The Sweet Potato Factory
An Archaeological Investigation of the Pouerua Cultivation Landscape

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Abstract

Pouerua is a volcanic cone at the centre of a large archaeological landscape in the inland Bay of Islands, Northland, New Zealand. The volcanic cone has been extensively modified by Maori in the past, and the surrounding landscape shows similar levels of widespread modification.

The results of the field surveys and the investigation of the horticultural features indicated that the horticultural landscape at Pouerua was not one large development but rather a series of smaller constructions that overlapped and abutted one another.

The interpretations of the horticultural data were used to investigate whether temporal and spatial change could be identified in the surviving horticultural systems.

The results of the investigation of both the individual horticultural features and the horticultural systems was used to investigate how the cultivation landscape at Pouerua related to the numerous pa and kainga in the area. This section examined whether the horticultural features could be used to

The results of this study suggest that the horticultural aspect of the Pouerua landscape underwent a series of changes in a similar vein to the pa and kainga within the same area.
Acknowledgements

There have been many people who have contributed to the completion of this thesis by sharing their knowledge and resources. To all, I am very grateful.

To Dr Ian Barber, who has overseen my research from its lofty days as an undergraduate dissertation, thank you for providing much needed guidance and feedback and ensuring that my work (and sometimes my written cultivation ramblings) could develop into the chapters that follow.

To my parents, I am eternally grateful for the support which you have shown me over the years. It is hard being a young archaeologist, but it is even harder being a young archaeologists parents. May you breathe a sigh of relief now that I have finished this thesis and found employment in my chosen profession.

To Messrs. Dickson, van Halderen, Shaw-Bennett and Howie, my gratitude to you for ensuring that however much snow fell, rain poured, or wind blew, I always had good company in sunny Dunedin. A better gang surely never existed.

To the land owners past and present, thank you for allowing me to come and take photos of rock heaps and old garden paths. Thanks must also go to the hapu Ngati Kawa of Oramahoe for their interest and assistance with this thesis.

To all others too numerous to name, who read my work, offered books, references, maps, photos, and breaks from the labour of thesis writing, I thank you very much for your assistance. If it takes a community to raise a child, then it must surely take an extended network of archaeologists, friends, family, and internet resources to hatch a Master’s thesis.
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1

The Archaeology of a Landscape

Pouerua Pa stands at the centre of a vast horticultural landscape. It would never be possible to understand the nature of settlement at Pouerua without also understanding the nature of horticulture on the surrounding lava field. (Sutton, Furey and Marshall 2003:10)

1.1 Introduction

The Pouerua volcanic landscape is home to some of the most extensive and well preserved archaeological remains of large scale Maori gardening in New Zealand. Furthermore, the horticultural evidence extends on to or abuts the modified volcanic cone of Pouerua, as well as seven fortified pa sites (Sutton 1993:3) and perhaps 300 or more undefended kainga settlements (Sutton 1990b) within an area covering approximately 500 hectares. Investigating the nature of the relationship between horticultural production and the occupation of the settlements at Pouerua is the central research focus point of this study.

Despite the intentions of the original Pouerua Project (Sutton 1982:183), the relationship between horticultural systems and the larger pattern of settlement have not been investigated. Archaeological interpretations of settlement within the pa and kainga have focussed primarily on change within the identified boundaries of those sites, often with limited discussion of how those sites existed within the immediate surrounding area, and how the horticultural landscape was related to change within the settlements and the wider environment.

In order to better understand the relationships between field systems and settlements at Pouerua, this thesis looks closely at the horticultural aspect of the Pouerua landscape. A detailed understanding of the form and distribution of horticultural features complements the earlier archaeological interpretations of the investigated settlements at Pouerua (Sutton 1990a; 1993; Sutton et al. 2003). Furthermore, a thorough understanding of the Pouerua landscape means that it is possible to examine how different sites may have been related to one other temporally and spatially, and how the Pouerua landscape came to exist in its current form.
1.2 Research Aims and Objectives

1.2.1 The Archaeology of Cultivation at Pouerua

This section addresses each of the two research approaches developed to investigate the horticultural relationships and settlement at Pouerua. In the first instance, this section examines the horticultural evidence at Pouerua, with a focus on the form and distribution of features and the identification of change in the way in which the horticultural features may be constructed or utilised.

The size of the Pouerua landscape (approximately 500 hectares), the extended history of occupation (Sutton et al. 2003:217-227), and the variation in the environment within the volcanic area, means that the horticultural evidence is widely distributed and its construction potentially influenced by a number of factors including cultural and environmental elements. In light of this, the first research question has been framed as follows:

1. How diverse is the Pouerua horticultural landscape? Can the distribution, form, and possible function of the recorded features be used to identify discrete areas of horticultural or other activities at Pouerua?

This first question is addressed in this study using the combined results of field work undertaken by Phillips (1980), Phillips and Hilton (1981), Sutton (1990a; 1993), Challis and Walton (1993), Sutton et al. (2003), and Bell (2008). This field survey evidence is supplemented with assorted topographical and geological maps and aerial photographs, and field work undertaken as part of this thesis project.

This archaeological evidence from Pouerua is then used to investigate how to expand the examination of horticultural features beyond identification and form and into the issues associated with function and the changing nature of horticultural systems. This is an issue which was raised by Furey (2006) in her investigation of Maori horticulture in New Zealand. In this volume, Furey (2006:118) argued for the identification of base horticultural systems and analysis of the changes that take place with the horticultural system, such as the subdivision of land.

The horticultural landscape presents an interesting archaeological conundrum. Much of the evidence for gardening, including the very medium within which the plants grow, is invisible without excavation or indistinguishable from the surrounding soil. While Furey (2006:118) notes that identifying change within the horticultural landscape is the next logical step in the investigation of Maori horticulture, archaeologists are faced with the question of how to investigate something that is at the same time so visible on the landscape, and yet so
concealed. In order to utilise the horticultural data resulting from this and earlier studies, the second part of this investigation asks:

2. Using a testable method, is it possible to identify temporal and spatial changes within discrete areas of horticultural activity at Pouerua?

