importance of hill soils (mostly colluvium) and alluvial soils in traditional Māori gardening. Hill soils were believed to be favoured because they gave better frost protection (especially on north facing slopes), were in abundance and were easier to clear by burning. This was certainly the observation by early visitors to the Marlborough Sounds

[26] Also, personal communications, ngā kaumātua o Ngāti Rahiri me Ātiawa (Taranaki)
[27] Personal Communication, Mrs Whero-o-te-rangi Bailey (Taranaki), December 2004

(Law, 1969). Alluvial soils generally have better natural fertility, better water holding capacity, were easy to clear and could be gardened with more intensity. Barber (1989) quotes an 1840 statement that: *'Māori were very partial to cultivating the face of hills, contending that the crops are better'.* He doesn't clarify the slope or aspect of these hill faces in his statement however. Papakura (1938) noted that cultivations were generally not positioned at the foot of hills due to the potential for water run-off to damage the gardens. Jones (1984) described an archaeological site on yellow-brown sandy soils in the Hokianga Harbour which appeared to have been gardened to support an adjacent settlement. The soils were located in a pocket between steep parabolic dunes, were modified with charcoal additions, free draining and ideally suited to both kūmara production and storage.

Ngāti Maru of inland North Taranaki sought elevated flat sites sheltered from the cold south winds and preferably sloping to the north-east for the morning sun for their cultivations[28]. Tribes in the Queen Charlotte Sounds always chose sites on hill sides facing north to receive the most sunlight (Law, 1969; Potton, 1986). Gardens were often located within a convenient distance from the seasonal settlement of the landowners and access to tracks for ease of movement of produce[29]. Other hapū and iwi throughout the country selected sites suited to their particular location and climatic tolerance. Evidence from some of the historical stone gardens at Otuataua (NZHPT, 2003), Cape Runaway and the Wairarapa Coast (Jones, 1989a; Molloy, 1993) and Little Barrier Island and Kapiti Island (Best, 1976) indicate the stone rows may have been orientated and used as windrows, windbreaks or boundaries. Artificial shelter is recognised as one of the management techniques applied by Māori over horticultural sites (Molloy, 1993).

Land covered in bracken fern which was to be used for intensive cropping was usually cleared manually through weeding rather than burning to minimise regrowth of the fern (McFadgen & Sheppard, 1984). General clearance however and the intentional stimulation of fern growth was achieved through burning off bush and forest lands prior to their utility (Best, 1976; Beever, 1981; Anderson, 1998). Clearance of scrub, bush and forest creating

[28] Personal communication, the late J W Nuku, Kaumātua o Ngāti Maru, December 2004.
[29] Personal Communication, Mrs Te Ra Wright, Kuia o Ngāti Apakura hapū o Maniapoto iwi, Tānehopuwai Marae, 19 December 2004.

new land for cultivation usually occurred in late autumn followed by a fallow period during winter and then the land was dug over in preparation for planting (Firth, 1972). This almost equates to the 'stale seedbed' approach used in contemporary horticulture. Hillside clearing was generally approached through swiddening or the 'slash and burn' technique (Leach, 2005). Shortland (1856) observed that in the Waikato they generally cleared land around the month of July and left the debris to dry. It was burned the following January or February and left until the next September when it was finally cleared and planted.

Experienced Māori horticulturalists are also believed to have understood the value of planting alongside any river whereby the constant air movement counters the cold air or frosts for up to 150m on either side (Jones, 1986). Valley floors were not generally used for horticulture as they were very prone to frosts. The proximity of cultivations to defensive pa was also important to ensure the safety of the community against raiding tribes (Best, 1995b). The concept of defensive pa is relatively new in Māori society as prior to the introduction of guns and frequent quarrelling, most tribal groups lived in papakāinga or settlements that were associated with their activities such as fishing or cultivations and only retreated to a defensive pā in times of threats.

4.5 Terracing

History has shown that terracing of sloped lands is one of the oldest forms of land modification in an enduring effort by agriculturists to manage soil, water and geomorphic processes and to conserve land resources (Sandor, 2006). Ongley (1931) noted the existence of 'Māori terraces' on the Porirua-Titahi Bay headland and considered them as having been purposefully established for kūmara production[30]. His position was corroborated by evidence of earlier ethnographers and by the recent nature of the terraces, their regularity, distribution, situation on north facing slopes and the occurrence of unweathered greywacke pebbles which had obviously been added to the soil to assist drainage and heat retention (Ongley, 1931; Walton, 1983; Jones, 1989; NZHPT, 2003; Mitchell & Mitchell, 2004). These specific terraces have succumbed to residential

[30] These terraces are known as Kōanga-umu and are believed to derive from the Ngāti Ira occupation of the area after 1500AD. Currently some remnants are within Stuart Park, Titahi Bay (Fordyce & MacLehn, 2000)

development but their existence contributes to the understanding of pre-European horticulture. Other terraced sites attributed to pre-European Māori horticulture have been recorded at Kawerau, Aotea Harbour, and Weiti in Northland (Furey, 2006).

Terracing can achieve a number of responses in agricultural systems. Their function in major amendments includes: creation of a stable topographic base for crops, soil retention and erosion control, water runoff management and microclimate modification (Sandor, 2006). They are also often used to bring land otherwise unsuitable for sustained agriculture or horticulture for reasons such as slope into economic use (Sandor & Eash, 1995).

4.6 Rotation

Land rotation was a common practise generally applied as a rotation of not more than three years crop production at any one site. Best (1976) stated that for kūmara crops, cropping was undertaken for no more than three years on any site which was then allowed to lie fallow for the next 7-14 years, allowing for the regeneration of scrub and natural fertility levels through plant litter. Simmons (quoted in McFadgen & Sheppard, 1984) stated that in general, cultivated crops were grown on any one site for only 2 years out of 6. Taylor (1958) noted that there is good evidence that fallow lands were valued for their store of fernroot and that crop rotation was a standard approach to crop production by almost the whole of Māori. It has been suggested that the fallow period extended for 25 years or longer & secondary forest or scrub was allowed to regenerate between crops (Leach, 2005). In contrast to the above rotation principles, Shortland noted in 1856 that potato crops in the North Island were grown by Māori communities for two years as a seed crop and then a further five years as a maincrop often followed by a self perpetuating crop and the ground was then left to fallow. He surmised this approach was based on the natural fertility of the soil. Furey (2006) suggests a cropping period of up to 6 years continuously depending on key variables followed by a fallow of 10-20 years based on archaeological investigations in the Hauraki and Auckland regions. It is almost certain that the rotational practices varied between tribe and location (as indicated above) and were a response to the environmental factors which each tribe had to contend with.

4.7 Māori soils

New Zealand soils modified by pre-European Māori in such a way as to benefit horticulture are recognised in the science of soil classification and officially classed as 'Artefact fill anthropic soils' or 'plaggen soils' (Gumbley *et al.* 2004); or simply as 'Māori soils' or 'made soils' by many lay people.

Challis (1976) states that *'Māori-made soils are distinguishable from their surroundings by different, usually darker, colouration and the apparent addition of gravel and sand or in some cases shell'*. Soils modified by pre-European Māori communities have been studied throughout the country and reveal extensive areas used for agricultural pursuits in both dryland and wetland systems (Barber, 1984). Chittenden *et al.* (1966) classified 1000 acres (445ha) on the Waimea Plains near Nelson as 'Māori Gravelly Sandy Loam'. These soils are described as:

> *'... found in scattered areas of the Waimea Plain and at Riwaka and Motueka, marking the sites of kūmara beds made by Māoris prior to European settlement. The reputed practice of the Māoris was to transfer and spread fine gravel and sand over the land to provide suitable cultural conditions for the kūmara plant. Scrub was taken to these sites and burnt on slow fires to give ash and charcoal, which increased soil fertility and gave them their characteristic dark-coloured topsoils. The European soon recognised the value of these old kūmara beds, but the fertility built up by the Māoris is gradually disappearing under modern farm use. Consequently the soils are not as well defined as in the past and will in time, apart from their physical properties, resemble the adjacent Waimea and Riwaka soils.*
>
> *Profiles of this soil vary with the locality. The topsoil to a depth of 10-12in (25-30cm) is usually a very dark grey or black gravely sandy loam overlying the original soil, which on the Waimea Plain, is typically a greyish brown silt loam...*
>
> *The fertility is high. The soil is only slightly acid, phosphorus and potassium are high, and the calcium in medium supply. The increased fertility from the addition of the wood ash is less apparent than 30 years ago and likewise the darker colour is less conspicuous. This soil is used for market gardening and farm crops on the Waimea Plain and for tobacco and orchards at Riwaka and Motueka.'*
> (Chittenden *et al.*, 1966:16-17)

The addition of gravels and sand to the A Horizon[31] has been scientifically proven as a deliberate action by cultivators (Rigg & Bruce, 1923; Wellman, 1962; Challis, 1976) and is considered to have extended the growing period for crops by one or two weeks in marginal

[31] A Horizon: a horizon in the soil profile forming at, or adjacent to, the topsoil that shows an accumulation of decomposed organic matter (McLaren & Cameron, 1994:7)

climatic zones (Challis, 1976) or simply efforts to improve crop production on soils already with potential (Walton, 1984). The practise appears so widespread that Māori had a special name for the baskets used for taking gravel to the kūmara beds; these were known as Pūkirikiri. Yen (1974) considered the addition of gravels to kūmara grounds was a response to the clay content of New Zealand soils and the shallow topsoils over clay subsoils. A further function he considered was the insulating or heat retention effect of the gravels for the plants.

The pre-European stone gardens around the Auckland Isthmus (to be discussed in Chapter 5) all incorporate sand or gravel to the soil profile, ostensibly to warm the soil and sometimes include additions of shell, charcoal and ash to improve fertility of the soil (Yen, 1961; Wellman, 1962; Law, 1975). The term ahuwhenua refers to the action of working the soil. Traditional practices, especially for kūmara production, included adding sand, pebbles, shell and gravel to heavy soils to create a friable consistence, improved porosity (Shortland, 1856) and/or to add warmth through the taking in of heat by the stones – heat retention (Jones, 1986; HZHPT, 2003; Gumbley *et al.,* 2004). Laying stones under the kūmara plant laterals or runners was another practice used to nurse the plant into production. These soils were often referred to as *Onehanahana.* Wood ash was often collected after burning scrub and added as a fertiliser (Hargreaves, 1963) and in some areas such as Taranaki, mixed compost from ash, leaf & branch matter was specifically made and mixed in. Burning any woody remains previously felled and left to dry on the proposed cultivation site and using the ash as a fertiliser; a technique known as *whakaparapara* and the clearings were known as *waerenga.*

Ngā Rauru of South Taranaki have identified large tracts of coastal land within their rohe or district which, prior to colonisation, had been specifically amended with beach sand to benefit cultivation. Accompanying these areas are many so called 'borrow pits' believed to be the sites where the sand was quarried or extracted and carried to the cultivation sites[32]. Stones and sand were also sourced from river beds and coastline areas. Jacomb (1994)

[32] Unpublished notes on traditional resources by Ngā Rauru and presented at Ngā Rauru Muru me te Raupatu hearing, Ihupuku Marae, Waitotara. 14 October 1991.

describes 'borrow pits' on the shores of Waihora (Lake Ellesmere/Wairewa) at the southern limit of kūmara cultivation. Walton (1984) identified similar borrow pits on the Matarikoriko block in North Taranaki and their contribution to what he called 'made' soils. Further, he identifies these soils as very similar to other soils in Waikato and argues they were not amended to bring particular soils into kūmara production but to improve production overall. An extensive area of soil altered by Māori cultivation through the addition of sand and charcoal materials is at Ration Point, Pauatahanui inlet north of Wellington, (Healy, 1980).

So-called 'black' soils still encountered on some Māori soils provide evidence of even more intensive amendments to assist crops (Taylor, 1958). Ash from the burning of existing vegetation or slow-burning of tight bundles of dried fern and brushwood (mānuka etc.) brought to the sites, contributed to their immediate fertility and the creation of a charcoal laden topsoil[33]. Taylor (1958) identifies these soils at sites north of Whangarei, the eastern Bay of Plenty, Waikato and Waipa river flats and the Nelson region and noted that earlier analyses showed '*elevated available phosphate* [phosphorus] *and potash* [potassium] *levels and higher total nitrogen levels, indicating a better organic regime in the soil*'. Rigg & Bruce (1923) considered the blackening of the soil was also a material advantage as the whole profile would absorb heat better and result in an earlier crop.

These black soils show similarities to the Amazonian Dark Earths or *Terra Preta de Indio* found in the Brazilian Amazon region. These Amazonian Dark Earths are believed to be human artefacts or the product of indigenous soil management created by pre-Columbian Indians from 500 to 2500 years BC to support large human settlements and abandoned after the invasion of the Spanish (Mann, 2002; Baskin, 2006)[34]. The blackening of these soils is believed to have been achieved through the charring of biomass resulting in nutrient-rich charcoal which was then incorporated into the pre-existing yellow soils. The black soils are

[33] See also transcript of radio interview with biologist Alfred Harris on Radio Live (NZ) 5 May 2007 – available at www.pubicaddress.net/print,4153.sm

[34] See also the transcript for *The secret of El Dorado*, screened on BBC Two television on 19 December 2002. Transcript is available at www.bbc.co.uk/scienceandnature

characterised by high carbon and phosphorus content and, high cation exchange, pH & base saturation levels giving them high fertility status (Lehmann *et al.,* 2003).

4.8 Drainage

Māori were known to actively drain swampy and flood-prone areas to assist in their horticultural operations, especially in the production of kūmara which preferred free draining soils. Wilson (1922) described remnant surface drains from 6-12 feet (2-4m) in depth and up to 25 feet (8m) wide around the Kaitaia and Papatoetoe districts. These drains were presumed to achieve two outcomes for local inhabitants; drained soil for cropping and flood spillways for occasional flooding which may have occurred from rivers, streams and lakes near the cultivated sites. Similar drains were described in the Marlborough region by Skinner (1912) who also considered them big enough for a small canoe to navigate. Minor drainage was achieved with the addition of stones, gravel or shell materials to many soils.

Conjecture also exists that drains and ditch systems may have purposefully been dug to assist in the agronomy aligned to taro crops. Better drained soils contribute to protecting the crops from *Phythium* spp. diseases, to which taro are prone. They may also contribute to improved ground-storage of crops, including taro and kūmara (Barber, 1984). In his review of the role of wetland horticulture, Barber identified four primary, agronomic reasons for such extensive drainage systems in pre-European times: solely as drainage of excessively wet soils or soils prone to wetness, water diversion, ostensibly for irrigation, the reclaiming of land for alternative land uses, and modification of soils to assist specific crops. Taro and flax plantations would benefit from managed water content in their soils while kūmara crops would require fully drained soils for best outcomes.

Barber (1989) later states that ditch systems or drains associated with traditional Māori horticulture have been identified in many archaeological investigations and had four practical functions: steep and gentle slope ditch systems respectively for drainage, land boundaries and wetland ditches for the purposes of drainage, water reticulation and probably some irrigation practices.

4.9 Soil fertility

The incorporation of ash from the burning of groundcover and bush prior to planting is accepted as a frequent amendment to soils (Best, 1976; McAllum, 2005) which contributed to the soil fertility levels. The ash and charcoal additions are recognised as contributing to increased levels of phosphorus, potassium and calcium. Some conjecture has been noted however as to how Māori supplied enough nitrogen in their amended, gravely soils to benefit crop production. Taylor (1958) concluded that the problem may not have been too difficult.

> *'First, the slow fire method of fertilisation would produce much charred material and soot – absorbent material from which the nitrogen is not completely lost as it is in ashes. Secondly, soil nitrogen would build up during a fallow under native vegetation. Thirdly, successive slow fires producing additional charred material would partially sterilise the topmost layer of the soil causing a flush of available nitrogen. This combination of practices could well provide the answer.'* (p78)

Compost production and incorporation into cultivations was not considered to be a common practice in traditional Māori horticulture. An example of traditional practice in compost-making can be found in samples taken at the turn of the twentieth century from a compost heap in coastal Taranaki used for kūmara beds (Bishop, 1903). The compost was found to be in two fractions: coarse and fine sands which made up around 80% of the mix and a mixture of twigs, leaves, silt and charcoal and it provided a surprising amount of phosphate to the soil believed to have originated from the charcoal material (*ibid.*). Remnant stone gardens in the Auckland district also corroborate this practice.

An interesting example of traditional compost was related in notes by the editor of the Journal of the Polynesian Society in 1923. He wrote:

> *'It is interesting to note... the practice of the Taranaki Māoris in the preparation of a compost for use in the cultivation of kūmara. It was the custom of these people in by-gone times, after a flood in the rivers, or a storm at sea for the experts in agriculture... to examine most carefully the deposit of sand and silt thrown up or left by storm or flood. If, in the opinion of the tohunga these deposits were suitable for the purpose, and the omens propitious, the people were at once assembled, and what we may term a 'kete brigade' was formed and the sand and silt gathered in ketes or baskets and passed from hand to hand to a spot selected where it was mixed with vegetable matter, gathered in by other bands of workers. This consisted mainly of the succulent ground-fern called Mouku (Asplenium bulbiferum), which grew in abundance throughout the neighbouring forests, and the leaves and tender*

branches of certain shrubs of the coprosma family – the taupata, karamu, raurakau – and probably leaves of other trees and shrubs in a lesser degree.

This deposit when thoroughly mixed was carefully covered and after due religious ceremonies, was set apart and left to mature in readiness for the planting season, when it was opened up and apportioned out by tohunga to the various family plots prepared for the growing of kūmara.

The term applied to this mixture was whakaparapara, a free translation of the meaning which is, to add or blend ingredients (into a compost) for the purpose of producing vigorous growth.' (Anon, 1923:93)

A key point to note about pre-European Māori is that they did not have access to livestock or their by-products (dung, urine etc.) which were often mainstays in the continued fertilisation of land accessible for crop production by most other indigenous peoples. Māori tradition frowns upon the waste products of any organism, humans included, being used directly as manure on food production sites. Waste materials were returned to non-productive land areas to break down naturally and then re-incorporate into the soil profile. This was considered as the return of the products to *Papatūānuku* (the Earth Mother) who would in turn purify them before they were allowed to contribute to any system accessible by her descendants (mankind), especially food production systems.

The modern farming systems in New Zealand are now based upon an inclusion of animal husbandry as part of a land-use rotation and stem from the origins of agriculture itself (Taylor, 1958). Māori did not have this aspect in their land management systems and thus relied upon their own interpretation of soil fertility factors and the needs of various crops they produced.

4.10 Irrigation

In general Māori did not irrigate their crops, preferring to leave the functional needs of the plants to the natural elements[35]. Tregear (1904:105) wrote:

'It is, however, a most extraordinary thing for so observant and industrious a people not to have furnished clean water to their plants. They never watered their gardens even in times of drought and when water was close by, and crops sometimes perished for want of this simple aid in the struggle for existence.'

[35] Personal Communications, T Farquhar; V Adlam (both Ngāti Rahiri) and other informants

The need for irrigation will have varied considerably due to the site and soil characteristics where cropping was being undertaken. Site selection based on crop determinants such as drainage characteristics or inversely, water holding capability, appears to have been a key factor in achieving successful crop outcomes.

4.11 Chapter summary

There is no doubt that Māori knowledge relevant to the soil mantle is on a par with other indigenous cultures already investigated in this discipline. Māori can therefore contribute to ethnopedology knowledge systems within the soil science or pedology discipline. Until now, Māori knowledge from an ethnopedological perspective has not been considered from an academic standpoint. From a purely linguistic point of view, the variety of names applied to soil types and land classes by Māori is highly descriptive and suitably diverse. The classification criteria follow those of other cultures in that they are applied to a range of characteristics, usually morphological or biological, and focus on the topsoil horizon of the resource. While many of the Māori terms applied to the soils are no longer in regular use, ostensibly as a result of the influences of colonisation, many are still used by remaining native speakers of the Māori language in their daily conversation or retained in whakatauāki or traditional proverbs.

Māori also have a body of knowledge or mātauranga associated with land-use activities, primarily around horticulture but also other uses. The expertise applied to management of the land resource around cropping or utility was determined through generations of experience and has been proven to be highly effective. Actions such as site selection for crops, amendment of soils to benefit [kūmara] crops, nutritional amendments of soils, amendment of sites (e.g. terracing) and crop rotation were all based on long-standing and sound knowledge about the soil resource and crop or plant needs and are still appropriate in modern horticultural systems.

Chapter 5: Māra Kai

5.1 Introduction

This chapter looks at the type of horticultural activities undertaken in traditional Māori society and how those activities contributed to their traditional economy and subsistence needs. There is a wide diversity of crops which were managed under various levels of intensity; some, such as aruhe or fernroot, in their natural environment and others in a wholly cultivated environment. The horticultural skill applied by the community to achieve these production systems with a limited array of tools is remarkable in itself and contributes to a cultural foundation for contemporary Māori horticulture.

5.2 Traditional horticulture

Anthropologists refer to the development of agriculture (and horticulture) as the Neolithic Revolution (Leonard, 1974) and acknowledge that it contributed to the acceleration of man as the dominant life-form on Earth and the development of large and complex societies. The early cultures of civilisation held horticulture in very high esteem. The Greeks described agriculture (read: horticulture) as 'the nursing mother of the arts, for where agriculture succeeds prosperously, the arts thrive' (Xenophon 444-359 BC). It was understood that the origins of cities – and hence civilisation – arose from agriculture as he [the agriculturist] became bound to his cultivations which gave him his returns and consequently became his fixed abode. Early civilisations such as those in Egypt and China grew on 'recent soils' derived from alluvium; they were friable, deep and fertile soils rejuvenated with each flood that brought fresh materials (Taylor, 1958). Much of the knowledge drawn together by archaeologists is sourced from the excavated remains of plants and animals and their association to early civilisations and agricultural practices (Heiser, 1973).

Māori are horticulturists. We know this through whakapapa which identifies the fact right at their very origins; the sons of Papatūānuku and Ranginui included Rongo-marae-roa and Haumia-tiketike, manifestations and guardians of the cultivated and uncultivated crops respectively. History recalls the importance of key crops during the periods of migration to

Aotearoa; taro, aute, uwhi or yams, hue, kūmara and tii kōuka (cabbage tree). Māori were also quick to identify useful attributes of many endemic New Zealand plants and the contribution they could make to their society, and thus plants such as harakeke were added to their suite of horticulturally managed plants. Prior to the arrival of Europeans, Māori were subsistence horticulturists' dependant on the success of these crops for matters of survival, hospitality and health. Leach & Stowe (2005) identify pre-European Māori as horticulturists and arboriculturists (including agroforestry) rather than agriculturists. This recognises the domestication and cultivation of food and utility crops in both annual and perennial systems.

Subsequent to the colonisation of Aotearoa, Māori became key players in the cultivation, production and marketing of horticultural crops – primarily vegetables but not exclusively – to the new settlements. In the mid-nineteenth century Māori were the key suppliers of fresh produce to burgeoning settlements such as Auckland and Nelson.

Buck (1954), supported by his peers at the Bishop Museum in Hawaii, speculated that there are two methods by which many food and utility plants became introduced into Polynesia; the gradual advance eastward from the Melanesian region and successful establishment where conditions were agreeable and, the deliberate introduction by man as he discovered and settled each island or atoll, usually for utilitarian reasons. They deduce that all food plants, especially root crops such as yams, kūmara and taro were introduced to Polynesia and ultimately Aotearoa/New Zealand by man on his many voyages. Duff (1956) noted that the introduction of kūmara in particular during the migration of Māori created a distinct advantage over the earlier inhabitants (tangata whenua) who were reliant on bush and uncultivated foods and contributed to a population burst, especially in the North Island where the climate favoured such crops.

If you consider these crops, think of the kūmara. In a tropical climate it flowers and seed is produced for the following season. It allows for two parents to create the seed and the resulting plants and occasionally a cross would occur which produced a new variety. In Aotearoa, the climate is such that kūmara don't flower and the only way to continue

cultivation is to store or overwinter kūmara and then to encourage shoots or vegetative growth in the spring to take on the role as new plants. This is a key adaptation and yet Māori were quick to learn the processes required to continue production of kūmara in the cooler and seasonal climate of Aotearoa (Law, 1970; Yen, 1974). Taylor (1958:72) stated:

> '*... there can be few people, who with tropical plants, have successfully established a system of agriculture in a temperate land*'.

Horticulture [agriculture] was once a part of daily life for the whole Māori community or population and necessary for the survival of the people. It supplemented the activities of fishing, forest and uncultivated food gathering, and the hunting of birds for food sustenance in pre-European times. The extent of any reliance by Māori communities on gardened produce for their daily and year-to-year sustenance is the subject of many debates, primarily based on evidence of archaeological scholars of non-Māori descent. There is a myriad of evidence however of, among other things, *pā* being occupied on a seasonal basis, generally aligned to the activities associated with kūmara or crop production (especially in northern districts) (McFadgen & Sheppard, 1984) and other seasonal activities such as fishing or bird snaring. Forbes (1996) noted that Muaupoko cultivations around Lake Horowhenua were somewhat small in size due to the abundance of natural food sources in surrounding forest, bush and lake resources. Moon (1993) and Firth (1972) both conclude that the rise of horticulture in traditional Māori society led to the development of specialist skills and more permanent settlements.

The late Ātiawa kaumātua, Moki White, in his submission to the Waitangi Tribunal for the Taranaki claim on 11 April 1991 spoke of the relationship between the tribe and hapū and the whenua as a sustaining resource. In reference to the strategic Ātiawa pā Manukorihi, he commented that:

> *'Obviously, any area supporting large numbers of fighting men, not to mention those women, children and old people dependant on them, would have extensive areas of cultivation set aside. At the base of the cliff below Owae itself was a sheltered alluvial terrace which was planted in garden right down to the canoe harbour. Gardens stretched from Kainganui to Hikawera and Hikamutu, and Pariroa was another area with large tracts of cultivation, as was Otuhitekai, lying among the sandhills down by the beach.*
>
> *In addition to these major planting sites, smaller gardens were dotted throughout the area, as Waitara was famed for its rich fertile soils and good*

growing conditions. In actual fact, the district was cultivated so extensively that in later times all the big timber was gone and materials for canoes had to be brought in from beyond Tikorangi.

Flax was another item extensively cultivated, with many acres tended by our people... '

This statement echoes others by the older generation of Māori who identify the extensive nature of traditional horticulture activities and the relationship between the people and the activities of plant husbandry and food production. This is also compounded through the naming of the gardens, names which are recalled in perpetuity, especially in whakapapa[36].

The ordinary or daily Māori diet in pre-European times is considered to have been based on a mix of fernroot, some kūmara and fish. Shawcross (1967) aptly noted that cultivated crops were *'strictly occasional foods'* for Māori in the late 18th Century as they were not available year round, even with good storage. They were often regarded as delicacies or as a piquant to meals and added to the diet during feasts or hospitable occasions.

Today however, the practice of traditional horticulture by Māori is governed by both political issues of the last 160 years, especially relating to land confiscations and sales or whether Māori have retained any land to manage, and the demands of the markets – both export and domestic. There is considerable Māori involvement in the horticulture industry, not necessarily as traditional producers but definitely as contributors to the New Zealand economy.

5.3 Pre-European phase (pre 1769)

Ngahuru: kura kai, kura tangata.
Harvest time [autumn], wealth of foods, consequently of mankind

1769 is accepted by Europeans as their first major interactive contact with Māori (not including Abel Tasman) however, Māori believe they had visits prior to this date from traders and explorers which accounts for some possessions they had prior to Cook in 1769 (Richards, 1993; Wiseman, 1998). Agriculture and horticulture were essentially the same

[36] Various informants including B Manaia (Ngāti Ruanui); K Stirling (Ngāti Porou); M Timutimu, M Tapuke & A Taiaki (Ātiawa)

thing - subsistence farming of crops and no herbivores. Activity surrounding production was extremely structured with a strong deity relationship and reliance for some crops (e.g. kūmara [Best, 1976]). Tools were almost exclusively wooden with a wide range of specialist implements for various aspects of production. Bartering was common, especially among tribes who lived among various resources e.g. inland and coastal tribes bartering forest foods for seafoods. The primary cultivated foods were *kūmara (Ipomoea batatas)*, *hue* or (bottle) gourd *(Lagenaria siceraria)*, *taro (Colocasia antiquorum)*, *uwhi* or yams *(Dioscorea* spp.*)* and *aruhe* or fernroot *(Pteridium esculentum)*. Barber (1984) refers to these crops as a 'limited cultigen inventory' especially due to the limiting climatic factors. Furey (2006) identifies only six 'imported cultigens' as being grown by Māori at the time of the European arrival; kūmara, taro, yam, gourd, *tii-pore* (*Cordyline fruticosa*) and *aute* (*Broussonetia papyrifera*). These writers and almost all others reviewed for this thesis fall into the trap of considering only plants purposefully cultivated in gardens as the composition of traditional horticulture for Māori where in fact there is a much wider inventory which will be discussed in Chapter six. The fact that Māori acknowledge both Rongo-maraeroa and Haumia-tiketike as their gods of cultivated and uncultivated foods respectively confirms the broader interpretation they have for horticulture within traditional society.

All these afore-mentioned foods except the fern-root which is in fact the rhizome of the bracken fern are considered to have been brought to this country during the migratory phase of Māori over 700 years ago. Yen (1990) states:

> *'The achievements of Māori agriculture were both adaptive and innovative. Of all the Polynesian colonisations, New Zealand presented the greatest ecological contrasts to the tropical island conditions under which Pacific agricultural systems were developed.'*

Many writers have commented on the skill required for Māori horticulturists to adapt to the temperate climate of New Zealand (Buck, 1954; Yen, 1961; Yen, 1990; Leach, 1989; Roskruge, 1999). Other introduced crops that did not succeed in this new environment included: coconuts, sweet & plantain bananas *(Musa eumusa* spp., *Musa australlmusa)*, breadfruit (*Artocarpis altilis)* and sugar cane *(Saccharum officinarum)*. Māori tradition records the breadfruit in old waiata for its variety of uses prior to the migration to Aotearoa

under the name of *kuru,* but it is not known to have ever flourished in Aotearoa itself (Cowan, 1910). Leach (1989) suggests the salt spray on the long Pacific voyages would have contributed to the fate of the breadfruit and banana and, the rich humus of New Zealand soils to the fate of the coconut. Yen (1961) & Buck (1949) both suggest the climate would have been the key factor in the demise of these tropical crops.

5.3.1 Stone gardens

Within the Auckland region there are remnants of over 8000 hectares of stone gardens which were a complex of horticulture production units and settlements prior to European settlement (Sullivan, 1972; NZHPT, 2003). The remnant gardens are known as the Otuataua Stonefields and are now a reserve under the management of the Department of Conservation and the Auckland Regional Council. Archaeologists have found that these gardens provide good evidence of gardening practices prior to European intervention. For example; incorporating sand or gravel to the soil profile to warm the soil (Yen, 1961; Wellman, 1962; Mitchell & Mitchell, 2004; Furey, 2006) and allow for earlier planting and harvesting and, additions of shell, charcoal and ash to improve fertility of the soil (*ibid*). Stone rows believed to have been used as windrows, windbreaks or boundaries are a distinguishing feature of these gardens and are similar to those found at other sites around New Zealand including Cape Runaway and the Wairarapa Coast (Jones, 1989a), Blenheim (Matthews, 1988) and Little Barrier Island and Kapiti Island (Best, 1976) Taiamai Plains [Bay of Islands], Waipoua, Three Kings and Great Barrier Islands, North Canterbury & Banks Peninsula (Furey, 2006). Yen (1961) commented that the stone walls have been related to kūmara production partly in the form of limited shelter, but they created a further limitation to the shifting or relocation of production grounds.

5.3.2 Wetland cultivation

Several archaeologists have worked on remnants of ditch and drain systems, primarily in northern New Zealand (Kaitaia and environs, Bay of Islands, also South Auckland) and attempted to explain their role in traditional horticultural systems. The evidence of wetland gardening is becoming increasingly obscure due to modern land uses destroying the physical traces and also the loss of recorded history to corroborate the evidence. Barber

(1984) reviewed the role of wetland horticulture based on study of sites in Te Tai Tokerau (Northland). He identified that primarily there were four reasons for such extensive drainage systems in pre-European times;

1. solely as drainage of excessively wet soils or soils prone to wetness
2. water diversion, ostensibly for irrigation
3. the reclaiming of land for alternative (non-agricultural) land uses
4. modification of soils to assist specific crops, namely;
    a. taro – which would benefit from consistent wetness
    b. kūmara – which would benefit from the drainage and added warmth
    c. flax – which like taro would benefit from increased wetness

Other aspects of the pre-European horticulture system employed by Māori include the use of a 'slash and burn' technique of clearing ground for planting (McGlone, 1988; Jones, 1989); terrace gardening on slopes and foothill areas (Ongley, 1931; Jones, 1989; NZHPT, 2003; Mitchell & Mitchell, 2004); abstract fencing around gardens (Best 1976; Jones, 1989) and several labour intensive practices such as mounding of production plots for kūmara and yams, and weeding.

5.4 Contemporary Māori horticulture

Horticulture was a key element of pre-European Māori society. The place and role of Māori agriculture and horticulture in New Zealand society since colonisation has varied considerably throughout the decades. It is pertinent to focus on the phases of agricultural development which have contributed to the position of Māori in the industry today. The term agriculture is used in the context of economic land uses and includes horticulture.

Hargreaves (1963:101) stated that:

> *'...while it is known that Abel Tasman in his 1642 landfall on the New Zealand coast had had on board his vessels pigs, and possibly other European animals, no record exists of any attempt to land them, nor to provide the Māoris with seeds of any European food or tree crops.'*

In relation to Cooks second voyage of 1773, Begg & Begg (1969:117) wrote:

> *'George Forster described Cook's efforts to introduce potatoes. 'Captain Cook who was determined to omit nothing which might tend to the preservation of European*

garden plants in this country, prepared the soil, sowed seeds and transplanted the young plants. ...he chiefly endeavoured to raise such vegetables as have useful and nutritive roots, among them particularly potatoes ...corn of several sorts, beans, kidney beans and pease [sic].'

The arrival of Cook and other subsequent early explorers saw the introduction of many new crops – all of which provided challenges for the Māori horticulturist. Grains – e.g., wheat and corn, fruits, peaches, apples and citrus and new vegetables such as pumpkins, potatoes (some taewa cultivars) and cabbage were all introduced during this time in the 18th century. This introduced a new diet to Māori, especially the new sweet foods along with the meats provided by grazing stock such as pigs and cows. Grains proved a challenge before becoming a key economic crop for many iwi. Cook left the Marlborough Māori with wheat seeds which the iwi grew successfully but, he did not tell them how to prepare the grain for cooking and eating. In their ignorance the iwi tried to eat the hard grains and many broke teeth in the process so they threw away this new food. Only on his return did Cook teach them about grinding the grain and turning it into flour. A number of tribes created successful businesses in the early colonial years based on wheat and grain. The introduction of new tools, beasts of burden and an economic society based on wealth and possessions played a major role in the changing practices of horticulture of the time.

5.5 Phases of contemporary Māori horticulture

The following phases have been determined for ease of discussion:

1. Post contact (1769 - 1840)
2. Post Treaty of Waitangi (1840 - 1860)
3. Post Land Wars (1861 - 1940s)
4. Post World War 2 (1940s - 1980s)
5. Contemporary Society (1980s onwards)

5.5.1 Post Contact Phase (1769 -1840)

Ngahuru kai hangai, kōanga kai anga ke.
At harvest time eating openly, at spring eating secretively

This was the period of fastest change for Māori and one where new crops, tools and the European ideals of economics were introduced and partially accepted by Māori. From the time of Cook (1769) a number of European crops such as grains (wheat, oats etc.), a range of vegetables including potatoes, parsnips (tara), pumpkins (paukena) and some fruits (water melons, peaches, apples) became commonplace (Table 5.1 lists early introductions). By the end of this phase, the introduced crops were replacing the staple Māori crops.

Table 5.1: Crops introduced by early explorers to Aotearoa/New Zealand

Year		Location/region	Crops
1769	Capt. James Cook[37,38,39,40,41]	Mercury Bay (Coromandel)	Potatoes given to a local chief
1769	de Surville[39,41]	Doubtless Bay, Northland	Wheat, peas, ears of rice
1772	Marion du Fresne (Crozet)[38,40]	Bay of Islands	Wheat, maize, potatoes, nuts
1773	Cook (second voyage)[37,39,42,43,44]	Motuara & 4 other locations at Queen Charlotte Sound, Marlborough, also at Dusky Sound	Potatoes (sourced from the Cape of Good Hope), carrots, parsnips, cabbage, onion, leeks, parsley, radish, mustard, broad beans, peas, turnips, wheat, pumpkins, corn
1777	Cook (third voyage)[37,38]	Queen Charlotte Sound	Cabbage, onion, leeks, & mustard– self sown, limes, lemons, oranges, nuts

(Note: some discussion exists as to earlier 'visitors' to New Zealand who may also have introduced crops. See Richards, R. 1993: *Rongotute, Stivers and other visitors to New Zealand*)

When trying to interpret the writings related to this early contact period, it is important to recognise that non-Māori writers will apply their own cultural (often Eurocentric) understanding of the subject under review. We must therefore recognise this bias in our own interpretation in later years. Jones (1989) reviewed Cook's perception of the horticulture he saw in Māori communities in 1769.

[37] Harris, 2002
[38] Morris, 1900
[39] Richards, 1993:27-30
[40] Begg & Begg, 1969
[41] McNab, 1914:287, 399
[42] Leach, 1983
[43] Best, 1976
[44] Shawcross, 1967a:138

It is clear that Jones applies an anthropological thought process to the horticulture Cook wrote about by the use of terms such as 'carrying capacity' of the land area and 'production efficiency'; all used in the context of determining the welfare of the group (Māori) i.e. their physical effort in horticulture for a subsistence or social return. In a Māori cultural context the horticulture would have been measured as a success or otherwise based on an entirely different (and perhaps subjective) set of rules than that of Cook, Jones and others.

These new crops were responsible for major changes in Māori agriculture. Potatoes replaced the *aruhe* (fern-root) as the staple carbohydrate and starch food in the Māori diet and were arguably the most important introduction of the time (Hargreaves, 1963). The advantage for potatoes lay in their climatic tolerance and the ease of cultivation and storage, especially in areas where the climate was cooler and kūmara were difficult to grow, as well as the increased volume or yield taken from the same areas of land used for other crops. Anderson (1998) observed that the introduction of the potato to the southern districts (Otago and Southland) led to more permanent settlements. Grains provided further sustenance through flour production. In a general sense the wider range of crops brought an improved nutritional status to the Māori diet for much of the year.

Many of the introduced crops were obtained en-route by the visiting explorers. Cook and most of the other early European explorers travelled via the Cape of Good Hope (Cape Town, South Africa), a prominent trading port established by the Dutch during the 17th Century[45]. It is believed that early introductions of potatoes, wheat, maize and many of the vegetables and fruits were all sourced from the Cape of Good Hope (Yen, 1962), where in turn they were sourced from trading operations which stretched worldwide from the Indian Empire, South America and Asia. Later, sealers and whalers may have sourced stock from the Americas (*ibid*). These early contacts and visiting sailors often made it their habit to release animals at remote locations including pigs, poultry and rabbits and to supplement this by planting 'food depots' or simple gardens of vegetables and some fruits as food

[45] *http://regentsprep.org/Regents/global/themes/movement/exp.cfm* accessed 31 March 2006

stores for future castaways (Raynal, 1880). These gardens generally included self propagating crops such as potatoes, cabbage and some grains.

Other introductions which impacted heavily on Māori horticulture were the introduction by the first European explorers of iron implements - including axes and gardening tools and, draught animals to assist the human labour component in gardens/agriculture (Jones, 1989a; Hargreaves, 1963). Many plants were introduced, either intentionally or not. Some plants were introduced for their utility and others for their sentiment and nostalgia value to the emigrants. Many became fortuitous invaders or weeds in the landscape (Clark, 1949), the cabbage being a good example which was noted as growing wild like an indigenous plant (Hargreaves, 1963). Non-edible plants such as dock (*Rumex sp.*) and Scotch thistle (*Cirsium vulgare*) were introduced, both wittingly and unwittingly during this same time and remain as weeds in the New Zealand landscape today (Hargreaves, 1963: Leach 2005). Yen (1974) aptly noted that the projectional capabilities of exotic plants in the agricultural economics of communities are one of the primary contributors to the modern study of ethnobotany.

Along with the new crops, weeds, pests and diseases, the early European colonisers also introduced pigs and other animals for farming. The pigs mostly became feral and as such created one of the greatest threats to Māori gardens of the time. Aside from requiring fences strong enough to withstand the pigs, another control process was to take the pigs well into the bush away from the gardens and leave them to range at will until after the harvest when they were rounded up and brought back as required (Clark, 1949).

Along with European ideals came the creation of a market and the system of trading and bartering. By the early 19th century Māori were successfully growing crops to supply visiting traders - sometimes to the detriment of their own food supplies. An example is the dependence by settlers at Petone, Wellington district for supplies of fish, pork and potatoes from the local Māori where a 50lb (22.5kg) basket of potatoes could be sold for one shilling in 1840 (Leys, 1890). It was also to the detriment of their land resources and the increased area under production required new land to be broken into crops and increased labour

requirements. The traditional methods of cultivation were still very much in practice except in the choice of tools. Europeans had introduced metal implements e.g. spades and rakes, and Māori were quick to realise the benefits of such tools and how they allowed them to increase the area and amount of crops grown. However Europeans also introduced new sicknesses and alcohol - both destructive to Māori society, and animal and plant pests which were (and are still today) detrimental to the environment.