These first questions explore the horticultural evidence at Pouerua and the how the horticultural landscape may have developed and been modified in the past. This study looks to advance the study of Maori horticulture in New Zealand by identifying a method that can be used to look at how Maori modified the landscape around them to meet their needs. The successful identification of a process for investigating change within horticultural systems also means that it becomes possible to compare different horticultural systems from different environments and potentially different periods.

1.2.2 Gardens, Pa and Kainga – Constructing a Cultivation Context for Settlement

Context is the focus of this final section of this study. The importance of considering a site in relation to its archaeological surroundings was noted by the authors of the third Pouerua volume (Sutton et al. 2003:10), and it is the Sutton et al. (2003) quote regarding context, that introduces this thesis.

In order to make the best use of the horticultural evidence resulting from the previous two sections of this thesis, this section examines how the horticultural evidence relates back to the settlement features. In the same way that settlement is best understood in the context of the horticultural landscape (Sutton et al. 2003:10), this thesis examines whether a settlement context for the horticultural features can affect interpretations of use and modification. In this case, this means asking:

3. Is there evidence of a spatial relationship between settlement features (pa and kainga) and horticultural systems at Pouerua? Can the settlement evidence be used to assist interpretations of the use and modification of the horticultural systems?

An investigation of the relationship between horticultural sites and settlement features considers how the horticultural landscape may have developed in relation to the construction of numerous settlements. It also begins to examine whether settlements and horticultural
systems were necessarily discrete groups of features on the Pouerua landscape or larger and more interactive site types.

1.3 Thesis Structure

There are many unique elements that shape and define the way a landscape appears and the way in which it is interpreted and experienced. The following chapter in this thesis draws together many aspects of Pouerua’s archaeological, cultural and environmental history to provide a sound lead into the investigations that follow in subsequent chapters. Chapter Two also looks beyond Pouerua to discuss the archaeology of cultivation, and the ideas and influences from New Zealand, the Pacific and further abroad that shaped the investigative approaches applied in this thesis.

In Chapter Three, the different methodological approaches utilised in this study are presented. This begins with the survey techniques applied in the initial stages of this research project, and continues through with the approaches used to investigate temporal-spatial change in horticultural systems and the spatial relationship between settlements and horticultural systems at Pouerua.

Chapter Four begins to address the first research question of this thesis (section 1.2.1). The evidence presented in this chapter is a collation of the horticultural data from across the Pouerua landscape. It details the form, distribution and frequency of the horticultural features identified on the land surrounding the Pouerua volcanic cone.

In Chapter Five, the potential function of the horticultural features identified in the previous chapter is explored. The analysis of features in this chapter also contributes towards an understanding about whether discrete areas of horticultural activity are present on the Pouerua landscape. This is an idea which forms the basis for an investigation of change in Chapter Six.

In Chapter Six, the temporal and spatial development of horticultural systems is investigated using the methodology presented in Chapter Three. This chapter focuses on whether patterns of construction and landscape development can be identified in areas identified as individual horticultural systems. It goes on to consider the implications of this investigation of change, on interpretations of the wider Pouerua landscape.

Chapter Seven addresses the third and final research question in this study. Drawing together horticultural and settlement evidence from this and earlier studies (Phillips 1980; Phillips et
al. 1981; Sutton 1990a; Challis et al. 1993; Sutton 1993; Sutton et al. 2003), it examines whether there is sufficient evidence to identify a spatial relationship between horticultural sites and settlement features. It looks at the individual relationships between horticultural systems and the cone pa, peripheral pa, and kainga and whether the horticultural systems can assist in the interpretation of settlement at Pouerua.

Finally, Chapter Eight considers the three central aspects of this study. In the first instance this means discussing what exactly the Pouerua horticultural landscape consists of and whether there is evidence of discrete areas of cultivation. It continues on with conclusions about the process of identifying temporal and spatial change within horticultural systems, and concludes by examining the argument for considering sites within their archaeological contexts rather than as isolated finds.
2

Pouerua

2.1 Introduction

The movement of Maori settlements and cultivations from the coastal Bay of Islands, to the inland volcanic area near Pouerua/Pakaraka is suggested to have been at least in part, the result of ‘rapid botanical degeneration’ (Sutton 1990b:682) following Maori clearance of the primary forest from the landscape. The loss of the primary forest species resulted in the extensive spread of the bracken fern (*Pteridium esculentum*) across cleared lands, including some areas of cultivation. In response to this botanical invasion, Maori sought out soils which were easier to cultivate (Sutton 1990b:682). This, Sutton *et al.* (1990b; 2003) suggest, is at least part of the explanation for why Maori moved inland from the coastal Bay of Island, and began settling on the Pouerua volcanic landscape around 1400 A.D. (Sutton *et al.* 2003:217-227).

The Pouerua landscape as it exists today is the culmination of approximately 600 years of human agency, 170 years of which has included a European influence. The Pouerua landscape includes the construction of pre-European pa, kainga and gardens and then later post-contact examples of the same. Overlapping and interwoven with this Maori evidence of settlement and cultivation, is extensive European farming features and settlements.

In order to understand how these European and Maori archaeological features may have developed, this chapter looks at what factors may have influenced their location and construction. These include the environment, the surrounding political landscape, the cultural history of the Pouerua area, the extent of social and economic interaction between Maori and Europeans, and the introduction and availability of new cultigens. This section also looks at the influence of archaeological research on the interpretation of the landscape and current
interpretations of the use and development of the Pouerua landscape, with a particular focus on settlement features such as pa and kainga.

Part two of this chapter looks at the archaeology of cultivation. This section provides a New Zealand context for the study of horticulture. It discusses how horticultural systems in New Zealand and the wider Pacific have been investigated previously, and provides perspective about the role of cultivation recorded in other sites.
Figure 2.1 – Location of the Pouerua study area
Figure 2.2 – The Pouerua landscape
2.2 The Landscape

The volcanic cone of Pouerua is located on the Taiamai Plains, 4.5km south-east of the small township of Ohaeawai, and approximately 20km from the Bay of Islands coastline (Figure 2.1). The Pouerua cone is centrally positioned in a lava field that occupies approximately 550 hectares of land in the inland Bay of Islands (Figure 2.2) (Sutton et al. 2003: 13).

2.2.1 The Formation of the Pouerua Cone and Surrounds

The Pouerua cone stands 130m above the level of the surrounding landscape. Dating from 30,000 to 60,000 years ago, Pouerua is a ‘…scoria cone complex surrounded by a mosaic of lava flows, some of which are buried by air fall ash’ (Hayward and Smith 1992:1). The Pouerua cone, which at its base measures 1km x 0.7km across, has two craters. The larger of the two craters has been over steepened by the withdrawal of magma, while the smaller southern crater has been breached to the south (Hayward et al. 1992).

During the eruptive phase of Pouerua’s history, deposits of air fall ash on the cone itself as well as on the surrounding area helped shape the landscape that we know today. The ash deposits were uneven and consequently the stone deposited during the eruptions is less visible on the eastern side of Pouerua, where greater deposits of ash fell. The damming of the Puketotara stream by lava flows resulted in the formation of Lake Owhareiti, to the east of Pouerua (Sutton et al. 2003:13). To the south of Pouerua, the breaching of the southern wall of the second crater resulted in a landscape of shallow soils and rocky outcrops (Hayward et al. 1992).

2.2.2 Environment and Climate

The proximity of this area to the sea and the sub-tropical latitude mean that the climate is warm and humid. Climate data recorded at nearby Kerikeri (Table 2.1) gives an idea of the current environmental conditions and what type of climate may have been encountered by cultivators at Pouerua in the past. This does not mean that the past environment would have
been identical to today’s, but rather that in the absence of significant climate change, Maori may have encountered a similar environment to that recorded at Pouerua now.

Table 2.1: Climate Summary Table. Data recorded at Kerikeri, 17km north of Pouerua (Source: New Zealand Metservice 2010)

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<table>
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<td><strong>Mean Annual Rainfall</strong></td>
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</tr>
<tr>
<td><strong>Months with Greatest Rainfall</strong></td>
<td>June (183mm)</td>
</tr>
<tr>
<td></td>
<td>July (162mm)</td>
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<td></td>
<td>August (174mm)</td>
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<tr>
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<td>December (88mm)</td>
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<td></td>
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<td><strong>Temperature Mean Min January</strong></td>
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</tr>
<tr>
<td><strong>Temperature Mean Max July</strong></td>
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<tr>
<td><strong>Temperature Mean Min July</strong></td>
<td>6.6° C</td>
</tr>
<tr>
<td><strong>Ground Frost Days</strong></td>
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</table>

Today most of the Pouerua landscape is under pasture, with pockets of native bush to the north, south and west of the Pouerua cone. The cone itself is partly under pasture, although the heavily terraced flanks on the north-eastern, northern, and western aspects of the cone are now hidden under a heavy cover of gorse (*Ulex europa*). Lake Owhareiti and Jacks Lake (Lake Waingata) are located to the immediate east and south of the Pouerua cone. The Waiauruhe and Waiparera streams run along the western and southern edges of the Pouerua landscape, approximately 1km from the base of the cone.

An area of swamp covering approximately 7 hectares of land is located 600m north-west of the base of the volcanic cone. Natural outcrops of stone such as chert have been recorded near Lake Owhareiti (Figure 2.2). Other than these outcrops of rock, and areas of forest and wetland, the greater majority of the Pouerua is pasture on an open and undulating landscape.
2.2.3 Geology and Topography

There is considerable variation in the nature of the landscape which surrounds the Pouerua cone. To the east, the steep sided cone becomes a series of plateaus and ridges, before levelling out closer to Lake Owareiti. Low conical hills are a common feature on the land near the northern tip of Lake Owareiti (Figure 2.4). To the north and northeast, a series of ridgelines and elongated low hills (Phillips et al. 1980:5) have resulted in numerous low sided valleys and basins. Further north, the land levels out significantly, becoming a flat area of land interspersed with collapsed lava flows and rocky outcrops (Figures 2.5 and 2.7). The western aspect of the Pouerua landscape is notable for its numerous low conical hills and the largest valley on the Pouerua landscape (Figure 2.6). Close to the cone, there is minimal visible surface stone; however this changes significantly 400m out from the base of Pouerua cone where the western stone field begins. Finally the land to the south of Pouerua is an undulating landscape of stony hillocks and rocky outcrops partially covered by turf (Figure 2.5).

Ridgelines are narrow and radiate out from the base of the volcanic cone (Phillips et al. 1980:5). The low conical hills are most common to the east near Lake Owareiti and to the northwest between the northern and western stone fields. Maori used many of these conical hills for settlement as indicated by the cut terraces on the flanks and hill tops. Low rises are also a notable feature at Pouerua. They are often only a few metres higher than the surrounding land (<10m in height) and have a flat surface.

A series of closely clustered conical hills, or two or more interconnecting ridges or low rises will often result in small, shallow basins or valleys. Phillips et al. (1980:9) noted that the absence of any natural drainage outlets for the shallow basins and valleys around Pouerua meant that these valleys and basins would act as sites for the natural accumulation of minerals and soil particles. Theoretically this would mean that these natural sinks are likely to have greater deposits of accumulated soil from erosion of the valley and basin slopes.