Prior to the Treaty of Waitangi in 1840, Māori were producing crops as an item of trade. Cameron (1964) summarised this change in production as follows:

> *'The Māori people underwent an agricultural revolution. This was caused by the introduction of the potato, which not only resulted in a return to ancient methods of crop cultivation, but also, because of the demand of visiting ships for food and the consequent value of potatoes as an item of trade, greatly encouraged agricultural expansion, particularly in the Northern districts.'*

The greatest influences during this phase came first from the visiting explorers, whalers and sealers during the eighteenth century, followed by the missionaries who settled among the Māori population early in the nineteenth century. The effect of the new cultures on the Māori lifestyle, economics and politics cannot be underestimated.

The burgeoning settlement of this country created a strong demand for vegetables to supply the growing population in this country and Tasmania and New South Wales, Australia. Māori rose to the occasion and turned to producing crops for market rather than for self-use. This created its own problems in that the move from a rotational production of crops to meet subsistence needs to a market driven demand saw huge areas of land under production, often for years in a row. Tribes in the Firth of Thames were recorded in 1801 as growing extensive fields of potatoes for trade as were iwi near Bluff in 1813 where a field considerably larger than 100 acres (40.5ha) was noted as *'attended to with as much diligence and care as ever seen...'* (McNab, 1908) and presented 'one well cultivated bed of potatoes'. Shawcross (1967a) noted that in the Bay of Islands vicinity, notable crops of wheat, peas, potatoes, turnips, cabbage, kūmara and corn were being grown in 1815. In the late 1830s the Chatham Islands were known as the 'potato gardens of the Pacific'. All of

this shows the ability of Māori to adapt to their changing environment and to be entrepreneurs in horticulture.

5.5.2 Post Treaty of Waitangi Phase (1840 - 1860)

Kei muri i te awe kāpara, he tangata kē, māna i te ao, he mā.
Behind the moko is a different man, one who claims the world, he is untattooed.[46]

This was a phase of very dynamic history for Māori. William Hobson arrived in New Zealand in January 1840 and began drafting the Treaty of Waitangi in English. The Māori translation was entrusted to the missionary Henry Williams and his son and completed on 5th February 1840. The northern Māori chiefs were invited to a hui (meeting) to debate the new treaty and on the 6th of February they were invited to sign it; 41 to 43 chiefs signed at Waitangi on this day. On the 16th of February 1840 an English version of the treaty was forwarded to the British government (the first of several) (Orange, 1987).

Over the next few months, representatives of the Crown (missionaries and officials) travelled the country acquiring the signatures of chiefs of other tribes. Not all signed but between 540 and 545 signatures were obtained by July 1840. On 21 May 1840 Hobson proclaimed sovereignty over all of New Zealand. Hobson did not acknowledge the non-signatory tribes, and in effect all Māori were to come under the umbrella of the treaty from this date. The Treaty has three objectives- the protection of Māori interests; the promotion of settler interests; and, securement of strategic advancement for the Crown.

The period of the Treaty of Waitangi brought a major influx of settlers and traders. It also brought an interest from both settlers and the British Crown in acquiring 'land'. Crop production boomed for Māori and they were the primary providers of produce to settlers, settlements and traders over much of the country - especially during the 1840s and early 1850s. The reliance on new tools and management techniques grew stronger (e.g. flour mills, grain harvests). Land was being cleared to cope with increasing demand for produce by settlers. Many coastal tribes including the Ngāti Mutunga of Wharekauri (Chatham

[46] Translation taken from Mead & Grove, 2001.

Islands) were producing commercial crops which were being sold both locally and overseas to countries such as Australia.

> *"The Māoris are our largest purveyors of foodstuffs. So large, indeed, as nearly to monopolise the market and to exclude Europeans from competition."* (Quote from 'The New Zealander' newspaper, 1848, given on Telstra Clear Biz (TV1),1-9-2003)

In 1844 the iwi of Opotiki were observed by missionaries to be in possession of two small vessels used for trade and the iwi of Whakatane also owned a vessel. This scenario was repeated in many parts of the country. Vegetables were the key crops of production by Māori at this time. In 1857 many iwi had thousands of acres in grain and potato crops to meet the demands of a growing society. Labour was in plentiful supply among Māori and the key issue was the reduced land area being available for crops limiting good crop management. Pastoral opportunities began to appear in the 1850s and agriculture was becoming the primary land use in many regions (Jones, 1989a). By 1860, wheat was the major arable crop, surpassing potatoes for the land area under production. Potatoes featured as one of the crops in many cash crop rotations in the South Island (Clark, 1949)

In some regions, Māori also produced commercial volumes of fruits such as peaches and apples. As late as 1886 Māori were still the primary suppliers of fruit in the Tauranga and Wanganui markets however, more commonly, areas of old and neglected fruit orchards marked the sites of abandoned villages (Hargreaves, 1960). Other lesser known crops trialled and abandoned by Māori in the 1870-80s were tobacco, hops and mulberry trees. Tobacco continued to be grown for personal use and was never considered as a commercial crop by Māori, primarily because of the variable quality of seed and produce (*ibid.*).

The innate European interest in 'acquiring' title to land was becoming a focus of this era and eventually led to the so-called 'Māori wars' during the 1860s. Sinclair (quoted in Jones, 1989a) summed the situation up: *By the end of that decade* [1850s] *a consciousness that the land should not be sold grew in the Māori community.* The fighting caused Māori to be distracted from their routine of cropping to defending their resources. Confiscation of prime horticultural and agricultural land following the wars destroyed any Māori dominance in crop production.

5.5.3 Post Land Wars Phase (1860 - 1940s)

Kua maoa te taewa [Te Whiti ō Rongomai, Parihaka]
The potato is cooked [meaning that when the potato is cooked (after the wars), the life principle is lost and it is then incapable of reproduction]

This phase began with the general neglect of Māori crops due to the people being involved in defending the same lands. This is also the period where pastoralism replaced cropping and the introduction of herbivore farming which utilised larger tracts of land became common. The introduction of a government-imposed land tenure system on Māori (Māori Land Court) effectively changed the social structures for them. Māori were beginning to disperse from the communal settlements, *kainga* or *pā,* and as a result their reliance on the group structure to survive was changing. The government of 1892 imposed a ruling to end private sales of Māori land making the Crown once more the sole purchaser of Māori land. Between 1892 and 1900 more than a quarter of the total Māori land holdings (1.12 million hectares) was sold to the Crown and a further 172,000 hectares exempted from the private purchase laws.

Smaller groups and families began to provide for themselves independently. Pastoralism provided for this, as did the new system of land tenure. For other Māori (especially in Taranaki) the confiscation of their land and introduction of perpetual leases took away their ability to continue providing from their traditional land bases. For New Zealand in general, the establishment of the frozen meat industry in 1882 signalled a major change in land use (Morrell, 1954). Prior to this advent landowners had diversified from meat and wool to wheat production but profits were limited (*ibid*).

The Native (later Māori) Land Court was set up in 1865 under the Native Lands Act 1862 followed by subsequent legislation such as the Native Reserves Act 1881, Native Lands Administration Act 1886 and the Māori Land Settlement Act 1894. The court at this time was charged with creating title to Māori land, as is the system in European countries, and facilitating the sale of land to settlers to meet the constantly growing demand from this section of the population. It has been stated that:

> *'British law faced a problem in dealing with Māori society as it simply had no concept of tribally or communally owned land. Land was a commodity that could*

be owned by individuals or by legally recognised organisations... ideally land should be freely disposable.' (Butterworth & Butterworth, 1995:2)

Aside from the constant demand for land by Europeans in the nineteenth century, the communal ownership of land was seen by non-Māori as an impediment to economic cultivation of land. As early as 1886 there seems to have been a demand for the individualisation of title of Māori land by some of the Māori owners (Hargreaves, 1960). This brought its own problems and Hargreaves (pg 356) also noted that:

'...in 1870, the individual reserves at Kaiapoi was only fourteen acres in extent – a size too small to be an economic proposition, even for the Māoris.'

The process of change to Māori society and agricultural practices continued, supported by legislation, changing technology and economics. During the late Nineteenth Century other issues relative to Māori impacted on New Zealand society in general. In Taranaki, the settlement of Parihaka by Māori in 1866 (and subsequently), many of them landless as a result of the confiscations, played a key part in the politics of the day. Parihaka Pā briefly attempted to return to 'Māori self-sufficiency' replacing meat with seafood, tuna (eels) and foods of the forest and returning to traditional vegetables such as aruhe, mamaku, pitau (fern shoots), and kūmara and taro in favour of potatoes. This approach was later abandoned and European foods allowed on the marae (Scott, 1975). The sacking of Parihaka by the government in 1881 followed by the imprisonment of many of their men created a landmark in our history which still exists. During the 1890s a group of charismatic young Māori established a political party and their influence continued throughout the 20th Century and on to today. These men; (Sir) Apirana Ngata, (Sir) Peter *(Te Rangihiroa)* Buck, (Sir) Maui Pomare and (Sir) James Carroll are well known for their parliamentary influence during the first quarter of the century, one which affected Māori land ownership and management among other factors.

The new century brought about fast economic changes and overseas wars. The loss to Māori through fighting wars overseas and the influenza epidemic was very high. In 1903 the establishment of 'incorporations' as a management system for multiple owned Māori land came about through the Māori Lands Administration Amendment Act. This is a key factor for Māori agriculture as it allowed for the amalgamation of land interests to a single

management option and the return 'in principle' to communal living on the land which is the traditional system for Māori. In the late 1920s, Ngata led a reform of the corporate tenure of Māori land thus creating a significant development of Māori land in pastoral and dairy farming (Morrell, 1955; Firth, 1972; Kawharu, 1977). The focus at this time was in agricultural utility of land rather than horticulture.

In 1920 the Native Trust Office (later, The Māori Trustee) was established through the Native Trustee Act. The trustee was vested with the management of all the native reserves previously under the control of the Public Trustee. Monies and rents from these lands would then be used for the development of Māori land and of Māori farming in general. The Māori Trustee was also involved in funding the Māori hostels set up around the country to accommodate Māori visiting towns and unable to gain accommodation in hotels or boarding houses.

5.5.4 Post World War 2 Phase (1940s - 1980s)

This period was post-war and post-Depression. There was a large loss of potential Māori leaders through both world wars creating a deficit still felt today. The influence of Māori politicians such as Sir Apirana Ngata and Te Rangihiroa Buck extended over most Māori settlements. Ngata brought about some legislative changes which still affect Māori today - the creation of 40 acre (16.2ha) 'economic' blocks (i.e. amalgamated family interests) so families could stay on their land and effectively have an area considered economic (sustainable!). In some areas Ngata focused on rebuilding the Māori identity which was becoming lost through a loss of population and land base. Many Māori who grew up during the times of The Depression in the 1930s and through to the 1960s, recall the extensive gardens planted around the homesteads and marae. These gardens were tended to by all the whānau and contributed to the food resources harvested from the bush, streams and ocean. The urbanisation of Māori and division of land interests has contributed to the demise of these gardens and reliance on retailed produce[47].

[47] Various informants including B Manaia (Ngāti Ruanui); K Stirling, H Hautapu, T Karauria & R T McClutchie (Ngāti Porou); M Timutimu & A Taiaki (Ātiawa); P Kruger (Tuhoe); Q & E Gripp & O Bullock (NgāRauru); A Lawrence (Ngāti Kahungunu)

The Māori population started to shift towards urban areas in search of work and housing, hence the continued breakdown of Māori society. Māori hostels in the main towns assumed a greater role in accommodation for young Māori heading to the city. Rural employment was concentrated on agricultural labouring for managers and non- Māori landowners as against the earlier practice of managing their own land. From the late 1950s significant areas of Māori land were afforested by the Crown and forestry companies (TPK, 1994). Continued fragmentation of land titles through succession to deceased owners through the Land Court caused many interests in land to be considered 'uneconomic' by the government and the titles were given to the Māori Trustee (Firth, 1972; Butterworth & Butterworth, 1995). This caused the further loss of interest in traditional lands and land use for many Māori. Furthermore, new ownership structures such as trusts and incorporations have taken over much of the other land interests by Māori.

The 1950s and 1960s was a period of public works boom e.g., State housing, new roads and motorways, hydro-electric schemes, and land development. The Māori Trustee was *'an instrument of ensuring that Māori land was by hook or by crook brought into production, made to pay rates and cleared of noxious weeds.'* (Butterworth & Butterworth, 1995). Little regard was given to the traditional Māori understanding of land ownership.

The 1950 Māori Purposes Act allowed for the Māori Land Court to appoint the Māori Trustee as agent for the owners of any 'idle' Māori land. The classification as idle was determined if one or more of the following conditions were met:

- The land was unoccupied
- It was not properly cleared of noxious weeds
- Charging orders for unpaid rates had been made in respect of the land
- The owners had neglected to farm and manage it diligently and that it was not being used in the interests of the owners and the public interest
- No beneficial owner could be found

These conditions were somewhat draconian and caused strong resentment between Māori land owners and government agencies, including the Māori Land Court and Māori Trustee.

Further issues were created by the Māori Affairs Act, 1953 which included a land title conversion programme whereby land interests worth under £25 were defined as uneconomic and the Māori Trustee was required to buy them. These conditions were withdrawn with the Māori Affairs Amendment Act in 1974 (Butterworth & Butterworth, 1995).

In 1952 the Board of Māori Affairs extended their financial support to cropping landowners (hitherto they had focussed on dairy and sheep farming) as part of their role in taking over the land development activities of the Māori Trustee and Māori Land Boards. Strict conditions were applied to Māori wishing to gain assistance in getting their land into horticultural production and '*only suitable men and suitable land can be considered*' (Anon., 1952). Cropping operations and marketing were supervised by the Department of Māori Affairs (*ibid.*), a paternalistic approach which was the norm for that time.

In 1958 the Department of Māori Affairs was recognising the economic limitations of some of the land blocks under Māori ownership and advising diversification into short-term crops such as potatoes, kūmara, pumpkins and carrots to supplement the main farm activity such as dairy production (Falconer, 1958). Furthermore, the value of maintaining home gardens to supply family needs in fruit and vegetables as well as donations to hui and tangi was advised.

During the 1960s the government introduced policies targeting incentives to raise farm production levels, including horticultural exports (Sutton, 2001). The government also provided scientific research and free advisory services through horticultural advisors, inspectors and trainers under the Department of Agriculture. From 1970 these formed part of the Advisory Services Division of the Department but the service was phased out by the government by 1992 (*ibid.*).

Treaty of Waitangi Act

In 1975 the Treaty of Waitangi Act was passed into legislation creating the Waitangi Tribunal as well as official versions of the Treaty of Waitangi in the English and Māori

languages. The Tribunal was charged with looking at contemporary claims by Māori against the Crown for breaches of the Treaty. In 1985 the Treaty of Waitangi Amendment Act allowed Māori to lodge retrospective claims with the Tribunal dating back to 1840. A number of pieces of legislation since this time have been more responsive to the Treaty of Waitangi and its objectives such as the Resource Management Act 1991 which requires those administering the Act to have regard for the principles of the Treaty of Waitangi. While this does not actually state how the principles should be included, it is at the very least an acknowledgment of the treaty at an important level of involvement in New Zealand's affairs.

From the mid 1970s the establishment of incorporations to successfully manage multiple owned Māori lands has developed into large areas of Māori land being managed under this system. Some larger incorporation's (Parininihi ki Waitotara Inc., Taranaki; Mangatu Inc., East Coast; Wakatu Inc., Nelson; Mawhera Inc., West Coast; Morikaunui Inc. and Atihau-Whanganui Inc., Wanganui) have proven to be very successful as businesses however they do have disadvantages. Some of these are the distancing of the land from the owners creating a loss of identity and the owners assuming their status as shareholders in the incorporation rather than in particular blocks of land.

5.5.5 Contemporary Society (1980s onwards)

E tipu, e rea, mo nga ra o tou ao;
Ko to ringa ki nga rakau a te Pākehā
Hei ara mo to tinana
Ko to ngakau ki nga taonga a o tipuna Māori
He tikitiki mo to mahuna ***[Sir Apirana Ngata]***
(Grow up o youth, and fulfil the needs of your generation
making use of the Pākehā skills for your material well-being,
but cherishing with pride your Māori cultural heritage.)

The consequence of the preceding phases in colonisation is that we now have Māori crop production systems which have more of a commercial focus rather than purely sustenance of the people. The horticulture industry is based on both export and domestic markets and the fresh and processed produce supports a varied industry in the wider agriculture and

primary sectors. Māori participate in the industry in varied roles; very few however are involved in traditional horticulture practices in a commercial environment.

The loss of land resources available to Māori through legislation or sale over the last 160 years has resulted in very little land suited to horticulture now being available to owners. Most Māori land is isolated, has a low Land Use Capability (LUC) (Table 5.2) and suffers from multiple ownership issues such as lack of capital investment, lack of a skills base, no mandate for utility, or a history of leased utility. In some ways the isolation can be seen as an advantage for organic options on the land but the other issues remain (Roskruge, 1996).

Table 5.2: Māori Land Use Capability (LUC) ratings – 1998 (Source: MMOLDC, 1998)

MĀORI LAND USE CAPABILITY (LUC) RATINGS – AS AT 1998			
LUC Class	**% total land**	**% Māori land**	**Description of LUC**
1	0.71	0.40	Most versatile multiple land use – virtually no limitations to arable use.
2	4.55	2.69	Good land with slight limitations to arable use.
3	9.22	5.75	Moderate limitations to arable use restricting crops able to be grown
4	10.31	9.81	Severe limitations to arable use. More suited to pastoral and forestry.
5	0.79	0.038	Unsuitable for cropping - suited to pastoral or forestry.
6	27.98	34.04	Non-arable land. Moderate limitations and hazards when under a perennial vegetation cover
7	21.45	32.19	With few exceptions can only support extensive grazing or erosion control forestry.
8	22.10	13.28	Very severe limitations or hazards for any agricultural use
Other	2.97	1.43	
TOTAL	**100**	**100**	

Incorporations such as Wakatu in Te Tau Ihu (Northern South Island) and Trusts such as Wi Pere Trust in Gisborne are examples of highly competitive and successful Māori entities within horticulture. Wakatu manage a diverse enterprise including kiwifruit and apple production. Their production systems are world-class and responsive to industry and consumer demands from around the world.

These examples indicate a Māori involvement in the perennial fruit production sector of horticulture. This in itself is a change from earlier times where vegetables were the main crops. Horticulture includes many production systems and perennial crops are generally higher risk as they take some years to mature and fruit only once a year. Indoor crops tend to be highly intensive and expensive to establish in comparison to outdoor crops but both can be used for production of annual crops. Within the nursery, vegetable and cut-flower sectors there are examples of Māori success. Small production units abound all over the country but they have a limitation in size and investment so are often not highly visible.

What this tells us is that Māori are still players in the horticulture sector, although they are no longer the key producers they once were. Māori are also starting to move from being solely producers to a system where adding value to their crops is a key to continued financial success. The emphasis now falls on trade as the key for production.

5.6 Examples of present-day Māori horticulture

While there are a number of constraints for Māori in the economic development of their land resource there are some very good models of Māori land development through horticulture which serve as an inspiration to all Māori land owners. Most models are based on a monocultural system such as a single horticultural crop or forestry rather than a diverse system typical of many smaller producers. Following are a selection of models.

5.6.1 Ngāi Tukairangi

Ngāi Tukairangi are based near Mt Maunganui in the Bay of Plenty. In 1980 they developed dairy land on the Matapihi Peninsula into a kiwifruit orchard which now covers 30 canopy hectares of kiwifruit and 5 hectares of avocados. In 1992, the Ngāi Tukairangi Trust took over the management of the land on behalf of the 500 owners and a board of 7 trustees administers the orchard. The orchard has been successful in that they are regularly producing 10000 trays of count size 32 fruit per hectare. At the time of full production in 1996 the block employed 3 full-time experienced staff as well as seasonal gangs of pickers, pruners and thinners.

5.6.2 Moteo Trust

Moteo Trust, inland of Taradale in Hawke's Bay, has developed a 40 hectare block from pasture into a grape orchard in partnership with a local grower after gaining approval from its 310 owners in 1994. The primary development included ripping a hard pan several centimetres beneath the soil surface. The trust now employs a number of full-time staff as well as a number of seasonal employees. The success of this venture is seen in the ability to develop a vision which is accepted by all the owners, assistance from government departments, availability of good advice and strong hapū leadership. Moteo Trust has become financially independent and is supplying grapes on contract to New Zealand winemakers.

5.6.3 Wi Pere Trust

The Wi Pere Trust is based near Gisborne and owns a number of horticultural and agricultural initiatives. Their horticulture is based around grapes (50ha), citrus (20.2ha) and cut-flower production. During 1998 they entered into partnership with a number of other Māori grape growers to create Tohu Wines, a totally Māori owned enterprise who produce wines specifically aimed at the export market. This trust has been sufficiently successful to date to be able to provide education grants to their beneficiaries and continue to make investments in their various enterprises.

5.6.4 Te Māra o Te Umutahi

Based at the Kānihi Marae near Okaiawa in South Taranaki is an example of a non-profit garden of 1-2ha based on traditional principles. Typical crops include corn, potatoes, mustard and fruit trees. The basis of this land-use is the communal approach and management, based on the historical system of gardens for Māori (Winder, 1999).

5.6.5 Tānehopuwai Gardens, Te Kuiti

These gardens were established to raise finance for a new marae and focus on traditional or indigenous crops such as kānga and taewa but also have some modern crops as well. They have been building their own seed bank of taewa for several years and progressively

becoming more viable each season. Much of the labour is provided on a part-time and voluntary basis (Smith, 2005).

5.7 The social politics of horticulture

The New Zealand horticulture industry is now worth in excess of $4.8 billion annually (Hortresearch, 2006). Within the wider horticulture industry there are a number of sectors which exist independently whilst contributing to the industry as a whole. The key sectors are: fruit production, cut-flower production, nursery production, amenity horticulture, organic production and vegetable production. There is now scope for a wide range of horticulture production systems which are applied by growers and will differ because of market, regional and resource implications. Horticulture production systems can be classified as:

- Indigenous cropping
- Commodity crops
- Niche crops
- Outdoor production
- Indoor production
- 'Organic' production
- Market specific production
- 'Interest' and 'home' gardens (list drawn from Roskruge, 2004)

Māori contribute to all of the above sectors and production systems to some extent.

Māori now have a quite different relationship with land than they ever had before. Legislation controls how Māori align to the land resource and how Māori manage it for any productive system. New technology in the horticulture industry has meant the ability to participate has become more skilled and expensive. Essentially, horticulture is no longer the labour intensive industry it once was. It is now highly and intensively managed to gain the optimum outputs from a limited resource, but this comes at a price. The cost of participation is continually increasing and those who are entrepreneurial have the opportunity to move out of commodity production and into high-value, niche production.

This requires a continued development of skills and knowledge relative to the specific land use on any horticulture block. No longer is the generic knowledge of the resource and crop sufficient to guarantee an income. The industry has become global rather than national or local; a major change from the production in the 19th and 20th centuries and one which will continue to move in that direction.

So where do Māori fit into horticulture in the 21st century? Horticulture remains an economic option for Māori and Māori landowners but the processes have changed. Success requires producers to be highly skilled managers targeting both economic and sustainable land use incorporating technological advancements. Investment in research and development is often the key to both creating and implementing technology in the horticulture sector. Māori are yet to be highly visible in the modern high-value horticulture sector in this country. This does not mean they are not there, just that Māori are a minority within the industry.

Māori agriculture or horticulture as a separate entity within New Zealand is virtually non-existent in modern times. Today the Māori land base covers approximately 1.51 million ha of 'Māori freehold' land – some 4.7% of the total land mass in New Zealand, a vast reduction from 1840 when Māori owned 26.9 million ha of land (Table 5.3). An estimated 40% (600000 ha) is undeveloped or under-utilised (MMOLDC, 1998). Māori land is now governed by Te Ture Whenua Māori Act 1993, which has the aim of:

> "... *retention, use, development and control of Māori land as taonga tuku iho* [a treasure from the past] *by Māori owners, their whānau, their hapū, and their descendants.'*

Table 5.3: Māori land area by Māori Land Court (MLC) District

MLC District	Total Land Area per MLC District (ha)	Māori Land Area (ha)	% of Māori Land by Land District	Number of Land Blocks	Average Land Area per Land Block (ha)
Tai Tokerau	1 732 192	139 873	8.07 %	4 889	29
Waikato-Maniapoto	2 156 583	143 388	6.65 %	3 594	40
Waiariki	1 936 270	426 595	22.03 %	5 074	84
Tairawhiti	1 169 091	310 631	26.57 %	5 320	48
Tākitimu	1 936 492	88 608	4.58 %	1 254	71
Aotea	1 284 284	334 207	26.02 %	3 710	90
Te Wai Pounamu	16 715 185	71 769	0.43 %	1 795	40
TOTAL	**26 930 100**	**1 515 071**	**5.63 %**	**25 636**	**59**

Source: Māori Multiple-Owned Land Development Committee (MMOLDC), 1998 (see Appendix 3)

The Māori Land Court functions under the Department of Justice. It is presided over by a Bench of 8 Judges including a Chief Judge and Deputy Chief Judge. Currently they look after the interests of over 2 million ownership shares in Māori land, much of it believed to belong to deceased or absentee owners. One of the major issues for Māori landowners is multiple-ownership. The Māori Land Court imposed a tenure system based on individualised title and succession to land owned by Māori. Since its inception in the nineteenth century this has led to thousands of owners succeeding to land shares which are becoming increasingly smaller as each generation passes. The government has identified some key issues relative to multiple-owned land. These are:

- Access to finance
- The management capacity of Māori land owning groups
- The valuation and rating of Māori land
- The extension and coordination of commercial facilitation services to Māori land owners
- The identification of appropriate land use options
- The succession of owners to their entitlements, and,
- The amalgamation of Māori land blocks.

(Māori Multiple-Owned Land Development Committee, 1998)

At present a significant amount of Māori owned land remains undeveloped in a commercial sense and is unlikely to be developed without considerable investment in the future. Māori

continue to become more urbanised and lack an economic base. Technology has become an important tool in the management of Māori land regardless of its particular use. This is all proof of their evolving to a completely different economic system from the time before European contact.

5.8 Māori economics

What is the status of Māori horticulture in New Zealand economics today – the 21st century? Māori freehold land still comes under the jurisdiction of the Māori Land Court and in some cases, the Māori Trustee on behalf of absent or deceased owners. The agricultural base for Māori is not just on Māori land however. There is a considerable contribution to the wider primary sector of New Zealand by Māori in agriculture, horticulture, forestry and fisheries and also to the support industries. Politically, a range of interest groups exist for Māori. These groups are based on region, iwi or whakapapa, land-use or interest (Lambert, 2004).

Technology is becoming more accessible to the agricultural sector – including Māori. The use of GIS systems to document information relating to land and land use or potential is an opportunity to empower Māori through better decision making regarding their resources as well as improved knowledge on which to base economic decisions for their land. Other processes of technology e.g. computer systems and programmes, email, aerial mapping and so on all allow for improved transfer of technology and information to land owners and for improved management systems for the land managers.

The future of Māori in the primary sector including agriculture and horticulture is secure in the knowledge and relationship that exists for Māori with the land resource. The reconciliation of the Māori world view with the demands of a growth-orientated capitalist economy is essentially the first step on the economic development path (NZIER, 2003). Modern economic processes can only enhance the land use options and strengthen the Māori position in this sector. Complimenting this positive direction is the growing demand for other niche or traditional foods which are sourced from Māori entrepreneurs throughout the country. Examples include pikopiko or shoots of the *Asplenium bulbiferum* fern and

fresh water crayfish – koura – which can be farmed using aquaculture methods (Tait-Jamieson, 2004).

At present, there is an array of environmental, economic, social and global issues with potential influence on Māori and the horticultural sector. The recent 'Growing for Good' report by the Parliamentary Commissioner for the Environment (2004) highlights a range of environmental issues affecting the intensive farming industry – of which horticulture is a part. The report identifies the following issues as significant risks to the primary industry:

- Intensive land management practices and fertiliser application
- Escalating water demand and water quality issues
- Climate change implications and the Kyoto Protocol (the protocol agreement and climate issues will not be discussed in the context of this thesis)

In an economic sense, the horticultural export market is affected significantly by the fluctuating strength of the New Zealand dollar, which affects export earnings. Additionally, rising energy costs (i.e. carbon taxes and oil prices) and subsequent market implications will cause a ripple effect across the international and New Zealand economies.

Increased international trade and tourism, also brings with it the risk of biosecurity and border control issues. Exotic pest infestations have the potential to seriously affect New Zealand's primary industry. The Royal Society for New Zealand[48] identifies that:

> *'A relatively isolated country like New Zealand faces a wide range of security risks, some large, some small. There are many possible hazards and threats, and increasingly new technological or systemic risks that could affect people, the economy, the environment, or normal community functions.'*

Furthermore, the growing genetic engineering and modification debate poses a range of ethical issues of particular significance to Māori (Roberts, *et al.*, 2004). HorticultureNZ acts on behalf of the industry as a lobby group and policy development agency. They note that some of the contemporary issues affecting the horticultural industry include:

[48] http://www.rsnz.org/events/sciencesecurity/

- Marketing system development and restructuring
- Transport costs and efficiency
- Quarantine and border protection
- Grading and quality control of produce
- Taxation issues
- Resource management issues
- Horticultural education and training
- Research – related to both markets and production
- Industrial relations
- Export development/market access
- Use of chemicals in production systems
- Promotion of products, nationally and internationally
- Labour – skilled and unskilled

These issues are equally relevant to Māori as sector participants, although it is inherent that Māori will also apply a cultural perspective to these same issues.

Māori face specific issues in their horticultural development and have unique factors to consider (NZIER, 2003). Māori land tenure and issues already identified with multiple-ownership continue. Furthermore, increasing Māori capacity and capability across the economic and social sector, has been a focus of recent government campaigns. Although the 'disparity' gap between Māori and non-Māori has closed considerably in recent decades, there is potential to grow key skill and knowledge bases in the sector. Furthermore, ethical and cultural questions are becoming more prevalent in relation to issues ranging from genetic modification to land and water management.

Importantly, the overriding issue for any Māori horticultural development is the incorporation of the holistic Māori worldview into horticultural development. This aspect differentiates Māori from other producers, and places unique demands on Māori, and also provides benefits and opportunities associated with this 'uniqueness' (e.g. niche marketing) (Lambert, 2004).

5.9 Organics

Many Māori horticulturists have chosen to align to the organic sector because they believe that conceptually, it meets their ideals in land and food management practices. This is evidence of Māori increasingly providing appropriate cultural responses to environmental issues and organic horticultural and agricultural systems are no exception. Organics is a production system in horticulture which came about as a response to the chemical management techniques of the early twentieth century. Technically it is not based on any indigenous system but it does appear to fit better with indigenous groups because of the mix of management techniques it employs.

Since 2002, Māori involvement in the organic industry has continued to evolve. Organics to Māori is not just in horticulture and agriculture but also sectors such as tuna (eel), seaweed extract, flax crafts and rongoa (medicines). Māori are party to all the national initiatives related to the organic industry and much of their involvement is complimented by the advancement of indigenous elements to their production systems and also to marketing. There is considerable interest by Māori and other indigenous peoples to collaborate on their management systems and marketplace options to promote traditional factors utilised in all aspects of their businesses. Many Māori have aligned to these organic systems because of their apparent links to traditional systems and the tikanga which is applied to the resources throughout any utility. For Māori, it is the tikanga or culturally accepted methods applied to production that is important and organic systems appear to better align to traditional tikanga (Roskruge, 2002).

5.10 Chapter summary

Horticulture in Māori society has changed considerably from what it was in pre-European times. Māori were very responsive to the economic opportunities which presented themselves with the introduction of the settler economy. They adapted their land-use skills and crop choices to meet the needs of the market and supplied produce accordingly. In the mid-nineteenth century, it was only the change of emphasis to defending their land which saw the demise of horticulture, followed by the processes of the Native Land Court and a move to pastoralism with the advent of individual ownership of land and a refrigerated transport system.

In the 20th century Māori endured varied impacts on themselves, their society and the asset base which they owned. Aside from the ongoing effects of colonisation and the impact of the (now) Māori Land Court, there was the loss of leadership through the two world wars. Urbanisation in the 1950s and 1960s meant that the rural Māori community was relocating and along with it the horticultural activities of keeping whānau and hapū gardens was being diminished. Very few examples of traditional community gardens now exist and the present generation of young Māori are relatively unfamiliar with horticulture.

In recent years the resurgent interest in indigenous systems and knowledge has contributed to a greater awareness of Māori horticulture as a core activity within Māori culture and Māori are now looking to renew their application of value systems through actions such as kaitiakitanga with regard to the land resource.

Chapter 6: Key crops in Māori Horticulture

Te utu kei runga, te utu kei raro
Kei tara wiwini, kei tara wawana.
Mihi mai koe, tangi mai koe.
I tou kiri, ka ripiripia, ka taetaea
Tau te hue, ka haehaea
Ki te taha o te umu, i te matai na,
Umaka whakawhano, ki roto ki te kakano
No hue, tau.
[Traditional (pre-European) karakia recited by Maia of Rongowhakāta
as he planted his hue at plantations around Taruheru, Gisborne]

6.1 Introduction

This chapter introduces a number of horticultural plants which featured in traditional Māori society. They provide the basis for a body of knowledge or mātauranga aligned to traditional horticulture and which is available within the Māori community for reference and/or application in contemporary times. The information contained within this chapter is indicative of the breadth of traditional horticultural knowledge and application in Māori society. The following crops can be considered the key crops in traditional Māori society however; other plants and crops not identified here may have featured in pre-European times and are no less important because of their absence in this thesis.

Not all cultivated plants in the Māori garden were, or are, solely for eating; several plants were grown for their utility value such as harakeke (NZ flax) – used for weaving and textile production, aute grown for its use in making cloth and, hue or (bottle)gourds which were dried and used as containers. There was also the availability of food stores from 'uncultivated' plants such as aruhe (fernroot) and berries or fruit of tree crops such as the hīnau (*Elaeocarpus dentatus*) and miro (*Prumnopitys ferruginea*) which were often located near to settlements and harvested in much the same way as cultivated plants. Whilst these crops were considered uncultivated, they were no less managed to ensure maximum production of the harvested plant parts e.g. the timing of harvest or minimising competition between plants for the best quality produce.

6.2 Kūmara – *Ipomoea batatas* (Sweetpotato)

Kūmara is the collective noun for the sweetpotato[49]. Buck (1954) noted the name *kumar* exists in the Kechua dialect of Northern Peru for the sweetpotato and has probably contributed to the generic name *kūmara* used around Polynesia. Leach (1989) states that kūmara or sweetpotato is the only South American plant in the inventory of indigenous plants grown by pre-European Māori. Early visitors to this country identified sweetpotato *(kūmara)* as the most prominent crop being grown by Māori in northern districts (Yen, 1963; Best, 1976; Jones, 1989). Kūmara production was adapted by Māori to grow the crop in our temperate climate. In New Zealand both the pre and post-European cultivars of kūmara are not known to flower[50], and in fact, efforts to induce flowering have not been successful (Yen, 1963). This means that all varieties are propagated vegetatively. The kūmara plant is tolerant of salt winds, drought and lower fertility in soils, thus making it quite suitable to the sand and silt loams of much of the coastal fringe in New Zealand. It was not very successful however in much of the South Island because of the cooler climate but was grown is pockets such as D'Urville Island, Waimea district, Karamea on the West Coast and Kaikoura, Kaiapoi, Wairewa (Lake Ellesmere) and Banks Peninsula on the east coast of the South Island (Rigg & Bruce, 1923; Gregory, 1976; Challis, 1976; Jacomb, 1994; Bassett *et al.*, 2004: Mitchell & Mitchell, 2004). It was however, also considered a difficult crop to grow in the Central North Island because of the severity of frosts and short growing seasons experienced there – except in some microclimates on river terraces with alluvial soils (Williams & Walton, 2003).

Traditional production of kūmara is immersed in tikanga or customs expressed as ritual, karakia (prayers and incantations), and sacred behaviour because of the tapu accorded to the crop. Te Ātiawa are said to have deified Rakeiora, a tohunga who arrived on the Tokomaru waka, into a kūmara god and they shared this god with Ngāti Ruanui in later times (Smith, 1910). Other tribes had their own deities. Considerable effort was given to preparing sites which would benefit kūmara production such as the digging of channels to

[49] To distinguish this crop from the tuberous potato (*Solanum tuberosum*) the common English name is now written as one word and is accepted convention internationally (Lewthwaite, 2004; Janick 1978).
[50] An exception is the testimony of T G Hammond who ONCE saw a kūmara plant in flower in Kaeo in 1883, Northland during the mid nineteenth century (Hammond, 1894).

drain soils in Northland (Barber, 1984). Early production systems were based on 'pieces' of kūmara with shoots being cut and planted rather than the process of tipu/shoot production which is the procedure used today (Berridge, 1913 & 1914; Yen, 1961; Best, 1976). Plants were placed in ridges or mounds and tended to religiously throughout the growing period (generally from November to the following March). Berridge (1913) also states that *'an almost general cessation of war was accepted at the harvest'*.

Harvest, grading and storage of the kūmara crop were equally important activities, also steeped in tikanga practices. In the tropical Pacific, kūmara was continuously harvested year-round as it was needed and there was no need for specific storage techniques to be employed. The temperate and seasonal climate of New Zealand required Māori to adapt their management of the crop to ensure it was accessible throughout the year. Yen (1961) noted that in no kūmara growing region within New Zealand had he encountered over-wintering of kūmara in the field or in propagating beds of previous seasons. This observation was supported by over-wintering trials at several sites around New Zealand where the kūmara failed to survive the winter season.

It is believed there were several cultivars of pre-European kūmara cultivars of which only a handful survive and are grown today. The modern cultivars are sports of earlier sweetpotato cultivars (mostly American varieties) which have gained favour with consumers and producers alike (Coleman, 1972; Yen, 1974). Te Aupouri iwi of Northland talk of a variety known to them as *Taputini* which was less precocious than other varieties and upon harvest they used to score it with toheroa shells, sit the tubers on rocks to dry in the sun and breeze and then pack into kits which they hung in pātaka or storehouses. From this activity the settlement of Te Kao got its name; kao being in reference to processing dried kūmara[51].

Broughton (1979) gives *tamamore* as an ancient name for kūmara used by the Ngā Rauru tribe of South Taranaki. There were a considerable number of recognised varieties of

[51] Key points from story retold by Mr Toro Ihaka, kaumātua of Te Aupouri, 1992.

kūmara grown in pre-European times and these have now been supplemented with the introduction of American strains of sweetpotato, probably introduced by American whalers (Gillard, 1965: Coleman, 1969 & 1972).

6.3 Hue – *Lagenaria siceraria* (bottle gourd) [*Lagenaria vulgaris* – Best, 1976]

He karakia whakamahutanga, mo nga hue, me ka taona; ka urua te umu,
ka karakia te wahine mana e tao te umu, ka mea.
Te tamariki kaitangi hue, Pu te hue, tanu te hue, tupu te hue, Toro te kawai, whanaua.
Whanaua, kia tini, whanaua, kia mano, whanaua, kia rea[52].

One of the key crops prior to European colonisation in New Zealand; hue is an annual crop that belongs to the Cucurbitaceae family of plants with a prostrate and spreading growth habit common to these plants (pumpkins, cucumbers, melons etc.). Smith (1910) recorded that hue was the only crop to succeed from the original introductions by Māori prior to the migration phase of the 14th century. Hammond (1924) stated that it was introduced to Aotearoa as seed from the cargo of the Tainui waka during the migrations. It was a dual-purpose plant; the mature fruit was variously used and young immature hue *(kotawa)* were eaten when the skin and flesh of the fruit were soft – generally around January and February (Yen, 1974). It has been suggested that the young leaves and growing tips *[tohihi]* of the plants were also eaten and possibly the dried seeds as well (Maingay, 1985). The physiology of the plant was well understood with terms applied to all the plants' components including the cotyledons which emerge from the seed and were known as *pātangaroa.*

Dried fruit were utilised as food bowls, bailers, water vessels (*ipu*), floats and storage containers and also for cooking containers (Maingay, 1985; Best, 1976; Clarke, 2006) and small hue occasionally used for musical instruments[53] (similar to drum or flute) and tops (Maingay, 1985) or rattles as amusements. In this instance, mature fruit were selected, left on the vine and sat on a base of dried grass while the fruit matured and the outer rind dried

[52] Source: Ko ngā moteatea, me ngā hakirara o ngā Māori (www.vuw.ac.nz/library/subjectguides/maoristudies/websites/waiata.aspx) accessed 24 November 2006

[53] Hue Puruhau – gave a deep vibrating sound; Hua Puruwai – a rain sound; Poiawhiowhio – imitated bird noises; and Koauau Ponga Ihu – small gourd used similar to a flute. Also Nguru or nose flute (Burtenshaw, 1999).

and hardened over a period of months. Some practitioners note the old traditional method of curing gourds by burying them in warm dry sand for 4-5 months to let the moisture drain out to the sand as still being the best method (Schoon, 1962). The hue was widely grown around New Zealand in pre-European times however; it does best in places with long, warm summers and has not been very successful at higher altitude or much of the South Island due to the colder temperatures and limited summer periods. Newman (1903) states it was seldom seen growing to maturity south of the Bay of Plenty.

Hue were traditionally planted during the maramataka phases of *Turu* and *Rakaunui*[54] (Best, 1976; Schoon, 1962) however Tregear (1904) identified the maramataka phases of *Rakaunui* and *Rakaumatoi* as the preferred planting days[55]. It was the only crop in traditional times that was raised from seed known as kākano (Colenso, 1880; Best 1976; Barratt, 1979); all other crops were raised vegetatively. Colenso (1880); Papakura (1938); Best (1976), and Maingay (1985) all introduce the concept of priming hue seed by placing them in fern within a basket and soaking in running water for a few days prior to planting and this practise was known as *whakarau*. The crop was planted in depressions, usually cultivated in the banks of streams and rivers and protected from the weather with cut scrub. Young fruit on the hue were lifted and dried grass put underneath to protect them while they were growing and maturing.