The basalt stone at Pouerua has been likened to that recorded on the Auckland isthmus (Phillips et al. 1980:5). The Taheke basalt at Pouerua is ‘bordered on all sides by rock of sedimentary origin…to the north and south is a rock of argillaceous limestone…undifferentiated alluvium to the southwest…to the west are two islands of
sandstone...to the east of Pouerua the rock is shale and sandstone’ (Phillips et al. 1980:9). Figure 2.4 and Table 2.2 provide detail about the soil types recorded across the Pouerua volcanic landscape and those soils which abut it. While it has been noted that the soils at Pouerua may be of low, medium or high fertility, this relates only to the natural fertility of the soil (Phillips et al. 1980:11). There is always the potential that soils could have been modified to increase their suitability for cultivation. The majority of the horticultural features at Pouerua have been recorded on the Ohaeawai silt loam, Ohaeawai bouldery silt loam and Papakauri silt loams which have been identified as being highly fertile (Table 2.2).

2.2.4 Factors Affecting Site Survival

The volcanic loams surrounding the cone are divided by Ludbrook Road and State Highway One. In the case of the former, the road initially runs along the eastern margins of the horticultural area, but later crosses through the middle of the horticultural systems located around the base of the cone and the edges of Lake Owhareiti. State Highway One runs along the northern edge of the horticultural landscape. The majority of features relating to horticultural production at Pouerua along this northern edge marked by the highway have either been destroyed by ploughing or are not present this far from the cone (approximately 1.5km). The small township of Pakaraka sits on the north-eastern edge of the volcanic landscape.

Most of the land surrounding Pouerua cone is run as sheep and beef farms, much as it has been for the last century (Cyclopedia Company 1902:572). This land is mostly pasture which has been sown by different methods. For the Maori archaeological sites this means there are varying levels of site survival depending on the extent of land clearance and the contour of the land. Along the fringes of the surviving Pouerua landscape are several lifestyle blocks, however these are unlikely to have had significant impact on the level of preservation of sites surrounding the cone.
Figure 2.3 – Soil types on the Pouerua Landscape as identified by Phillips and Hilton (1980)
Table 2.2: Soil codes for the Pouerua landscape identified in Figure 2.4 (Department of Lands and Survey 1980; Phillips et al. 1980:11)

<table>
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<th>Soil Code</th>
<th>Soil Type</th>
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<tr>
<td>AP</td>
<td>Aponga clay</td>
<td>Yellow-Brown earth from sedimentary rocks. Formed under Podocarp forest. Have granular topsoils of medium fertility.</td>
</tr>
<tr>
<td>KB</td>
<td>Kiripaka bouldery silt loam</td>
<td>Red Brown Loams derived from basalt rock. Highly fertile soils that are often shallow and boulder strewn.</td>
</tr>
<tr>
<td>KR</td>
<td>Kara silt loam</td>
<td>Yellow-Brown earth from sedimentary rocks. Formed under Kauri forest. Leached soils.</td>
</tr>
<tr>
<td>OMH</td>
<td>Omu clay loam</td>
<td>Yellow-Brown earth from sedimentary rocks. Formed under Kauri forest. Leached soils.</td>
</tr>
<tr>
<td>OW</td>
<td>Ohaeawai silt loam</td>
<td>Red Brown Loams derived from basalt rock. Highly fertile soils that are often shallow and boulder strewn.</td>
</tr>
<tr>
<td>OW + OWb</td>
<td>Ohaeawai silt loam / Ohaeawai shallow bouldery silt loam</td>
<td>Red Brown Loams derived from basalt rock. Highly fertile soils that are often shallow and boulder strewn.</td>
</tr>
<tr>
<td>OWB</td>
<td>Ohaeawai shallow bouldery silt loam</td>
<td>Red Brown Loams derived from basalt rock. Highly fertile soils that are often shallow and boulder strewn.</td>
</tr>
<tr>
<td>OW + PK</td>
<td>Ohaeawai silt loam / Papakauri silt loam</td>
<td>Red Brown Loams derived from basalt rock. Highly fertile soils that are often shallow and boulder strewn.</td>
</tr>
<tr>
<td>PKH</td>
<td>Papakauri silt loam (Hill Soil)</td>
<td>Red Brown Loams derived from basalt rock. Highly fertile soils that are often shallow and boulder strewn.</td>
</tr>
</tbody>
</table>
| WF        | Whakapara silt loam and clay loam | Recent soils derived from river sediments. Fertile in areas where drainage is
<table>
<thead>
<tr>
<th></th>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFm</td>
<td>Whakapara mottled clay loam</td>
<td>Recent soils derived from river sediments. Fertile in areas where drainage is adequate</td>
</tr>
<tr>
<td>YC</td>
<td>Waiotira clay loam</td>
<td>Clay soils. Formed under Podocarp forest. Have granular topsoils of medium fertility.</td>
</tr>
<tr>
<td>YCH</td>
<td>Waiotira clay loam (Hill Soil)</td>
<td>Clay soils in hilly areas. Formed under Podocarp forest. Have granular topsoils of medium fertility.</td>
</tr>
<tr>
<td>YO</td>
<td>Waiotu friable clay</td>
<td>Red Brown Loams derived from basalt rock. Shallow topsoil of low fertility.</td>
</tr>
<tr>
<td>YU + KO</td>
<td>Kamo clay loam / Waipu Clay</td>
<td>Gley soils with water on or near the soil surface for prolonged periods</td>
</tr>
</tbody>
</table>
Figure 2.4 – Pouerua aerial showing the eastern flank of Pouerua cone. Note the undulating nature of the terrain in this area with numerous hills and low ridges (Source: Kevin Jones, Department of Conservation Wellington).
Figure 2.5 – Looking over the land to the north of Pouerua. Closer to the cone the land is hilly, and similar to the eastern landscape in Figure 2.4. Further out, it is defined by low ridges and hills, and large open areas with high concentrations of surface stone (Source: Ell 1998).
Figure 2.6 – Pouerua aerial of the western landscape. This side of the cone is characterised by a number of low conical hills and a large valley. The edge of the western stone field can be seen in the foreground (Source: Sutton et al. 2003).
Figure 2.7 – Aerial photo looking south. The land immediately south of the cone consists of numerous low and very rocky hills and ridges. There are lower concentrations of settlement and cultivation evidence in the southern areas (Source: Kevin Jones, Department of Conservation)
2.3 Origins and Alliances – Politics on the Taiamai Plains