As in kūmara production, there are considerable tikanga or cultural practices aligned to the successful production of hue. Maingay (1985) suggests that substantial soil modification was often undertaken to encourage early growth, strong plants and fruit. This included the addition of charcoal and/or ash to discrete areas of soil before planting and sometimes the construction of mounds for planting inclusive of carefully positioned stones or rocks, charcoal and burnt twigs.

Best (1902:61) commented on a relationship between hue management and harvesting wild mushrooms; possibly alluding to a toxin involuntarily carried between plants. He wrote:

[54] The 14th and 15th nights of the maramataka Māori (calendar).
[55] The 15th and 16th nights of the maramataka Māori (calendar).

> *'A curious superstition is connected with this plant* [the tawaka; a variety of *Agaricus* mushroom]: *if a person has eaten of the tawaka he is not allowed to go into the hue or gourd plant cultivations, for if he did so all the fruit of the gourd vines would decay prematurely.'*

Hue are protected by the god or atua Pu-te-hue, a child of Tane (Best, 1976 & 1995a) and as such required strict ritual during planting and harvest. Pu-te-hue is quoted as saying: *'the seeds within me shall provide water vessels for my descendants'* as she gave herself to the people, specifically a tribe known as Ngāti Toi, the first to cultivate the hue (Schoon, 1962). Best also gives *kowenewene* or *wenewene* as alternative names for the hue in the East Coast Ngāti Porou district. See Appendix 4 for a list of vernacular names.

The hue is known to many Pākehā as the Polynesian bottle gourd and its' origins and movements through various continents and cultures have been studied to add to the body of knowledge about the movements of the Polynesian peoples and potential relationships between the Americas and Polynesia over the last 1000 years (Whitaker & Carter, 1954; Sorenson, 2005). Clarke *et al.* (2006) have determined there are two possible origins for the hue in Aotearoa; via the Americas or via Asia. Science favours the American route and suspects post-European introductions of the Asian gourd accounts for hybridisation of the traditional Māori cultivar since colonisation. The plant itself is now ascribed to African origins based on the known existence of a wild population there as against cultivated populations of the crop elsewhere (*ibid*).

6.4 Uwhi/Uhi – *Dioscorea alata* (yam)

The yam is acknowledged as one of the vegetables introduced to Aotearoa during the time of the migration of Māori from Hawaiiki. Several varieties of yam are known to have been cultivated throughout Polynesia and St John (1954) stated:

> *'Such a widespread dispersal implies its esteem by the early Polynesian colonists. Its tubers, of course, were easily carried. When once planted in the forest, they would persist and multiply and maintain a food supply available for residents or occasional voyagers.'*

The traditional variety of yam (*D. alata*) is believed to have been grown extensively in New Zealand in former times but now it is not found anywhere, including heritage plantings

throughout the country. The journal of Banks from Cook's voyage of 1769 and Cook's later correspondence mentions the yam or uwhi identifying that it was being grown in the Bay of Islands area relatively extensively at that time (Begg & Begg, 1969). The uwhi had a long growing season (9-12 months) and was susceptible to frosts and this limited where it was grown. The introduction of the potato hastened the demise of the yam in Māori horticulture because the former was a much easier grown crop. Shawcross (1967a) noted it was still a relatively common crop in Northland in the 1820s. Leach (1983) stated that by 1844 the original yam was nearly forgotten and in Northland the term uwhi was taken to mean winter grown potatoes.

Barber (1984:29) quotes from a letter written by a Mr George Graham, corresponding with Mr H D Skinner, an early Northland ethnographer. In 1922 Graham wrote [in reference to artificial drains isolated in the Kaitaia region]:

> *'I myself have seen such drains for growing the uwhi (yam) and taro in the Kaipara. The drains were also used as eel preservers, and weirs were built in them... such places however, are ideal for the taro... and also the uwhi – a kind of yam, now perhaps extinct. I last saw it growing at Tauhara [North Kaipara Heads] about 1885.'*

6.5 Tii / Kōuka – *Cordyline* spp. (cabbage tree)

Ehara i te tii e wana ake.
Not like the tii tree whose life persists (Best, 1908).

Several species of the tii, kōuka or cabbage tree (the name given to the plant by Captain Cook) were used for food and other activities by early Māori. It is well recognised that the cabbage tree was cultivated by Māori near their settlements as a food crop (Walsh, 1900; Rudman, 1992; Park, 1995; Simpson, 2000). Different cultivars of tii or cabbage tree were grown in different regions for their specific uses and the cultivated groves were aligned to the food utility of the plant rather than other uses. Primarily, cuttings were taken from offsets on the rhizomes known as *Tiipara* to establish new plants or crops. These cuttings were known as *kōpura*, included a piece of both the stem and root and were ready to harvest in 12 months (Tregear, 1904). Fankhauser (1982; 1986 & 1990) & Matthews (1988) have both noted that the remains of large ovens (pits) known as *umu-tii* specifically used for the cooking of tii can still be found in parts of the South Island. There were

several types of umu-tii used for specific purposes, of which many examples have been recorded by archaeologists and also compared to umu-tii of Eastern Polynesia which are remarkably similar in construction (Knight, 1966).

The tii is renowned for its ability to defy death and to live on or regenerate from any situation. The plant has the ability to produce a leafy shoot at each leaf axil, particularly after any damage or internal rot. The tell-tale circle of cabbage trees often seen in the landscape is the result of the underground rhizomes sprouting after the death of the original tree above ground. The well-known proverb warning against gossip alludes to the qualities of the cabbage tree: *He uru a ki, he wana te tii, ke rito te tii* [the spoken word reappears, just like the tii sprouts again].

The tii had a range of uses (Table 6.1) including use of the coarse leaves for thatching, rope making, wrapping and weaving, using the heart leaves as a vegetable or the edible rhizome or root of some varieties (known as pūhanga) as a food and source of both carbohydrates and sugars (Fankhauser, 1990). Taylor (1966) gives the name *mauku* (used in the Waikato district) to the processed roots and likened their flavour to liquorice. Other tribes refer to the processed roots as *kōuru* or *kāuru*. The roots were only harvested in late spring and summer when the maximum amount of carbohydrates were within the plant (*ibid*). Dried roots were often stored for long periods in pātaka for use out of season. Tregear (1904:98) explained the harvest and processing of the roots as follows:

> *'The plants were dug up, stacked in piles, and dried in the sun. The fibrous roots were burned off while drying. When dry the roots were scraped and slowly baked for from 12 to 18 hours. They were either chewed at once, or pounded, washed and squeezed to extract the sugar which was contained in great quantity, partially crystallised among the fibres of the root. The sugar was eaten as a relish with fern-root.'*

The sugar type (mainly fructose) found in tii roots exists in levels higher than that found in sugarcane or sugarbeet making it a very sweet food product (Fankhauser & Brasch, 1985; Fankhauser, 1990). It was considered an important food source in the South Island where kūmara did not grow easily. For most tribes the sugar product was used as a kīnaki or relish with fern-root or kānga wai (also known as kānga pirau or fermented corn) and also as a sweetener with water.

The edible stems of the Tii-para variety of tii, known as *kōuru*, were a primary food source for some Ngāi Tahu settlements (Anon, 1931; Anderson, 1998) and also the Northland tribes (Best, 1976). Today only the *rito* or heart leaves of tii are used as a seasonal 'green' by some Māori and this practice is becoming less common amongst the younger generations. Raw kōuka or heart leaves (known as kōata or kōmata[56]) were also eaten to aid digestion of fatty foods such as tuna (eels) and muttonbirds (Simpson, 2000). Various parts of the tii also had medicinal uses, but this application is rarely used today due to modern medicines and alternative management for health problems. The fibre of the leaves was renown for its robustness and use in making ropes (called aka-tii), snares for catching birds and water fowls, pāraerae or sandals and other items of clothing including leggings (whakapuru), capes and waist mats (Scheele, 2002).

Table 6.1: Varieties of Tii (cabbage tree) in New Zealand and their uses.
Drawn from Tregear, 1904; Beattie, 1949; Best ,1976 & Simpson, 2000.

Māori name	**Botanical name**	**Uses**
Tii papa (Tii para, Tii tahanui, Tii koraha, Mauku) Tii rauriki [Northland]	*Cordyline pumilio* Pygmy or dwarf cabbage tree	Eating, especially the saccharine roots
Tii kōuka (whanake)	*C. australis [C. fruticosa]*	Eating, thatching, cordage
Tii pore	*C. terminalis*	Prized for the root as a food source. Propagated vegetatively.
Tii kapu (Tōi) *[Titoi in Ngāti Mamoe dialect]*	*C. indivisa* Broad leafed or mountain cabbage tree	Tap root & upper part of trunk used as food
Tii tawhiti *[Taranaki district]*	*Cordyline* spp. probably *C. australis* Kirkii	Stems used as a food Dwarf & non-flowering variety
Tii ngahere (Tii kapu, Tii torere, Tii parae)	*C. banksii* Forest cabbage tree	Inner part of tap root used as a food
Tii kōuka (Poor Knights & Three Kings cabbage tree)	*C. kaspar*	

During the late 1980s and 1990s, a disease afflicting cabbage trees became apparent across the northern half of the North Island which turned out to be responsible for the sudden death of thousands of trees. In 1991, the then DSIR identified a mycoplasma like organism as the culprit for the disease which was being transmitted by sap feeding insects such as a native leaf hopper. This bacterium disease is the same one causing yellow leaf disease in

[56] Personal communication, Mr Te Uri Hautapu & Mrs Christina Kawau, pakeke o Te Whānau ā Ruataupare, March 2003.

harakeke and dieback in karamū trees (Rudman, 1992; Beever *et al.,* 1996; Beever, 2002). The situation highlighted the role of cabbage trees in New Zealand landscapes and the impact of environmental factors on their continuing presence in the wild and on pastoral properties.

6.6 Taro – *Colocasia esculenta* (L.) Schott [referred to as coccos/cocos in antiquity]

Taro is one of the plants said to have been introduced to Aotearoa at the time of the Māori migration from Hawaiiki. A number of stories exist as to the origin of taro and how Māori came to be in possession of it prior to their migration across the Pacific. It is often referred to as 'the food of chiefs'- *he kai rangatira* - (Hammond, 1924) and this indicates the status given to the crop by earlier generations. The New Zealand taro (as distinct from the tropical or island taro) has certainly diminished as a favoured crop by Māori, and is not often seen in gardens of today; rather it is more likely to be found growing wild near streams and old water-courses. The natural habitat of wild taro is generally in wet and warm situations such as permanent streams, waterfalls in tropical rainforest or permanent springs or seepages in monsoonal savannah (Matthews & Terauchi, 1994; Matthews, 1997).

The New Zealand taro (*Colocasia esculenta*) is a temperate variety of the taro which is grown throughout Oceania and Asia. It is commonly understood that taro was introduced to Aotearoa during the migration of Māori from Hawaiiki (Best, 1976; Hammond, 1924; Matthews, 1985; Stowell, 2002). Tribes of Te Tai Hauauru believe the taro was sourced from another island called Wairua-ngangana about seven generations prior to their tūpuna leaving Hawaiiki for this country (Hammond, 1924). Their waka, the Aotea, is said to have carried two varieties of taro to the new country; *tutahi* and *whakatauere* (*ibid.*). It was one of the main cultivated crops of pre-European Māori society, said to be second in importance to kūmara for cultivated crops (Best, 1976). The taro however was displaced during the introduction of European crops which were easier to grow and supply to markets and probably preferred in their flavour and cooking qualities. Shawcross (1967a) identified taro as still being an important crop for Bay of Island Māori as late as 1835 and that the rate

of decline was slow over the first four decades of the nineteenth century. Best (1922) noted that by 1900 Māori had almost ceased to cultivate taro in their fields.

Both the leaves and the corms were used for cooking and eating. Best (*ibid.*) also identified the leaf stalk or petiole, known as *whawha taro,* as a favoured edible portion of the taro plant. Generally no tapu procedures were applied to the production of taro as a crop (Yen, 1974) and it was not stored with other root crops in rua (storage pits), but stored above ground covered by bracken. In the warm northern districts taro was considered as a perennial plant and the tuber or corms could be dug all year as necessary for use thus making this a useful plant for out-of-season produce. Further south, for example in Taranaki, the taro was described as limited in quantity and never extensive enough to provide continuous supply, thus requiring assiduous management (Buck, 1949).

6.7 Aute (Maro) – *Broussonetia papyrifera* (paper mulberry)

The aute or paper mulberry was a cultivated shrub or small tree, not for food but for its bark (Buck, 1954; Hammond, 1924) which was used for the manufacture of tapa like cloth, clothing materials and bandages. The bark of the tree was also used for making kites known as Manu-aute. It is a dioecious plant (male and female flowers on different trees) and is generally grown from vegetative cuttings or suckers. The plant was said to have been brought to Aotearoa by Māori during the migration from Hawaiiki on the waka Otureareo (Evans, 1997) but it struggled to survive in the cooler, temperate climate and eventually died out of cultivation. At the time of Cook's visit to this country in 1769 only a few aute shrubs were observed in the Bay of Islands and these were specimen trees rather than utility trees (Hindmarsh, 1999). Banks and Solander – members of Cook's expedition - collected a specimen of aute describing it as *'in parte septentrionalis, culta sed rara' (in northern parts [of the country], cultivated but rare)* (Simpson & De Lange, 1992).

Matthews (1996) in an essay on the use and dispersal of paper mulberry in the Pacific Islands states:

> *'In the North Island of New Zealand, the paper mulberry was widely cultivated before the arrival of the Europeans. In 1844 the destruction of paper mulberry by European cattle in the Hokianga district was reported by E.M. Patuone in a letter*

cited by Colenso. .....the plant became extinct soon after 1844. .....Numerous factors could have contributed to cultivar extinction in New Zealand: (i) a decline in cultivation for social reasons. (ii) destruction by newly introduced herbivores (cattle, sheep and others), (iii) an inability to breed and disperse by seed, because only one sex was introduced, or because male and female plants were introduced to different parts of the country, (iv) loss of flowering ability because of mutations accumulated over a long period of vegetative propagation and cultivation, (v) previous adaptation to tropical conditions, leading to weak vegetative growth in the temperate climate of New Zealand, and (vi) an accumulation of pathogens or harmful mutations leading to weak vegetative growth. No evidence is available regarding the last four possibilities.'

The Marutūahu tribes of Hauraki have a tradition around the aute confirming the existence of the plant in traditional gardens until the early twentieth century. Royal (2007) states:

'According to Hauraki tradition, the aute was brought from central Polynesia to Hauraki on the Tainui canoe. However, only a small plantation, Te Uruaute-o-Mārama-tāhanga (Māramas aute grove), was grown. Planted at Waihihi in Western Hauraki, it flourished until the beginning of the 20th century. This gave rise to the saying 'Haere mai ki Hauraki, he aute tē awhea' (Come to Hauraki where the aute tree survived) which refers to the great fertility and mana of Hauraki.'

6.8 Taewa/Peruperu/Riwai/Parareka – *Solanum tuberosum* (Māori potatoes)

The taewa or Māori potato is known by a number of generic names which vary according to tribe and dialect around the country (taewa, peruperu [Northland], parareka [Ngāti Porou], mahetau [Ngāi Tahu], rīwai; refer to Appendix 5 for a full list of vernacular names). There are a number of different beliefs regarding the origin of taewa in New Zealand and the route they took to get here. Many Māori believe there were cultivars of taewa here before European explorers such as Cook made contact. Richards (1993) reviewed the recorded information on the existence of a Captain Stivers who is said to have visited the northern coast of New Zealand and introduced (either wittingly or unwittingly) the potato which the local Māori called taewa as a transliteration of his name.

Captain James Cook is credited with the earliest recorded introduction of potatoes to New Zealand. On his first voyage and contact in November 1769 he visited Mercury Bay in the Coromandel region. Te Horeta Te Taniwha was a child at the time but his recollections in old age included:

'Cook then gave two handfuls of potatoes to the old chief [Toiawa], *a gift of profound importance to the Māoris. By tradition these potatoes were planted at*

> *Humua where, after cultivation for 3 years, a feast was held and a general distribution made.'* (Begg & Begg, 1969:36)

The tribes of Queen Charlotte Sound make reference to a variety called Te Winiharete which they believe descends from Cook's introduction. It is generally accepted that taewa were not brought as cargo during the migrations of Māori to Aotearoa but how they arrived is an interesting point. Some believe that chance visits by trading vessels (unrecorded) which had earlier visited South America are responsible for the introduction of taewa (Richards, 1993). Other tribes hold beliefs that taewa were sourced by their own people from the bush or through other obscure processes. Ngā Rauru of South Taranaki claim the cultivar Tātairongo was obtained from the underworld by their tupuna Te Reke Tātairongo (Hammond, 1924). Lieutenant King, Governor of Norfolk Island is known to be a catalyst in the introduction of a range of exotic flora and fauna to the northern districts during a visit to New Zealand in 1793 (Shawcross, 1967a). Aside from presents of tools and implements, King is credited with the introduction of the European or 'white' potato which is said to have had an *'immediate influence on the food producing and dietary habits of the Māoris associated with these travellers'*. (Shawcross, 1967a:142)

Ivan Simonov, the astronomer with the Russian expeditionary Bellingshausen wrote in his journal on their interaction and trading with local Māori at Queen Charlotte Sound in 1820. On investigating some cultivated ground he commented that:

> *'...there we found... a long row of baskets containing potatoes, just dug up. We took a few with us; on boiling them, we found them very tasty and not inferior to* [the] *English potato.'* (Barratt, 1979:82; Hindmarsh, 1994:75)

Taewa or Māori potato ultimately replaced (or displaced) the traditional crops such as kūmara and aruhe as the primary carbohydrate and subsistence crop produced by Māori for their own use (Morris, 1900; Walsh, 1902; Yen, 1961; Yen 1962; Hargreaves, 1963; Best, 1976; Barratt, 1979; Roskruge, 1999) some calling it the:

> *'... greatest gift of the European to the Māori agriculturist... which by 1835 was much more in use than any native vegetable'* (Hargreaves, 1963:103).

In comparison to many of the other crops grown by Māori, taewa had a high labour requirement which was able to be met by Māori communities at the time and yielded a

plentiful return for the labour input (Firth, 1972). The potatoes were grown in a similar fashion to the production of kūmara which Māori were very adept at and thus they became experts in production in a very short time. Localised variations in cultivation such as the planting of crops by Tuhoe of the Bay of Plenty in light scrub as early as June to shelter young growth from frosts were common (*ibid*).

Harris (2006) recorded the effects of a potato blight (*Phytopthera infestans* or late blight) epidemic on Māori communities during the 1905-07 period. The spread of the disease decimated the traditional potato crops on which many Māori were reliant as their key carbohydrate source and considerable effort was applied to introducing new potato seed and other crops into the Māori gardens of the time.

Today taewa are produced using the same processes and technology as commercial potato crops. During the early colonisation period taewa were a key crop in Māori economic development. They provided a marketable product which sold readily and was in continuous demand both in this country and Australia. This intensification of horticultural demand contributed to the large areas brought into production during the rapid colonisation of the nineteenth century (Yen, 1962).

Plate 2: Sample varieties of taewa (*Solanum* spp.)

6.9 Kānga – *Zea mays* (Indian corn/maize)

The maize or Indian corn originates in the Americas and is important in food, feed and industrial crops worldwide (Neuffer *et al.*, 1968; Heiser, 1973). Known to Māori as *kānga* it is one of the primary crops in Māori horticulture and has a variety of uses. It is one of the crops introduced during the early decades of the contact period between Māori and explorers such as Cook, du Fresne and sealers, whalers and traders. It is said that while Māori were adept enough to learn how to grow grain crops, hitherto unknown in their

horticulture systems, they were not shown the accepted methods of using the grains at harvest (this applied mainly to wheat). After attempting to eat the dried grain the response was to discard the grains and return to their usual crops. When they were eventually shown the best methods for growing, grinding and utilising maize [and other grains], it then became an important crop and Māori set about creatively using the produce in both fresh and processed ways to supplement their diet. Best (1974) stated that the tribes of the Bay of Islands were the first to acquire maize which came to them from Governor King of New South Wales in the 1790s. It was the influence of the missionaries in the early nineteenth century that consolidated maize and wheat as important crops alongside the flour and bread products they contributed to (Hargreaves, 1963). Shawcross (1967a) adds that by the decade of the 1830s, corn rivalled potatoes as the chief Māori produced crop for home and European consumption.

Leach (1983) noted that maize was:

> '*...the only cereal to be fully accepted in Polynesian horticulture, but not without repeated introductions.*'

Leach commented that maize was treated akin to bamboo and grasses across Polynesia and usually roasted immature within the husks until cooking pots were freely available. Early maize production was considered a trial and error process and it didn't become widespread and accepted as a crop until about 1813 (Hargreaves, 1963).

Kānga crops, as in modern maize and corn varieties, must accumulate considerable heat units to achieve maturity and are therefore more suited to the regions which experience long dry summers such as northern regions of the North Island, Hawke's Bay and Canterbury. Anderson (1998) noted maize being grown by Māori at Kararoa north of Hokitika on the West Coast in 1846. There are several varieties of kānga grown by Māori, many with names that have now been forgotten and which would be considered as mutants by maize breeders worldwide. Yen (1959) commented that as the seed was relatively inconsistent in producing the same quality of cobs year by year, the names were not retained in the same way they were for other crops. The white kernelled variety is considered by some to be the best for processing. One white variety with large kernels was

known as *Niho Hoiho (Horse teeth)* and is still grown in some parts of the country. There are also black cultivars (referred to by Yen [1959] and also grown in recent Massey University trials), red cultivars, yellow cultivars – which are the most common grown in Māori gardens, and a mottled variety which is assumed to be a product of cross pollination. All these variations of colour and quality in maize are generically known as mutants and occur in cropping systems worldwide (Neuffer *et al.*, 1968). Popcorn (*kānga pakaru*) was also a popular crop for many Māori families in past generations and was grown in the same way as kānga[57].

Plate 3: Sample varieties of kānga (*Zea mays*)

6.10 Kamokamo[58] – Cucurbitaceae family (believed to be *Cucurbita pepo* cv kamokamo)

Kamokamo is a variant of the cucurbita, similar to the marrow *(Cucurbita pepo* L*)*. It is a fast growing summer annual plant believed to have been introduced during the early years of settlement in the 18th and 19th centuries. There are several distinct varieties of kamokamo which have probably arisen from cross pollination, seed selection and isolation

[57] Various informants: Ngāti Porou, Ātiawa, Ngāpuhi, Mātaatua and Ngāti Kahungunu.
[58] Some suggest the name *kamokamo* is derived as a transliteration of *cucumber (Anon communication, 2006)*

over several decades. Many whānau and marae jealously guard their own kamokamo seed to ensure they continue to grow their preferred variety. For Māori, kamokamo is a favourite vegetable generally eaten as an immature fruit and used to accompany pūhā or as a base for penupenu, a mash of vegetables prepared for infants. It is sometimes marketed as kumikumi (Gourley, 1996). Early crops are harvested from December onwards around the Bay of Plenty and later crops will fruit through to late summer in more southern districts.

Plate 4: Sample of kamokamo (*Cucurbita* spp.)

6.11 Rengarenga / Māikaika – *Arthropodium cirratum* (rock lily)

The rengarenga is a New Zealand native plant which colonises coastal areas from North Cape to about Kaikoura or Greymouth in the south. Some literature suggests that the rengarenga or rock lily was purposefully cultivated by Māori for the thick fleshy roots which were roasted or steamed and then eaten (Riley, 1994; Harris 1996; Harris & Te Whaiti, 1996). Their flavour has been likened to potatoes. Wild plants produce a mass of matted roots whereas cultivated plants have been noted as having much larger roots. Colenso (1880:30) wrote:

> *'This plant [rengarenga] grows to a very large size in suitable soil, and when cultivated in gardens. From this circumstance, and from not unfrequently noticed it about old deserted residences and cultivations, I am inclined to believe that it was also cultivated.'*

The rengarenga was a significant food resource to some Māori communities and also had considerable utility in both medicinal and spiritual ways.

6.12 Pūhā (sometimes given as pūwhā)/Rauriki/Pororua – *Sonchus* spp. Including *Embergeria grandifolia*; Chatham Islands sow thistle

Essentially not a cultivated crop by early Māori, pūhā (sow thistle) is making a renaissance in the New Zealand diet and is now being cultivated purposefully for the market. Gourley (1996) in her publication on vegetables written for the [then] industry body VegFed (NZ Vegetable & Potato Growers Federation) included pūhā as a green vegetable used in the same way as spinach and wrote:

> *'... it* [pūhā] *was one of the staple green vegetables of the Māori... the 'smooth' leaved pūhā being the most popular. The slightly bitter and 'prickly' leaved pūhā is also eaten. Whilst it is not grown commercially it is occasionally available and there is certainly demand for it in some areas.'*

Aside from the Chatham Island sow thistle which is endemic to the island (McKenzie & Johnston, 2004), there are several varieties of *Sonchus* spp. considered native to New Zealand and the Kermadec Islands; *Sonchus oleraceus* (sow thistle, pūhā pororua, rauriki), *Sonchus asper* (prickly sow thistle, pūhā tiotio, taweke/tawheke, rauroroa), *Sonchus arvensis* (perennial sow thistle) *Sonchus Kirkii* Hamlin (shore sow thistle; ex *S. littoralis*) – although their origin and existence in New Zealand is mostly conjecture (Kirk, 1894; Cheeseman, 1923; Best, 1977; Sykes, 1977). Microfossil evidence from research on an historic Māori Pā site known as Kohika in the Bay of Plenty has identified one of the pūhā varieties as a pre-European component of the Māori diet. Horrocks (2004:326) identified findings of:

> *'... very high proportions of pollen of Sonchus kirkii (pūhā) and Typha australis (raupō) indicating that these taxa were part of the diet of the local people in prehistoric times (AD 1700–1750).'*

Leach (2005) suggests that at least one of the pūhā varieties [*Sonchus asper*] was probably introduced to the New Zealand environment by Māori during their migratory period. Shawcross (1967) includes pūhā as one of the green vegetables occasionally eaten by Bay of Islands Māori in early times. While primarily used as a vegetable, pūhā juice also contributed to the diet as a form of tonic and some people note the raw sap could be rolled

into a ball and used as a chewing gum known as *pia* or *ngau* (Papakura, 1938) and a beneficial product for teeth and gum health. The sap was sometimes mixed with the gum of the tarata plant (*Pittosporum eugenioides*) for a similar use as a chewing gum (Tregear, 1904). Pūhā was only ever used as a fresh green vegetable, especially in spring and early summer and provided a relish for meals, primarily fish.

Pūhā is a wild vegetable which grows prolifically throughout New Zealand and off-shore islands. It is considered as an indigenous vegetable or food by most and is now under scrutiny as a potential commercial crop option. Colenso (quoted in Leach & Stowe, 2005) listed pūhā generically as *Sonchus* spp. and as one of the most important of the New Zealand endemic plant foods.

An interesting note on the discovery of pūhā by soldiers the Māori Battalion during the Second World War attests to the value of the plant to the Māori diet and also to other cultures. The following extract is from the *Te Ao Hou* publication in 1954 (p62) and is also mentioned in Cody (1956):

> *'It was Colonel Bertrand, who as Major Bertrand, 2 I/C 28th (Māori) Battalion, made the discovery that the Māoris were not the only people who recognised the merits of pūhā. The New Zealand Division had landed in Greece and 5th Brigade transport was proceeding by road to its position near Olympus. During a halt for lunch it was observed that the farmers were very busy weeding their crops and Major Bertrand strolled over to get a closer view. The workers were not weeding but gathering pūhā, which they said was a much prized vegetable with them. Very soon, at the rate of a shilling a sugar bag, they were gathering pūhā for the Māori transport drivers.*
>
> *Pūhā, sonchus oleraceus to the botanist and sow thistle to everybody else, is such a typical New Zealand plant that it is generally thought to be native to this country. It was first noted scientifically by Ernst Dieffenbach, who came here in the Tory as surgeon and naturalist to the New Zealand Company. As early as 1843 he mentioned that the Māori people used it freely as a green vegetable. It is not, however, a native plant for it is common in Europe and may have come to New Zealand as a stowaway in the canoes of the great migration. At least that is what Dr H. H. Allen, of the Department of Scientific and Industrial Research, thinks possible.'* (Anon, 1954:62)

6.13 Hāria / Paea/ Nīko/ Puka/ Rearea/ Nanī/ Pora – *Brassica oleracea* (wild cabbage, Māori cabbage)

An introduced plant, the hāria was said to be introduced at the time of first contact from Europeans in the 18th Century. It was grown as a green vegetable and used in much the same way as for pūhā. The Māori cabbage is now found as a cultivation escape which has become a generic weed species throughout New Zealand and is also common on coastal cliffs (Roy *et al.*, 1998). Beattie (1949) noted *pora* or wild cabbage as a diet staple and sign of past settlement in South-Westland in the few clearings where it can be found there, often alongside patches of pūhā.

6.14 Poroporo – *Solanum aviculare*

Poroporo (also pōporo) is a wild plant sometimes planted around kainga or villages as a '*kai tamariki*'[59]. Essentially the children were given the ripe berries – known as Hareto or Hōreto – as a food supplement. The berries are slightly toxic and unpalatable when green but edible when ripe. Early European colonists made jam from the fruits (Cheeseman, 1923). The mature leaves of the poroporo were also used for flavouring in hāngi and layered on the hot stones before the uncooked food was put down. The soot of the plant after firing was also used as a component in tattooing pigment. Sometimes the plant *Solanum nigrum* or 'black nightshade is also referred to as poroporo and used in the same way as pūhā. In Taranaki (more so than any other district) it is a favoured green vegetable used in preference to other wild green vegetable plants in daily meals and for hui[60].

6.15 Harakeke – *Phormium tenax* (New Zealand lowland or swamp flax) Whaririki – *Phormium cookianum* (NZ coastal or mountain flax) [ex: *P. colensoi*]

Me he wai korari *Like the nectar of flax*

New Zealand swamp flax or harakeke is an evergreen perennial plant grown throughout the country, often as features in landscaping or windbreaks or native plantings. It is not related to the European (linum) flax which has been cultivated since Babylonian days, but was given the flax name because of the similarity in uses. New Zealand flax species are

[59] 'Kai tamariki' – literally 'children's food'.
[60] Ngā kaumātua/kuia o Taranaki whānui.

generally hardy and tolerate most soil types and climate including medium to heavy frosts. As an added bonus, the flowers of harakeke are well-known for their sweet nectar used as a food sweetener and also renown for attracting feeding birds in the spring. It is also believed that the endemic flax snails or *pupuharakeke* (*Placostylus hongii*) which lived within the plant clumps provided an occasional food source for some northern Māori (Hayward & Brook, 1980; Brook & McArdle, 1999).

An interesting observation concerning the korari or nectar of flax was made by McDonald an early resident and historian of the Horowhenua region. He stated (O'Donnell, n.d.:60):

> *'Wai-korari is a sweet syrupy fluid, which fills the large reddish-brown flowers of the flax stalks, and was sucked out of the flower by the Māoris and also gathered in calabashes and brought home to the pā for more leisurely use. A curious thing about the flower of the flax is the state of the tide can be told from them with considerable exactitude. I will not guarantee that this holds good everywhere, but on the coastal country I can vouch for the correctness of the statement from personal observation. At low tide the flower is empty, and as the tide comes in, so the wai-korari gradually rises in the flower, until at high tide it is full to the brim, and at spring tide actually flows over in a steady drip. As the tide goes out, the wai-korari recedes until the flower is dry again, and so on twice a day while the flowers are in full bloom.'*

Harakeke was understood to be the most important utility plant to Māori society after their food plants. It was recorded that when Māori were informed that flax did not grow in England, some chiefs are reported to have asked, "How is it possible to live there without it?" (Hindmarsh, 1999). There are a considerable number of known varieties of flax in New Zealand and Māori are known to have selected and grown flax for their particular qualities especially strength, softness, durability, colour and quantity of fibre (Scheele & Walls, 1994). (Refer to Appendix 6 for a list of vernacular names.)

New Zealand flax is one of four natural fibres used by Māori in their weaving: the other three being pingao (*Desmoschoenus spiralis*), tii (*Cordyline australis*), and kiekie (*Freycinetia banksii*) (Best, 1898; Bergin & Herbert, 1998). All four plants were managed *in-situ* for their contribution to traditional society. Whaririki or coastal flax was not so commonly used in Māori society as its leaves were relatively soft and droopy by comparison. Nevertheless it remains a plant of considerable interest to Māori society and

has a lot of common factors with harakeke. Buck (1923) identified several other plants that provided leaf material suited to weaving including paopao (*Scirpus lacustris*), kōwharawhara (*Astelia* spp.), kāretu (*Hierochloe redolens*), lacebark (*Hoheria populnea*), maurea (*Carex* spp.) and nīkau palm (*Rhopalostylis sapida*).

Flax plantations, known as *pā harakeke* (*pu harakeke* for a single plant/clump), were propagated from root division off parent plants and planted near every settlement and in forest areas where it didn't grow naturally (Best, 1977) for harvesting and use in making clothing, sandals, belts, fishing nets, sails, baskets, fly swats, matting and cordage among other items. Beattie (1949) wrote how flax was used to make drinking cups:

> '*The Māoris were very adroit at making drinking cups from flax and would twist up a watertight cup in surprisingly quick time. One of my friends said they use the rito (young leaves) of the flax...this ingenious cup was called konenewai.'*

McNab (1908) quotes Ensign McRae in a statement made to a Commission of Enquiry in England in May 1821 regarding the newly discovered New Zealand. McRae said:

> *'They dig small trenches about a foot wide and nine inches deep and plant the flax between the trenches. They generally select moist lands for the flax, and when they wish to have it for a very long or any particular purpose they plant it on rich soil ' [how was it propagated?] ... always by plants. We were told by the natives that it did not grow from seed.'*

Harakeke has recognised qualities in fibre, variable between cultivars grown and the intended utility of the fibre (Scheele & Walls, 1994). Harakeke also has the distinctive advantage of being a sought after product for *rongoa Māori* or traditional medicines. All parts of the plant have *rongoa* uses - often specific to tribal or family groups. Flax was an important commodity crop in the early 19th century (McAllum, 2005) for purposes of trade by Māori throughout the country and providing the base material for ropes, sacking, upholstery and other fibre products (*ibid.*). When the Europeans arrived with their range of textile materials, the traditional use of flax suffered immensely as it could not compete with the warmth of wool, versatility of cotton, or the durability of hide (Hindmarsh, 1999). Convenience was also considered a factor as flax was relatively laborious to prepare compared to the other textile materials. At this point in our history the woollen blanket became a favourite garment for Māori.

The flax provided the basis for an industry that lingered until the 1980s in parts of New Zealand. In 1873 there were 50 flax mills within 16km of Foxton (Esler, 1978) and by 1906 there were 240 flax mills throughout the country employing over 4000 people. The 5800 hectare Makerua Swamp near Shannon supported 19 flax mills alone and over 700 workers in its heyday in 1916-17, producing 2500 tonnes of fibre from 22000 tonnes of leaf annually (Hindmarsh, 1999).

Harakeke is now making a comeback in New Zealand society, especially as a component of the cultural renaissance and the base material for many traditional crafts and art-forms. A national collection of 60 cultivars of harakeke is maintained by Manaaki Whenua Landcare Research at their Lincoln campus, Canterbury.

6.16 Karaka – *Corynocarpus laevigatus* (Kopi [Chatham Islands])

The karaka is an evergreen tree found predominantly in coastal districts of the North Island, the northern part of the South Island to Banks Peninsula, the Kermadec Islands, and the Chatham Islands where it is known as kopi (Molloy, 1990; Gilmour, 1993; Leach & Stowe, 2005). This tree was often planted in the vicinity of settlements and the fruit provided an addition to the subsistence food supply from the cultivations in the late summer and early winter. The karaka is said to have also been introduced to Aotearoa during the period of migration from Hawaiiki. Descendants of the Aotea waka claim karaka seeds were among the freight of the Aotea and were planted in the vicinity of Patea on their arrival (Hammond, 1924). The seeds were believed to have been sourced en-route to Aotearoa, probably from the Kermadec Islands (referred to as Rangitahuahua in Aotea tradition) where the karaka is considered endemic and where tradition states the Aotea stopped briefly (*ibid.*). The descendants of the Tainui, Tākitimu, Kurahaupō and Nukutere waka also claim to have brought the karaka to this country. There is also a school of thought that the karaka was not introduced through the migration of Māori but was already established because it is a native plant of New Zealand (Molloy, 1990). Hamilton (1903) quotes the notes of a Mr Shand in stating that the Moriori tradition believes the karaka was earlier

introduced to the Chatham Islands by Maruroa and Kauanga who travelled in the waka *Rangimata* from Hawaiiki and successfully planted the karaka seed at a number of sites.

There is reasonable evidence to show the karaka was purposefully planted in groves near settlements and cultivated for its fruit which was an important food (Molloy, 1990; Park, 1995; Wilmshurst *et al.,* 2004)[61]. Leach & Stowe (2005) conclude that *'on the Chatham Islands, the absence of kūmara 'sweet potato' meant that karaka might have assumed a greater value than on the mainland.'* Aside from the belief the karaka was purposefully introduced and planted on the Chatham Islands there is also the belief that some of the quarrels among Moriori prior to the arrival of Māori centred on the possession of valuable karaka trees as the fruit was the basis of a staple food (Hamilton, 1903).

The flesh of the fruit is relatively palatable and eaten as a fruit when ripe. Colenso (1880) wrote that the karaka was *'of inestimable value to the Māori as a common and useful article of vegetable food, second only in place to their prized kūmara tuber".* It is the kernel which is known as the *kou* or Māori peanut[62] that is the well known product of karaka consumed by Māori. The kernel of the fruit contains poisonous compounds however and considerable processing through steaming and drying is required before they can be eaten[56].

6.17 Aruhe/Roi – *Pteridium esculentum/ P. aquilinum / Pteria acquiline/* (Fernroot)

Note: aruhe or roi is only the rhizome, not the whole plant which is known as raruhe (Taranaki), rau-aruhe or rarauhe

Arguably one of the primary foods of early Māori, aruhe or fernroot no longer provides any input to the diet of Māori or non-Māori alike. In pre-European times, aruhe was a staple food providing the necessary starch and carbohydrate needs of Māori, especially where kūmara could not be easily grown (Jones, 1989). There is consensus that when Māori migrated to Aotearoa from the tropical Pacific, their previously reliable food crops which were cultivated and harvested year-round such as kūmara, yams, taro and breadfruit were

[61] Also in, Ngā Ruahine evidence relating to the Taranaki claim to the Waitangi Tribunal, 1991`
[62] Personal communication, Mrs Hinehou Lincoln, pakeke o Ngāti Porou, 1996, and other informants

no longer to be relied on because of the temperate climate and risk of frosts on production. As a consequence, aruhe became the most reliable starch-based food which could be sourced throughout the country. The greatest advantage attributed to fernroot was that it was an absolutely sure food supply for the many districts where it grew prolifically (Shawcross, 1967). The quality of the rhizome fluctuated somewhat depending on the climatic conditions or soil conditions, but nevertheless, its hardiness and reliability ensured survival of many Māori communities.

The following short waiata (song) quoted in Firth (1972:322) about the aruhe alludes to the value of this plant as a food for man throughout the generations:

He aha he kai ma taua?	What shall be the food for us two?
He pipi, he aruhe.	Some pipi and some fern root.
Ko te aka o Tuwhenua	That root which spreads through the earth
Ko te kai i ora ai te tangata.	Ah! Tis the food which revives man,
Matoetoe ana te arero	roughening his tongue
Te mitikanga, mihe arero	As he rolls it over in his mouth;
Kuri au, au, au	Rough it grows as the tongue of a dog, au, au, au.

Aruhe was considered a staple food by Māori and had a wide range of terms applied to the plant as a whole or various plant parts (Best, 1908 & 1977). Several varieties of fernroot were also recognised by different tribes and there were also several names applied to the processed and cooked product of the fernroot. The aruhe was essentially an uncultivated crop and was considered the mainstay of vegetable foods for many if not all tribes (Shawcross, 1967). Papakura (1938) however describes how she remembered her Te Arawa people occupying cultivation grounds to plant and harvest aruhe. These grounds were jealously guarded as were other crop cultivations. While many people focus on cultivation techniques as the criteria for classifying horticultural production, Māori were well known to manipulate the environment to encourage fresh aruhe production within foraging distance. Primarily this was achieved by burning the old fern and promoting new growth and hence new rhizome growth as well. This can be considered a horticultural approach through environmental management and one which assisted the provision of a staple food throughout the year.

number of medicinal uses as well. It has been described as second only to harakeke in its use as a utility plant by traditional Māori society (Toole, 2006).

6.20 Kōkihi / Rengamutu – *Tetragonia tetragonioides* (NZ Spinach)
[ex. *Tetragonia expansa* (Cheeseman, 1923)]

Kōkihi is an indigenous plant found growing wild throughout the country, including the Kermadec Islands (Sykes, 1977); mostly in coastal areas with sandy soils and rocky debris slopes (Dawson & Lucas, 1996). Commonly called New Zealand spinach or perpetual spinach (Lloyd, 1950), it is not often seen in the gardens or on the dinner tables today yet it was a popular vegetable with earlier generations of Māori. Cook (Vietmeyer, 1991) and de Surville (Riley, 1994) both utilised it as a substitute remedy for scurvy amongst their crews. From seeds collected on Cooks expeditions, kōkihi is now grown as a vegetable in many parts of the world. It is still grown by some elders around Taranaki[65] and possibly other tribal areas but it is not currently produced anywhere as a commercial crop[66]. Early settlers also used the leaves mixed with alum and soda to make a bright yellow dye (Lloyd, 1950).

An interesting note regarding kōkihi is that it is believed to be the only true vegetable that any part of Australasia has provided to the world's cuisine and yet it is relatively unappreciated in New Zealand itself (Vietmeyer, 1991).

6.21 Para – *Marattia salicina* (King fern or horseshoe fern)

He aha tō kai? He para tō kai, ka taka ngā hua o te whakairo.
What is your food? If para is your food the pattern of your tattoo will revolve
[the root of the para was such a delicacy that even the moko revolved in appreciation]

Also known as parareka (Taranaki tribes), para-tawhiti, uwhi-para or uhipara, this fern is said to have occasionally been purposefully cultivated near kainga or villages in pre-European and colonial times (Cheeseman, 1923; Best, 1977). Propagation was achieved by splitting the rhizome into individual pieces which were then planted. In their evidence to the Waitangi Tribunal in 1991, Ngā Rauru Kītahi of South Taranaki noted the rhizomes of

[65] Personal communication, Mrs Ngungu Salinovich and Ngapera Teira, kuia o Ngāti Rahiri – 1997 & 2004, and observations within Ātiawa rohe.
[66] NZ Spinach seed is now available at specialist nurseries for the home gardeners to grow this crop

para as a popular food in earlier times[67]. Park (1995:121) quotes the 1870s surveyor Edwin Brooks as stating that '*para(tawhiti) was evidence of a place being long inhabited by the natives'*. In North Taranaki it is remembered as requiring rich damp soils and being grown in vegetable plots or gardens near their kainga right through to the 1920s but the utilitarian uses are less well remembered as it was replaced as a food product by this time[68]. In Northland, important groves of para were managed in damp bush areas at Motatau, Pukenui, Mimiwhangata, Whananaki, Matapouri, Russell, Mangamuka and Omahuta, however they are now almost unknown because of damage from feral animals (Anon., 2006). The large starchy rhizome was cooked, preferably boiled, then pounded with a pestle and eaten as a vegetable. This is a slow growing fern and takes up to 5 years for the roots to reach harvest maturity. For this reason it had considerable tapu applied to it and was restricted to being managed by only selected people within the community (Riley, 1994) to deter indiscriminate harvesting.

The para is said to have been brought to Aotearoa on the Aotea waka, hence the name *para-tawhiti* (from a distance). The root is a horseshoe shape and considered a great delicacy, hence the reason this fern was cultivated near villages. Some writers termed it the pre-European potato saying it tasted variously like truffles, potatoes or bananas. Buchanan (1876) noted that the slow growth of this fern probably accounted for its 'disappearance' in localities where there was a high Māori population. A famous statement by Kahu of Te Arawa led to the naming of the Kaipara Harbour: Katahi au ka kai i te para ki konei, me hua te ingoa o te kainga nei ko Kaipara (Now that I have eaten para fern here, the name of this place should be Kaipara).

6.22 Pikopiko *(sometimes referred to as pitau)*

Fronds of the **Mauku/Mouku** – *Asplenium bulbiferum* (hen & chickens fern); **Kiokio** – *Blechnum novae-zelandiae*; **Paretao/Pānako** – *Asplenium oblongifolium* (shining spleenwort); **Pākau** – *Pneumatopteris pennigera* (gully fern); **& Shield ferns** *(Polystichum richardii & P. vestitum* [Puniu]*)* (Chinnock, 1999)

The pikopiko ferns, especially the mauku, had a range of uses in traditional Māori society, primarily spiritual, healing and utilitarian such as woven cloaks and whāriki (mats) (Riley,

[67] Unpublished notes on traditional resources by Ngā Rauru and presented at Ngā Rauru Muru me te Raupatu hearing, Ihupuku Marae, Waitotara. 14 October 1991.
[68] Personal Communication, Mrs S Lawson, Kuia ō Ātiawa, Waitara; 1989

1994). It was the young, unopened fronds known as pikopiko or pitau that were used in a culinary way and which are now finding favour with chefs in New Zealand with it commonly referred to as bush asparagus (Brownsley, 2001). In general terms pikopiko is sourced from wild populations of the different ferns found in various habitats throughout the country however, with the renewed interest from the food industry, the possibility of managed production is being researched.

6.23 Mamaku /Korau – *Cyathea medullaris* (Black tree fern)

(includes; **kātote** tree fern - *Hemitelia smithii*)

Generally the tallest fern in stands of native bush, the mamaku has several medicinal uses and also the inner pith of the upper trunk is similar to sago and is used as a food product, especially as a relish to aruhe or fernroot. The trunks of the tall tree ferns (including mamaku, korau and ponga [*C. dealbata*]) were also used for construction of houses and food stores by Māori (Brownsley, 2001). In the account of the introduction of kūmara to the southern Ngāti Mamoe region, the arrival of Rokoitua from Hawaiiki was welcomed by offerings of the pith of the mamaku fern, tii kōuka and kiekie for a meal. He responded by taking some dried kūmara from his waist belt, soaking them and giving it to his hosts to taste. The people then built two canoes to return to Hawaiiki and obtain the new food (Anderson, 1998).

Some early botanists noted mamaku as one of the staple plant foods of pre-European Māori (Leach & Stowe, 2005) especially in the South Island (Barratt, 1979). It was superseded as a food by the potato and grain products introduced during European settlement of this country. The unopened fronds or *pitau* were sometimes laid on the stones in a hāngi to add a distinctive flavour[69]. Papakura (1938) wrote that the pitau was cut into slices and cooked for a long period in a hāngi and then threaded onto a flax string and dried for later consumption. The fibrous cone at the base of the fern was also used as lining for hāngi pits. The key disadvantage to utilising mamaku was the slow rate of reproduction or regeneration which meant it could not be relied upon as a regular food source (Best, 1977).

[69] Ngā kaumātua o Te Ātiawa ki Taranaki, personal comments made to author.

6.24 Nīkau – *Rhopalostylis sapida* – (Miko [Chatham Islands])

Rhopalostylis is a genus of three species of palms native to the New Zealand, Norfolk, Chatham and Raoul Islands. They are solitary plants with prominent inflated crown shafts and obliquely erect fronds (Jones, 1994) which are self-propagating by seed. *Rhopalostylis cheesemanii* or the Kermadec nīkau is endemic to Raoul and Kermadec Islands and *R. sapida* endemic to the main islands of New Zealand and the Chathams, including Pitt Island

The nīkau is the southernmost naturally occurring palm in the world (Jones, 1994) and the only true native palm in the New Zealand landscape growing as far south as Banks Peninsula and Greymouth (Davis, 1961; Hunt 2003). It had a variety of uses in traditional Māori society; thatching (Davis, 1961), weaving (e.g. mats, hats, baskets) (Buck, 1924), and leggings from the leaves; containers and pots made from the outer portion of the trunk; necklaces and adornments from the hard berries; rongoa or medicines; and as a food product (Riley, 1994). Jones (1994) also noted the seeds were occasionally used as bullets when shot was scarce during the nineteenth century. The edible *rito* or heart leaves of the nīkau palm produce a 'cabbage' similar but larger than the one produced by the tii (*Cordyline* spp.). This heart was eaten either raw or cooked and known as Te korito by Te Arawa tribes (Papakura, 1938). Unlike the tii, removal of the heart leaves kills the nīkau (Best, 1977) and Rudman (1992) and Hunt (2003) both note that this gave rise to the term 'millionaire's salad' by early European settlers.

Plate 5: Nīkau palm (*Rhopalostylis sapida*)

6.25 Other crops

A wide range of other native trees and shrubs were managed within the landscape of traditional Māori for a variety of reasons. To early Māori, all plants contributed to the health of the community whether through rongoa (medicines), foods, and practical uses such as clothing or thatching, or as the repository of other wildlife with further diverse uses. Some specific trees were revered for their spiritual association, utility as a repository for the remains of the dead[70] or links to earlier activities such as inter-tribal fighting and so on. Certain kahikatea (*Podocarpus dacrydioides*) groves are recognised for their role in burial rites (Park, 1995) and various rātā (*Metrosideros robusta* and others) and pōhutukawa (*Metrosideros excelsa*) trees are retained and renowned for their role in traditional society (Simpson, 2005). A tapu pōhutukawa tree stands at Waikanae, used as a repository for placentas of important births of the local iwi (*ibid.*). All these trees (and shrubs) were managed in a horticultural sense within the traditional society to ensure their continued survival and association to the community.

6.26 Crop migration

As the European influence grew in New Zealand during the early nineteenth century, the movement of new crops and marketable produce also occurred. Te Rauparaha is credited with the introduction of several crops to the Wellington region during the resettlement of Ngāti Toa from northern districts as described in the following statement by Ngāti Toa kaumātua Pateriki Rei to the Waitangi Tribunal in 1994:

> *'After they settled in Kapiti, Whanganui-a-Tara. They set the people at different locations. Te Rauparaha had a nice trade. He introduced the potato to the Wellington province. Also introduced kamokamo, corn to the Wellington province. And he had māra* [gardens] *at Kapiti, at Otaki, at Māna, at Pukerua and at Wairau. And he sold the produce in the ships.'* (Boast, 1997:39)

[70] As an example, the kahikatea trees of a wāhi tapu known as Tauwhare in the Mokau River, North Taranaki where, in pre-European times, the deceased were placed in the kiekie clumps high in the trees to decompose (as relayed by Ngāti Tama Kaumātua) or a clump of pūriri trees at Waimate North (Bay of Islands) also a wāhi tapu as they were used for the storage of human bones (Davis, 1961).

The speed and ease of which crops such as the potato spread and became distributed among iwi is evident in the writings of many observers of New Zealand of that time. Bellingshausen observed in 1820 that the original potatoes planted by Cook (ostensibly in 1773) had spread considerably from their original plantation – with the assistance of local communities (Barratt, 1988). Some Otago scholars believe Ngāi Tahu to have originally sourced potatoes from Queen Charlotte Sound in the 1770s by a chief known as Koroko (Anderson, 1998). Firth (1972) noted that:

> *'...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* [Māori].'

Potatoes became invaluable to many Māori in their subsistence lifestyle of the times. It is well known that whalers and sealers released pigs and planted potatoes and some other crops so that when they returned from their expeditions they would have a food source to access, no matter how isolated the location. Mariners knew these plantations as 'food depots' (Raynal, 1880). Māori were of the same behaviour and took the time on their travels or seasonal movements to build shelters and plant gardens in preparation of a later return. Kehu was a well known guide from Ngāti Tumatakōkiri of the Nelson district and accompanied Thomas Brunner, Charles Heaphy and William Fox in their explorations of the South Island in the 1840s (Host, 1974). Kehu frequently took the time to *'fashion shelters, plant potatoes and make other preparations for a possible return in the district'* (Mitchell & Mitchell, 1996:12). These types of actions would have contributed to the spread of European crops among Māori settlements of the time, and thus the introduction of new foods and diet.

Some tribes were introduced to new 'European' crops earlier than others. Papakura (1938) noted that while recognising the early introduction of potatoes by Cook and De Surville in the eighteenth century, Te Arawa of the Bay of Plenty district were not introduced to them until early in the nineteenth century. She wrote:

> *'... it was many years before it* [potatoes] *was introduced for the first time to our parts by Te Whatiu, a man of Tuhourangi, and by Te Whiu, a man of Ngāti Rangiwewehi at Puhinga.'* (pg 217)

Alongside this spread of crops was the introduction of economic activities such as the flour mills, trading posts and vessels to tribal groups throughout the country. Horticulture was undergoing a remarkable change in Māori society.

6.27 Chapter summary

The broad application of Māori knowledge to horticulture activities including crop production, plant or resource management and/or manipulation and, allied disciplines is evident in the number of crops managed for their uses and the resilience of Māori to economic influences since the time of European colonisation through adaptation. Evidence has been provided as to the extensive knowledge applied by Māori in regard to horticulture which complimented the ethnopedological knowledge held concerning the soils resource. The traditional horticultural knowledge also has the distinction of being relatively transferable between crops and sites because it has originated from experience in typical New Zealand conditions over generations and has been refined as a result.

As with the knowledge aligned to the soils resource, that which is applied in horticulture has suffered from the influences of colonisation and is retained by only a few within the Māori community today. There are many proponents of aspects of this knowledge, but generally very few with the full gamut of Māori horticultural expertise which would have existed in past generations. This knowledge can add considerable value to Māori in the horticulture sector, both culturally and economically and this is a key reason to include it in the process of land assessment where any decision on land-use activities is being applied.

Chapter 7: Decision systems

7.1 Introduction

Decision systems are a pertinent component of the techniques land and soil managers might apply to their assessment processes in the management of resources. This chapter will introduce both traditional Māori and contemporary decision systems used in the horticultural and soil management areas. A single case study is also used to indicate how a traditional Māori decision system would have been applied to a crop production system which contributed to the subsistence of a community. The value of mātauranga Māori or Māori knowledge as a primary component of the system is also considered and discussed.

7.2 Systems approach

A system can be defined as:

> *'A group of interacting components, operating together for a common purpose, capable of reacting as a whole to external stimuli: unaffected directly by its own inputs and has a specified boundary.'* (Spedding, 1988).

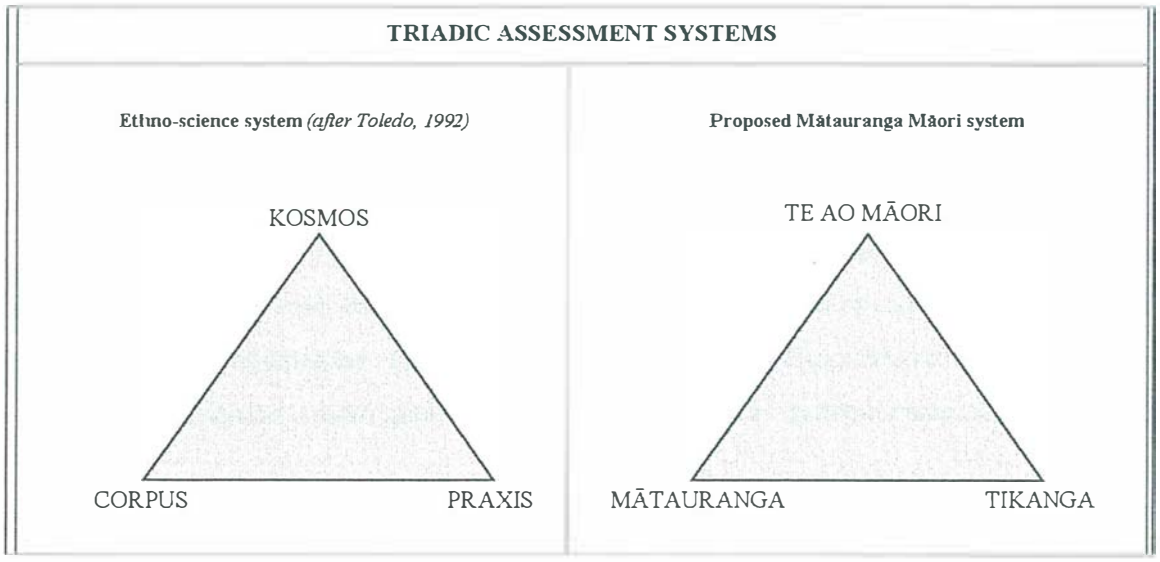
In general terms the development of systems is undertaken to retain and retrieve a knowledge set which people want to use periodically. Hard systems are relatively inflexible approaches to this concept and can withstand external factors well. On the other hand, soft systems are somewhat more flexible and also more responsive to external factors and thus more representative of systems representing, among others, human factors.

The soft systems approach is based on fluid boundaries associated with an activity under management and can generally be applied to the approach relevant to Māori knowledge and its role in indigenous horticulture and soil management systems. To apply a systems approach in a Māori context works towards acknowledging the holistic nature of Māori systems and the relationship between individual components (sub-systems) that contribute to these (supra)systems. Culture itself is sometimes considered as a system of shared understandings held by a group of people with a continuing, but not necessarily static and unchanging concept (Metge & Kinloch, 1984).

7.3 Traditional decision systems

Traditional (indigenous) systems for horticulture and land are varied and crop and site specific. The experience of the people and their knowledge of both the intended crop and resources available to them impinge on the production system used. This section will look at how traditional decision systems have evolved and give some examples of implementation as tikanga practices. There are three main components to ethnoscience which are transferable and will form the basis of this discussion; *Kosmos* or traditional belief and perceptions systems, *Corpus* or traditional cognitive systems, and *Praxis* or traditional management systems (Toledo, 1992; WinklerPrins, 2001). In a Māori context these can be applied as Te Ao Māori (The Māori world/kosmos), mātauranga (body of knowledge/corpus) and tikanga (practices/praxis) (refer Figure 7.1).

Figure 7.1: Visual depiction of traditional systems



7.3.1 Kosmos

The relationship between a culture and their world view or belief system forms the very backbone of that culture and its identity. World views, culture and social institutions provide a template through which people perceive their opportunities and the threats facing them (NZIER, 2003). Māori, both urban and rural, are strong in the knowledge of their whakapapa and the relationship it consolidates between them as a people and the resources through which they traditionally survive. Their identity can be distinguished in part

through the value set which forms part of the cultural makeup of the people and their behaviour as a whole.

Values

Every culture carries a set of values which defines and informs them and contributes to their daily living. Cultures often judge each other on their unique set of values looking for common ground or obvious departures from common understandings. There are limitations as to how others might interpret values, seen and unseen. Māori values and culture are often viewed by non-Māori under the preconception of what is expected of them under the viewer culture and concepts. Dr Danny Keenan (quoted in Phillipson, 1996:11) notes that:

> *'Apart from the more obvious moral judgements* [in early European observations of Māori], *there were also more subtle ones which underlay the use of words like comfortable and uncomfortable, poor or rich, hygienic or unhygienic. These were loaded terms involving culturally specific value judgements.'*

Values and their identification to assist management processes are generally fraught with problems of interpretation because of the subjective nature of personal knowledge applied to their understanding. Increased attention is being given to the human dimensions in natural resource management and conservation with the notion of 'values' a means of addressing socio-economic considerations and involving affected communities in environmental decision making (Jackson, 2006).

Māori are probably more at ease describing their value set rather than defining them (Harmsworth, 1995) such that they contribute to their identity and are derived from a common belief system. The lack of written or recorded information about Māori values can also affect their interpretation by the wider community. Thus when it is required to be written for future use, it is often relatively simplistic. An example is the outcome of a series of hui between a team focussing on Auckland Regional Economic Development (AREDS) and local iwi throughout 2001-2002. Their final report presented a value set determined through a series of hui in pictorial form as an analogy to a whare or meeting house (refer to Appendix 7). The values were inclusive from whakapapa through to unity,

integrity and empowerment. The basis of the values was seen to be represented through the three kete (baskets) of knowledge in Māori folklore (recognised as the origins of Māori knowledge):

1. *Te Kete Uruuru Matua Tuauri* containing the philosophy of love, peace, goodness and the study of humanity
2. *Te Kete Uruuru Tau Aronui* containing the knowledge of arts, war, agriculture, building and carving, and
3. *Te Kete Uruuru Rangi Tuatea* containing the knowledge of ritual, incantations, intercession and tradition and which includes the history of the people.

These lead to *Whānau ora, taonga* and *mātauranga* [health of the people, their treasures and knowledge] which were effectively the three objectives the hui set themselves as tangible outcomes based on these values (AREDS, 2002).

In 1999, the Hauraki Māori Trust Board released a strategic plan to take them through to the year 2021. Their model was based on a series of *pou* or traditional posts to hold up their people and culture. These pou were based on a set of values identified as:

- *Tapatahi,* 'of like mind' – to ensure they have a sense of unity as an iwi
- *Manaakitanga,* 'Caring for' – caring for each other
- *Ngakau Tapatahi,* 'Integrity' - recognising individuals' value with dignity and respect
- *Whakaute,* 'Respect' – acknowledging our rich and diverse backgrounds and skills
- *Tohungatanga,* 'Professionalism' – quality of service and standards to the wider community
- *Ngakau Whakapuke,* 'Enthusiasm' – positive thinking, energy and approaches

This has then been built into an updated strategic plan for 2006-2012 which has diversified to include values based on rangatiratanga (self determination), kotahitanga (unity), manaakitanga (hospitality), whanaungatanga (relationships), kaitiakitanga (guardianship), tikanga (cultural best practice), te taiao (the environment), whenua (land) and titiro whakamua (foresight) (HMTB, 2005).

In their report on Māori economic development, the NZ Institute of Economic Research (2003) identify the following traditional values as highly relevant to modern day Māori society:

- *Iwitanga* – an expression of identity and collectivism
- *Whanaungatanga* – kinship
- *Whakakotahitanga* – respect for individual differences, consensus, unity and solidarity
- *Tau utuutu* – giving back or replacing what you receive, reciprocity
- *Taonga tuku iho* – recognising and holding onto treasures including knowledge
- *Kaitiakitanga* – stewardship or guardianship of the environment (NZIER, 2003:44)

7.3.2 Corpus

This component of the approach to ethnopedology and traditional horticulture is primarily the 'local' or indigenous knowledge formed in relation to the soil resource and the cropping or horticulture activities reliant on the resource. In Māori terms this is the knowledge which exists about the soils resource and which contributes to the management of the resource itself and the body of knowledge associated with the horticultural expertise aligned to the culture. The corpus is inclusive of the nomenclature or classification systems applied to the soils resource, the knowledge of relationships to the resources and the uses applied to them, and the cultural assessments of quality such as presence or absence of key vegetation. It is informed and based in the core values which are identified as part of the kosmos and which are interpreted with some variation by iwi, hapū, whānau and individuals. The variation is accepted as part of the natural variation you would expect to see within a cultural group.

7.3.3 Praxis

Praxis refers to the practical implementation of the corpus of knowledge held within the community. This application of knowledge is highly variable for Māori, especially as the physical resources relied upon to produce their crops are extremely variable between regions, localities, iwi and hapū groups. Māori define this specific knowledge and its application as 'tikanga' and acknowledge the variations which might exist between them. Examples of praxis activities will also be found in related actions such as creating admixtures for the soil e.g. organic amendments or external factors such as social occasions or behaviours dictating the level of implementation to be applied.

7.4 The application of tikanga in traditional horticultural management

Prior to European contact, Māori had no beasts of burden, no metal tools or implements and no exposure to other cultures. And yet, they had perpetuated [primarily tropical] crops which did not naturally grow in temperate regions, e.g., kūmara and taro. Yen (1990) identified that in general the New Zealand environment is marginal for any tropical crop adaptation at its subtropical north. Farther south the seasonal nature of the climate dictates the cropping systems applied to production. The Canterbury region, specifically Kaiapoi, Banks Peninsula and Waihora or Lake Ellesmere were considered the most southern places that kūmara could be grown, and even then with some reservation about how successful the crops might be (Taylor, 1958; Davies *et al.*, 1994; Bassett *et al.*,2004).

Māori lived in permanent settlements and their cultivations were distributed around a district claimed by the residents. They practiced a form of rotational land use, generally used only woodash as fertiliser and were understood to have cropped for no more than three annual seasons on a piece of land. Food storage was as important as the production of the crop itself. Without knowledge of storage they were likely to despair for good nutrition during winter months. The whole production system was based on the annual seasons with planting in spring, crop husbandry in summer through to harvest in late autumn. The winter was always a period of rest for both the people and the land resource.

Some important agricultural practices developed and used by Māori during the crop production phase include:

- Improvement of soil through:
    - application of wood-ash/plant material or charcoal as a soil amendment
    - placement of stones around crops to increase soil temperatures by improving heat retention
    - addition of sand or gravel to improve soil structure by "lightening" heavy clay soils
- Crop rotation
- Controlled burning of fern lands to control overcrowding and encourage vigorous regrowth and therefore edible fern-root production
- Pest control (e.g. caterpillars) through fumigation by burning kauri gum or dried kawakawa (*Macropiper excelsum*) or manual destruction of the pests

- Crop storage mechanisms (both storage houses above ground and insulated storage pits below ground)
- Sophisticated processes were developed to transform poisonous or otherwise inedible plants in order to make them edible (e.g. tutu [*Coriaria arborea*] juice had to be strained through finely woven bags in order to separate it from the highly toxic seeds and stems).

Table 7.1 introduces some of the key tasks on the horticultural calendar for pre-European Māori. This table should be read in conjunction with the maramataka Māori or traditional calendar which was an important factor in the determination of the timing or application of tasks. The tasks are elaborated on in the following discussion on tikanga and management activities in Māori horticulture and also in the taewa case study (Chapter 7, pgs 139-144).

Table 7.1: Calendar of events in traditional Māori society for horticulture activities. Drawn from information in Shawcross (1967), Firth (1972:72) & various tribal informants

SEASON	MONTH	TASKS	NOTES
Hōtoke; Takurua *Winter*	Pipiri *June*	Occasionally the breaking of new ground, generally too cold for any key tasks.	Matariki (New Year). Occasional harvest of pikopiko through winter.
	Hōngongoi *July*	Coldest month, some clearing might be undertaken for new cultivations	
	Hereturi-kōkā *August*	Burning off ground and turning soil in readiness for planting	Rise of Puanga (Rigel)
Mahuru; Kōanga *Spring*	Mahuru *September*	Continue clearing for new crops, flax planting – fernroot digging (next 3 months)	Time for Tii harvests Planting of pā harakeke
	Whiringa-ā-nuku *October*	Planting of majority of crops. Harvest of Tii (cabbage tree) roots for processing	
	Whiringa-ā-rangi *November*	General management of crops	
Raumati *Summer*	Hakihea *December*	Second Tii harvest, crop management and occasional late planting. End of fernroot harvest.	Occasional harvest of young hue.
	Kohi-tātea *January*	Harvest of forest foods/berries, firing of dried felled trees on new cultivation ground Fencing and crop management	Harvest of raupō pollen (pua) begins. Early harvest of karaka berries
	Hui-tanguru *February*	Weeding of crops, storehouses prepared for harvests. Harvest some early kūmara for processing into kao (dried kūmara)	Main taewa harvest underway and storage begun
Ngahuru; Te kohi-ō-Autahi *Autumn*	Poutu-te-rangi *March*	Main harvests, especially root crops & hue prepared for storage and festivities	Plaiting of kūmara baskets and first harvest.
	Paenga-whāwhā *April*	Cropping tasks now complete, clean up time. Karaka kernels harvested	
	Haratua *May*	Crops are put into storage. Time to harvest seaweeds for curing. All stores are in and preserving completed before Hōtoke..	Time of relaxation, socialising & entertainment

7.4.1 Seasonal approach

Crops are planted and grown according to their natural season and the calendar of events is well known prior to any activity taking place. To support this Māori utilise the maramataka or Māori calendar which is based on indigenous knowledge of astronomy, cosmology and the seasons, effectively 'indigenous lunar science' and substantiated by observation of the environment. Other tohu or signs are utilised in determining horticultural activities e.g., the arrival of the shining cuckoo and its shrill call *koia, koia, koia (dig!, dig!, dig!)* in spring is seen as the calling of man to work the tilling of the ground for crops (Firth, 1972), similarly the arrival of the star Poutu-te-rangi or flowering of certain trees or shrubs such as the kowhai also signify the arrival of spring and the start of a new planting season[71]. These tohu or signs would differ between regions, iwi and hapū.

7.4.2 Labour

All levels of society, including chiefs (Firth, 1972) participated in various activities associated with gardening or production of food. Labour was understood to have a social contribution and value (*ibid.*) and many whakatauāki or proverbs recognise this point. Each person had tasks assigned to them as suited to their rank. Tohunga for example, were responsible for the karakia and well being of the tribe through the spiritual presence over the crop. Mōkai or slaves had the arduous tasks; young women graded the harvest (so as not to physically exert themselves if their childbearing years were yet to come)[72] and the young men performed the more physical tasks such as planting and mounding. Labour fluctuated by seasons as various members of the community were taken away for other activities such as fishing or war. Pere (1982) states that:

> *'... labouring on the land, planting and harvesting crops, were regarded as a prized accomplishment not to meet a commercial market, but of itself. Rangatira did not lose any prestige by performing menial and manual tasks.'* (p22)

7.4.3 Seed selection

Based on experience, the tikanga associated with seed selection for crops is based on keeping the best for planting (regeneration) so that the traits held within the seed are

[71] Personal communication, Hemi Cunningham (kaumātua o Ngāti Hauiti), December 2005, and others
[72] Personal Communcation, Mrs V M Adlam, Kuia o Ngāti Rahiri, 2000

transferred between generations. This was metaphorically aligned to the process of whakapapa within tribal communities and strongly adhered to as it ultimately contributed to the survival of the people. Spoilt or undesirable crop material was eaten straight away or at least stored temporarily for use before the next season.

In contrast to the accepted practice of keeping the best produce for seed, it was noted by Clark (1949) that potato seed supplied by Māori from the Wellington region to Ngāi Tahu in the south noticeably deteriorated in quality during the early 1840's. Clark hints that the inverse process of keeping only the small and non-marketable tubers for seed might have contributed to this situation and new seed was then sourced from England & New South Wales. This imported seed was noted as yielding one-third to two-thirds more than the locally sourced seed (Clark, 1949). Of course, other factors such as virus within old seed stock or environmental inputs may have contributed to the poor yields alluded to.

7.4.4 Crop production

This is a varied and highly ordered process. From the initiation of the production system through karakia and association with key atua and people through to the day to day activities which kept the crop growing and targeting fruition. Production systems are based on tikanga specific to those undertaking the tasks. Different groups within the community would have different tasks. Specific tools and implements were used for specific jobs.

Planting any crop was a major activity in Māori society and the following statement on kūmara planting at Maketu prior to 1914 gives insight to the activity a century ago;

> '... [planting] *itself was quite a ceremony and planting time was usually November, or when the weather signs were favourable to the young plants. When a marangai* [mist] *came in from the sea, and the sun was obscured and the air damp with the sea mist, was the most propitious time to plant.*
>
> *.....it has been said by those who remember kūmara planting ceremonies in Maketu prior to 1914 that the singing in the early morning, the rise and fall of the chanting as the planters worked in unison, was almost ethereal as it rose on the mist-laden air. All work was done on a cooperative basis, each plantation being visited in rotation, while individual owners, or groups of owners, provided the meals for the working teams in turn. At the end of planting one big feast for everybody, followed by dancing and singing, rounded off the ceremony.'*
> (Tapsell, 1947)

The gardens were known for their meticulous appearance and fastidious workers. Aspects of production would include pest and disease control, weed management, nutrition and fencing to keep out animals. It should be noted that the majority of the pest and disease pathogens seen today were not present in pre-European Māori society and hence no traditional management approach exists for many of the current plant health issues surrounding the traditional crops. Tregear (1904) made some interesting notes on pest and disease management in a traditional kūmara production system. He wrote:

> *'The larvæ* [of the anuhe caterpillars or *Cordiceps robertsii*] *were carefully picked off into baskets, carried away and burnt; it was a job always greatly disliked. This part of the work, fetching the gravel, weeding, watching for the caterpillars, etc., was faithfully and carefully performed by the women. Sometimes, however, old men past other work would be set, as the crop grew towards ripeness, to scare away thievish rats by working rattles at night, these rattles being composed of lines on which mussel shells were strung in bunches, that jingled and made a sound sufficient to scare away the rodents.'*

Most plants now considered weeds in New Zealand cropping systems were not present in early Māori society. The problem plants were likely to be shrubby plants such as mānuka (*Leptospermum scoparium)* or tauhinu (*Ozothamnus leptophyllus*) however with long rotation periods and short cultivation seasons, weeds did not appear to be a major problem to these early systems (Leach, 2005).

7.4.5 Harvest

Again an activity which was based on tikanga and involved the whole community with each person having their own task. As mentioned, young women did not carry heavy loads so would be involved in grading the produce with their older relatives. The harvest activity was supported by tohunga and karakia and chants throughout the process and undertaken based on the maramataka or traditional calendar.

7.4.6 Storage

Another process that required skill and was based on tikanga specific to each tribe; the reliance of stored produce to maintain the community through the winter months or during periods of drought, or war highlights the importance of this activity. The traditional rua or

storage pit was considered to be the most successful method of storage of root crops (excluding taro corms) (Berridge, 1913) based on excluding any moisture from the storage environment and the maintenance of a moderate and even temperature (Walsh, 1974).

With the introduction of feral animals such as pigs, Māori adapted their storage facilities for crops such as potatoes and kūmara. The timanga was an elevated platform, 2-3 metres high with sides that enclosed the platform but no cover. The enclosure was lined with fern and the crop stored within it (Beckett, 1953). Pātaka and whata are other well known raised structures used as storehouses. Generally enclosed and often permanent structures, pātaka were often elaborately carved and used for long term storage of preserved and dried foods not suited to rua and also sometimes for tools, implements and garments (Best, 1974).

Subterranean storage pits or *rua kūmara* are the most obvious remnant of early Māori horticulture evident today. Their presence is regarded as evidence of both gardening practice and settlement in many old pa sites (Jones, 1989a; Furey 2006). The number and distribution of the pits also indicates the size of horticulture practices and crop volumes handled by tribes. There are two types of *rua:* rectangular pits, generally accepted as being for storage of kūmara[73] and the bell shaped ones for fruits and other foods preserved in-situ.

Essentially rua were wholly or semi-subterranean and the sides were strengthened by the use of tree fern trunks and then lined with rushes and the floor covered with dried mānuka and fern fronds. A roof (kōpani) was placed over the rua after the kūmara or other produce was put inside (generally stacked loose) and often soil was then placed over the roof.

Primary storage methods included:

- *Whakatoke* or simple pits for shorter-term storage of a lesser quantity of kūmara or other root produce;
- *Timanga* which are essentially open tiers on raised platforms to protect from browsing animals;
- *Whata* – similar to timanga;
- *Pātaka* or raised storehouses on legs at least one metre above ground level and sealed against rats and other pests.

[73] Note: seed and eating kūmara were divided at harvest and stored in separate rua.

The choice of storage option was primarily aligned to local conditions. Colenso (1880) and Best (1974) both noted that all storehouses were rigidly tapu (sacred) as were the few persons allowed to visit them for any reason.

7.4.7 Preserving

Preserving food products was a common practice to extend the storage life of the food. Examples of traditionally preserved foods are:

- Smoked fruits of forest trees – stored in a *rua* and 'smoked' by burning brush wood such as mānuka and sealing the *rua* before the burning process was complete.
- Foods fermented in running water such as with kānga and taewa.
- Dried and cooked foods such as kūmara kao (steamed and dried).
- Foods preserved in *hinu* or animal (bird or fish) fat (huahua).

There were many other preparation and processing methods applied to food products in traditional times. Some of these methods continue to be used in the present day as a specifically Māori process and some are re-gaining favour as potential commercial opportunities in New Zealand and abroad.

7.4.8 Trading

It was common in traditional times for tribes to participate in a system of exchange known as hoko or ohaoha. The exchange was generally of commodity products allowing both parties to partake of each others food products and thus break their monotonous diet. The term given to the act of receipt of these food products was whakaeanga (Graham, 1948).

Table 7.1 introduced some key activities undertaken with horticulture crops in traditional Māori society. In a contemporary perspective, these traditional actions have an added value in that they can be used as a key contributor to an international market looking for indigenous crops produced using indigenous systems. This economic opportunity alone adds a considerably wider value for Māori horticulture and for the knowledge that makes it unique.

7.5 Case study - Sample Crop; taewa

Note: this information has been collated from interaction with Māori representing iwi from Te Tai Tokerau through to Murihiku (Northland to Southland; the breadth of New Zealand) over at least the last 20 years and more recently biannually through the national Māori vegetable growers' collective – Tahuri Whenua Incorporated Society. The information has not necessarily been published but general aspects can be found in relation to Māori horticulture in a few publications of note and referenced in chapters three, five and six as appropriate.

Taewa are also known as riwai, parareka, peruperu or Māori potato and are a cultivated crop introduced by early contacts with Māori at least as early as the eighteenth century. They are grown annually during the summer months and stored for use in the winter or off-season. Their importance ranked with kūmara as a staple part of the Māori diet. The advantage of taewa over kūmara was that they could be grown in colder climates and were easier to establish as they grew from tubers rather than shoots. As a late introduction to the Māori production system taewa were not subject to the same level of tapu as kūmara and proved to be much more reliable in production. In recent years there has been a strong demand for commercially produced taewa for the hospitality market in New Zealand and increasingly for the general consumer market as well.

Traditional (prior to the colonisation period – 1840 onwards) production of taewa followed some generic tikanga applied to most crops of the time. The following points highlight the key factors associated with taewa production during the early period of colonisation:

7.5.1 Participants

As with all crops tohunga or seers said the karakia over different activities during the crop production and made the decisions when to plant and harvest the crops. Whatever the tohunga did guaranteed a successful crop. The rangatira or chiefs decided where the crops would be planted and which whānau or family group would look after which plot or crop. The rangatira would often participate in the planting of crops, as it was an important process, but leave the rest of the production work to the different workers.

The young men of the community would do all the hard physical work such as turning over the earth and cultivating the ground ready for planting. The whole area for the garden was cleared ahead of planting but generally only the part to actually be mounded and planted was dug over. Women looked after the grading of seed ready for planting as well as the grading the crop post-harvest ready for storage. Lastly, slaves, if any, were used to do the weed and pest control and they were not given any responsibility to fulfil with the crop which required *mana* or status.

7.5.2 Rituals

A number of rituals were applied to the production of taewa. These were targeted at *Rongo* (also known as *Rongo-maraeroa*) the god of cultivated food and considered very important. *Rongo* would look after the crop and ensure a good yield and the survival of the tribe. The rituals included:

- Placing (or burying) mauri stones, sometimes known as taumata, which represented the god(s), around the planted area.
- The first part of the crop planted in a special area, next to one of the stones, the mauri would look after this crop and in turn the produce would be offered back to *Rongo*.
- The tohunga would cook and participate in the first of the crop (harvested from the specially planted area) as they were the direct channels to the gods.
- In North Taranaki *Rakeiora* was acknowledged as their local god of kūmara – and later of taewa. Mauri stones representing him were placed among the crop[74].
- Te Arawa acknowledge *Matuatonga* as a kūmara god (and of cultivated root crops) brought on the Arawa waka and buried on Mokoia Island (Papakura, 1938).

7.5.3 Pre-cultivation

Site selection criteria for the crop were based on the knowledge of the region including soil variances, micro-climates, historical land use and nuances. Early crops were usually planted on north facing slopes to catch the morning sun. In Te Urewera, Bay of Plenty, they planted in light bush for frost protection (Best, 1976). Main season crops were planted

[74] Ngā kaumātua/kuia o Ngāti Rahiri me Ātiawa

in the flats and open ground. A crop was generally grown for no more than three years on one site. Preparation then included clearing of vegetation at the crop site prior to winter, burning any woody remains on the proposed site in spring and using the ash as a fertiliser; a technique known as *whakapara* with the clearings were known as *waerenga*. Lastly, turning the soil was undertaken so that any remaining vegetation decomposed naturally prior to planting.

7.5.4 Cultivation

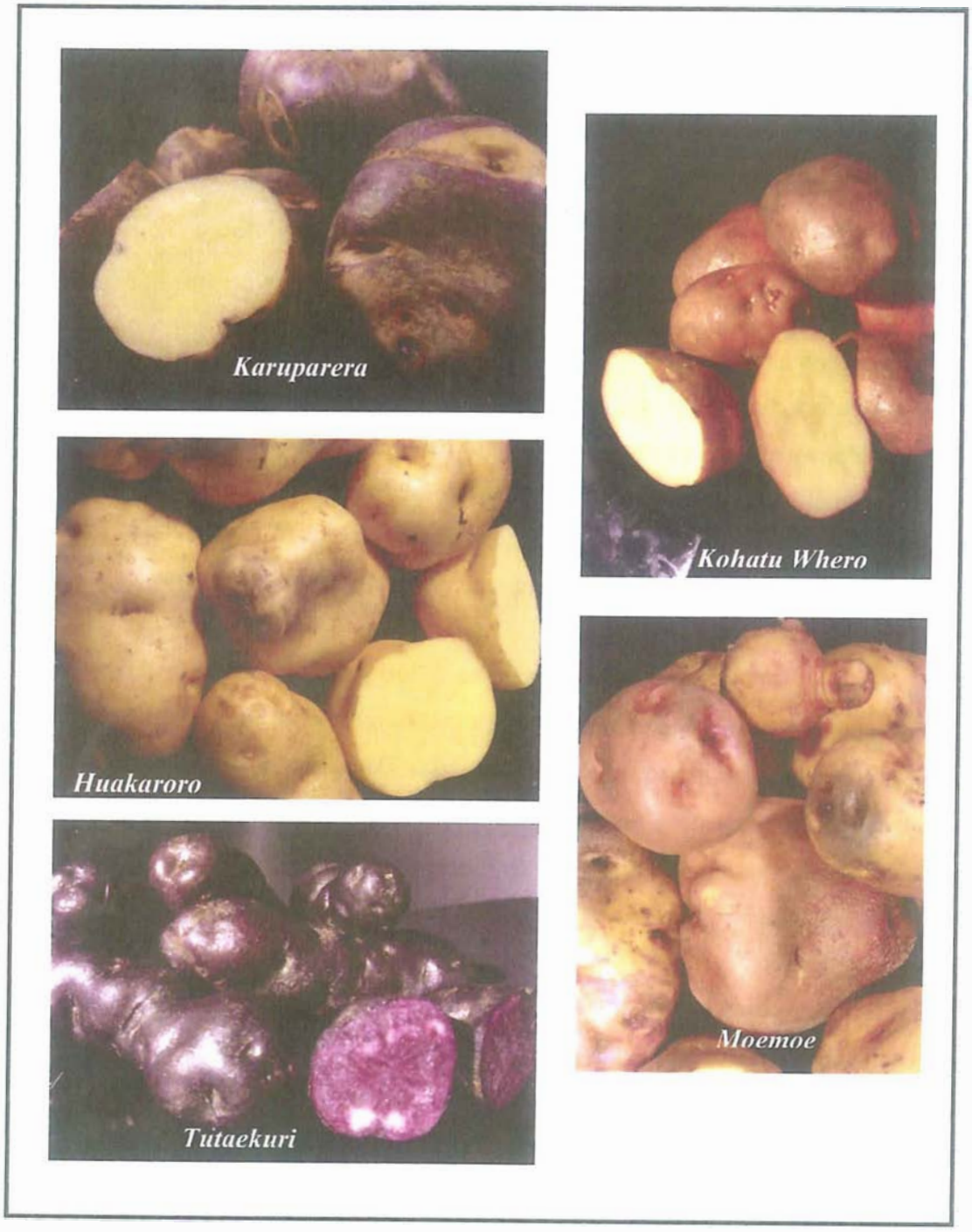
All cultivation and harvesting activities were undertaken in working parties known as ohu. The first task was to break up the ground again after the first turnover and leave for a week at least, break down a third and last time ready for planting The mounds were moulded into rows then left until the tohunga and maramataka (calendar) indicated it was time to plant. The tools used were *kaheru, hoto & peka.* These were forms of spades while *koko* and *tikoko* were forms of the shovel and *timo* and *timotimo* were forms of grubbers.