The text *Nga Puriri o Taiamai* (Sissons *et al.* 2001) is a study of the political history of Nga Puhi in the inland Bay of Islands (Taiamai/Waimate North). It traces the early ancestors of the tribe, various relationships between groups, and the activities and actions that shaped the political layout of the inland Bay of Islands up to the 1820s.

The text itself makes only limited references to Pouerua directly. The authors take a broad approach with focus on the wider Bay of Islands/Taiamai/Waimate North landscape, of which Pouerua is only one part. The text investigates the relationship between lineages of various Maori hapu and what impact these associations may have had on the political landscape in the Taiamai/Waimate North areas in the period leading up to the 1820s. Sissons *et al.* (2001) associate Pouerua with the early origins of Nga Puhi, however, the focus of the traditional narrative shifts to other areas as the timeline progresses towards the arrival and settlement of Europeans (Marshall 1987: 231).

The name, Pouerua, means two posts. This is said to refer to the two posts which supported the ridge pole for the house of Tahuhunui-o-rangi, one of the oldest named ancestors of Nga Puhi (Sissons *et al.* 2001:69; Marshall 1987:231). The tribal history highlights this early connection between Maori living at Pouerua and the early Nga Puhi ancestor Tahuhunui-o-rangi (from Sissons *et al.* 2001:66-79) as well as identifying some of the alliances and political groupings that tie Pouerua directly into the wider northern landscape. Those histories of particular relevance to this research are those which establish the familial connections between Pouerua and the Hokianga (Pakanae) and Waitangi (Table 2.3). These provide some insight into the role of Pouerua within the greater northern political structure.

This narrative relayed by Wi Hongi, a Tu Uri-o-Hua elder, sets out to explain the geographical and genealogical relationships between various Nga Puhi hapu (Sissons *et al.* 2001:80). Most relevant to this thesis are of course the iwi and hapu associations that relate directly to the Pouerua cone (and the surrounding landscape). However, the traditional history that Sissons *et al.* (2001) recounts describes a complex series of relationships over an extended period of time that influenced the wider landscape beyond the 500 hectares of land that we think of today as Pouerua. The account presented by Sissons *et al.* (2001) highlights
the movement of Maori between the Bay of Islands, Waiate North, Taiamai, Waitangi and Hokianga areas, discusses the hapu which operated in these areas, and potentially occupied the Pouerua cone, the peripheral pa or kainga on the Pouerua landscape. The traditional history, much like the archaeological history, illustrates that the Pouerua archaeological landscape is the result of numerous influences acting upon a landscape over an extended period.

As noted by Marshall (1987:233) one interesting point to emerge from Wi Hongi’s narrative is the distinction between fighting pa and pa which are associated with important ancestors. Marshall (1987:233) suggests that Pouerua is associated with the latter because:

1. Pouerua is identified as the ancestral land of the non-fighting te taha wahine side in Wi Hongi’s narrative, with the Hokianga being the fighting te taha tane side (Sissons et al 2001: 80).

2. Although Pouerua has been identified as a pa on existing archaeological grounds (Sutton et al. 2003), it is not identified as such in Wi Hongi’s narrative. Other named locations are identified as pa or fortified places i.e. Whakaruanganagana and Pakinga (Sisson et al 2001:77, 87).

3. Pouerua is not mentioned as the site of any battles. The only battle associated with Pouerua involves the people of Pouerua but does not occur at Pouerua (e.g. when Ngati Maru sent a war message to the people of Pouerua, Sissons et al 2001:75).

What Sissons et al. (2001:40) make clear is that Pouerua was a landscape associated with the early history of the Nga Puhi iwi, and one which played a fundamental role in shaping the mid-northern political landscape during the 18th and 19th centuries, perhaps even earlier. The allegiance of the Maori at Pouerua to the northern alliance during the 18th and early 19th centuries helped shape the way in which Maori at Pouerua related to other hapu on the
Taiamai Plains and further afield in the Hokianga and Bay of Islands and this in turn impacted on the lives of Maori at Pouerua.
<table>
<thead>
<tr>
<th>PLACES</th>
<th>PĀKANAE</th>
<th>WĀIMĀ</th>
<th>TŪHUNA</th>
<th>PĀRAHIRAH</th>
<th>POUERUA</th>
<th>WAITANGI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANCESTORS</td>
<td>Whakaruru = Rāhiri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Uenuku = Kareariki</td>
</tr>
<tr>
<td></td>
<td>Kaharau</td>
<td>(Kaharau) = Kohinemataaroa</td>
<td></td>
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<tr>
<td></td>
<td>Taurapoho = Ruakiwhiria</td>
<td></td>
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<td>Ruakiwhiria Uewhati Maiku=Hua</td>
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<td></td>
<td>(Uewhati)</td>
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<td>(Ruakino)</td>
<td></td>
<td>Te Rā</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Ruakino Rangiheketini Te Rā</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAPŪ</td>
<td>Te Māhurehure</td>
<td>Ngāti Tautahi</td>
<td>Uri-o-Hua</td>
<td>Ngāti Rangi</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ngāti Korokoro</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

= Marriage

| Descent |

Geographic movement

1. Maikuku went from Pouerua to Waitangi and back to Pouerua. Hua went to Pouerua from Waitangi with Maikuku.

Table 2.3: Geneological and geographical relationships between Pouerua and other Northland locations
(Source:Sissons et al. 2001:81)
2.4 ‘I have purchased a piece of land at Taiamai’

In 1833, Henry Williams made the first of what was to be a series of land purchases in the vicinity of the Pouerua cone. His land purchases at Pouerua are interesting because they saw the majority of the Pouerua archaeological landscape shift into the control of Henry Williams and his family early on in the New Zealand European settlement phase.