Planting was undertaken using the maramataka Māori calendar (refer to Appendix 1). Anything planted from *Korekore-turoa* through the *Tangaroa* period to *Ao-tane* (day 26) will produce both good size and number of that crop. Days 25 and 26 (*Tangaroa-a-kiokio* and *Ao-tane*) are the best days for the whole month for both planting and fishing. (Note: these days and names are from the Ātiawa version of the maramataka.)

7.5.5 Seed preparation

In traditional (pre-colonisation) practice, seed tuber preparation was undertaken by the women and children of the tribe. They graded out seed straight after harvest, taking out any imperfections so that other seed was not damaged during storage. Prior to planting seed tubers were brought out of storage, placed under trees or in a shaded place so the skins could harden and then sprout in the warm spring sun.

Plate 6: Selection of taewa cultivars (*Solanum tuberosum*)



7.5.6 Planting days

In preparation for planting the eyes of the tubers that had sprouted were rubbed out leaving only one sprout. The first ohu or work gang would mould the rows while another followed and made a hole for the seed tuber. The next ohu would place the seed with the sprout facing toward the rising sun and cover it with earth. During planting there was no food eaten until the end of the day when the planting had finished (the planting process was tapu (sacred) and food would have broken this).

7.5.7 Crop husbandry

Primarily the slaves would weed and manage the insect problems in the crop as well as re-mould the rows. If no slaves were available then ohu were formed. People, often the old people, would be sent to work in the crop and also to scare off the birds. In some cases seagulls were trained to eat the insects and caterpillars. Similarly, the hand picking of caterpillars from crops was common practice and the pests were taken off site and destroyed. The burning of dry kawakawa (*Macropiper excelsum*) in-between the rows was used as a type of fumigation/pest control. In the northern districts, kauri gum was used to similar effect. Essentially there was no irrigation applied to the crop; early Māori believed that if a crop died through a lack of water then it was not supposed to grow. Unproductive crops were known as *pūweku* or *pūeru* and barren potato seed tubers were known as *puhina*.

7.5.8 Harvest

The tohunga would decide when to harvest. Taewa were harvested in autumn, before the ground got too wet but the later in the season the better. Allowing the vegetation of the taewa to dry right back before harvest was a common practice, this allowed for the tuber to harden / mature in the skin making it more suitable for storage.

7.5.9 Storage methods

Only the best quality tubers for kept for storage. Storage of taewa was undertaken very much on the same principles as for kūmara. The tubers needed to be completely dry before

they were stored otherwise there was risk of rot spreading through the store. Tubers that were spoilt (*tauhere* or *puakiweu*), damaged or wet were either used straight away or allowed to ferment in fresh water to be used as a form of flour.

The most common method of long-term store was the *rua* which is an underground pit, lined with fern to keep it dry. The rua is naturally cool and dark, both good for storing root crops. Later when pigs became commonplace, *timanga* or raised platforms in the bush were used as stores for taewa. Taewa were packed into *kete* or woven kits which were tied and then stacked in the store.

7.6 Contemporary decision support systems

Decision making in management has been identified as following a 10-step process (Table 7.2) whereby the first seven steps work through the decision making stage leading to implementation in the final steps including review and evaluation (Boehlje & Eidman, 1984).

Table 7.2: 10-step decision process used in decision & management processes
Drawn from Boehlje & Eidman, 1984

Step	Decision process
1	**Formulation of goals & objectives**
2	**Problem recognition & definition**
3	**Collection of information**
4	**Specification of alternatives**
5	**Evaluation of technical feasibility**
6	**Financial evaluation**
7	**Choice of an alternative**
8	**Implementing decision**
9	**Bearing responsibility**
10	**Evaluating outcome**

Haverkort & MacKerron (2004) in their introduction to the use of Decision Support Systems (DSS) in potato production highlight the three types of decision to be made.

1. ***Strategic decisions*** – the most strategic decision itself is the one made to produce the crop in the first place. Other decisions such as the proposed location of the crops, variety, projected yields and markets are also strategic and the authors identify the role of experience in making these decisions.
2. ***Tactical decisions*** – generally applicable in the year of production only and includes decisions such as planting dates, rate and timing of nutrient applications, crop health systems, response to soil tests and so on.
3. ***Operational decisions*** – those decisions made by the farmer once the crop is planted.

These different decisions apply to any crops; annual or perennial, indoor or outdoor MacKerron & Haverkort (2004).

The identification of different levels of decisions required and how they can be incorporated into systems thinking has led to the development of decision tools, primarily in the form of computer models. The timing and regularity of utility for such models varies widely and often they are not suitable for many landowners, especially those without the technological training or access to the level of technology required. Māori landowners are as diverse as their locations and opportunities, and many would not be proficient or have access to the technology aligned to some of the contemporary models. But also, these models do not take into account the cultural factors which many Māori might apply to their management approaches.

WinklePrins (1999) argues that:

> '*... scientists and local people function in different realities, spatially and temporally and that scientists may never really understand the rationale behind indigenous decision systems because of this*'. She continues to argue that '*such separate realities can and should inform each other because local knowledge is flexible but place specific, whereas scientific knowledge is less flexible but can be applied in many places.*' (p156).

The integration of indigenous soil knowledge with soil management strategies and ultimately horticultural land uses has been suggested for use in the Caribbean and Latin

America (Barrios *et al.*, 2002) with a methodological guide focussing on a common language for local and technical knowledge. This strategy is based on identifying a set of local indicators of soil quality (ISQ) related to permanent and modifiable soil properties. The critical levels for the retention of quality are identified and then developed into a soil quality monitoring system (SQMS). The SQMS is then applied as a quality diagnosis and monitoring tool. If it is accepted by the landowners or community of interest it then becomes part of the overall decision support system applied to the resource as a whole (*ibid*). The emphasis lies in the first step of identifying appropriate ISQ.

A localised strategy trialled within Bolivia for the motivation and development of the mostly passive farming community there incorporates a combination of collaboration between extension workers and farmers, and incorporation of the human dimension into processes that contribute to a holistic framework of rural development activities (Kessler, 2007). Participatory research tools are acknowledged in their role towards achieving change in any community but they are also recognised as having a top-down approach and retention of control by the researchers. The human dimension they have identified looks to recognise the diversity of the community from gender and status to the individual experiences each person brings to any project. In this strategy they identified that voluntary participation was preferred but remained a challenge overall. Raising awareness and achieving motivation for people to participate is important but is recognised as taking time to accomplish. Once achieved, they believe any strategy can be implemented with better community acceptance and timelier outcomes.

Oudwater & Martin (2003) researched the methodology and issues aligned to exploring the local knowledge of soils within indigenous communities and looked to develop an integration domain for the indigenous and scientific knowledge through Geographic Information Systems (GIS). Key issues arose through epistemological differences aligned to each knowledge source and also to the potential misunderstandings and misconceptions an uncritical approach to indigenous knowledge can create. Applying the GIS tool involved a range of participatory inputs including interviews, mapping exercises, transect walks and group discussion; all of which drew confidence within the community.

7.7 Soil and resource assessment models

There are a large number of assessment tools available for land owners the world over to assist in decision making regarding a change in land-use or horticultural activities. Many are focussed on land inventory attributes such as crop determinants e.g. berryfruit crops, or resource evaluation to determine viability classifications. Some are focussed on spatial distribution of soils and soil properties through soil surveys. Very few assessment tools exist at this time which incorporate a cultural index or value system, however some have been identified in regard to resource management and they will be considered for this thesis in conjunction with the other models.

Crop-weather models were common in the 1950-1990 period and often the climatic information used was described in a form of notation, for example, where $Y=f(x_1, x_2, x_3, \ldots x_n)$. Here Y is the output in its preferred form e.g. yields or growth rate for a crop which is a function (f) of a series of climatic factors (x_1 to x_n). In this case the models were assumed to imply a relationship between effect and cause and could also be used for statistical descriptions of the systems (McPherson *et al.,* 1979). The inputs and outputs of these models were based on functional relationships identified in four groups:

1. truth tables where crops will succeed if all input requirements are met, fail otherwise
2. additive factors where each additional factor is combined additively and applied to the success-fail approach
3. multiplicative factors where each additional factor is combined multiplicatively and applied to the success-fail approach, and
4. limiting factor relationships are identified and applied. (*ibid.*)

Quantifying soil quality factors has evolved from the notational approach to intricate matrices whereby scientists apply quantifiable measures and weightings to a range of variables and then evaluate them through statistical processes, primarily exploratory and correlation analysis to provide a check for normality and the analysis of variance which is standard statistical practice (Gobin *et al.,* 2000). This approach has its place in a purely scientific environment however it ignores the context of indigenous or local knowledge and

would be biased towards western understanding if it were to be used to justify solely cultural determinants.

The DSIR discussion paper 'Land Alone Endures' (Molloy, 1980) looked toward wise land use in regard to a number of options from urban housing to horticulture and forestry. The social and spiritual values of Māori toward land were briefly mentioned including the option of non-use as a legitimate and wise use of land in some instances. Horticultural land-use is described as a logical evolutionary endpoint of land development on rich fertile lowland soils; however crop selection is only introduced from a market approach rather than from resource suitability (Hewett, 1980). Similarly, a manual published by the Taranaki United Council (TUC, 1985) focused on identifying crops with economic potential and then looked at matching them to suitable resources in the Taranaki region. Other key points identified included planning and management skills. Shepherd (1991) took a similar approach in matching crops to soils or vice versa in considering economic use of arable land in the Manawatu-Wanganui region.

Webb & Wilson (1994) produced a report that identified a classification system suited to identifying land for orcharding. Quantifying climatic factors to assess risk to perennial cropping systems is an important component of the process. Their system used a matrix whereby a set of technological factors related to soil and climate were identified, measured and the results reviewed to determine the viability of the land resource for an orcharding option. They state:

> *'... while the classification is designed to provide a semi-quantitative, objective method for extrapolating results of crop production gained from scientific investigations and land use experience gained from orchardists, an element of subjectivity results from insufficient knowledge to determine the exact effects that different land qualities have on crop growth and crop quality.'* (p13)

This approach followed an earlier report by Wilson & Giltrap (1984) which introduced the technological classifications to achieve reproducability, precision and direct relevance for users (p6) but had (or has) limited application in the field because of technical constraints, language and accessibility to the reports by land managers.

Other specific reports also look to soil properties for specific horticultural uses. A recent CSIRO report on identifying categories of viticulture soils within Australia (Maschmedt *et al.,* 2002) focused on viticulturally important (and mostly visual) diagnostic features including; changes in wetness (waterlogging), consistency, colour, structure, calcareousness within soil layers, and texture contrasts within the soil profile. Their descriptors are based on morphological features of the soil such as colour, presence of ground water table, texture and segregations of soil materials e.g., gravels. Their assessment approach was termed 'bifurcating' or based on the presence or absence of each particular key property within a set of groupings and sub-groupings. A workbook was provided with colour plates to assist landowners in applying the approach.

Shepherd (2000) produced a series of visual assessment guides for soil quality factors on varying landforms in New Zealand; hill country, sloping, and flat to rolling country. Essentially this approach was prepared for landowners, as laymen in technological terms, to be able to visually assess and score a range of quality factors such as soil structure, colour, texture, moisture levels, erosion, tillage pans and earthworm counts. These assessments were then scored subjectively and a ranking applied as determined for cropping needs (Shepherd *et al.,* 2000). Shepherd introduced the guides as a process for identifying the relationships between land use and soil characteristics and assisting land managers in their roles. Both soil and plant indicators are assessed and knowledge of previous land-use or paddock history assists the final interpretation. Furthermore, the technique becomes another skill for managers to access in their decision processes (Shepherd & Park, 2003).

The inclusion of Māori values in any resource assessment is more apparent in environmental management approaches than in horticulture or agriculture systems. Within New Zealand there has been an increased awareness of the role of Māori in resource management through the Resource Management Act (1991 and amendments), the Fisheries Act 1996 and Kaimoana Customary Fishing Regulations, 1998. Through legislation the relationship Māori have with the land and sea resources is introduced to society in a formal process and Māori are slowly encapsulating their role in the management of these resources because of this.

An example of a Māori centred approach to recognising and expressing Māori values in relation to streams and waterways has been collated by Tipa & Tierney (2003) and released as a Ministry for the Environment report for public perusal and use. In their guide the authors identify three key components to the approach they term as a 'Cultural Health Index (CHI)'. These are; identifying cultural values, determining cultural health indicators and, applying the index for implementation. They acknowledge the two distinct knowledge bases (science and Māori) combined to create the management tool, recognising the final outcome of the CHI would not exist without both bases. The development of the tool confirmed the valuable resources each community can add to this type of management and ultimately, the capacity building it gives to the Māori community in their role as kaitiaki or guardians of the resource.

In the development of the CHI, the authors identified at least four cultural values central to the development of the tool and of the Māori relationship with fresh water. These were:

1. mauri, a signature of the health of the resource itself,
2. mahinga kai, the ability to access the resource for food gathering,
3. kaitiakitanga, protecting the interest of future generations, and
4. ki tai ki uta, the philosophy of the water resource being an entity 'from the mountains to the sea'

This value set is transferable to the land resource as the relationship between the culture and different physical resources is based in the same cultural paradigm. Furthermore, Tipa & Tierney identify the need to understand and appreciate the 'cultural landscape' the resource exists within and the relationship of Māori to the resource. This can be elucidated through whakapapa (genealogical descent), pakiwaitara (stories), waiata (songs), prose and other forms of knowledge sharing.

7.8 Education needs

For any assessment process to gain acceptance by the stakeholders, an education process is required. The ethnopedology and soil science disciplines recognise the need to target both the assessment process and education needs for the landowners and other parties to be involved in the process (Barrios *et al.*, 2002; Karlen *et al.*, 2003). As many of the scientists

who work in the field with indigenous knowledge of soils or horticulture have stated, there is a need to look for the integration of indigenous and science knowledge systems and this requires an education process from both knowledge sets.

The need for policy, both national and international, that informs soil and resource management systems, to respond to the environment as a whole is very pertinent for the 21st century. Benbrook (1991) wrote that natural resources policy will move to recognise and respond to the interconnectedness of the resource base and the complex ways all our management inputs interact. The '*Laws of Nature*' he added '*cannot be amended and should not be ignored in evaluating and refining policy'*. Other resource managers sometimes refer to this interconnectedness as the 'ecosystem concept' or 'utility by soilscape' i.e. management practices matching soil and landscape characteristics (Pierce & Lal, 1991). These approaches all lead to an acknowledgement of a holistic body of knowledge relevant to soils knowledge.

An interdisciplinary approach to soils knowledge recognises the holistic nature of indigenous knowledge and the more regulated approach taken by scientists. Local soils knowledge is inclusive of a range of social sciences through the relationship between the community and resource. It also includes the worldview of the community, handed down through the generations and providing the basis for their commonality and practices. Implementation of local knowledge will also include some science practices, however, based on ecology, biology and other disciplines applicable to the management of resources.

Education can be achieved at a range of levels from informal processes within the community or family group to structured tertiary education at polytechnics or universities. In-between lie a myriad of education and skill development opportunities including interactive or participatory processes between the community or landowners and technological experts, consultants, field workers, advisors, researchers or other like-minded communities. The conduit or mechanism for learning is equally diverse including structured learning - group or one-on-one, field days, internet processes, books, and technologies such as CD's or DVD's.

7.9 Chapter summary

Māori knowledge or mātauranga can be viewed from a systems perspective in a contemporary approach to management of land and crops. A systems approach aligns well to the holistic interpretation of traditional knowledge and helps define the knowledge in a form that is easily understood by both its informants and applicants.

In a purely cultural (Māori) sense, traditional decision systems have existed for millennia. They are founded in the very basis of the culture, in the world view which is often expressed as *Te Ao Māori*. This foundation is then refined to mātauranga specifically valid to resources and management situations and applied through processes such as tikanga.

In trying to relate this systematic approach to mātauranga Māori and soils and horticulture management, a triadic approach frequently applied by ethnopedological experts has been considered and manipulated to meet the expectations of Māori working with their communities and resources. Essentially the triad is based on a *kosmos/corpus/praxis* model which can be applied as a *Te Ao Māori/mātauranga/tikanga* model by Māori. This triad has the ability to be easily applied in contemporary situations and can also respond to changes in land or resource assessment criteria which might be applied in different ways through individual and group variations.

In reviewing the range of decision tools and assessment criteria currently applied to land assessment and horticulture, it is apparent that nothing exists that takes any account of cultural factors which align to the land or people as owners and potential managers of the land. The body of traditional Māori knowledge aligned to soils and horticulture is extensive and has the potential to contribute in a very positive way to the economic utility of Māori land, especially that which is not currently in any form of productive use. One method to encourage landowners into better economic utility and also greater acceptance by the horticulture sector will be an assessment tool which incorporates all these factors and which will be addressed in the following chapters.

Chapter 8: Case Study Report

8.1 Introduction

The case study approach to this research will contribute to the process of justifying the role of cultural tools in soils assessment and horticulture for Māori land owners. The case studies were undertaken with three distinct entities representative of Māori land interests in the 21st century. The evolution of Māori land ownership and management since the inception of the Māori Land Court in the mid nineteenth century has created a unique suite of land ownership structures for Māori from incorporations through to various trusts and individual ownership. Regardless of the ownership structures as defined in the court system (which is a non-Māori context), the common factor for all Māori land interests remains with the whakapapa and connectedness that exists between both the land and owners. This whakapapa element cannot be taken away and will always contribute to the relationship between the resource and the people.

Three case studies were undertaken based on the following terms of reference determined in discussion with kaumātua at the instigation of this thesis:

- An historical association to the land was apparent
- Group identities were based on kaupapa Māori terms
- Land/activities identified which came under the jurisdiction of the group, and
- Past developments and/or interests in horticulture were apparent

The case studies purposefully target a mix of Māori land ownership structures which in turn represent the type of land interests many within the Māori community hold. The structures are variably:

- an incorporation responsible for a portfolio of land and other resource interests,
- a whānau block aligned to hapū and marae activities which has been succeeded to generationally but which now represents absentee owners, and

- a national Māori entity formed by a group of landowners with a common interest in the economic use of Māori land through horticulture. Land ownership structures held by group members range from marae reservations to trusts and individual blocks.

Each case study looks at the history of the land under study, the unique cultural factors aligned to the land or owner group and the ability to apply a cultural layer to the assessment of the land for the potential change of land use to commercial production of taewa - inclusive of cultural management inputs. The case studies are intended to provide commentary and discussion on these factors and will contribute to the final development of a land assessment tool suited to Māori land development. In the context of this thesis, the cases studies can be viewed as a trial application of pertinent components of such a tool.

An information gathering process relative to management processes and horticulture was undertaken in support of each case study. Information was sourced from written sources and from community (predominantly Māori) and industry informants. The physical, capital and economic resources aligned to each study such as soil and climate needed to be fully identified in order to support the nature of the study. An awareness of the time constraints to achieving a full return to horticultural production by any group is acknowledged.

Each case study concludes with a SWOT analysis to review the Strengths, Weaknesses, Opportunities and Threats as they might apply to the assessment process and any potential horticultural land use. The SWOT is a standard management systems tool and has a practical role in the case study as it will summarise the key points relevant to the overall project. A SWOT analysis is also a way of analysing an organisation's or group's internal and external environments; the SW component considers those factors comprising the inside of a system and the OT considers those that would be outside of the system or externalities (Inkson & Kolb, 1998).

8.2 Case study 1: Wakatu Incorporation[75]

Piki mai ra, kake mai ra. Ki nga mana, ki nga waka, ki nga hau e wha. Nau mai, haere mai, haere mai. E aku rangatira. Mauria mai nga aroha. Mauria mai nga mate o ia marae, o ia marae, kia tangi hia, kia mihi hia. No reira, e nga mate, haere, haere, haere. E te iwi, ka koa te ngakau. Nga taonga o tatau tupuna, nga whenua o Wakatu kua hoki mai ki te iwi Māori. No reira, ka nui te mihi, tena koutou, tena koutou, tena koutou katoa. (Excerpt from the mihimihi given by the inaugural chairman of Wakatu Incorporation, Mr Pirihana Te Hineurangi (Kahu) Kotua at the official establishment hui held at Nelson, 19 December 1977).

8.2.1 History – te toto

This case study focuses on whenua in the Motueka district, west of the general Wakatu settlement in the Nelson district. Early occupation of the Motueka district is credited to some obscure tribes including Ngā Rapuwai who are believed to have originated from Taranaki as descendants of the brothers Pananehu and Tamaki, original occupiers of North Taranaki alongside another brother Taitāwaro who did not migrate south (Waru, ND). Waitaha may have also occupied the area in earlier centuries and ancient gardens believed to originate from either Ngā Rapuwai or Waitaha occupation have been identified in various locations in Te Tau Ihu – the top of the South Island (Mitchell & Mitchell, 2004).

Following the migration period of Māori from Hawaiiki, the area had associations with various tribal groupings including Ngāti Mamoe, Ngāi Tahu, Ngāti Wairangi, Ngāti Tumatakōkiri, Ngāi Tara Pounamu and lastly, Ngāti Apa and Ngāti Kuia. In the early part of the nineteenth century, some of the Taranaki and Tainui tribes extended their influences to the South Island and by the time of the Treaty of Waitangi they were the dominant residents of the Wakatu region. It is the descendants of these tribes: Ngāti Rārua, Ngāti Koata, Ngāti Tama and Te Ātiawa who form the nucleus of owners of the incorporation now known as Wakatu.

[75] *Wakatu Incorporation & Ngātahi Horticulture (www.wakatuhort.org)*

In 1842, NZ Company representative Samuel Stephens landed at Motueka to assist with the surveying in that district. He noted extensive cultivations in the area known as Te Mātu or the Big Wood from a point known as Te Kūmara near the Motueka River mouth to several kilometres upstream (Mitchell & Mitchell, 2004:306). In his words *...the natives have a large potato clearing at this wood where they grow annually some hundreds of tons of potatoes...* (*ibid*). Phillipson (1995) noted that archival records indicate Pākehā witnesses gave evidence in 1844 that Māori residents in the Motueka district specified to the NZ Company representatives that settlers were not to interfere with their cultivations and that the whole of the 'Big Wood' was to remain exclusively in Māori hands. Evidence collected by the Waitangi Tribunal for its Northern South Island reports states that Stephens told Motueka Māori they would have 'tenths' **in addition** to their cropping land in the Big Wood but this area (the Big Wood) was later included and divided among the settler and tenths allotments (Phillipson, 1995).

The tenths system of land allotment to Māori was the brainchild of Edward Gibbon Wakefield of the New Zealand Company, the earliest settlement company to establish themselves in Aotearoa/New Zealand. The New Zealand Company's colonisation policy included reserving a portion of territory from land sales equivalent to one-tenth of the whole as an inalienable estate in an attempt to improve the social and material conditions of the indigenous population (Phillipson, 1995). These reserves would be scattered among the settler allotments on a random basis. The inspiration was drawn from the example used with American Indians whose isolated reserves did not encourage community participation. These reserves from the New Zealand Company therefore were meant to 'civilise' Māori through 'participation in new ways of life and all the social amenities of the new community (*ibid.*). As a consequence of redefinition by the company these tenths were in fact an eleventh (one block for every ten), not one-tenth, of the land purchased by the company (Phillipson, 1995 & 1996).

Alongside the tenths reserves, occupational reserves were created as a result of the 1842-45 Commissioner Spain hearings into NZ Company purchases. It had become clear that Māori were not expected to actually live on their tenths reserves; they were seen as beneficiaries

but without consideration given as to where they were supposed to actually live and sustain themselves (Mitchell & Mitchell, 2004). Thus the occupational reserves were created and Māori were to live and utilise them as needed. Sixteen 'tenths' sections covering 800 acres [364ha] in total at Motueka, mostly in Te Mātu or the Big Wood, were redesignated as occupational reserves for resident families living in Motueka. This in itself created additional grievances for the wider iwi interests and the NZ Company alike who were unhappy with the process and outcomes (*ibid.*).

The first economic census of Māori in the region in 1886 showed there were just 96 Māori living in the Tasman Bay (Nelson/Motueka) region, subsisting on 41½ acres [18.5ha] of potatoes and 89¼ acres [40ha] of other crops. They also had 50 acres [22ha] in sown grass, 400 sheep, 114 cattle and 107 pigs (Phillipson, 1996).

8.2.2 Establishing the Incorporation

The Wakatu Incorporation was established by a government order in council under Part IV of the Māori Affairs Amendment Act 1967 on 4 August 1977, to administrate around 1400 hectares of Māori reserved lands (to be known as the Corpus Lands[76]). These lands were then valued at around $11million and previously known as the "Nelson Tenths' and Motueka and Mohua (Golden Bay) occupational reserves located around Nelson and Motueka (Jones, 1998). These reserved lands all originated from the NZ Company policy of a tenths estate applied to the Motueka district in the 1840s.

Prior to 1977 the land had been administered on behalf of its owners by a succession of Crown-appointed Boards, Commissioners and Trustees. From the 1880s this land was subject to perpetual lease. The ownership and [perpetual] leasing arrangements for these blocks were originally established by over 40 pieces of legislation dating back to the 1850s. The terms and conditions of the leases were consolidated in the Māori Reserved Land Act 1955 which provided for perpetual leases on renewable 21 year terms, fixed rent over the 21 year period and rent fixed at 5% of the unimproved value for rural lands (Te Puni Kōkiri, 1997) under the control of the Māori Trustee.

[76] Personal communication, Rōpata Taylor, CEO Wakatu Inc. 8 June 2004.

Subsequent government enquiries found the leases unjust but no action was taken until a Royal Commission of Inquiry report of 1975 created the impetus from which Wakatu was born (Te Puni Kōkiri, 2003). With the passing of the Māori Reserved Lands Act in 1997, Wakatu Incorporation initiated the transition from perpetual leases managed under legislatively provided conditions to normal renewable leases on market rentals with commercial conditions (Te Puni Kōkiri, 1997).

The land vested in Wakatu Incorporation is held in trust for the owners. In 1977 there were 1,668 owners, descendants of the original owners, all of Ngāti Rārua, Ngāti Koata, Ngāti Tama and [Te] Ātiawa[77] iwi, who received shares in Wakatu Incorporation, and are now known as shareholders who receive dividends and not rents. The lands which Wakatu Incorporation administers now also include land investments purchased since 1977.

Plate 7: Motueka district and Wakatu orchards – looking eastward towards Nelson
(Photo courtesy of Wakatu Inc. 2004)

[77] Known variously as Ātiawa, Te Ātiawa & [Te] Ātiawa nui tonu – these terms are often used interchangeably

8.2.3 Wakatu in the 21st Century

Wakatu Incorporation is a large private company governed by a board drawn from the shareholders. The organisation maintains a head office in Nelson and also maintains section groups comprised of subsidiary companies and joint ventures. The Wakatu board focuses on governance and section managers focus on management (Te Puni Kōkiri, 2003).

Wakatu Incorporation has become very successful in a number of ventures, including horticulture, dairy production, forestry and fisheries. Their portfolio is divided into four arms; primary, property, seafood and tourism[78]. The incorporation now manages over $200 million (Wakatu, 2006) of assets and is looking to diversify into land and sea management alongside global marketing (Jones, 1998).

The incorporation has evolved through strategic planning from a simple land owning company to an international marketing company. The Wakatu group of companies identify their core purpose as being to create wealth for its owners through developing a diversified asset base, while also upholding the tikanga of the owners and is export focused marketing all its products internationally (Te Puni Kōkiri, 2003).

Their horticulture initiatives cover over 85 hectares (pipfruit, kiwifruit, tamarillos) as well as a packhouse and coolstores, and produce is sold nationally and internationally to supermarket chains in the United Kingdom & France. They employ a number of staff and offer a cadetship programme to train youth in horticulture which has proven very successful. The incorporation owns over 1000 hectares of dairy farms (4 farms) in the South Island which are managed under a joint venture arrangement. Forestry is based in Marlborough and Parapara (Golden Bay) and covers 1335ha and is well into a silviculture programme with the first harvest due to begin around 2015. Fisheries investments include crayfish processing in a joint venture with Port Nicholson Fisheries, paua processing based on fishing quota and aquaculture projects for shellfish and wetfish. In 2006 the board determined to develop a technology platform to amalgamate their business systems, streamlining management and adding value overall to the incorporation (Wakatu, 2006).

[78] Personal Communication, Rōpata Taylor, CEO, Wakatu Inc. 8 June 2004

In 2005, Wakatu's horticulture arm joined with Ngāti Rārua Ātiawa Iwi Trust in Motueka to form Ngātahi Horticulture – a combined initiative to participate in the ever-changing horticulture industry (Brown, pers. com. June 2004).

The Board of Wakatu tries to maintain a balance between commercial and tikanga Māori skills. Commercial skills involve understanding business and its analytical requirements, sound judgment and decision-making. Their CEO explained that it has not always been easy finding people with the required commercial skills, but it has been easier to find people with skills in tikanga Māori (Te Puni Kōkiri, 2003).

The Board's overall performance is assessed using bottom line indicators such as absolute profit, return on funds from each asset group and net funds growth. The shareholders can assess the boards' performance by their own measures, cultural or otherwise, and determine the dividend at the twice yearly shareholders meetings. The company benchmarks its performance against similar organisations, but also has independent goals to raise financial returns over a five-year programme (Te Puni Kōkiri, 2003).

Wakatu Inc. carries out extensive business risk analysis including the exchange rate, economic risk, climate and other environmental factors. The Incorporation uses industry analysis and internal analysis to create core strategies for each business arm. This is a formal planning cycle which involves reviewing and evaluating the previous year's operations, preparing forward business plans and preparing budgets. This process begins in February and runs until August, and is very important as it dictates where Wakatu will allocate funds.

Management has a monthly reporting responsibility at board meetings. In addition to this process, at least one member of the Wakatu board is on the subsidiary company board. This ensures clear communication and flow of information between the Wakatu board and its subsidiaries.

Key issues for Wakatu identified in their recent annual reports (2003-6) and by their CEO in 2003 (Te Puni Kōkiri, 2003:34) include:

- meeting market demands, especially for their horticulture arm
- an end to the perpetual lease regime that currently exists over many Wakatu lands
- progression on granting water for aquaculture initiatives
- more influence over the Reserve Bank to ensure the currency does not fluctuate.
- training programmes established for young people wanting entry in the horticulture industry.
- government invest more in research, development and training

The CEO states his belief in a successful Māori organisation giving its people mana. He believes the business must uphold the owners' tikanga and create and distribute wealth (*ibid.*).

Plate 8: Te Tau Ihu indicating Wakatu district. (Photo courtesy of Wakatu Inc. 2004)

8.2.4 Cultural evaluation

Kosmos

Four distinct iwi form the nucleus of shareholders and relationships to the land which is Wakatu Incorporation: [Te] Ātiawa, Ngāti Rārua, Ngāti Tama, Ngāti Koata. Only [Te] Ātiawa are considered with regard to the individual values applicable to Motueka and 'Robbies block' (the focus of this case study) as they hold the *mana whenua*[79] for this district.

Te Ātiawa whakapapa to Taranaki maunga. The following *pēpeha*[80] identifies Te Ātiawa:

> Ko Taranaki te maunga tapu
>
> Ko Tokomaru te waka
>
> Ko Waitara te awa
>
> Ko Ātiawa, Ngāti Mutunga, Ngāti Maru me Ngāti Tama-ariki ā Te Ātiawa Nui Tonu ki Taranaki, Te Ikaroa a Maui te wharenui ō ēnei iwi
>
> Ko Owae whaitara te marae-ā-iwi

The movements and migrations of Ātiawa alongside Te Rauparaha of Ngāti Toa during the early nineteenth century saw them settle in several distinct locations south of Taranaki including Waikanae, Te Whanganui-ā-Tara (Wellington central), Waikawa (Picton), Arapawa Island and Motueka mostly displacing earlier inhabitants by conquest. By the 1830s Te Ātiawa were ensconced in Te Tau Ihu or the Northern South Island but they always retained their relationship with their family and relatives in Taranaki and often journeyed between the two districts for family reasons (Phillipson, 1995; Roskruge, 1999; Mitchell & Mitchell, 2004).

The whakapapa of Te Ātiawa, sourced in their descent from Tamarau te heketanga-ā-Rangi aligns them to the celestial realm and origins of Māori. From this they draw their worldview, firstly in its relationship to their primæval origin and secondly to the influences of the environment and social factors which have moulded the traditions of the tribe.

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[79] *Mana whenua;* literally translated as 'status over the land' or, the primary cultural relationship to the land.
[80] *Pēpeha*; in this context, a proverb or exclamation.

Corpus

Values applied to the Wakatu Corpus Lands vary according to the relationship of the people to the specific reserves created were politically rather then culturally defined. Phillipson (1996) suggests the owners of these particular Māori reserves were looking to the Crown to fulfil their promises to give them Crown grants for individual interests on land in the region however; they were not necessarily looking to stop their communal farming practices. In 2007 it is apparent there are two equally valid value sets aligned to Wakatu lands; the collective incorporation and, individuals' representative of whānau, hapū and iwi relationships to specific land blocks. Each set is evolving as their relationship with the whenua changes over time.

Plate 9: Wakatu marae, Nelson

Collective Wakatu Incorporation values set

The collective values applied by Wakatu in regard to their business activities and land interests are dynamic and evolutionary. The 1994 Strategic Plan for Wakatu Inc. included the following extracts regarding the overall mission of the incorporations' business, their 'values or philosophy', social responsibility (people, administrative and financial) and investment strategy (note there is no Māori translation aligned to the 1994 statements):

> Mission Statement: *A business of the land – he taonga tuku iho. Striving for profit, social and cultural growth through leadership, professionalism, honesty and diligence* (p2)

Values or philosophy: *In all our business activity, decisions will be taken only after consideration of their impact on our people* [shareholders], *on our environment and on our assets as well as our business. This consideration will encompass the principles of guardianship, leadership, management and challenge.*
In our actions we are guided by the values of knowledge, welfare and relationship.
It is our belief that these principles and values are fully compatible with the objectives of efficient, profitable business. (p2)

People policy: *Recognising and providing for the obvious stakeholders: the beneficial owners of the incorporation /the shareholders, the owners' descendants and, the employees of Wakatu, also including consideration of the less obvious stakeholders including customers, suppliers, business partners and the local community.* (p3)

Table 8.1: Vision and values identified by Wakatu Inc.- 2006

Vision:	*Titiro whakamuri kia mohio ai koe te huarahi kei mua i a koe* You know not your future until you know your past; Our dream has a purpose and our dream has a history.
Values: Our organisation reflects our values in everything we do, those values are:	
Kaitiaki	*Manaaki whenua, manaaki tangata, haere whakamua* Care for the land, care for the people, go forward We are the guardian of our assets and community
Integrity	*He tangata kī tahi* A person who speaks once (a person of their word) We are honest fair and trustworthy
Commitment	*Tama tū, tama ora, tama moe, tama mate* He who stands lives, he who sleeps dies. We are focussed on achieving our goals
Manaaki	*He aha he mea nui o te ao? he tangata, he tangata, he tangata!* What is most important in the world? It is people, people, people! We respect, nurture and support one another
Innovation	*He manga wai kōia kia kore e whitikia* It is a big river indeed that can't be crossed We are adaptable and creative
Communication	*Kanohi ki te kanohi* Face to face We are open and transparent
Tikanga	*Kia mau koe ki ngā kupu ō ōu tūpuna* Hold fast to the words of your ancestors We embrace our traditional values and beliefs
Whanaungatanga	*Waiho i te toipoto, kaua i te toiroa* Let us keep close together, not far apart We are a family business and value our relationships

In the 2006 preamble to the Wakatu half-yearly meeting (June), the incorporation identified a vision and values set (Table 8.1) to its shareholders (quoted verbatim):

Praxis

Tikanga me taha Māori ki Wakatu – FoMA model

Wakatu Inc. is a member of the Federation of Māori Authorities (FoMA)[81] who are a Māori business entity representing Māori interests at a national level in a number of fora. They have produced a set of objectives which they believe meets their members' needs and by virtue of their membership, Wakatu also acknowledge these objectives in their core business.

FoMA objectives are designed to advance the following roles played by all Māori organisations[82]. They are:

- Kaitiaki - Guardian of the taonga: protect taonga, develop taonga;
- Kaiwhakahaere - Representative of the beneficial owners: communicate, optimise benefits;
- Rangatira(tanga) - Leader of the business: lead with vision, secure best business performance;
- Kaiwerowero - Challenger of the external environments: know environments, obtain advantages, and overcome constraints.

FoMA independently promote their primary objective as *'to foster and promote the development, sound management and economic advancement of Māori authorities and in that process to protect, to foster, and to advance the interests of the Federation'*. Refer to Appendix 8 for a more detailed breakdown of the Federation's objectives and application of their cultural model especially as it relates to the *whenua tūturu* (traditional lands).

[81] At the time of writing, chairman of the Wakatu Board, Paul Morgan, was also Chief Executive of FoMA.
[82] Source: www.foma.co.nz

8.2.5 Physical evaluation

Environmental

The case study block is known locally as 'Robbies Block' and is a 2ha block situated on Whakarewa Street, Motueka (Plate 10). The block lies on the outskirts of Motueka township. At the time of the assessment it was bare ground and bordered on both sides by privately owned land.

This block had recently (2002) been taken over from a lease arrangement and was under assessment for future land use options, including the opportunity to plant in pear trees (variety – Doyenne du comice) to add to the established pipfruit orchards of the incorporation. The full history of the block prior to the lease being purchased was unknown, however the most recent 3 years had included maize crops (2) and grazing, including horses.

The ground cover was primarily in pasture grasses but included a range of weed species including: buttercup *(Ranunculus* spp.*)*, clover *(Trifolium* spp.*)*, wild geranium *(Geranium dissectum)*, dock species *(Rumex* spp.*)*, nipplewort *(Lapsana communis)* and plantain *(Plantago* spp*)*.

Soils

The soil type for this block as identified from the soil survey carried out by Paul Nelson in 2003 is characteristically a Riwaka silt loam, the predominant soil type in the general Motueka district (Nelson, 2003). Riwaka soils are located on the floodplains of the Riwaka and Motueka Rivers and include a range of physical attributes from good to excessive drainage characteristics, relatively low water holding capacity and a high soil bulk density. The soils are of moderate to high natural chemical fertility with an average pH of 6.4 but a low content of potassium, especially in the subsoil (*ibid.*).

Plate 10: Robbies Block looking to Whakarewa Street, Motueka (2004)

Soil Samples

A standard soil sampling technique was applied in obtaining a composite sample for analysis from this block. Using an augur, ten 15cm cores were collected on 10 June 2004 from a random pattern over the block representative of the site. The soil sample was analysed following standard soil testing procedures by the Fertiliser and Lime Research Centre, Massey University. Palmerston North (Refer to Appendix 9 for test results).

Soil Test Results

Table 8.2: Soil test results - Robbies Block, Wakatu Inc. Motueka.

Soil Test	Robbies Block	MAF 'Quicktest'
Olsen-P (µg/g)	47.6	57
K (me/100g)	0.33	6
Calcium (Ca) (me/100g)	7.0	10
Mg (me/100g)	1.13	31
Na (me/100g)	0.03	-
pH	6.2	6.2
CEC (me/100g)	11	-
Organic Matter (%)	2.3	-
Carbon (%)	1.3	-
Total Nitrogen (%)	0.11	-
Soil Volume (g/ml)	1.20	-

µg = micrograms; g = grams; me = milliequivalent; ml = millilitre;

Interpretation of results

Based on these results the nutrient status can be summarised from the results with regard to the future use in horticulture, primarily taewa production, as:

- Phosphorus is available at good levels
- Potassium is present at a low level
- Magnesium is present in a moderate level
- pH 6.2 is acceptable
- Soil volume (bulk density) at 1.20 is high
- CEC at 11 is low
- Nitrogen at 0.11% is low
- Organic matter content is low
- Carbon content is low

Based on these results, the nutrient status of this block is satisfactory but lower than desired for some key attributes relative to horticultural development. The low potassium and

nitrogen levels need to be considered for any land use (agricultural or horticultural) to be undertaken on the block. A fertiliser programme targeting superphosphate and potassium or N:P:K products will improve this block and can be applied over several seasons to gradually raise the soil nutrient status. The soil pH of 6.2 is acceptable for taewa or potato crops. The soil volume of 1.20 is high and along with the low organic matter content can be improved with the addition of externally sourced organic matter to the topsoil.

Spatial

There is a considerable range of horticultural production in the general Motueka region. Fruit and vegetable cropping are dominant land uses[83] around Motueka and range from pipfruit [1301ha], kiwifruit [499ha], hops [218ha], berryfruit (including blackcurrants) [94ha], grapes [50ha] and market gardens [37ha] producing a range of vegetable crops. More recently, viticulture has become a common land use as well as plantation forestry, mainly in exotic species, on the steeper and less fertile lands of the region. Some smaller, more intensive, horticultural operations also exist such as cut flower and specialist nursery producers covering a wide range of crops from roses through to shelter tree species. There are a considerable number of support industries located at both Motueka and Nelson as well as the port at Nelson.

Climate

The Motueka climate is distinctive and temperate due to the topography of the region and the coastal influence. The following summary is given using historical data collected at the nearby Riwaka Research Station (HortResearch). A mean annual temperature of 12.5°C is achieved with a summer high of 17.4°C (February) and winter low of 7.0°C (July) (Figure 8.1). The annual rainfall at the Riwaka site is 1381mm with twice as much rain received over the winter months when compared with summer months (Figure 8.2). The average annual sunshine hours are 2400 and typically there are 82 days of ground frosts from May to September each year (NZMS, 1983). Frosts are described as local phenomena, often specific to sites and areas in the region. They appear to be rarely experienced outside of the

[83] Figures for production areas are taken from Nelson (2003) and are representative of the production mix in the region.

winter and spring months. The following graphs are prepared from data recorded in de Lisle & Kerr (1965).

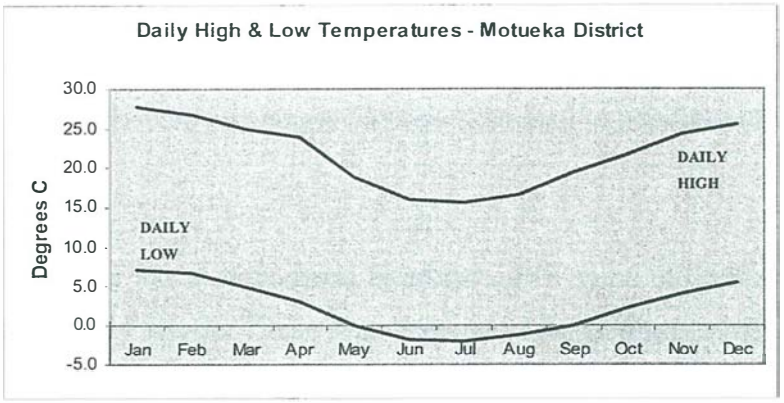

Figure 8.1: Climate data, Motueka District – Temperatures (monthly averages)
Source: de Lisle & Kerr, 1965

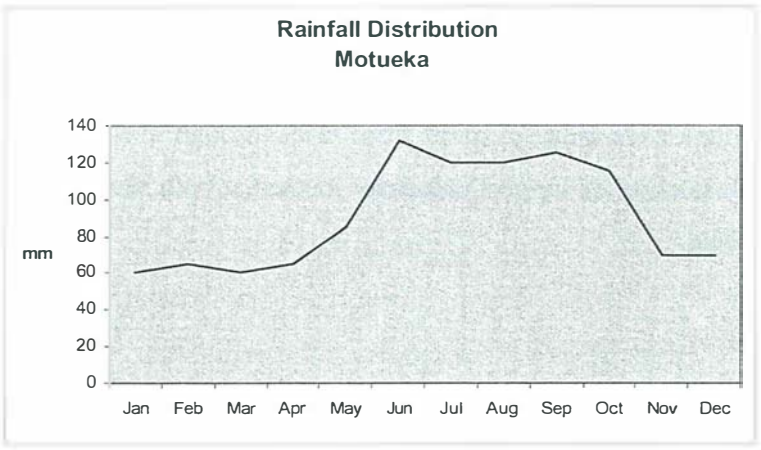

Figure 8.2: Climate data, Motueka District – Rainfall distribution
Source: de Lisle & Kerr, 1965

8.2.6 Capital evaluation

Within Wakatu Incorporation there is considerable capital available to invest in a horticultural land use on this block. Wakatu have full production, packhouse and transport plant and facilities within one kilometre of this site as well as a compliment of staff with appropriate skills in horticulture. This block is situated within the Motueka township and other Wakatu land interests lie as near as 50m on Whakarewa Street. It is intended to

contribute to the production systems aligned to the whole Wakatu interests around Motueka township.

Structural

The block itself carries no structural assets other than the perimeter fencing and shelter. Water can be accessed through town supply although a bore is being considered if horticulture is the final land use.

Investment

The incorporation is prepared to invest in this block to bring it into production in line with other land they own or manage around Motueka.

Natural

Horticulture (fruit, vegetables and floriculture) is a key industry in the Motueka district along with processed fisheries, agriculture and forestry. The only factor of note relative to the natural capital is the availability of water which is becoming increasingly managed and will likely impact on the more intensive production systems.

People

Wakatu have a large contingent of full-time and seasonal staff. Within the staff programme they also have training initiatives and have full input from the Horticulture ITO for modular staff training in horticulture. Outside of the production team, the incorporation also have a suite of staff at the management and governance level and interests in aligned businesses such as 'KONO' (an indigenous marketing brand developed by Wakatu Inc.), whose focus is on marketing and development of the indigenous brand for Wakatu products.

8.2.7 Economic evaluation

A SWOT analysis (Table 8.3) was undertaken as an economic evaluation for identifying some key limitations and advantages with regard to the potential production on 'Robbies Block' using taewa as an example.

Table 8.3: SWOT Analysis: taewa production on Robbies Block, Wakatu Incorporation

Strengths	Weaknesses
• Cultural and values based organisation • Incorporation, structure and acumen • Existing horticulture in region & infrastructure • Skill and expertise in horticulture • Knowledge of regional resource • Access to technology	• Change to vegetable production a new direction from perennial crops • Corporate decision making processes • Specific skills in vegetable cropping
Opportunities	**Threats**
• Indigenous products and markets • New products to existing suite of products • Build on cultural identity • Ability to utilise regional infrastructure	• Markets and fluctuations in money value • Single block insufficient for crop rotation • Iwi politics

8.2.8 Summary

The Wakatu Incorporation is a well structured horticultural business managing land resources with a unique history and relationship to its owners. They are in a position to invest in a change in land use providing it meets their criteria relative to the value systems applied to the incorporation and business risk. The physical assessment identified a resource well suited to taewa production and this has been complimented by the cultural, capital and economic assessments. The next step is a strategically planned entry into taewa production through the identification of machinery needs and access to certified seed.

The cultural assessment has identified some key cultural indicators which are applicable to the incorporation as a landowner representing a large number of shareholder interests. Primarily, the whakapapa links of the shareholders creates a primary relationship to the land. This is supported by knowledge of historical land use including soil and cropping characteristics, traditional and contemporary horticultural activities and the formal identification of a value suite applicable to the activities of the incorporation. This is further consolidated by the acknowledgement by both the entity and shareholders of key aspirations for their land resources for their future generations.

8.3 Case Study 2: Ngāti Parewahawaha Hapū o Ngāti Raukawa

8.3.1 History – te toto

This case study focuses on a block aligned to Ngāti Parewahawaha hapū of Ngāti Raukawa ki te tonga. The Section 141C2A Ohinepuhiawe Block, Rangitoto Survey District, covers a total area of 0.4ha (1acre) and is located off Domain Road, Bulls township. It lies directly beside Parewahawaha marae on its' northern boundary. Access is from a 'right-of-way' off Domain Road or, through the marae reservation.

Ngāti Parewahawaha is a hapū of Ngāti Raukawa within the Tainui federation of tribes. The waka Tainui made its final landing at Kawhia on the west coast of the North Island during the migration of Māori to Aotearoa and from there the people settled and their descendants spread. The following whakatauāki describes the seat of Tainui and hence their identity:

> *Mokau ki runga, Tamaki ki raro. ko Pare Hauraki, ko Pare Waikato, Mangatoatoa ki waenganui, ko te kaokaoroa o Patetere.*
> From the Mokau River to Tamaki-Makaurau (in the Auckland area), the Hauraki Plains and the Waikato River basin, Mangatoatoa and Patetere being the inland areas, this indicates the extent of the area.

The origins of the migration of Ngāti Raukawa to the Rangitikei lie with the migration of Te Rauparaha and his Ngāti Toa Rangatira kin in the early 1820s. Te Rauparaha invited Ngāti Raukawa to follow him and assist in his claim of utu or revenge against the Muaupoko iwi and allocated them land around the Otaki region. During the period 1826-1829 the Ngāti Raukawa people journeyed over three distinct migrations, finally settling for two years on Kapiti Island with Te Rauparaha before moving on to the land which had been apportioned for them. At this point their settlement area was bounded by a place known as Miria te Kākara at present day Kākāriki on the Rangitikei River to Kukutauaki Stream which lies between Otaki and Waikanae. As of 1840 or the signing of the Treaty of Waitangi, Ngāti Raukawa were considered the occupying tribe around the Rangitikei River from Kākāriki to the sea whilst allowing Ngāti Apa to continue their occupation on some sites under sufferance (Anderson & Pickens, 1996). In the 1869 hearing of the Rangitikei-Manawatu claims to the Wellington Native Land Court the court found that Ngāti

Parewahawaha and other Ngāti Raukawa hapū had settled peaceably and permanently aside the Rangitikei River with Ngāti Apa at their invitation and effectively created an integrated community with conjoint rights (*ibid.*).

The hapū Ngāti Parewahawaha descend from Parewahawaha, a direct female descendant of Raukawa from whom the iwi take their name. The majority of this hapū came south from the Maungatautari area of Waikato during the final stages of the migration of Ngāti Toa Rangatira in the late 1820s in the journey known as *'Te heke mai raro* (Arapere, 1999). Te Nge o Raukawa, a son of Parewahawaha was an old man at the time and travelled south and it was he who settled at Ohinepuhiawe with his whānau (family).

The flat land upstream of the Bulls SH1 (State Highway 1) bridge aside the western bank of the Rangitikei River - in its current course - and accessed from Domain Road at the northern end of the present Bulls township, is the area earlier known as Ohinepuhiawe by the Ngāti Parewahawaha inhabitants. This river flat constituted part of the kainga or settlement for this hapū leading also to the site of the present day marae, also known as Parewahawaha (Plate 11).

8.3.2 Entity

The Parewahawaha marae trustees have been informally leasing the block under study (Ohinepuhiawe Block 141C2A – Refer to Plates 13 & 14) from the whanau owners for the last ten years, paying the rates and other costs as appropriate and grazing or cropping, also as appropriate. The whānau owners are absentee owners, almost entirely domiciled in the Auckland region and not actively involved in marae or land related affairs at present.

The long-term objectives for assessing this block include:

- To ensure the continuation of whakapapa associations between whenua and whānau
- Maintenance and application of tikanga-ā-iwi
- Economic development of the block;
- Profitability of the block through commercial crop production/horticulture;
- Creation of employment opportunities through alternative land uses.

The trustees are looking to achieve these objectives by considering alternative land management options and through diversifying risk management.

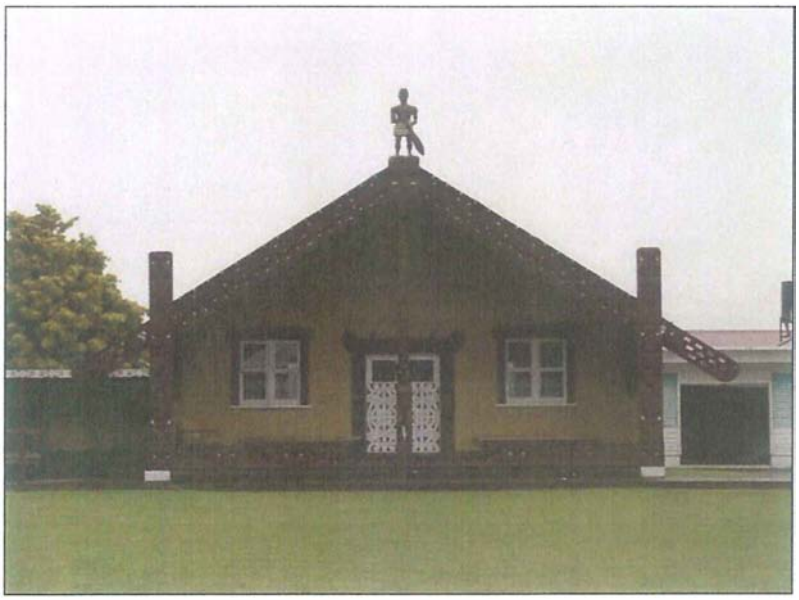

Plate 11: Parewahawaha marae, Bulls

Plate 12: Aerial view of Bulls district indicating Parewahawaha Marae

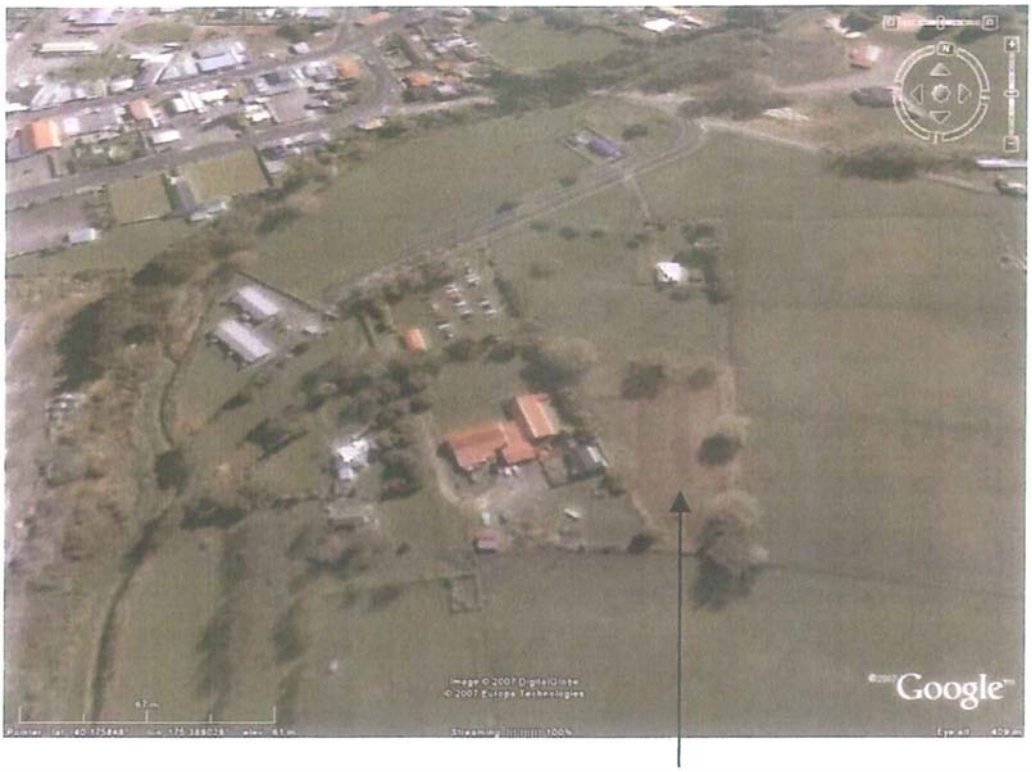

Plate 13: Parewahawaha Marae and surrounds - Section 141C2A Ohinepuhiawe block is the ploughed paddock to the right of the buildings

Plate 14: Ohinepuhiawe Block 141C2A (Spring 2005)

8.3.3 Cultural evaluation

Kosmos

Ngāti Parewahawaha and the whānau that whakapapa to the specific block of land under study align to Tainui waka as indicated in the following pēpeha:

Ko Tainui te waka
Ko Tararua te maunga
Ko Rangitikei te awa
Ko Ohinepuhiawe te whenua
Ko Ngāti Parewahawaha te hapū

Corpus

The marae trustees consider the value set which applies to this land is the same they identify for the marae and hapū in general. Table 8.4 identifies the core values and it is important to recognise they exist because of each other so cannot, and should not, be segregated from each other – in other words they exist as a holistic set of values. They are:

Table 8.4: Core values identified by Ngāti Parewahawaha

Whakapapa	Recognising whanaungatanga, the relationship between the people and the resource and all other components of the physical world which contributes to the continued well being.
Manaakitanga	Contribution to hospitality within the whānau and hapū group and with external groups – manuhiri. A contribution to mana.
Tikanga-ā-iwi	Recognising specific tikanga or processes appropriate to the hapū and iwi aligned to the resource and the whānau as recognised owners of the land under study.
Kotahitanga	Unity among all hapū and iwi alike
Wairuatanga	Spirituality – in all its forms. A recognition of a higher being and the relationship it has in our daily lives.
Kaitiakitanga	The responsibility to manage the resources for the benefit of all who may draw on them for their well being and for their identity – not just for the present generations but for all those yet to come.
Rangatiratanga	The ability to take control of the inputs and influences on our people and to make pertinent decisions which affect Ngāti Parewahawaha and all iwi – self determination
Mana whenua	Retention of our mana or status over the land resources which contribute to the identity and sustenance of the hapū

Source: P Richardson, Ngāti Parewahawaha (personal communication – 30 December 2005)

It is important to note these values are drawn from the same Māori worldview that Te Ātiawa base their value set for Wakatu lands and also the combined Māori membership of the Tahuri Whenua collective. Additionally, it is important for the hapū and whānau owners of this block to be mindful of the history of the occupation of Ngāti Parewahawaha on the land block and the relationship all families of the hapū have to the block.

Praxis

The lands are known to be fertile alluvial flats and have been used for a range of returns in past decades from pastoral to horticultural. Ngāti Parewahawaha fully understands the origin of the silt soils through the flood actions of the Rangitikei River and that they originate from the headwaters or catchment of the river itself. Neither the block nor marae land are prone to any frequent flooding; the February 2003 floods reached the boundary of these lands but did not flood them *per se.* The proximity of the land to the marae and papakāinga or settlement also impacts on the potential utility of the land. The ideal scenario for the hapū is that this land takes advantage of its natural fertility and proximity to the community through being utilised for intensive horticultural production, primarily food crops, which will benefit the whole community.

8.3.4 Physical evaluation

Environmental

Section 141C2A Ohinepuhiawe Block lies directly off Domain Road, Bulls flanking the eastern boundary of Parewahawaha marae. It is on the river terrace aligned to the Rangitikei River which flows some 200-300m east of the block. The topography is flat and the block has good access from the road and via the marae. In recent years the block has been cropped in annual crops such as pumpkins, potatoes, and kānga to supply the marae and allowed to revert to weedy growth during off-season periods. Currently (late 2006) there is re-growth of weeds often found in pasture such as Californian (*Cirsium arvense)* and Scotch *(Cirsium vulgare)* thistles and broad-leafed dock *(Rumex obtusifolius)* and a number of other weeds which would need to be cleared before any intensive production system is instigated.

Water can be sourced from the town supply through the marae for any irrigation purposes. No shelter exists specifically on the block and this may need to be considered for any change in land use. Fencing is satisfactory for the present land use.

There is opportunity for the marae trustees to enter into lease arrangements with several owners of neighbouring land blocks to increase the available land base for any horticultural initiative. This includes 2 hectares belonging to the Rangitikei District Council on the opposite side of Domain Road.

Soil

Based on the information recorded for this district the soil type for this block is a soil classified as Rangitikei fine sandy loam. This soil is classed as a rapidly accumulating Recent Soil which occurs on the relatively frequently flooded low river terraces. It is a well drained soil with a fine sandy loam texture and relatively thick top horizon. Generally this is a naturally fertile soil and can be used for fattening stock, dairying, grazing and cropping on areas protected from flooding. Pastures on these soils tend to dry out during summer (Campbell, 1978; Cowie, 1978).

Soil Samples

The latest soil sample was taken on December 30th 2005. A composite sample (10 cores from a 15-cm depth) was collected on a diagonal through the accessible centre of the block. The soil sample was analysed following standard soil testing procedures by R J Hill Laboratories Ltd, Ruakura, Hamilton (at the request of the trustees for comparison purposes with earlier tests).

Soil Test Results

Tests were undertaken for key nutrients used in determining the fertiliser requirements of pasture and horticultural production. The results are summarised in Table 8.5 (See Appendix 10 for soil test results). The 2005 results are similar to the results of soil tests taken in 2003.

Table 8.5: Soil test results - Section 141C2A Ohinepuhiawe Block, Parewahawaha

Soil Test	Parewahawaha Nov 2003	MAF Quicktest	Parewahawaha 2005	MAF Quicktest
Olsen-P (mg/litre)	6.7	6	6	6
Available N (kg/ha)	-	-	113	113
K (me/100g)	0.60	8	0.44	8
Calcium (Ca) (me/100g)	-	-	7.8	8
Mg (me/100g)	-	-	1.39	28
pH	6.0	6.0	5.9	5.9
CEC (me/100g)	-	-	15	15
Organic Matter (%)	-	-	5.2	5.2
Base Saturation (%)	-	-	65	65
Soil Volume (g/ml)	0.83	0.83	0.88	0.88

g = grams; me = milliequivalent; ml = millilitre; kg = kilogram; ha = hectare

Results Analysis

Based on these results the nutrient status can be summarised from the results with regard to future horticultural use, primarily taewa production, as:

- Phosphorus is available at an extremely low level
- Potassium is present at a low level
- Magnesium is present in a moderate level
- pH 5.9 is slightly low but acceptable
- Soil volume (bulk density) at 0.88 is good
- CEC at 15 is acceptable
- Nitrogen at a rate of 113 kg/ha is low
- Organic matter content is relatively low

Based on the above results, the nutrient status of this block is lower than desired for any horticultural development. The very low phosphorus level will need to be addressed before any further land use (agricultural or horticultural) is considered or applied to the block. A fertiliser programme which targets superphosphate and potassium or N:P:K products will

initiate improvements to this block and can be applied over several seasons to gradually improve the soil nutrient status.

The soil pH of pH5.9 is at a slightly acidic level but acceptable for a change in land use to taewa production. The pH should be maintained at around 6.0 for taewa crops. The soil volume of 0.88g/ml is acceptable, and with time and the correct soil management programme such as minimal tillage, the soil structure will continue to improve.

Spatial

There is a considerable range of horticulture production in the general Bulls-Rangitikei region. Arable and vegetable cropping are commonplace and range from potatoes, asparagus and squash to grain crops and hay and silage. Some smaller, more intensive, horticultural operations also exist such as cut flower and specialist nursery producers covering a wide range of crops from roses through to shelter tree species.

Palmerston North lies approximately 25 kilometres to the east and is the centre for agricultural and horticultural activities in the region with a considerable number of support industries located there. Feilding and Marton are both nearby towns which also have a number of agricultural support industries and potential markets. Bulls is located at the junction of State Highways One and Three between Auckland, Wellington and Wanganui/Taranaki and offers considerable opportunity to transport produce or goods between many locations in the North Island.

Climate

The Rangitikei region has a temperate climate with an average rainfall of 950mm per year, spread relatively evenly throughout the year. It is one of the driest areas of the North Island and inadequate rainfall during the summer months may affect any production system. Hailstorms are infrequent with up to 7 occurrences annually during winter or spring. The Rangitikei/Manawatu region records up to 2000 sunshine hours per year with an average summer temperature of 17.7°C and 8.9°C during winter. February is the warmest month with a maximum average temperature of 22.5°C and July the coldest with an average

minimum of 4.4°C. Frosts are a common occurrence with nearby Ohakea recording an average of 44 ground frosts annually – predominantly over the winter months through to October. However, the mean annual soil temperature is 12.7°C at 10-cm depth. The predominant winds are from the northwest followed by the west or southeast winds (NZMS, 1982).

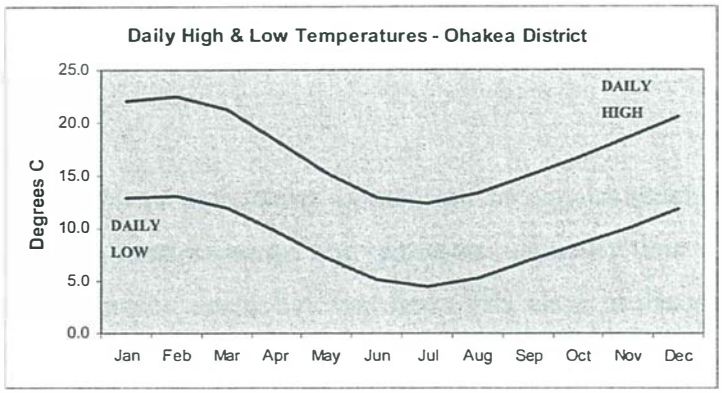

Figure 8.3: Climate data, Ohakea District – Temperatures (monthly averages)
Source: NZMS, 1982

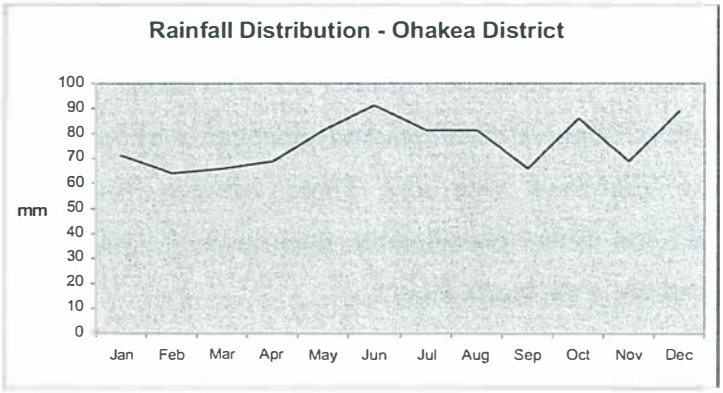

Figure 8.4: Climate data, Ohakea District – Rainfall distribution
Source: NZMS, 1982

8.3.5 Capital evaluation

Structural

Very little structural capital exists for the trustees to access for horticulture land use. The marae is in the adjoining block and provides toilet and staff facilities as required. Access to

tractor and harvest machinery for taewa is already determined on a cooperative basis with local hapū members.

Investment

The ability to invest in a new production system is limited due to the nature of the ownership structure applied to the block and the arrangement the marae trustees have for its use. The trustees will always be restricted in their ability to invest financially in new initiatives on land over which they have limited governance and need to look at broader options e.g. iwi or government policies to achieve this.

Natural

The block is located within the town boundary and has access to town supply water, good roading, transport and storage facilities.

People

Whilst there is a recognised need to consider the skill base accessible to the trustees, because the economic utility of a single land block is unlikely to create a full-time employment position, the initiative will depend on part-time input from key people within the hapū. A key output for the hapū will be the growth of any crop production system to creating employment and training opportunities and thus a level of self-sustainability for the future.

8.3.6 Economic evaluation

The SWOT analysis (Table 8.6, following page) identifies key limitations and advantages with regard to taewa production on the Section 141C2A Ohinepuhiawe Block.

8.3.7 Summary

The Ohinepuhiawe 141C2A block is limited in size and investment opportunity however it does present itself as a suitable resource for taewa production. The Ngāti Parewahawaha trustees are forward thinking in their desire to initiate a production system on land available to them which could be built into a successful operation through strategic management and

direction over the next few years. They have a strong foundation in their culture and values which will not be compromised in a change of land use to taewa production. The cultural component of their management system could in fact be a positive factor in the future production and/or marketing of their produce.

Table 8.6: SWOT Analysis: taewa production on Ohinepuhiawe 141C2A

Strengths	Weaknesses
• Access directly off public road • Central location • Flat topography of the block • Access to advice and/or expertise as required • Cultural integrity aligned to block & future outputs • Knowledge of block history & characteristics	• Relatively small area of land • Limited investment opportunity • Available resources – in machinery, structures and labour • Skill/expertise in horticultural cropping systems • Reliance on one or two key people
Opportunities	**Threats**
• To create a niche product aligned to hapū • Potential seasonal market in region • Extend production into related areas e.g. training • Contribute to hapū and/or marae development • Other available land nearby	• Lack of investment opportunity • Public scrutiny if reliant on public funding • Small and monocultural operation

A key strength for the trustees is their intimate knowledge of the land block, soils resource and physical attributes in the locality. Their continuous occupation of the block and wider relationship with allied resources such as the Rangitikei River means there is a body of knowledge which can be used beneficially in the future land use on the block. This case study has further identified some key cultural indicators for future assessment of land including: whakapapa association to the land, iwi and hapū based values, an intimate knowledge of resource characteristics and historical utility and the aspirations of the people for sound and economic utility of the resources.

8.4 Case Study 3: Tahuri Whenua Inc. Soc.

8.4.1 History of establishment

There is an old whakatauāki that draws on a horticultural analogy and supports the collective approach being pursued by Tahuri Whenua Inc. Soc: *Anei te ringa tango otaota.* ('Here is the hand that does the weeding'; a compliment to industriousness).

During 2004 a core collective of Māori vegetable producers took their needs in hand and established a representative body which was approved by the Inland Revenue Department and registered as an incorporated society. The entity is Tahuri Whenua Inc. Soc. (Tahuri Whenua); translated in simple terms as, returning to the land. Tahuri Whenua is based in Palmerston North however its membership and governing committee are drawn from throughout New Zealand from Kaitaia to Riverton. Members range from individuals to iwi, hapū, whānau or trusts as well as some schools and Māori centred entities. They represent their own land and horticultural interests which are as diverse as their locations and management structures.

While Tahuri Whenua has been established to represent the Māori interest in the vegetable sector, it is also broad enough to consider related matters such as traditional and non-traditional production systems, markets, indigenous branding, education and research needs. Thus far there has been widespread and positive support from the growers involved and from the general horticulture sector.

Tahuri Whenua was established to provide a national Māori entity representing Māori interests in the horticultural sector. The rationale behind the establishment of Tahuri Whenua includes (Roskruge, 2004):

- The need for a Māori presence in existing sector interests such as HortNZ, MAF and training and research institutions – there is a need to participate in, rather than compete with, such structures.
- The need for a structure which could participate in the sector and also provide for tikanga, mātauranga Māori and other components of the modern Te Ao Māori.

strategic plan and is used to facilitate the day-to-day operations of the organisation to achieve its core objectives. This plan highlights a number of actions the collective need to consider for the future including:

- Purchase professional input where possible
- Create policy for information management
- Create templates for relationships, quality assurance, monitoring and evaluation and reporting
- Ensuring support systems exist for the kaumātua group (within Tahuri Whenua)

Dispute Resolution Plan

An important need identified in the operational plan is a dispute resolution process suited to the organisation which draws on both cultural and ethical values, potentially unique to the organisation itself. This is a risk management tool used to prevent the breakdown of relationships.

Education Plan

Tahuri Whenua is well aware of the need to consider education, training and development within the Māori community to work towards positive economic development for Māori and preparing upcoming generations to succeed the current managers of the land resources and culture to be the future leaders within New Zealand society for generations to come.

Policy Development Plan

The strategic plan for Tahuri Whenua identified two key objectives that are the basis of the policy development plan:

1. To promote a collaborative Māori approach to horticulture within the wider horticulture industry, and
2. To facilitate full Māori participation in the horticulture industry.

Communication Plan

Communication is one of the key objectives to facilitate full Māori participation in the horticulture industry. This can only be achieved through sound and consistent communication processes which support and compliment the core business of the Tahuri

Whenua collective. The communication plan is a tool to assist in identifying how to participate with all stakeholders and the community of interest relevant to the core business of the entity. It also takes advantage of all the various communication technologies and processes available in the current business world.

Tahuri Whenua Inc. Soc. has had a very positive beginning in terms of development and entrenchment within the industry and Māori society and one where they are gaining wide acceptance by the horticultural community. A lot of effort has been applied by members to getting the kaupapa or purpose out to the community and there is now around 200 members including individuals, kaumātua, growers, supporters, schools, marae and trusts.

8.4.3 Land use decision systems and taewa production

Tahuri Whenua have been in a key position to contribute to the assessment and decision criteria Māori land owners access in the process of determining any proposed change in land use. The collective has been able to provide some direction to Māori land owners entering the commercial horticultural sector, including the opportunity to network and interact with other producers (and potential producers) in both formal and informal fora (hui). In recent years the growing consumer interest in taewa or Māori potatoes has created a demand for this product. As the bulk of the seed tuber stock needed to produce commercial volumes of the crop are held by Māori interests, the opportunity for Māori to bring land into commercial production to meet consumer demands is high. Tahuri Whenua has been able to act as an unbiased conduit of information regarding cropping systems for taewa and cultural considerations for producers.

Alongside the flow of information between Tahuri Whenua and its members there is also a growing input from research and development opportunities (and outputs) which the collective has been able to facilitate in its capacity as a national representative body. An example of this was a project which used tissue culture techniques to eliminate inherent viruses from the seed tuber stock of taewa. This was achieved over a three year process and has now reached the stage where the virus-free stock is being bulked up for commercial producers and will become available to the members of the collective in the very near

future. This is seen as a positive contributor to the economic returns producers of the crop can gain from their resource. More research projects aligned to taewa and other 'indigenous' crops have been strategically identified and will be contributors to the Māori horticultural sector in future years.

8.4.4 Summary

By creating an entity specifically to build on the positive contribution of Māori and Māori resources to the economy through horticulture, Māori have also created an entity that can look to identifying and recording mātauranga Māori relative to traditional horticulture and pedology or soil science. Ethnopedology has not been formally acknowledged or researched at this point in time. It is timely to attempt to capture more information, in whatever form, that can contribute to the remnant of knowledge apparent to Māori today. The elder generation within Māori society are the last repositories of this type of knowledge in a primary data format, i.e. they practised and learnt their knowledge first-hand. The majority of subsequent generations will be exponents of secondary data relative to pedology i.e. they will have been taught or exposed to the information through a primary source. This signifies an important role for the Tahuri Whenua collective in both collecting the relative mātauranga through culturally appropriate means to be managed, including dissemination, by Māori for Māori and educational resources. This will contribute to the rangatiratanga of Māori as a whole and ultimately the economic opportunity for Māori.

This case study has identified a generic pan-Māori approach to horticulture in the 21st century. From this approach several factors are identifiable that can contribute to cultural indicators for Māori land assessment. Primarily the whakapapa relationship of landowners to the resource is undeniable. The diversity of knowledge relative to historical and contemporary horticulture and soil management is very apparent as is the knowledge held by individuals and communities alike regarding historical land use and the 'ki uta ki tai' concept of a resource from its source to its natural end. Lastly, the aspirations of Māori as a whole to their economic future through horticulture and appropriate resource (and soils) management are becoming more and more important to successive generations.

Plate 15: Tahuri Whenua hui, Te Keete Marae, Otorohanga, 2003

Plate 16: Hāngi to complete harvest activities, Tahuri Whenua members, 23 March 2006

8.5 Chapter summary

The case studies have introduced three quite distinct Māori entities aligned to land resources, horticulture and the management of soils in particular. The intent of undertaking a multiple-case approach was to highlight the variability within the Māori community of the identification and application of cultural values in their soils assessment and horticultural activities and also recognising that evidence drawn from multiple case studies is often considered more compelling in the overall study and therefore considered more robust (Yin, 1994). The key points identified through these case studies are ultimately contributors to the overall investigative processes and will add to the validation of the model presented in this thesis.

All three entities – Wakatu Inc., Ngāti Parewahawaha Hapū (Trustees) and, Tahuri Whenua Inc. Soc. – base their existence in whakapapa processes which identify them as Māori entities. They identify a suite of values which are considered the basis of their activities. This value suite is not necessarily exhaustive or binding on the entity and is also variable between entities, ostensibly because of the diverse inputs each receives from its stakeholders. The affiliation however, between the whakapapa element and value suite, is highly pertinent to each entity and reflects their history, experiences, future directions, expectations and relationships, ultimately identifying them in a distinctive way.

As examples of Māori participation in horticulture and soil or resource management in the 21st century, the case studies have also identified the fact that Māori participate at different levels in the primary sectors, even within their own community, and that some are more inclusive of traditional mātauranga and systems inputs, whether or not they have been validated through any external processes. The locus of traditional knowledge is shown to be important to the decision criteria applied by land owners and this locus is invariably influenced by the cultural tikanga of the same land-owners or decision making group. It is a unique body of knowledge which is seen to compliment the land management processes and the ability of the landowners to participate in New Zealand's horticulture industry.

Chapter 9: Model

9.1 Introduction

In the introduction to this thesis it was stated that the thesis aims to produce a distinctive framework or model for the horticultural development of Māori resources, primarily land, inclusive of tikanga Māori and indigenous production systems based on the unique body of knowledge aligned to Māori. The integration of this knowledge with western science will be argued and applied through the framework or model itself.

9.2 Establishing a framework

A framework is a tool for converting observations into insights, useful for explaining development already achieved and to provide a basis for thinking about the future (NZIER, 2003). The term model is used by scientists to convey an implication of order and systems approach to theory. Models are ultimately a simplification of information drawn from paradigms or larger bodies of knowledge that allow for the examination of relationships between factors (Hoover & Donovan, 2001).

9.3 Māori resource assessment model

This Māori resource assessment model has been formulated drawing from all the current assessment tools applied to horticultural land use in New Zealand and the mātauranga or body of traditional knowledge existing around land and land use. Primarily the cultural component is formulated in response to the mātauranga identified in this thesis and is focussed on three areas; whakapapa and the values aligned to it, pedological knowledge and horticultural knowledge.

The model is presented in four configurations:

1. a diagrammatic representation of the assessment factors (Figure 9.1);
2. a table identifying the four critical assessment fields, subfields & indicators (Table 9.1);
3. a breakdown of cultural indicators (Table 9.2); and,
4. an implementation pathway (Figure 9.2).

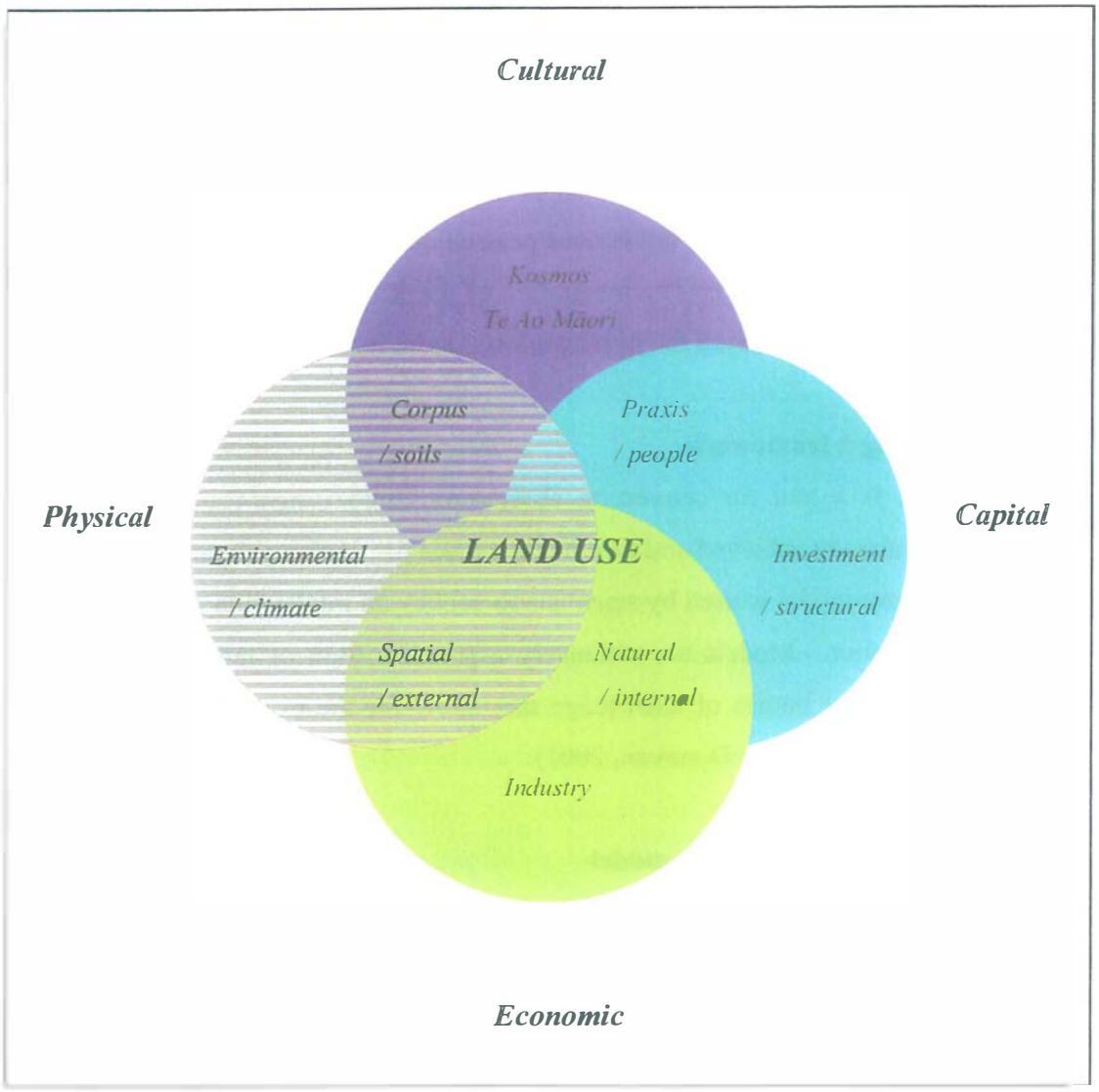

Figure 9.1: Visual representation of Māori resource assessment model

The visual representation in Figure 9.1 is a simplified systems approach to the assessment tool which also indicates the overlaps between assessment (sub)fields and ultimately the holistic nature of the relationship between factors which will contribute to the final decision on the land-use opportunity. The breakdown of the assessment process into four quadrants is important as it recognises the different influences on Māori land and on Māori management processes and allows for their interaction with each other and within the system as a whole.

Table 9.1: Model for assessment of Māori land

	Fields	Sub-fields	Indicators
Cultural (x_1)	Kosmos	Te Ao Māori; Whakapapa, [of whenua and owners]	*Cultural Indicators (CI) as determined by iwi/hapū/whānau e.g. historical land use or crop choice (Refer to CI Table 9.2, page 197)*
	Corpus	Mātauranga (incl. traditional horticulture & pedology)	
	Praxis	Tikanga (incl. people)	
Physical (x_2)	Environmental	Topography, flood/ erosion hazards, water resources, windrun	*Based on appropriate technology where individual factors are ranked additively or incrementally according to their influence on land use*
	Soil	Physical – drainage, texture wetness, WHC, structure, stoniness, biological, temperatures, potential root depth, Chemical -pH, CEC, organic matter, nutrients	
	Spatial	Topography, mapped characteristics, location, regional infrastructure	
	Climatic	Frosts, rainfall, sunshine hours, temperature, hail, wind, GDD, chill period	
Capital (x_3)	Structural	Buildings, roading, water reticulation, fencing	*Census of capital and identification of standing value to land use*
	Investment	Equipment, land area	
	Natural	Shelter, water, location	
	People	Skills, experience	
Economic (x_4)	Industry	Politics, research & development, technology	*Review of external and internal factors e.g., SWOT or PEST analysis*
	Internal	Ownership structures, political factors, skills	
	External	Markets, services, political, location, education	*Include owner aspirations*

The model is created using the analogy of $Y=f(x_1, x_2, x_3, \ldots x_n)$[84]. Here Y is the assessment decision or output (i.e. suitable horticultural activity) which is a function (f) of a series of four critical factors (x_1 to x_4); cultural, physical, capital and economic.