Although Europeans had been visiting and forming small settlements along New Zealand’s coastline since the 1790s, European settlement over all, had remained fairly low (Mein Smith 2005:30). William’s large and early purchase of land in the inland Bay of Islands then marked a significant development in the changing role of the Pouerua landscape. It should not be interpreted however, as indicative of the end of Maori association with the land at Pouerua/Pakaraka.

Just when Henry Williams first visited Pouerua and its surrounds is unclear. From his letters to friends and family it is clear that he had concerns for the long term welfare of his children who would soon be of an age where they were no longer supported by the Church Missionary Society (who employed Williams). As a means to support his children, Williams sought out a property that would provide them with a livelihood (Busby 1850:12). When exactly Williams decided that Pouerua was to be this place, is unknown.

The acquisition of the Pouerua landscape by Williams began with the first purchase in 1833 of an area that would later be known as Old Land Claim 54. Over the next four years a total of approximately 11,000 acres (4450 hectares) was purchased by Williams on behalf of his family for £1772 (in cash and chattels) (Evans 1998:75). The proclamation of British sovereignty over New Zealand following the signing of the Treaty of Waitangi in 1840 meant that all pre-Treaty land transactions had to be reviewed by Land Commissioners (Williams 1851:6), and for Williams, this initially resulted in the loss of a significant portion of his land. Following several reviews, he was eventually awarded 9000 acres (3600 hectares). This was a considerable purchase given the tools Williams and family could access in order to turn the land into productive pasture.
The sale of Pouerua to Williams presents an interesting example of how the arrival of Europeans affected the land use patterns of Maori in the 19th century. The traditional and archaeological evidence from Pouerua has been suggested to indicate that Maori would not have divested themselves of such an important ancestral area when they sold off land to Williams in the vicinity of Pouerua cone area in the 1830s (Daamen et al. 1996:201). Wyatt (2002) suggests that the sale of the land wasn’t really a sale at all, but rather the offering of land occupation rights to Williams. Strong ancestral connections have been cited in support of an argument that rangatira such as Te Kamera and Te Tao who sold land to Williams, did not intend to divest themselves of their ancestral or spiritual connection to the area (Daamen et al 1996:202). Further support for this interpretation includes:

1. The Pouerua cone was culturally significant to Nga Puhi, at one stage being considered ‘turangawaewae, seat of the ancestors’ (Marshall 1987:236).

2. The Pouerua area could be considered the cradle of modern Nga Puhi (Daamen et al. 1996: 200).

3. There had been extensive (and in some cases intensive) occupation on and around the volcanic cone with construction of numerous defended sites (Marshall 1987:234).

4. There is extensive evidence of Maori horticulture (Phillips et al 1980; Challis et al. 1993; Sutton et al 2003; Bell 2008).

5. The urupa Kaungarapa is supposedly the burial place of Hone Heke and very tapu (Kawharu 1998:6), although it has also been said that Heke was buried in the Umutakiura Native Reserve when he died in 1850 (Lee: MS).
Henry Williams however, was able to get Te Kamera and Te Tao to sign ‘what amounted to affidavits in which they swore to having willingly disposed of (i tukua) Pakaraka’ (Daamen et al 1996:198). When Williams asked them whether they wished the land returned they answered:

‘He teka rahoki na te Wiremu tana wahi matou na matou wahi’.

This Williams translated as:

‘No indeed, Williams’ portion belongs to him and our portion belongs to us’ (Daamen et al 1996: 198)

Just what relationship Maori did maintain with the Pouerua landscape is unclear. Evidence suggests that Maori did stay on or around the Pouerua cone and surrounding landscape for sometime after the purchase of the land by Williams for his children, but what percentage of the original population this represented is unknown. Marshall (1987:235) notes that settlement patterns changed with the arrival of Europeans and there was a movement of Maori to the coast. Given that Ngati Rahiri (hapu of Pouerua) had coastal rights near Waitangi in the Bay of Islands (Sissons et al. 2001:40), this is a possibility.

It is also possible however, to infer that Maori maintained an ongoing relationship with the land surrounding Pouerua following the sale of the land to Williams. When Williams had the land surveyed and divided into blocks of land for his children, he had the surveyors create three reserves for Maori – Ngahikuanga, Ngamahanga and Umutakiura, totalling 95 hectares. That these lands were at least partially occupied by Maori is confirmed by the fact that the crown purchased the blocks back from its Maori occupants in 1860 (Daamen et al 1996: 203).

Furthermore, in correspondence with his brother-in-law, Henry Williams makes mention of settling in a district populated by Maori (Carleton 1874: 182), that a house and paddock were being constructed for Williams by Maori, and that only one Maori family were inhabiting the land (Williams 1839: 302). That Williams was not simply ignorant of the fact that Maori
were continuing to occupy the land is suggested by his note that the missionary purchase of land at Waimate stood out from recent purchases, as the land purchased was that being cultivated by a ‘large population (of) natives of that place (Waimate North) (Williams 1839: 302).