[84] Analogy drawn from principles introduced in McPherson *et al.*, 1970

9.4 Cultural Indicators (CI) for Māori land assessment model

Accepting that indicators and ranking systems exist for the physical, capital and economic assessments, indicators suited to the cultural (Māori) assessment in relation to a horticultural option and soil resources can be relatively specific. The cultural indicators identified (refer to Table 9.2) are all drawn from the *kosmos* element, similar to the overarching goals and objectives any business entity would establish as their guiding principles for their future success. The indicators are all applicable to land management in a horticultural context and will also contribute to the maintenance of the mauri (life force or cultural integrity) aligned to the resource as well as the cultural association or whakapapa of the community of interest to the resource.

It is important to apply the cultural indicators in context with the remaining assessment as they cannot, and should not, be isolated because any future land use will be influenced by all these factors in some way. The key point of difference for this model is the identification and application of cultural indicators that impact on land use, present and future. There is also a variation from most other ethnopedological research which focuses on communities and knowledge primarily related to subsistence economies and therefore with a different relationship to the soil resource than contemporary Māori who now live in a non-subsistence economy.

Māori cultural indicators are primarily drawn from the whakapapa link to the resource and to others who have an interest in the same land. Of the indicators identified, not all can be modified to meet the needs of any change in land use. Whakapapa is an example of a unique Māori element to be considered in assessment processes which cannot be modified in any way. The identification of values, kaitiaki or mauri also draws from the unique Māori element and is strongly aligned to the group who have primary rights over the land. However, some other Māori or cultural elements such as the knowledge of, or application of, traditional knowledge systems can be modified through continued learning or exposure to that element. The traditional knowledge and management applied to the soils resource may also allow for modification of the soil as appropriate to any change in land use.

Table 9.2: Cultural Indicators (CI)

CI	Definition	Key points	Modifiable Y/N
1. Whakapapa	Within group; relationship to the resource; kaitiaki role	Whakapapa of group Whakapapa of resource including taxonomy of soils	N
2. Tū tangata	Skills/expertise within [iwi/hapū] group	Census of group – identify skills and skill gaps	Y
3. Values (kaitiaki)	Cultural value set or priorities applicable to the resource	Whakapapa, mātauranga, tikanga, agreement of group. Identify kaitiaki	N
4. Mauri	Quality of the resource	Identify status of mauri of resource and factors which affect it	Y
5. Historical land use	Earlier utility & when; productivity of land – role as mahinga kai*	Whakapapa, mātauranga, identified by discussion with land users, neighbours	N Y
6. Horticulture - traditional	Knowledge or application of traditional systems	Mātauranga and tikanga associated with these factors	Y
7. Horticulture - contemporary	Knowledge of contemporary systems and opportunities	Mātauranga and tikanga associated with these, especially markets/products	Y
8. Soil – physical	Knowledge of texture, structure, moisture and landform	Assessment based on cultural interpretation of these factors	Y
9. Soil – biological	Knowledge or presence of key vegetation or biology e.g. earthworms	Visual assessment based on cultural interpretation of these factors	Y
10. Soil – other	Fertility, workability, response to climate	Assessment based on cultural interpretation of these factors	Y Y
11. Soil – limitations	Knowledge of key limitations e.g. water holding capacity, erosion, stoniness	Whakapapa, mātauranga, discussion with land users, neighbours	Y
12. Ki uta ki tai (landform)	Knowledge of site to wider resources e.g., origin of water table, erosion type	Whakapapa, mātauranga, identified by discussion with land users, neighbours	N N Y
13. Te Ao Hurihuri (the future world)	Aspirations of the people to the resource	Petitioning of group – identification of goals and objectives	Y

* Mahinga kai; harvestable food resource

It is expected that these cultural factors will compliment the remaining assessment through the introduction of another dimension to the land resource and the ability of this dimension to contribute to a wider economic approach to the resources for the Māori community.

9.5 Decision matrix

The inputs to this model are based on functional relationships between knowledge and proposed outcomes in land use. The full assessment must be amalgamated and considered in a decision process to determine the final outcome and consideration of the change in land use. Using the analogy already identified of $Y=f(x_1, x_2, x_3, \ldots x_n)$ where Y is the assessment decision or output (i.e. suitable horticultural activity) and is a function (f) of four critical factors (x_1 to x_4); cultural, physical, capital and economic, the relevance and weighting given to each factor needs to first be determined by the land owners. An example of the decision matrix would be a bifurcating truth table where crops will succeed if all input requirements are met or fail otherwise, or additive factors where each additional factor is combined additively and applied to the appropriate approach/utility or, where limiting factor relationships are identified and applied. An example follows as Table 9.3:

Table 9.3: Sample decision matrix using success/fail approach.

Assessment	Field – critical factors	Limiting yes/no	Appropriate yes/no
Cultural x_1	Kosmos – Te Ao Māori	*To be determined by land-owners with input from cultural, technical and business experts*	
	Corpus – Mātauranga		
	Praxis – Tikanga		
Physical x_2	Environmental		
	Soils		
	Spatial		
	Climatic		
Capital x_3	Structural		
	Investment		
	Natural		
	People		
Economic x_4	Industry		
	Internal		
	External		

9.6 Implementation pathway

An implementation pathway has been diagrammatically prepared for the benefit of the community of interest who would become the primary applicants of this assessment model. This pathway summarises all the key factors already introduced as part of the model itself.

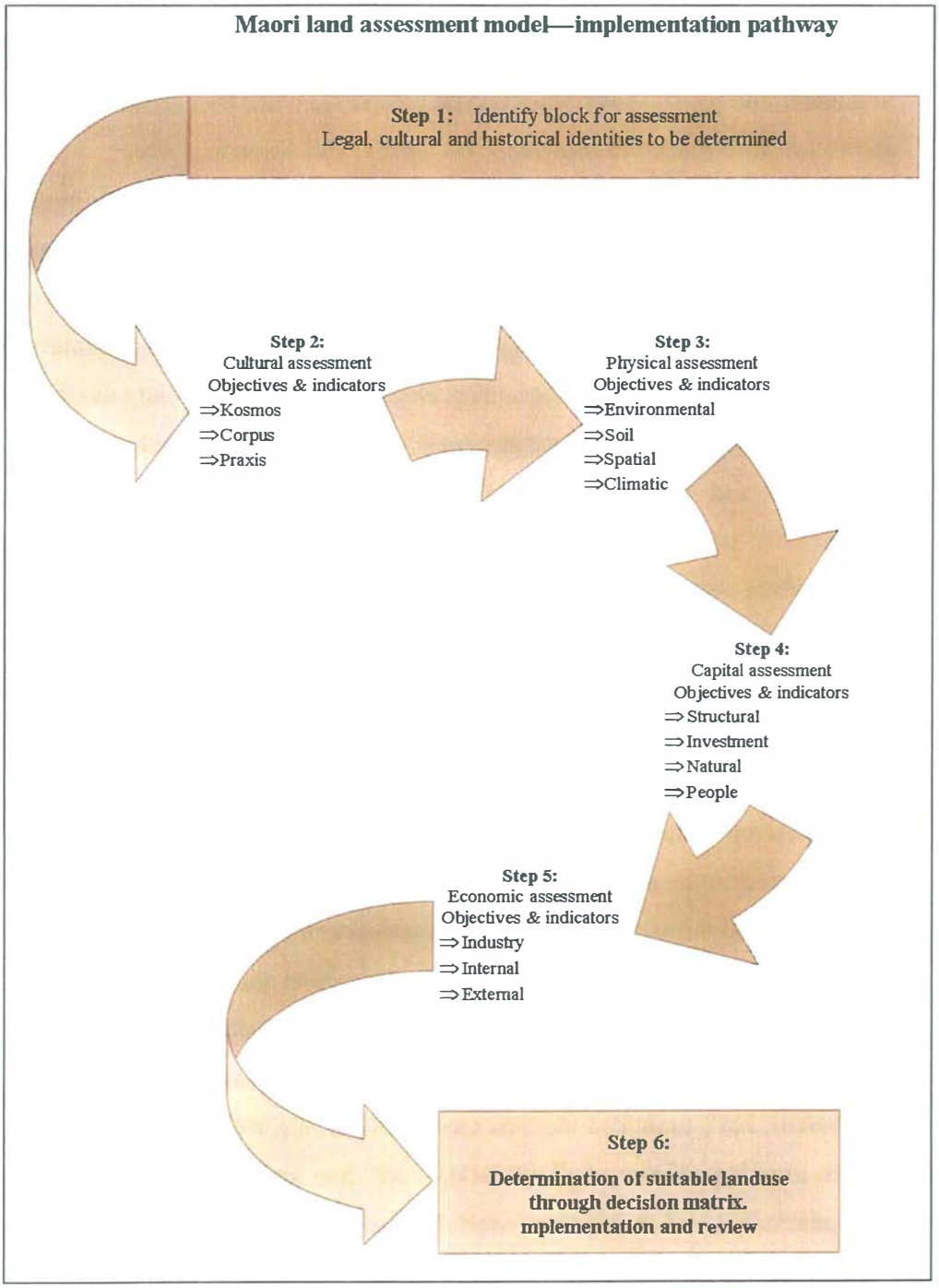

Figure 9.2: Implementation pathway for Māori land assessment model

9.7 Physical indicators

Several approaches to the physical assessment of land for future land uses in New Zealand are well established and documented (for example Webb & Wilson, 1994), such that other than identifying the range of attributes normally assessed and aligning the attribute standards to an intended horticultural use, no further comment is required.

In general, the physical attributes can be categorised into four areas or fields for assessment and follow through: environmental, soil, spatial and climatic.

1. *Environmental* – includes the assessment of localised and regional environmental factors such as erosion risk or hazards, flood risk, accessible water resources and quality, impact from or to other resource uses, topography and so on.
2. *Soil* – usually segregated into physical and chemical sub-fields for assessment. Physical will include the drainage characteristics of the soil, water holding capacity (WHC), wetness limitations, structure, texture, stoniness, biological components, water budgets and temperature variations. Chemical includes a range of assessments, primarily undertaken on soil samples in a laboratory. These include, pH, CEC, phosphate retention, organic matter levels and specific nutrient levels, and should be undertaken with the future land use in mind.
3. *Spatial* – this field is in reference to the relationship of the physical resource to its wider location. There has been considerable work undertaken over many years which maps resource catchments, soil, climatic and physical characteristics and the influence of location on land use options. This information needs to be drawn together and considered in the decision matrix. The historical land use of the land under assessment and regional infrastructure are also important and need consideration under this field.
4. *Climatic* – if horticultural land use is the option then climatic factors are crucial to determining the final crop choice. Climatic factors will include; frost – frequency and severity; rainfall, sunshine hours and temperature – monthly highs and lows and annual amounts; hail, snow and wind factors; chill periods, risk evaluations of wet or dry years and growing degree days (GDD). All are standard meteorological factors and requirements are reasonably well known for most crops, more so than the soil requirements for crops.

9.8 Capital indicators

Four fields have been applied to the capital assessment; structural, investment, natural and people. A census of all four fields needs to be undertaken to contribute to the decision process. Aside from the availability of capital, the quality and valuation of the capital needs to be considered along with any need to invest in maintenance or upgrades to ensure its' utility. Any limitation in capital can have a significant effect on final land use options.

1. *Structural* – this field is in reference to the structural or physical capital in the form of buildings, plant, roading, infrastructure e.g. fencing or water reticulation, which will be available to future managers of the proposed production.
2. *Investment* – essentially the financial position of the assessment, especially in the value of technology and other resources – including land – available to future production.
3. *Natural* – capital in this form can be identified in the form of natural shelter, access to water – including springs and water courses, access or utility of other resources, location to key resources or facilities, and the condition and maintenance costs of these assets.
4. *People* – a two-pronged approach to the 'people' component of the assessment approach is required. Firstly a census of the group aligned to the resources needs to be undertaken to identify potential skills and experience that could contribute to the change in land-use. Secondly, it is important that land development for Māori is not independent of people development in some form. There is a need to recognise the opportunity to build the skill base of the group through an alliance to education and training initiatives aligned to the future land use e.g. horticultural cadets through the industry training organisation (ITO).

9.9 Economic indicators

There are three core areas to consider in an economic assessment, all of which can have a major impact on any future, or change of, land use; industry, internal and external economic factors. The economic assessment follows the norm for any business approach to a change in core business activity and can be achieved relatively simply. The use of PEST (political, economic, social and technological) or SWOT (strengths, weaknesses,

opportunities and threats) analyses are simple tools to contribute to any economic review. Identifying the internal and external economic factors is important for managers to be able to respond appropriately to them. A SWOT analysis is a simple tool to help achieve this distinction with strengths and weaknesses targeting internal factors and opportunities and threats targeting the external ones.

1. *Industry* – within any industry, and this is especially pertinent to the primary industries such as horticulture, there will be established policy aligned to the industry identifying the status and strategy of key areas that will impact on future participants in the industry. These may include; political positioning e.g. in bioprotection; research and development priorities; employment; technological directions and so on.
2. *Internal* – a range of internal economic factors (including the financial position of the land owners) will impact on any consideration for land use. These may include; ownership structures applied to the land resource or other capital items, ability to access finance, skills and experience levels and willingness of individuals to contribute, condition and value of resources, and any cultural factors which might impact on it.
3. *External* – there will always be factors beyond the control of the landowners which will impact on future land use options. Some of these factors will include national and regional policy e.g. government or territorial authority policy directions, markets – both onshore and offshore (local and export), prices paid by consumers, access to, and quality of, services including technical advice, location (both strengths and constraints) and education.

It is important to consider that all these assessment fields have the ability to contribute positively to the decision criteria land owners will consider with a view to the assessment of land use opportunities. In many decision systems the decision criteria focus on identifying negative factors and understanding the limitations each criterion can operate under rather than the positive contribution they can make. This mindset needs to be challenged and the assessment process built on identifying the positive factors present within any group and their aligned resource. By understanding the positive factors the landowners can grow them to benefit their economic situation overall.

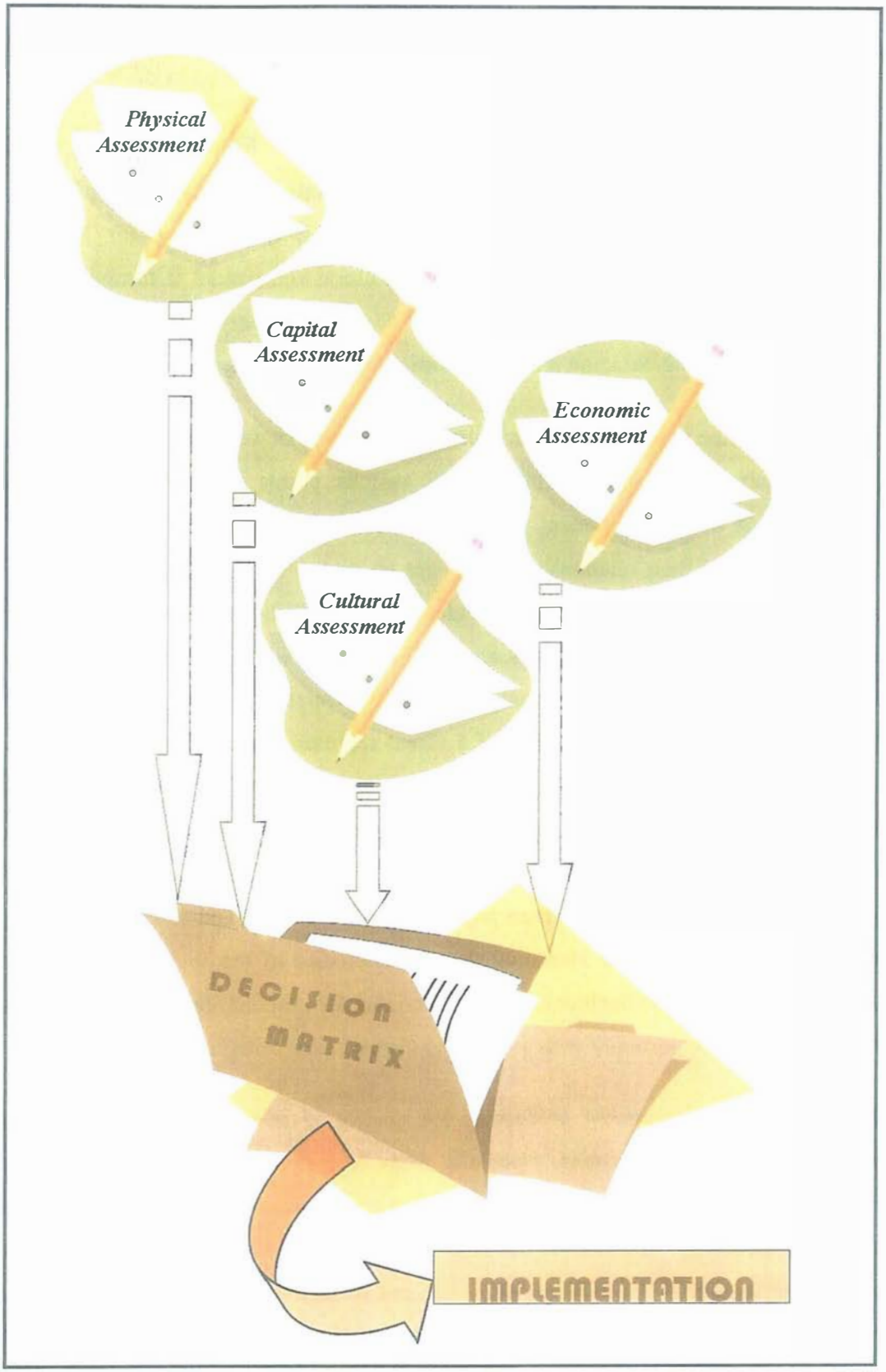

Figure 9.3: Visual representation of data collection within model

9.10 Chapter summary

The Māori resource assessment model presented has been created from both the contemporary assessment tools currently applied to horticultural land use in New Zealand and the mātauranga or body of traditional knowledge existing for Māori around horticulture, soils or land and land use. The cultural component is formulated using the mātauranga identified in this thesis aligned to three areas; whakapapa and the values aligned to it, pedological knowledge and horticultural knowledge.

By presenting the model in four configurations it can be viewed from different perspectives and therefore sustain its credibility from various points of view. The diagrammatic representation of the assessment factors (Figure 9.1) puts the key points in a systematic format indicating their relationship and effect on each other. A further breakdown of the information is provided in the table that identifies the critical assessment fields, subfields & indicators (Table 9.1) supported by another breakdown of cultural indicators (Table 9.2) which gives more specific information for implementation. Lastly, the implementation pathway (Figure 9.2) is an example of a visual representation for lay-people which gives another dimension to the overall process of assessment and is intended to simplify the information into a single visual presentation. The model is ready for application and could be applied, for example, on the case study at Parewahawaha. Here the land under assessment is clearly identified both physically and culturally and assessments undertaken for the study have already identified the characteristics of the resources. Based on the summary facts (pg 184) the block would be suitable for initiation into taewa production or a similar cropping opportunity with some clear management criteria also apparent.

The crux of the assessment process is the quality of information used to support the assessment of Māori resources, especially from the cultural perspective. The preceding chapters which have looked at the Māori cultural paradigm, traditional horticulture, traditional pedology, and various decision systems have been purposefully constructed to act as contributors to the assessment model and to highlight the diversity and quality of information which land managers will have at their disposal. This cultural factor alongside the physical, capital and economic factors will add considerable value to the process of Māori land assessment and utility in the future.

Chapter 10: Discussion

10.1 Introduction

Models are ultimately a simplification of information drawn from paradigms or larger bodies of knowledge that allow for the examination of relationships between factors (Hoover & Donovan, 2001). The model presented is drawn from the broad knowledge bases aligned to Māori specific or traditional knowledge related to horticulture and soils management. It is then integrated with scientific knowledge through physical assessments and complemented from an economic perspective through the capital and economic focussed assessment criteria. The result or output is a determination related to land use or crop choice that is acceptable to both the cultural and scientific paradigms landowners would ordinarily have access to.

10.2 Māori knowledge

New Zealand society has not looked to Māori as contributors to either horticulture or pedology in any serious way. Neither have Māori looked to these disciplines as their strength in any scientific representation of traditional knowledge. The review of these disciplines provided in the preceding chapters should help to dispel this incongruity and put in motion the role of Māori knowledge as a contributor to the future management of Māori resources and especially horticultural systems in a culturally acceptable way.

Māori are in a position to argue their body of knowledge as a broad representation of traditional horticultural and ethnopedological knowledge. It is not a new body of knowledge, just one that has been marginalised from public scrutiny for a number of reasons, not least colonisation, social impacts since the signing of the Treaty of Waitangi, and the move away from a traditionally rural environment to urban living for most Māori. Until now there has not been any opportunity to look to the traditional relationship between Māori and the soils resource as a contributor to the utility of the resource in the economic production of horticultural crops. Similarly, until recent years, most traditional crops grown in a Māori horticultural environment had been produced aside from the mainstream horticultural industry and had not been subjected to any scrutiny by scientists. That

ion is changing and the research industry is looking more and more at Māori ledge and Māori crops and foods as opportunities for research. Within New Zealand stablishment of Māori business managers at the majority of the Crown Research ites and various funding agencies such as FRST (Foundation for Research, Science Technology) and regulatory agencies like ERMA (The Environmental Risk gement Agency) bears testament to this.

vorld-view of any culture is ultimately the basis for the epistemology applied to that e. Some scientists argue that the supposed differences between local and scientific ledge should be rejected as a dichotomy. They perceive local knowledge as being l, non-systematic and holistic compared to scientific knowledge which is seen as systematic, objective and analytical and therefore non-comparable (Oudwater & n, 2003). There is an increasing trend however for science to recognise multiple types owledge and knowledge application and the disciplines of ethnoecology, ethnobotany thnopedology (even including farming-system sustainability) are an example of this ation of knowledge systems.

iadic approach of illustrating indigenous knowledge as proposed by Toledo (1992) is format for presenting this knowledge at a level of comprehension acceptable to both ndigenous and scientific communities. By also recognising the inextricable nship between the three criteria – Kosmos, Corpus and Praxis – those accessing this ledge are aware of the differences between the communities and the paradigms they under in the day-to-day application of their disciplines. The triadic criteria have led a consistent approach to identifying and discussing the knowledge relevant to pedological, horticultural and land management systems and thus for modelling ses.

Māori and horticulture

culture, Māori were traditionally living in a subsistence economy and heavily reliant op production by horticultural systems for survival. The gamut of horticulture led from land management systems, crop production for food and utilitarian uses, pest

and disease management, plant nutrition, harvest and postharvest systems, trading and hospitality opportunities, to production of seedlings and cuttings for future production. The knowledge base which evolved around the application of traditional horticulture for Māori was extensive and often highly specific to locations, groups, seasons, potential outputs and product uses. The skill of pre-European Māori horticulturists in adapting primarily tropical crops to a temperate climate on their arrival in New Zealand has also been acknowledged by a large number of published scientists and authors. Furthermore, they also applied their horticultural skills to the husbandry of new plants and crops drawn from the endemic plants of New Zealand. This skill represents an acute understanding of crop physiology and needs alongside an acute knowledge of the resources available to the manager, knowledge that is fine tuned even further as each successive crop or management process is applied or new crops introduced. Chapter six provides an introduction to the broad nature of traditional Māori horticultural.

Traditional horticulture is also recognised for the holistic nature of the systems applied in management of natural resources and the potential impact of any decisions on other elements of Māori society. In that regard Māori have developed highly sustainable systems over time, suited to their communities, population and demands on the resources. The creation and application of specialist cropping and soils knowledge supported by cultural tools such as the maramataka (Māori calendar) is evidence of this. Ultimately this knowledge is practised and retained as tikanga.

Tikanga as it was applied to traditional horticulture has been hugely influenced by the process of colonisation and the introduction of new economic processes. The introduction of new crops, pests and diseases, tools, markets, and more recently, technological advances, has impacted tremendously on traditional knowledge and systems. As well, most of the exponents of traditional horticulture have passed on and we now have a generation of Māori with different relationships and understandings of the resources and processes of horticulture. From this situation arises the need to create land assessment tools which satisfy both the cultural and scientific needs of contemporary horticulture.

10.4 Māori and soils

Barrera-Bassols & Zinck (2002) identified a number of research aims in their review of the discipline of ethnopedology. Aside from the capture of indigenous knowledge and behaviours aligned to the pedology discipline, they noted that a significant number of projects looked to the '*co-validation of ethnopedological knowledge, abilities and skills with modern soil science, geopedological survey, agroecological strategies, agricultural and other rural practices, to promote participatory land evaluation and land use planning procedures for endogenous sustainable development*' (ibid:6). Furthermore they noted that many indigenous groups have created their own land evaluation systems for agricultural purposes, generally requiring a sophisticated micro-environmental knowledge, and often more accurate than technical recommendations. This latter observation alone gives a level of credibility to indigenous evaluation systems however, the integration of both knowledge sources (indigenous and western) is deemed a '*promising new stream of research and application*' (*ibid:9*). The model proposed in this thesis contributes yet another system to the existing library of indigenous evaluation systems but ostensibly the first 'Māori system' focussed on soil resources.

A variation to this approach of integrating knowledge systems is inherent in the belief that in spite of any limitations that local knowledge systems aligned to soils (or horticulture) might have, the local taxonomies and linguistics provide information useful for understanding landscapes and can contribute to improving soil science classifications and mapping (Krasilnikov & Tabor, 2003). Over recent decades considerable indigenous knowledge, especially Māori, has been lost and the disconnection between folk and scientific soil management decision criteria has often wasted resources and affected the community's economic opportunities. The information drawn together in chapter four, especially the Māori soils nomenclature in Tables 4.1, 4.2. and 4.3, is partly an attempt to recapture some traditional Māori knowledge that has been overlooked in recent years.

There are difficulties in expressly applying ethnopedology in soil surveys because of the limitations with the localisation of knowledge and variability between members of a community (Tabor, 2006). One of the benefits however is the common means it provides

for a community to interact with pedologists (*ibid*). Barrios *et al.* (2002) applied a participatory approach with a selection of Latin American and Caribbean communities to identify and classify local indicators of soil quality related to permanent and modifiable soil properties which they then formulated into a tool to capture local demands and perceptions of soil constraints and management approaches. A core component of the tool is the level and quality of communication between technical officers and farmers or land owners, seen as having perhaps the most potential in their model to facilitate farmer consensus about soil related constraints to their [proposed] production systems. The interaction between technicians and experts and the Māori community is equally relevant to that of other indigenous communities.

Barrios *et al.* (2002) applied only soil quality factors in their model for indigenous farmers stating also that *'the indicators are identified from local and technical knowledge base and critical* [quality] *level defined.* (p601.3). They continue by identifying this as an integrative approach between technological and indigenous systems and that agreement is sought from all parties before any quality factors become accepted as a final quality diagnostic tool.

Soil resources are constantly being assessed for many and varied uses. Pressure from the community to benefit from the use or development of soils is mounting however our demands are changing. The concept of working with soil quality factors has become increasingly apparent as we recognise that sustainable management means more than just erosion control (Karlen *et al.* 2003). The Māori land resource is possibly the largest untapped resource in the primary sector of New Zealand and with it lies the opportunity to contribute to future national and Māori economic development. For owners to want to bring this land into development or look to alternative opportunities on already developed Māori land, it is important that the cultural aspect of their relationship to the resource is recognised and respected.

10.5 Cultural assessment

This cultural assessment model for Māori land resources looks to a range of cultural indicators, not just a set of soil or crop specific ones. Based on the holistic interpretation of

any affiliation to land by Māori, it is important to acknowledge the relationship that exists and the mātauranga that has developed as a result. The cultural indicators which are the basis of the model build on unique Māori relationships with the land resource and contribute to the quality and knowledge of the resource overall. Expressions of values and cultural factors such as mauri and whakapapa are definitive of the Māori knowledge around the land resource.

In some instances traditional knowledge merely informs the scientific community rather than integrates with it. It is important for Māori, especially in the context of rangatiratanga, that mātauranga Māori is a positive contribution to science, especially disciplines with which there is an obvious affinity such as horticulture and pedology. Therefore, mātauranga Māori is better represented through processes that encourage integration rather than being just informative in a secondary way to research.

10.5.1 Decision processes

The proposed cultural assessment model follows the trend of the 10 step decision making process (Boehlje & Eidman, 1984) in that the cultural assessment aligns to steps 1 and 2 (goals and objectives and problem definition) because the cultural factor needs to be considered at the point of determining the need for a decision. This is followed by the physical, capital and economic assessments in steps 3-6 and the implementation and review in steps 7-10. The following table (Table 10.1) indicates the relationship between the two models.

The outcomes of the assessment need to be applied to a decision matrix designed for the level of output under consideration and to meet the success criteria landowners will apply. Some horticultural options will be lower risk than others, for example the investment cost in perennial production is considerably higher than for annual production of most vegetable crops. Similarly, the key indicators of success for some landowners may vary; some may focus on financial returns, others on capital value or people (social) development. For these reasons, the final criteria to be applied to the decision matrix needs to be determined by the landowners with appropriate advice from cultural, technical and business experts.

Table 10.1: Comparison of decision processes after Boehlje & Eidman (1984)

Step	Decision process (Boehlje & Eidman, 1984)	Māori resource assessment model
1	Formulation of goals & objectives	
2	Problem recognition & definition	Cultural assessment; *kosmos/corpus/praxis*
3	Collection of information	
4	Specification of alternatives	Physical & capital assessments
5	Evaluation of technical feasibility	
6	Financial evaluation	Economic assessment
7	Choice of an alternative	Outcome of assessment
8	Implementing decision	
9	Bearing responsibility	Subsequent processes to assessment
10	Evaluating outcome	

From a conceptual approach to management and decision criteria, it is apparent the model is also valid through alignment to accepted management processes. This further validates the role of a cultural model in land assessment for Māori landowners and how the model will contribute to economic development over time.

The case studies undertaken with Wakatu Inc., Ngāti Parewahawaha hapū and Tahuri Whenua all highlight the relationship and presence and extent of Māori knowledge aligned to the land resource and horticultural activities, thus complementing the argument about the positive role of Māori values and culture in the consideration of any change of land use and contemporary land management. By using the kosmos/ corpus/ praxis maxim promoted in the discipline of ethnopedology, mātauranga Māori is consistently identified for the value it adds to the management of the resource and also the decision processes applied by the managers. Each of the case studies identified the capability of the land owners to undertake a change in land use to horticultural production in the present time.

In considering the three case studies, each represented a different stratum of Māori association to land and land utility. The primary point of difference is in the management structure applied to the production system. Wakatu Incorporation represents a considerable

number of landowners over a diverse portfolio of land, horticulture, fisheries and forestry resources. Regardless, they still acknowledge the role of Māori values and knowledge in their business structure and in the management processes they apply. This is supported by the value statement of FoMA to which Wakatu is a member. Ngāti Parewahawaha hapū trustees also represent a considerable number of people over a diverse range of activities, all contributing to the well-being of the hapū as a whole. Their business and management structures are less well defined but clearly indicate the role of whakapapa, tikanga and values in their implementation. Tahuri Whenua approach horticulture from a pan-tribal perspective but align to the other structures through their acknowledgement of cultural factors such as value systems, tikanga and mātauranga as central components to their activities in assisting Māori in returning to horticultural land uses. As participants in the modern business world, all three case study entities undertake their decision making in a structured way and are inclusive of a cultural component.

The contribution of a cultural model calculated to align to acknowledged (non-indigenous) decision support systems models in horticulture and management is a key factor in getting the model accepted by the wider horticulture industry and Māori community. The alignment through parallel associations with standard decision making processes and resource assessment models indicates there is a place for Māori cultural factors to be included in the assessment and management of Māori land resources through horticulture. It therefore supports the hypothesis promoted at the start of this thesis that:
'*Mātauranga Māori relevant to horticulture and pedology can inform and add value to the future economic development of land resources.*'

10.6 Rangatiratanga

An important factor contributing to this thesis has been the consideration of the status of 'rangatiratanga' for Māori as a result of the research and outcomes. The kaupapa Māori methodology implicitly looked to build the capability of Māori as a result of the research and the project has always been inclusive of this need. The model presented along with the supporting traditional knowledge base relevant to both soils management and horticulture is a positive contribution to Māori management of Māori resources and is timely in its

availability as more and more people look to sustainable management of resources under an increasing pressure to make those resources more intensive and productive due to increasing economic and social expectations.

The marginalisation of Māori and Māori knowledge in contemporary science and resource management systems has always frustrated Māori managers of natural resources. Māori are regularly expected to stand in non-Māori situations and justify their position because of the perceived dichotomy it has with science practitioners[85]. Research such as this that looks to validate Māori knowledge with a view to acknowledged integrity assists the role of all Māori in resource management areas and thus assists the rangatiratanga determination for Māori as a culture.

The recognition of a body of traditional Māori knowledge that has the ability to contribute to scientific disciplines, in this case horticulture and pedology or soil science is a positive step for Māori in these fields. It is also timely for many Māori for a number of reasons; much of the old or traditional knowledge is being lost as the generation of elders with first hand experience of the knowledge dies out and, the resurgence of a Māori identity through the acknowledgement of the Treaty of Waitangi, Waitangi Tribunal and inclusion in legislative processes requires the Māori community to build their capability to become participants on an equal footing with non-Māori. This knowledge therefore contributes to policy, education and science and is a potential contributor to the national economic good.

[85] Personal Communication, Pita Richardson, Iwi representative on Environment Court, 16 February 2007.

10.7 Chapter summary

The contribution of mātauranga Māori and contemporary knowledge to an assessment or decision system which supports Māori economic utility of the land resource is a wholly positive action. The ability to draw from a body of knowledge not previously included in decision models relative to land utility in New Zealand is a key point of difference with the model presented in this thesis. The preceding chapters have established the extent and quantity of traditional knowledge surrounding Māori horticultural and soil management activities. The case studies with three distinctive Māori entities supports this knowledge base and provides good examples of the role of a land assessment model in contemporary Māori society and as an inclusive assessment process which can contribute to all sectors of New Zealand society. It is also important to recognise the rangatiratanga of Māori as a collective body of iwi, hapū and whānau throughout the research undertaken for this thesis and recognise the contribution the output makes to *tino rangatiratanga ō ngā iwi katoa.*

Conclusion

The future management of Māori resources will become increasingly difficult as ownership structures become more complicated and the value set of landowners becomes increasingly diverse as a response to the pot-pourri of cultures that will contribute to the parentage of our future generations. The pressures from the wider community for an improved and responsible economic use of land resources will also impinge on future management of these resources by Māori. To have access to structured tools for assessing and managing land resources is but one way of the present generation contributing to the future generations of Māori. Resource assessment models such as the one presented will always be open to interpretation and refinement and as such can be considered as being dynamic and responsive to their environment just as tikanga is within the Māori cultural environment.

Māori society is unique among societies because of its world-view which acts as a basis for the culture, itself a response to the environment in which the people exist and the processes they undertake to manage the environment for survival. Horticulture has been a key component of traditional life for Māori as it contributed to the rather limited food-store available to them prior to the introduction of fruits, vegetables, grains and livestock through colonisation in the early nineteenth century. The traditional knowledge that was the practice of horticulture in those times included the knowledge surrounding the land and water resources which supported the crop systems aligned to both food and utility crops. This specialist knowledge was held by tohunga or people with specialist roles within the community to ensure it was managed and used appropriately to guarantee the continued survival of the group.

The study of ethnopedology, defined as the study of 'local' knowledge of soil and land management [pedology] in an ecological perspective has not previously been undertaken within the Māori cultural paradigm. It has been applied to a number of other indigenous cultures and the similarity in the range and value of soils specific knowledge with Māori

knowledge is exciting. By reviewing this 'local' knowledge using a triadic kosmos/corpus/praxis approach, the indigenous element has been appropriately included. This is especially relevant for Māori who sometimes struggle to communicate the cultural element of traditional knowledge or management to other sectors, especially science. Where *kosmos* is applied as *Te Ao Māori*, *corpus* as *mātauranga Māori* and *praxis* as *tikanga Māori*, the relationship between each element is clear and the interpretation of the associated knowledge becomes more apparent.

This thesis has introduced elements of the traditional knowledge aligned to horticulture in Māori society, inclusive of value systems underpinning Māori society, specialist soils and crops knowledge, decision support systems for horticultural land use, and economic impacts on Māori since colonisation. All these components of knowledge have been provided to support the argument that Māori have a body of knowledge which can contribute to science, resource management and ultimately the economic development and sustainability of Māori resources. The identified knowledge has been garnered to contribute to an assessment model for Māori resources looking to a change in land use through horticulture.

The case studies undertaken have given the opportunity to apply the triadic assessment process with a view to achieving a specific land-use (annual horticultural crop production system based on taewa crop). Each case study has presented a different entity structure and relationship to the land resource and thus highlighted the diversity within the Māori community with regard to land management and the potential contribution Māori can make to the economic future of this country. The cultural factors identified within, and as a result of, the case studies have contributed in a generic sense to the assessment model.

The Māori resource assessment model presented within this thesis is based on an analogy of $Y=f(x_1, x_2, x_3, \ldots x_n)$ where Y is the assessment decision or output and is a function (f) of four critical factors (x_1 to x_4); cultural, physical, capital and economic. The model builds on conventional assessment systems within the horticultural sector with an emphasis placed on elaborating and critiquing the newly identified cultural factor which overlays the

remaining factors. The cultural assessment factor has been broken down into thirteen distinctive cultural indicators, all supported by the mātauranga (traditional knowledge) presented in the preceding chapters on traditional horticulture and soil management systems and case studies. The case studies were selected because they could provide supporting evidence of the role of cultural values and value systems in the assessment of Māori resources for horticultural land use within a range of land ownership structures.

The key then has been to present the Māori land assessment model in a form that builds on conventional assessment processes and is acceptable to the various interests, or stakeholder, groups e.g. science or Māori communities and that can be applied appropriately. The model in its present form is now ready for application by Māori land owners with a view to a change in land-use. Only in its continued application will the cultural evaluation model continue to evolve and contribute to the rangatiratanga of Māori as a community.

The following whakatauāki is an appropriate conclusion to this thesis and acknowledges the mātauranga discussed and applied in the preceding chapters.

Kia mau ki te kura whero.
Kei mau koe ki te kura tāwhiwhi kei waiho koe
Hei whakamōmona mō te whenua tangata.
Hold fast to the valued treasure.
Not to the illusory treasure lest you be left as fertiliser for the human land.
(In other words: that which is of real high value should be securely retained
Translation as given in Mead & Grove, 2001)

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Personal communications

NOTE: Many of these personal communications (including many that are not listed here) are with kaumātua/kuia who offered insight into mātauranga and tikanga relevant to the topic of this thesis over several decades. The interactions have been informal, ongoing and knowingly contributing to my understanding of the subject which has now culminated in this thesis. Ngā mihi atu ki nga kuia me ngā kaumātua, ngā mihi aroha ki a koutou katoa.

Mr Akerama Taiaki, kaumātua o Ngāti Rahiri ki Whakarongotai; 28 Jan 2006

Mrs Arohānui Lawrence, pakeke o Ngāti Kahungunu, 23 March 2006

Mr Ben Maruwehi Manaia, kaumātua o Ngāti Ruanui; 28 January 2006

Mrs Christina Kawau, pakeke o Te Whānau a Ruataupare; March 2003 (& other dates)

Mrs Daphne Ngawaipaera Attenborough, pakeke o Ātiawa; March 2003 (& other dates)

Mr Ernest (Bunny) Gripp; pakeke o Ngāti Toa Rangatira; March 2004 (& other dates)

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Mr Paki West Raumati; pakeke o Ngāti Mutunga/Ngāi Tahu, March 2003 (& other dates)

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Mrs Pearl Kahurangi Lewis, pakeke o Ngāti Rahiri; March 2003 (& other dates)

Pita Richardson, kaumātua & Chairman, Parewahawaha Marae Committee;
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Mr Rangipo Metekingi, kaumātua o ngā uri o Aotea; April 2005 (& other dates)

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Rōpata Taylor, CEO Wakatu Inc; 8 June 2004

Mrs Ruth Jones, Te Tai Tokerau (Awanui); February 2004 (& other dates)

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Mrs Te Ra Wright & Mrs Eileen Winikerei, kuia o Ngāti Apakura hapū o Maniapoto, Tānehopuwai Marae; 19 December 2004.