A less passive example of Maori settlement in the area is suggested by an incident which occurred in the 1840s on land owned by Williams. It was reported that a Taiamai tribe wished to build a pa on a headland at Lake Owhareiti, but with the land being in possession of Henry Williams, his sons threatened to burn down any such construction (Lee 1983: 228). It appears that nothing further took place, and that no pa was constructed, and no pa was burnt down. The incident does however, highlight an ongoing Maori interest in the land at Pouerua and the establishment of control/ownership by the Williams family. It is worth noting also, that the threat the Williams family made may simply have been to do with keeping trouble away from their property (i.e. not wanting to be the scene of a Maori v. Maori or Maori v. European engagement) and not necessarily about excluding Maori from using the land or continuing cultural associations with the area altogether.

In terms of direct historical evidence of Maori cultivation at Pouerua, there is only a brief note made by a passing 1840 exploration party which mentioned that:

‘The plain which surrounds the cone is composed of an uncommonly rich soil, strewed with lava, which the natives collect in heaps, in order to obtain space for cultivation’ (Wilkes 1845:372).

However there is no mention of the United States Exploring Expedition having actually witnessed Maori in the process of clearing or preparing land at Pouerua. Furthermore, while the account indicates that the group actually visited Pouerua cone at this time, no mention is made of Maori living or gardening in the area (Wilkes 1845:372).

Finally, while the deed of sale for the Pouerua Block in 1835 (Turton 1875) does not suggest that the land at Pouerua was still being cultivated by Maori, it does provide limited insight into the availability of European trade goods available to Maori at the time. This included cattle, spades, hoes, and adzes. Theoretically, all these items could have left evidence of
continued Maori occupation of the Pouerua landscape in the early to mid 19th century. A metal adze found on one of the terraces on the flanks of Pouerua cone could be evidence of this ongoing early 19th century occupation (Sutton et al. 2003).

What the historical evidence suggests is that although Maori had sold a great deal of land around Pouerua to Williams during the 1830s, Maori may have continued to have some ongoing interest in the area. It seems likely that the role Pouerua played as a site of traditional settlement for part of the year may have decreased over time. That Maori may have continued to live on or near land owned by Williams should not have been surprising given William’s desire for Pakaraka to become a new township from which he could teach Christianity to the Maori, and perhaps educate them in the agricultural practices of the Europeans, following contemporary practices at nearby Waimate North. Furthermore, the purchase of land near Pouerua was not Henry Williams’ first experience purchasing land from Maori, or his first time sharing land with the vendors (Daamen et al 1996:200). It seems likely that Maori continued to reside in the vicinity of Henry Williams’ property, if not on it, for some time after the sale of the Pouerua cone and surrounds. This is supported by the fact that the area of land that would become the Williams family estate was purchased over a number of years. Maori could have continued to settle on Maori owned lands in the immediate vicinity of Pouerua for several years after the arrival of Henry Williams.

The significance an ongoing Maori occupation of the Pouerua landscape is that Maori would have been likely to have been cultivating introduced European crops at Pouerua, and perhaps keeping animals such as pigs, or perhaps other domesticated animals. As well as pre-contact Maori cultivation, the Pouerua landscape may contain evidence of early historic period European and Maori cultivation, as well as evidence of changing cultivation practices as new cultigens and cultivation technologies were introduced to New Zealand.
Figure 2.8 – View towards Pouverua volcanic cone from near Waimate North c.1840 (Artist: John Johnson) (Source: National Library)
2.5 The Pouerua Project

In the early 1980s, archaeologist Doug Sutton sought to investigate the settlement patterns and subsistence strategies of pre-contact and early contact period Maori on the fertile lava based soils surrounding the Pouerua volcanic cone (Sutton 1982:183). This archaeological landscape in the inland basin known as the Taiamai Plains provided an interesting research opportunity given the presence of the volcanic pa of Pouerua and at least six other peripheral pa around the edge of the volcanic soils. Furthermore, this was an area which had been extensively cultivated by Maori, and the cultivation features were well preserved and widely distributed across the Pouerua landscape.

As a study area, Pouerua and its surrounds had several distinct advantages over similar volcanic cone pa nearby (such as Te Ahuahu, Maungaturoto and Maungakawakawa). Firstly, despite having come into European hands in the 1830s, the area had not been heavily modified with clearance of land for European farming – unlike nearby Maungaturoto or Te Ahuahu, nor had it been partially destroyed by quarrying, as Maungakawakawa had. Secondly, of all the volcanic cones in the Taiamai Plains area, Pouerua was the only one with a large area of volcanic soils suited to horticultural production. Finally, because the Williams family established themselves at Pakaraka in the early 1830s, there are early historic accounts which describe the surrounding landscape as well as providing some clarification of the occupation of the area by Maori in the 19th century (Sutton 1982:187).

The archaeological investigation of the Pouerua landscape was to proceed in three phases. The first phase was to focus on the horticultural systems from a select number of sites from around the Pouerua landscape. Subsurface archaeological investigation of the horticultural features began in the small valley to the west of Pouerua which contained a regular pattern of shallow linear depressions (Sutton 1982). Four other areas with horticultural features were also nominated for excavation. It is not known to what extent these features were investigated as only the briefest of summaries of these excavations was published (Sutton 1983).

A related project also undertaken in the early stages of the Pouerua Project was the drafting of a detailed map of the Pouerua landscape. The map, here on referred to as the Leatherby
and Morgan map (n.d.) after the surveyors, recorded in detail, the horticultural and settlement features at Pouerua. This included both the Maori and later European settlement and cultivation evidence. While the map is an excellent resource for examining spatial relationships between features, the scale of the map (1:1000) makes it difficult to identify some features, particularly the stone heaps and some of the terrace features. Despite never being published in its entirety, the Leatherby and Morgan map (n.d.) has been incorporated into all three of the Pouerua publications (Sutton 1990a; 1993; Sutton et al. 2003) because of the detail contained in the initial recordings.