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Appendix 1

Maramataka Māori (Ātiawa version) – Māori calendar for fishing and horticulture

Hei whakamāori i tēnei e mau ake nei; No 1 (Whiro) – ko te ra i muri iho o ta to Pākehā new moon (the day after the new moon on the calendar); No 15 (Rakaunui) – ko te ra i muri iho o ta te Pākehā full moon (the day after the full moon on the calendar)

DAY	NAME	NOTES
1	Whiro	He ra kino tēnei mo te ono kai ma te hi ika, hoki.
		A bad day for fishing or planting, the moon is out of sight
2	Tirea	He po ahua pai tēnei mo te hi koura, tuna mo te ono kai
		A good day for planting, fishing, torching eels and crayfishing
3	Haohaoata	He ra tino pai tēnei, mo te hi tuna, koura ono kūmara ono hoki i ētahi atu kakano
		A very good day for planting kūmara or any seed, also crayfishing or torching eels, especially if the moon is out of sight
4	Ouenuku	He ra pai mo te ono kai, he ra pai mo te hi ika
		A good day for planting and fishing, from dawn to midday
5	Okoro	He ra pai ano tēnei mo te ono kai hi ika hoki
		A reasonable day for fishing, good day for planting from midday to sunset
6	Tamatea kai ariki	He ra ahua pai mo te ono kai mo te hi ika, he ra hau, he kaha te ia tera pea e marangai
		Fair day for planting and fishing. It is windy and the sea currents are strong, expect a change in weather.
7	Tamatea angaanga	He ra pai mo te hi ika, kia tupato te haere ki te hi ika i ngā ngaru pua i ngā kohu. He ra pai ki te ono kai.
		A very good day for fishing, watch out for the weather. It is either a big heave or a misty day. A good day for cropping also.
8	Tamatea aio	He ririki te tuna, te ika me te kūmara i tēnei ra engari he nui tupato te hunga ehi moana.
		Eels, fish, kūmara etc are plentiful but small in size. If boating, keep an eye on the weather.
9	Tamatea whakapau	He pai mo te ono kai i te ata ki te ra-tu. Kaore i tino pai mo te hi ika pou ngā tamatea.
		Fair for planting from morning to midday only. Only fair for any sort of fishing.
10	Ari	He ra kino tēnei.
		A bad day. OK for crayfish only.

DAY	NAME	NOTES
11	Huna	E hara i te ra pai ki te ono kai ki te hi ranei he noho mohoao te noho a te tuna, a te koura.
		Not a good day for planting or fishing. Eels and crayfish will get very timid.
12	Mawharu	He ra tino pai tēnei me te ono kai, he nunui te kūmara engari kaore e roa ka pirau he ra pai ki te hi ika.
		A very good day for planting but the produce does not keep for very long. A good day for fishing.
13	Atua	E hara i te ra pai mo te ono kai, mo te hi ika ranei.
		It is not a good day for planting or fishing
14	Turu	He pai tono mo te hi ika mo te ono kai, i muri o te ra tu, ki te ra to.
		A fair day for fishing, especially on the incoming tide, and for planting from midday to sunset.
15	Rakaunui	He ra tino pai mo te ono kai, ahakoa he aha taua kai ra pai mo te hi ika kaore e tino pai no te hi tuna.
		A very good day for planting and general gardening, not so good for eeling but good for other fish.
16	Rakaumatohi	He ra tino pai mo te ono kai, mo te hi ika, kaore mo te tuna.
		As for Rakaunui, a very good day for planting & fishing but not eeling.
17	Takirau maheahea	Takirau maheahea, kua makoha te marama te ririki te kūmara, te koura, te tuna.
		The moon is losing its brightness. Kūmara planted on this day are small, also crayfish and eels. Best from dawn until midday.
18	Oike	E hara i te tino ra pai, mo te ono kai mo te hi ika ranei
		It is only another day, not the best for planting or fishing.
19	Korekore te whiwhia	E hara i te ra pai, mo te ono kai, mo te hi ika ranei.
		It is only another so-so day for either planting or fishing.
20	Korekore te rawea	E hara i te po pai tēnei.
		Not a very good day at all.
21	Korekore turoa	He pai tēnei ra atu i te ra-tu, ki te ra-to. Koia nei ētahi ra pai ki te patu tuna, koura, ika me ngā momo kai katoa.
		A very good day from midday until sunset for both planting and fishing.
22	Korekore piri ki nga tangaroa	He ra pai ki te ono kai ki te hi ika, koura, tuna.
		A very good day for planting, fishing, crayfish and eels.
23	Tangaroa piri a mua	He ra pai tēnei ki te ono kai, ki ngā mahi hi ika koura
		A very good day for planting, fishing, crayfish and eels, especially from noon until sunset.
24	Tangaroa piri a roto	He ra pai tēnei ki te ono kai, ki ngā mahi hi ika koura
		A very good day for fishing, crayfish and eels. This is the best day for planting kūmara, taewa & other root crops, in general the best day for any planting in the garden. Also excellent for deep-sea fishing

DAY	NAME	NOTES
25	Tangaroa a kiokio	He ra pai tēnei ki te ono kai, ki te hi ika, koura, tuna
		A very good day for planting, fishing, crayfish and eels.
26	Ao tane	He ra pai tēnei ki te ono kai, ki te hi ika, koura, tuna
		A very good day for planting, fishing, crayfish and eels. Also excellent for deep sea fishing.
27	Orongonui	He ra tino pai tēnei mo te ono kai hi ika, koura, tuna. He pai mo te waihanga whakaaio.
		A very good day for planting, fishing, crayfish and eels. Also a good day for business.
28	Mauri	E hara i te ra pai tēnei he oro mauri te kai ka oma.
		Not a very good day for planting or fishing. Fish, eels and crayfish are very elusive.
29	Omutu	E hara i te ra pai tēnei.
		It is not a good day at all!
30	Mutuwhenua	E hara it te ra po pai tēnei kua hinapouri te ao e ai ki nga korero o neke ra.
		It is not a good day at all: the world is in darkness!

Appendix 2

Indigenous use of biological indicators of soil quality: vegetation and soil macrofauna (Source: Ettema, 1994)

VEGETATION	
Malaysia	Kedukuk bush (*Melastoma*) indicates high Aluminium level Pohon bakan (*Hanguana)* tree indicates acid soil with stagnant water
Shipibo, Peru	Use indicator plants for soil hydrology
Caatinga, Brazil	Thinly wooded vegetation indicates imperfect drainage
S. Mexico	Sparse vegetation is general indication for *tierra delgada*, thin soil
Maya, Mexico	Dark coloured vegetation indicates high soil fertility
Kekchi, Guatemala	Use indicator plants for site suitability for *Milpa* agriculture
Mebengokre, Brazil	Use indicator plants for general site suitability
Gabarone, Botswana	Use indicator plants for soil fertility
Yoruba, Nigeria	Odundun (*Kalanchoe sp.*) indicates high soil fertility, while Eran (*Digitaria horizontalis*), Okan (*Combretum platypterum*) and Pepe (*Mallotua oppositifolius*) indicate poor fertility.
Niger	Dark, dry roots of millet seedlings indicate 'sick' soil which is not fertile
SOIL FAUNA	
Yoruba, Nigeria	Earthworm cast indicate fertile soil
Sukuma, Tanzania	Termite soil is fertile, soil classification based on their presence/absence
Niger, Sierra Leone	Soil close to ant and termite hills is fertile and planted with special crops
Ecuador	Earthworm casts and grub casts (?) indicate good soil
Thailand	Soil from termite hills is used as soil fertility improver

Māori Land Court Boundaries - 2007

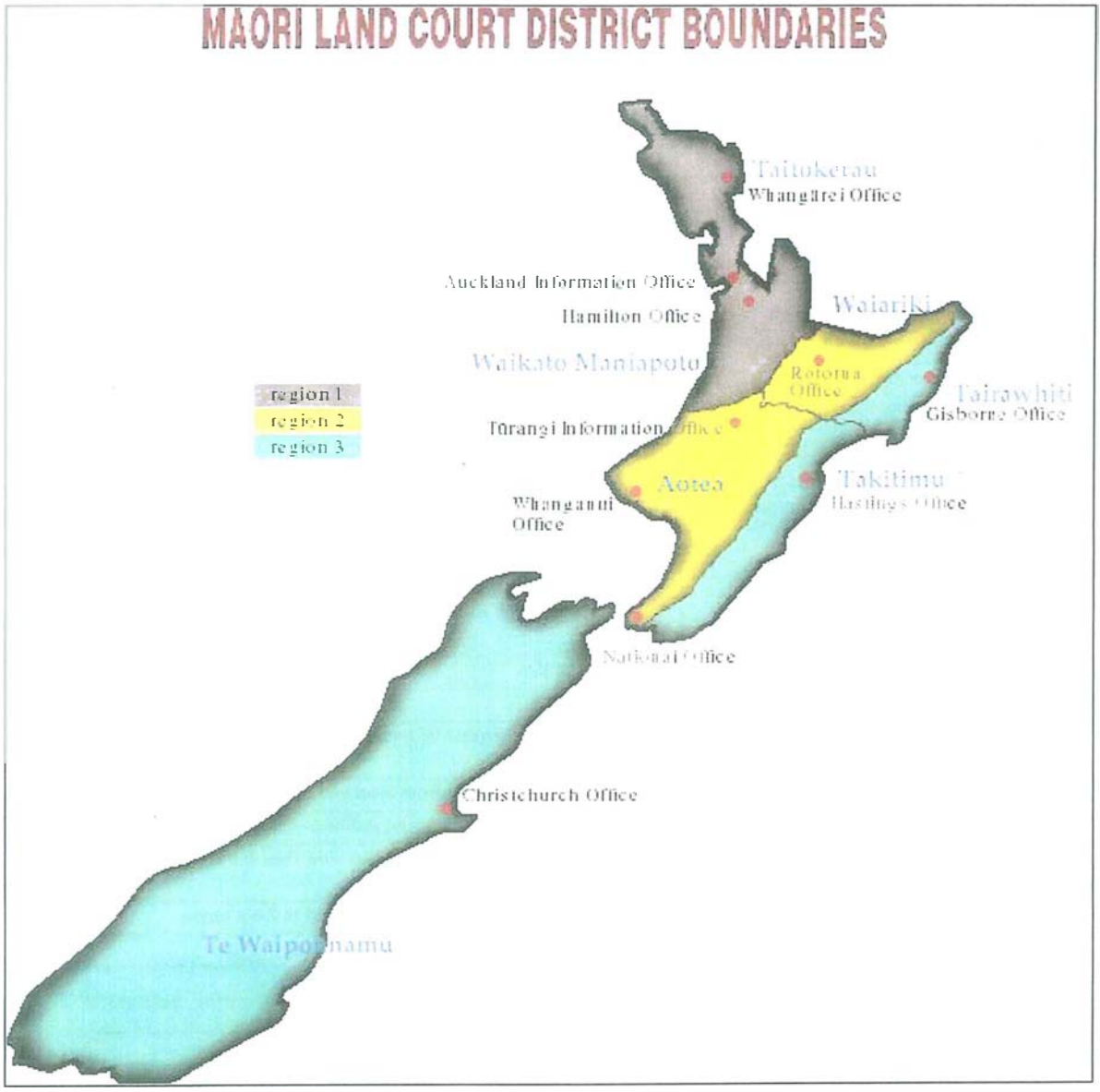


Image downloaded from http://www.justice.govt.nz/mlc/ (October 2007)

Appendix 4

Hue (*Lagenaria siceraria*) – vernacular associations[86]	
Kowenewene, wenewene	Alternative names for gourds (Ngāti Porou)
Kotawa	Immature fruit
Kakano	Seeds of hue
Rau kakano or pātangaroa	Cotyledon leaves
Rau-tara	Third leaf
Pū taihinu/ pū tauhinu	Fourth leaf
Hika	Growth stage just before branching
Toro	Lateral runners
Tohihi	Young shoots - edible
Kāwai/ kīwai	Branches, shoots or runners of the plant
Kia, kiaka, koaka	Generic term for calabash or fruit
Emiemi	'pito' of the hue – remains of the petals which remain at the base
Pukahu	Spongy interior of the fruit
Whakaaiai	Process of hand pollination
Whata-ipu	Platform for storing gourds (Northland)
Oko	Small hue cut in half and used as bowls
Hue puruhau	Musical instrument – deep vibrating sound
Hue puruwai	Musical instrument – rain sound
Poiawhiowhio	Musical instrument – swung around the head on a string and imitated bird noises
Koauau ponga ihu	Musical instrument made from very small gourds – similar to flute
Rarā	Shakers or rattles
Potaka hue	Humming top
Ororuarangi	Flute made from the neck of gourd – the holes are close together along the flute.
Nguru/ rehu	Mouth or nose flute made from stem end of the gourd
Pu-te-hue	Atua aligned to the hue plant and products
Whakarau	To prime seed by soaking in water and then burying in warm soil to germinate
Tahā tarata	Gourd for storing *pia –tarata* or scented gum from tarata
Tahā koukou	Gourd for scented oil used for anointing hair
Ipu	Generic name for water vessels
Tahā huahua	Large gourd for storing preserved birds
Tahā wai/ huewai	Gourds suited to storing or carrying water
Ipu whakairo(iro)	Carved water vessels
Wāwahi tahā	Broken calabash
Kiato; Kāhaka; Kokako-ware; Pahau; Pāhaka; Pahawa/Pahaua; Pare-tarakihi; Upoko-taupō; Wharehinu; Whakahau-matua; Whangai-rangatira; Upokotaipū	Varieties of gourds for various uses
Ikaroa; Mānuka-roa	Varieties specific to Bay of Plenty
Puau; Rorerore	Varieties of gourd used for tahā huahua

[86] Best 1902, & 1976; Maingay, 1985; Beever, 1991 and various informal informants

Appendix 5

Taewa (*Solanum tuberosum*) – vernacular associations[87]	
Taewa	Generic name – Te Tai Hauauru; Te Tau Ihu
Parareka	Generic name – Ngāti Porou/TaiRawhiti
Peruperu	Generic name –Te Tai Tokerau
Mahetau; maketau	Generic name – Ngāi Tahu
Riwai	Generic name
Tatairongo/tatarako; tutaekuri/urenika/ mangemange; keretewha; tuarua; ringaringakatira; parakaraka; piakaroa; para-kokako/pokerekahu; peruperu	Cultivar names – dark skin & flesh
Karuparera; kowiniwini; karupoti; raupi; ngaurere	Cultivar names – multi coloured skin, some flesh colouring
Moemoe; uwhiwhero; pawhero; uhi-po; makoikoi; tairutu; te Maori; rakiura; kohatuwhero; poiwa	Cultivar names - red or pink skin, white/cream flesh
Huakaroro; wakaora; ngauteuteu; paapaka; rapiruru/wairuru; maitaha; whanako kimokimo; ngaoutiouti; kapa/parihi/tekepo; matariki; Waikato; rokeroke	Cultivar names – yellow/cream or brown skin
Horotae/harirae	Pre-European cultivar – Aotea region
Rokoroko; araro; tapapa; aka-raupō	Pre-European cultivars – Mātaatua region
Wini-harete	Pre-European cultivar – Te Tau Ihu
Kopara; waitaha; kariparo	Obscure variety names – Ngai Tahu
Nipa; kotipu; kotipo; tahore; atiti; huamango; pairata; nepenepe; piho; ngangatawhiti; katote; huarewarewa; puahinahina; ongaonga; te rautika; whakairirongo; rape; matawhahati	Obscure variety names
Takuru	True seed of potato plants (as against tuber 'seed')
Pukeko	Crops harvested from previous seasons planting
Tamahou	Newly harvested crop (huahou –new/immature potatoes)
Tauhere, puakiweu	Spoilt tubers
Uwhi (Leach, 1983)	Winter grown potatoes (Northland)
Puhina	Barren seed tubers
Pūweku / pūeru	Unproductive crops
Ropi	Small blue potato, self propagating on Taukihepa (Mutton Bird Islands)
Kapana makumaku	Small blue potato, self propagating on Poho-o-Tai (Mutton Bird Islands)
Kirikiri	Waste potatoes (especially small ones used as pig food)

[87] Andersen, 1926; Best, 1976; Roskruge; 1999; Ashwell, 1999; Harris 2002 and various informal informants

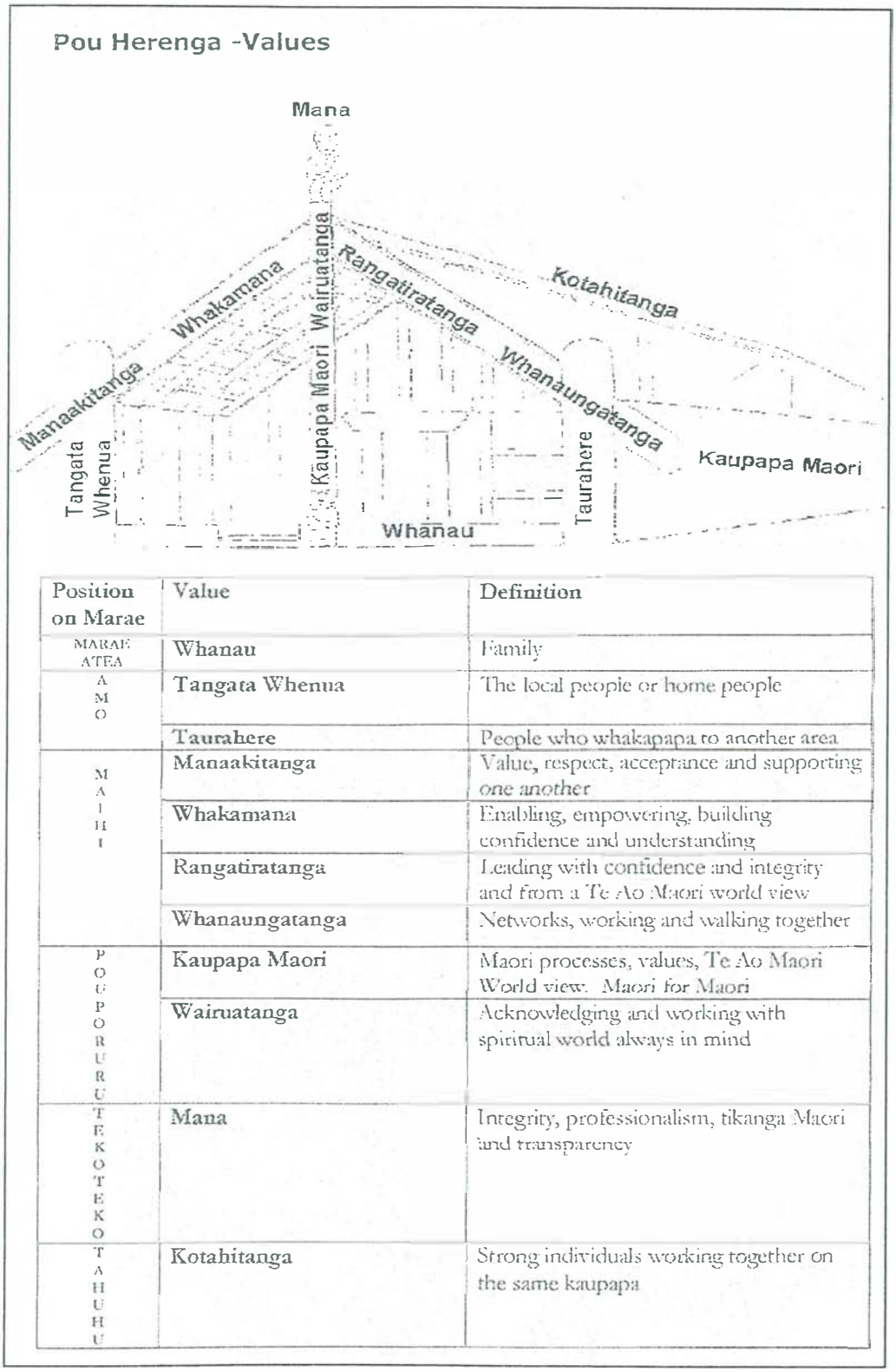
Appendix 6

Harakeke (*Phormium tenax*) – vernacular associations	
ohanga; Tupurupuru; Maaeneene; Tukura; Potaka; ākirikau; Paoa; Oue; Turingawari; Taniwha; Pango; uawai; Tapamangu; Parekoretawa; Tāne-a-wai; Te Tatua; Matawai Taniwha; Tarere; Waihirere	Variety names: Te Tai Rawhiti
ararikī; Atarau; Taeore (Taiore); Tuutaewheke; Huuhiroa; tiwhiki; Ate (Hati); Parekoritawa; Raumoa; Ngaro; opakipaki-ika; Ateraukawa; Koraka; Ngutu-parera; Ririhape	Variety names: Te Tai Hauauru
Mawaru; Paretaniwha; Wharanui; Awahou; Ruahine Makaweroa; Motu-o-rui; Taumataua; Arawa; Ruapani; roro-wharawhara; Takaiapu	Variety names: Mātaatua/Bay of Plenty
oohunga; Raumoa; Ngutunui; Ratawa; Rerehape	Variety names: Maniapoto, Tainui rohe
auhangaroa; Taapoto; Rangiwaho; Te Mata Takaiapu; Whareongaonga; Wharanui	Variety names: Kahungunu
Ngaro (Ngaru); Opiki	Variety names: Manawatu/Wellington
ihore harakeke	Generic term for very fine variety
Muka; whītau	Dressed flax fibre
liraka	Fibre resembling silk
Whariki/ taka/ porera/ tienga	Woven floor mat
aitaka; kakahu; mai	Variations of woven cloaks
atua/ tu	Generic terms for belts made from flax
atua whara/tatua pupara /tatua korara	Men's belts with designs woven into them
u maurea/ tu muka	Women's belts
araerae	Woven sandals
atu ngaro	Plaited fly swat
iupiu ahi	Plaited fan to assist rekindling fire
ipare/ kopare	Narrow plaited headbands
aepae umu; paepae raranga; paepae whakatu; kopae; oronae; konae	Various types of bands used around the edge of an umu/hangi to keep food in place on stones
apora	Woven mat to cover food in an umu
ete/ kono/ rourou	Varieties of woven kits and baskets
awe	Woven backpacks
a/ mamaru	Plaited sails
ia harakeke	Mucus extruded from the base of leaves
u harakeke	Single flax plant or single clump of plants
ā harakeke (pā muka)	Flax plantation
orari	Flower stalk
urawaka	Seed capsule
akirikiri	Leaf butt
urake; Pakauka	Outside leaves of bush, usually discarded
ito	Inner, unopened leaves; usually left uncut
onenewai	Drinking cup made from the flax leaves
Whahariki (*Phormium cookianum*) Whakāri-Urewera cultivar. Whitau/Whararipi/Wharaeki-obscure cultivars	

ource: Heaphy, 1869; Best, 1977; Buck, 1923 & 1924; Andersen, 1926; Heenan, 1991; Scheele & Walls, 994 & various informal informants

Appendix 7

Pou Herenga Value set – Source: AREDS, 2002: *Māori Economic Development: te huarahi pai, a future pathway,* Auckland Regional Economic Development Strategy.

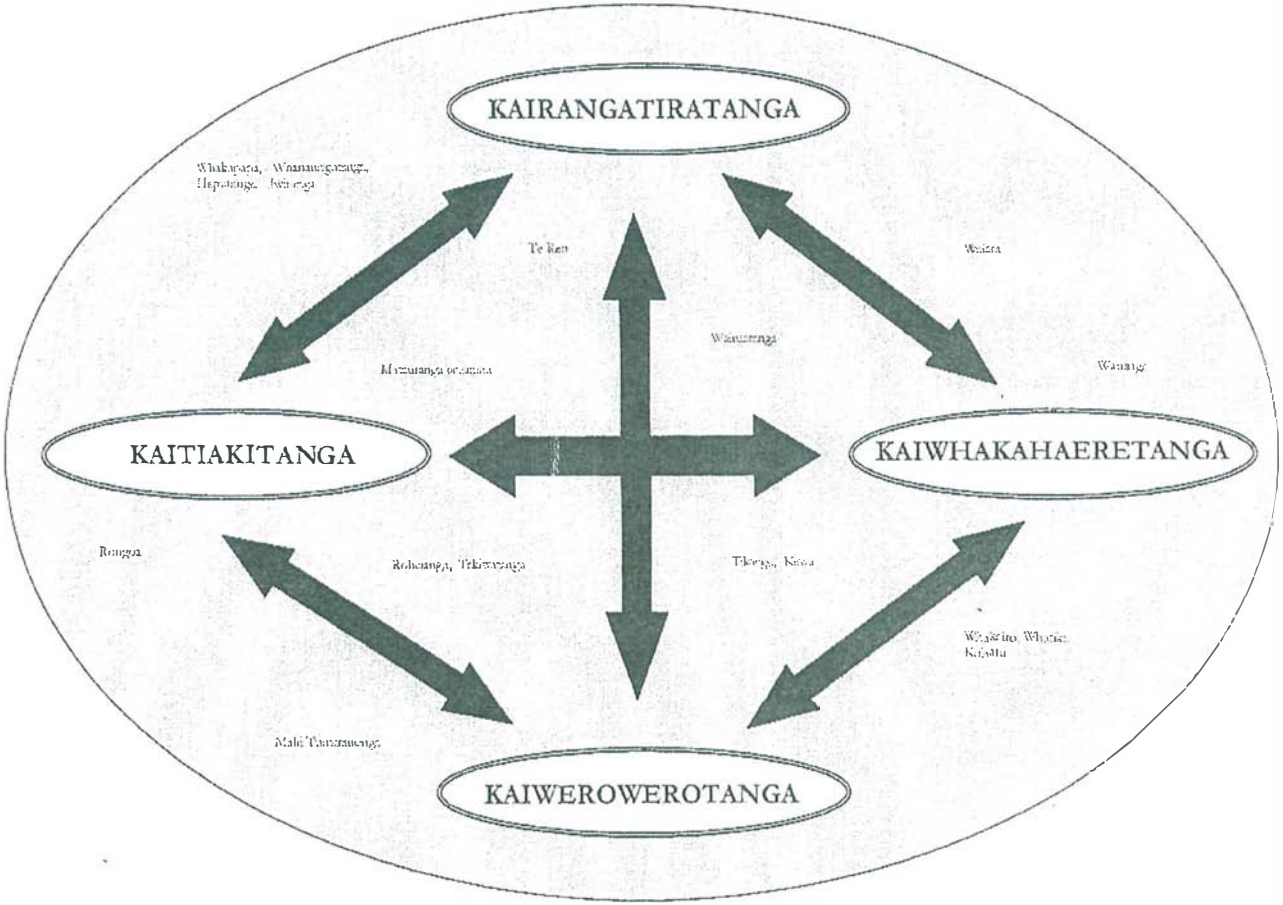


Position on Marae	Value	Definition
MARAE ATEA	Whanau	Family
AMO	Tangata Whenua	The local people or home people
	Taurahere	People who whakapapa to another area
MAIHI	Manaakitanga	Value, respect, acceptance and supporting one another
	Whakamana	Enabling, empowering, building confidence and understanding
	Rangatiratanga	Leading with confidence and integrity and from a Te Ao Maori world view
	Whanaungatanga	Networks, working and walking together
POUPORURU	Kaupapa Maori	Maori processes, values, Te Ao Maori World view. *Maori for Maori*
	Wairuatanga	Acknowledging and working with spiritual world always in mind
TEKOTEKO	Mana	Integrity, professionalism, tikanga Maori and transparency
TAHUHU	Kotahitanga	Strong individuals working together on the same kaupapa

THE FEDERATION OF MAORI AUTHORITIES MODEL

KAITIAKITANGA	KAIWEROWEROTANGA	KAIWHAKAIHAERETANGA	KAIRANGATIRATANGA
ROLES:			
1. Identify taonga	1. Identify opportunities	1. Identify Owners, Beneficiaries	1. Develop Vision and determine Mission
2. Develop taonga policies re: - social - cultural/traditional - sustainability - "exploitation"	2. Identify constraints and impediments	2. Empower Owners	2. Develop strategic plan and develop corporate and business plans
	3. Identify procedures for: - pro-active responses - reactive responses	3. Assess aspirations	3. Develop management structures
		4. Encourage participation by Owners	4. Identify opportunities
ACTIONS:			
1. Protect Taonga: - rahui - statutory	1. Appoint Coordinator(s)	1. Appoint Administrator	1. Appoint Management
2. Retrieve alienated taonga	2. Develop relations with relevant agencies: - Government - Local Authorities - S.O.E.s	2. Develop Owners' Register	2. Appoint Advisory Services (legal, real estate, rural, engineering, aquacult, etc)
3. Enhance taonga - development - occupation - create reserves	3. Develop relations with similar bodies: - other Trusts and Runanga - FOMA - Incorporations	3. Gain Owners' confidence through - effective communications - transparency - accountability - integrity - professionalism	3. Ensure optimum management performance
4. Develop relations with related bodies: - Iwi Trusts - Runanga - Marae - Maataa Waka	4. Join collectives	4. Create opportunities for Owners for employment - investment joint ventures	4. Secure business advantages through: - strategic purchases strategic sales - strategic leases
5. Develop relations with relevant agencies: - Waitangi Tribunal - Fisheries Commission - Maori Land Court - etc	5. Develop relations with relevant agencies: - Waitangi Tribunal - Fisheries Commission - Maori Land Court - etc	5. Maximise dividends	5. Establish business relationships with: - investors, - developers, - financiers
		6. Develop social policies to assist Beneficiaries through scholarships, cadetships - health benefits - relief of indigence	

ELEMENTS OF CUSTOMARY PRACTICES, CUSTOMARY RITES & CUSTOMARY RIGHTS



Soil Test Results – Robbies Block, Wakatu Incorporation

Massey University

FERTILIZER & LIME RESEARCH CENTRE

Private Bag 11 222,
Palmerston North,
New Zealand
Telephone: 64 6 356 9099
Facsimile: 64 6 350 5632
http://frc.massey.ac.nz

Laboratory Report

Name: Nick Roskruge **Date:** 12/07/04

Address: Institute of Natural Resources
Massey University

Type of material: Soil

ANALYSES:

SAMPLE	pH	Olsen P µgP/g	SO4 µgS/g	K me/100g	Ca me/100g	Mg me/100g	Na me/100g	CEC me/100g	Soil volume g/ml
Wakatu - Robbies Block	6.2	47.6	6.0	0.33	7.0	1.13	0.03	11	1.20

Phosphate and sulphate values are expressed as µg/g (air-dry). Exchangeable cations and CEC values are expressed as me/100g (air-dry).
Soil volume is a measure of the weight of air-dry soil (g) per volume (ml) and can be used to convert results to a volume basis.

CONVERSION TO MAF 'QUICK TEST' VALUES:

SAMPLE	P µgP/ml	SO4 µgS/g	K	Ca	Mg
Wakatu - Robbies Block	57	6	6	10	31

ADDITIONAL ANALYSES:

Carbon %	Total Nitrogen %	Organic Matter %
1.3	0.11	2.3

'Quick Test' values are calculated using conversion factors reported in Fertiliser Recommendations for Pastures and Crops in New Zealand (1984) compiled by I S Cornforth and A G Sinclair.
Total Carbon and Total Nitrogen were determined by IR and TC detection following combustion in an induction furnace (LECO).
Organic matter was determined mathematically: OM = OC x 1.72

Massey Agriculture

SIGNED: _____
Mr I. D Currie (Technical Manager)

Te Ikumenga ki Purehuroa

Lab Report 13 07 04.xls

Soil Test Results – Section 141C2A Ohinepuhiawe Block, Parewahawaha

Hill Laboratories

R J Hill Laboratories Limited

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Internet: www.hill-labs.co.nz

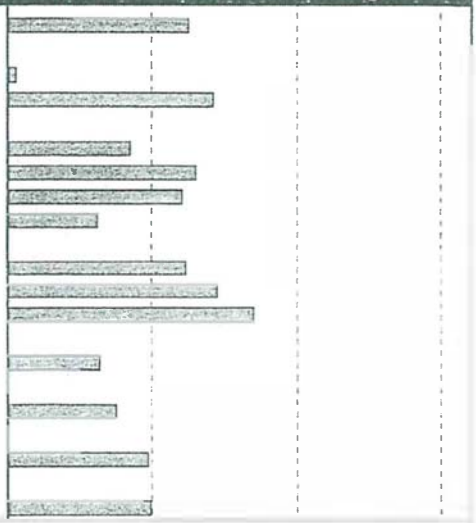
ANALYSIS RESULTS

Client: Land Management Group Ltd
Address: P O Box 1966, PALMERSTON NORTH, New Zealand
Client Phone: 06 356 7589

Laboratory No.: 289980/1
Registered: 4-Jan-2006
Reported: 9-Jan-2006
Order No.:
Submitted By: N Roskruge
Client Ref: a/c# 93676

Sample Name: Parewahawaha
Sample Type: SOIL Mixed Pasture (S1)

Analysis		Level Found	Medium Range
pH		5.9	5.8 - 6.3
Olsen P	(mg/L)	6	20 - 30
ASC/Phosphate Retention	(%)	42	30 - 60
Potassium	(me/100g)	0.44	0.50 - 0.80
Calcium	(me/100g)	7.8	6.0 - 12.0
Magnesium	(me/100g)	1.39	1.00 - 3.00
Sodium	(me/100g)	0.12	0.20 - 0.50
CEC	(me/100g)	15	12 - 25
Base Saturation	(%)	65	50 - 85
Volume Weight	(g/mL)	0.88	0.60 - 1.00
Available N	(kg/ha)	113	150 - 250
Organic Matter	(%)	5.2	7.0 - 17.0
Total Carbon	(%)	3.0	
Total Nitrogen	(%)	0.29	0.30 - 0.60
C/N Ratio		10.3	
AMN/TN Ratio	(%)	2.9	3.0 - 5.0



Base Saturation	K 3.0	Ca 52	Mg 9.4	Na 0.8
MAF Units	K 8	Ca 8	Mg 28	Na 5
Anaerobically Mineralisable N	86 ug/g			

The above nutrient graph compares the levels found with reference interpretation levels. NOTE: It is important that the correct sample type be assigned, and that the recommended sampling procedure has been followed. R J Hill Laboratories Limited does not accept any responsibility for the resulting use of this information.

No Laboratory Comments

TAHURI WHENUA INCORPORATED

THE RULES AND OBJECTIVES

TABLE OF CONTENTS

TAHURI WHENUA INCORPORATED

A. THE RULES

NAME AND ADDRESS:

1.1 The name of the Society shall be Tahuri Whenua Incorporated.

1.2 The registered address of Tahuri Whenua Incorporated shall be 30 Dahlia Street PALMERSTON NORTH. Every change in the situation of the registered office or the postal address of the organisation shall be notified to the Registrar and to members of Tahuri Whenua Incorporated in such manner as the Executive Committee of the organisation determines.

OBJECTIVES:

2.1 To set up a national Māori vegetable growers collective representing Māori interests in the horticulture sector.
2.2 To ensure Māori have access to resources relevant to the horticulture industry.
2.3 To promote an awareness of the Treaty of Waitangi.
2.4 To facilitate Māori participation in research and development in the horticulture sector.
2.5 To support Māori business development in the horticulture sector through the provision of advice and information.
2.6 To promote a collaborative Māori approach to horticulture within the wider horticulture industry by:
   a. working co-operatively with and across all sectors within the horticulture sector.
   b. working closely with partners to ensure their input adds real value to Māori producers and products.
   c. promoting awareness of healthy, safe produce and horticultural products.
   d. forging better/stronger trading relationships with other indigenous people.
   e. implementing research and development in all fields of horticultural production.
   f. fostering the protection of mātauranga Māori.
   g. supporting the transfer of knowledge/technology when it is in keeping with the objectives as outlined above.
   h. creating an information base for Māori vegetable growers.
   i. conducting the business of the Society incorporating kaupapa Māori.
   j. doing all such things as are incidental or conducive to the attainment of the above objectives.

3. MEMBERSHIP

a. The signatories to these rules shall be the first members of the Society.
b. Membership shall be open to all tangata whenua with a particular interest in vegetable and horticulture production and who agree with the objectives of this Society.
c. The Society will be empowered to confer on its members who have distinguished themselves as leaders in the horticultural field honorary membership of the Society. Honorary membership shall take two forms:
    i Ngā kaumātua
    ii Life membership
d. Members may cease membership of the Society by submitting a letter of resignation to the Secretary of the Society. Such letter of resignation however shall not release that member from any antecedent liability to the Society.

4. MEMBERSHIP FEES

Membership fees shall be by subscription due on 1 October annually, the amount to be reviewed annually and set by the Executive Committee, reflecting the views of the membership.

5. EXECUTIVE COMMITTEE

The affairs and businesses of the Society shall be controlled and managed by the Executive Committee which shall be constituted as follows:

a. Chairperson
Deputy Chairperson
Secretary
Treasurer

And a further three members who shall have recognition of a fair and equitable geographic representation. All seven to be nominated from current members of the Society at the AGM upon the written nomination of a member, signed by a seconder and bearing the nominees consent and submitted to the Secretary before the beginning of the AGM. Notwithstanding anything in the above provision, nominees may be nominated at the AGM subject to the signed consent of the nominee.

The elected committee shall each hold their office and position for a period of two (2) years.

b. The Executive Committee will have the power to co-opt members for any purpose and to fill positions left vacant for any reason.

c. The Executive Committee may at any time by letter invite any member to retire from membership for breach by him or her of these rules or for unbecoming conduct at any meeting or function of the Society or on any premises occupied by the Society. In default of such retirement the Executive Committee may deal with the question of expulsion of any such member at meeting to be held no earlier than fourteen days from the date of the letter and at such meeting the member whose expulsion is under consideration shall be allowed to offer an explanation orally or in writing and if thereupon two-thirds of the members of the Executive Committee shall vote for his or her expulsion he or she shall forthwith cease to be a member of the Society but shall not thereby be released from any antecedent liability to the Society.

ANNUAL GENERAL MEETING

6.1 The AGM shall be held at a time and place fixed by the Executive Committee for the following purposes:

i. to receive from the Executive Committee a report and an audited financial Statement of Accounts for the preceding twelve month period and an estimate of the receipts and expenditure for the ensuing twelve months.
ii. To select an Auditor and a Solicitor for the ensuing year.
iii. To deal with general business.

6.2 Financial members shall be advised of the AGM not less than twenty-one days before the meeting.

6.3 Conduct of meeting

i. At any AGM of the Society all members of the Society shall be entitled to be present but only those members of the Society whose subscriptions have been paid to the Treasurer for the current financial year shall be entitled to exercise a vote. A quorum at an AGM constitutes five of the total current financial members.
ii. At all AGMs the Chairperson or in his/her absence the Deputy Chairperson or any other Chairperson duly elected by the members present at the meeting shall take the Chair for that meeting only.
iii. Each member present and financial shall be entitled to one vote on any motion proposed and in the case of an equality of votes the Chairperson shall at his/her discretion have a casting

as well as a deliberative vote or adjourn the question under discussion to a subsequent meeting.

iv. Voting on an election where there is more than one nominee for a position will require a secret ballot to be held for which purpose a returning officer and a sufficient number of scrutineers will be appointed at the meeting.

7. MEETING OF THE EXECUTIVE COMMITTEE

i. The Executive Committee shall meet at such times and places as it determines.
ii. The Executive Committee shall have power to appoint sub-committees and may appoint to any sub-committee a person or persons not members of the Executive Committee.
iii. The Executive Committee may determine its own procedure and a quorum for all Executive meetings shall be three.
iv. In the case of an equality of votes the Chairperson may at her/his discretion either have a casting vote or a deliberative vote or adjourn the question under discussion to a subsequent meeting.
v. Notice of every Executive Committee meeting shall be given by the Secretary to each member of the Executive Committee not less than forty-eight hours prior to the time appointed for holding the meeting.
vi. It shall be the duty of the Executive Committee generally to conduct the affairs of the Society required by section 23 of the Incorporated Societies Act 1908 and/or by such other statutory provisions for the time being in force and to prepare and submit to the AGM a report, balance sheet and statement of accounts for the preceding year and an estimate of receipts and payments for the ensuing year.

7.1 Secretary

The Secretary shall take and keep minutes of all meetings, give the prescribed notices of meetings, conduct the correspondence of the Society, keep a register of members and generally carry out the duties usually devolving on a Secretary.

7.2 Treasurer

The Treasurer shall keep usual and proper books of accounts current, shall collect subscriptions, shall bank all monies paid to the Society at such bank or banks as the Executive may decide from time to time, shall write and present the Society's cheques when accounts are passed for payment, shall produce the bank pass books and / or

statements when so required by the Executive and shall present to the Executive at its meeting preceding the AGM an Annual Statement of Accounts and a balance sheet for the preceding financial year. Following the AGM, the Annual Statement of Accounts and the balance sheet for the preceding financial year are to be transferred to the Secretary and filed for accounting purposes.

Auditor

The Auditor shall audit the books of accounts and certify the accounts of the Society for presentation at the AGM. The Auditor shall not be a member of the Society.

7.3 Powers of the Executive Committee

Subject to these rules and to any resolution of an annual or special general meeting the Executive shall have the power to carry out all the objects for which the Society is established and to exercise all the powers of the Society.

7.4 Common Seal

The common seal of the Society shall be that appointed by the Executive Committee and held in the safe custody and control of the Secretary. Whenever the common seal of the Society is required to be affixed to any deed or document it shall be affixed pursuant to a resolution of the Executive Committee and in the presence of two members of the Executive Committee (one of whom shall be the Chairperson or Secretary) both of whom shall sign the document to which the seal is so affixed.

7.5 Bank Account

Any bank account or accounts as may be opened from time to time by the Executive Committee shall be operated on the joint signatures of two members of the Executive Committee (one of whom shall be the Treasurer) appointed by the Executive Committee for this purpose.

7.6 Financial Year

The financial year of the Society shall end on the 31st day of March in each year.

7.7 Alterations to Rules

These rules may be altered, added to or rescinded at any Annual General Meeting or Special General Meeting of the Society and passed by two-thirds of the majority present. Notice of intention to make such changes shall be given in the notice convening the meeting, which shall be provided to members not less than twenty-one days before the meeting. Any alterations to the rules shall not deprive members of the right to have special general meetings in a manner similar to the present provisions of rule 6 or affect the charitable status of the Society.

7.8 Winding up

a. The Society may be voluntarily wound up in accordance with section 24 of the Incorporated Societies Act 1908.
b. In the event of the Society being wound up the surplus assets and funds after payment of the Society's liabilities and expenses of winding up shall be given or transferred to some other charitable society or organisation within New Zealand having objects similar to those of the Society, or for some other charitable purpose.

7.9 Not for Personal Profit

a. The Society is not created for the profit of any of its members thereof and no member shall derive from the funds of the Society, except when a member is a salaried officer or paid employee of the Society and is therefore entitled to receive reasonable expenses incurred in and about the business of the Society.
b. Any income, benefit or advantage shall be applied to the charitable purposes of the Society.