Phase two of the Pouerua Project would focus on the fortified and unfortified settlement sites from around Pouerua. The excavation of these kainga and peripheral pa were published in the first two volumes of the Pouerua Project (Sutton 1990a; Sutton 1993). In the first volume, archaeologists examined several pre-contact undefended Maori settlements from around the Pouerua landscape (Green 1994; Law and McManus 1994; Damm and Sutton 1994; Marshall 1994; Sutton et al. 1994; Sutton 1994). Drawing on the results of the excavations, this first volume sought to examine several key ideas associated with construction and occupation of kainga:

1. How do archaeologists define a dwelling?
2. How are the kainga organised?
3. What portable artefacts are associated with kainga?
4. Are there identifiable changes in settlement patterns and construction of kainga before 1400-1500AD (when there were no pa)?

(Sutton 1994:84-91)

This volume reports on the excavation of three kainga to the west of Pouerua in the vicinity of the small valley (Law et al. 1994:5; Damm et al. 1994:14; Marshall 1994:23), as well as the excavation of two other kainga on the shores of Lake Owhareiti (Marshall 1983; Sutton et al. 1994:35; Marshall 1994: 56,). Based on the recordings of the then incomplete Leatherby and Morgan map (n.d.) of the Pouerua archaeological landscape, Sutton estimated that there were approximately 312 undefended settlements (or kainga) across the nine square kilometres of volcanic soil at Pouerua (Sutton 1994: 91).
Excavation of the kainga sites focused on the identification of house or structure features, and the classification of different forms of housing (Sutton 1994: 87). Although living areas within kainga were of primary interest to researchers, other associated activity areas in the immediate vicinity of the living structures were also identified. This range of activity areas provided increased understanding of the role of these settlements within the horticultural landscape that they are widely distributed throughout.

Although the relationship between the kainga and the immediate horticultural landscape was not investigated as part of this phase two research, there is indirect evidence that provides some limited insight into the level of interaction between the kainga and the horticultural features around the Pouerua landscape. Examples of horticultural sites which excavators have associated with dated settlement sites (Law et al 1994, Marshall 1994) provide a starting point for considering how to investigate the relationship between the Pouerua horticultural features and the kainga and peripheral and cone pa.

The Pouerua Project identified six peripheral pa on the volcanic loams surrounding the Pouerua cone pa. The excavation of three of these peripheral pa was reported in the second Pouerua volume (Phillips and Green 1993; Leahy and Nevin 1993; Sutton and Crosby 1993). The peripheral pa were of interest to the Pouerua Project because they occupied interesting geographical positions around the Pouerua cone, being located approximately 2.5km or less from Pouerua and with five of the six pa being located on the fringes of the recorded fertile volcanic soils (Sutton 1993:1). The presence of the peripheral pa also raises questions about the role of the central cone pa as a settlement component. Finally, the peripheral pa were considered particularly interesting because they represented a sort of middle ground in the development of settlements across the Pouerua landscape, having been constructed on top of older kainga, but before the construction of the major fortifications on the rim of the Pouerua cone itself (Sutton 1993:1)

The three excavated pa are located on different aspects of the Pouerua landscape. The first (P05/371 – The Stone-walled Pa) is located to the southwest of Pouerua on the shallow and very stony soils recorded in this area. It was selected for excavation because of its stone-walled defences (Phillips et al. 1993:7). Site P05/408 (The Cattleyards Pa) is located on the undulating, friable and moderately fertile soils found to the east of the Pouerua cone pa. The
pa is well defended with steep scarps and a large double ditch (Sutton et al. 1993:65). The third site, (P05/228 – Haratua’s Pa) was investigated because it was thought that this pa may have been occupied during the historic period and attacked by Colonel Despard in 1845, during the Northern Wars (Leahy et al. 1993:27). Although this did not turn out to be the case, excavations did produce a number of carbonised kumara tubers (*Ipomoea batatas*) (Yen and Head 1993:56).

The third and final phase of the Pouerua Project involved the excavation of the Pouerua cone in order to establish the chronology of the occupation and fortification on the rim and flanks of the cone (Sutton 1982: 189). The final Pouerua volume (Sutton et al. 2003) presents the excavation findings and interpretations from the research carried out on the volcanic cone pa itself. It was proposed by the authors that the best way in which to investigate a pa such as Pouerua was to identify the numerous stratigraphic layers that mark the many construction events in the cone pa’s history (Sutton et al. 2003:26). Unlike the previous two Pouerua volumes, this text uses the excavation data to extensively detail numerous individual construction events that took place on the rim of the cone. These have then been used to interpret in detail, the sequence of settlement and occupation of part of the Pouerua cone. The interpretation by Sutton et al. (2003) highlights the changing role of the rim of the cone over time, moving between periods of being defended and undefended. In this approach, Pouerua was not simply a defensive fortification on the top of a very steep hill where Maori could seek refuge, but also a place from which they could advertise their wealth and presence on the Taiamai landscape (Sutton et al. 2003:233).

Significantly, Sutton et al. (2003:227) conclude that while Pouerua cone may have been a pa or kainga during most, if not all its occupational history, to describe Pouerua cone as a settlement was misleading. The occupation and modification of the cone would have been for the most part, carried out by small groups and represents independent activities as opposed to large scale organised redevelopment of the cone. Pouerua for most of its history represented multiple sites which may not have been constructed or occupied at the same time, and to suggest that occupation on the rim and flanks of the cone represented a settlement was highly reductive, reducing multiphase development and occupation by an unknown number of developers into a singular collective construction event (Sutton et al. 2003:227)
Beyond these three Pouerua volumes, there have been several other research projects that have associations with and contributed to, the interpretation of Pouerua. An analysis of the lithic assemblage from Pouerua (Brassey 1985) examined the range of sources for lithic materials recovered from Pouerua and the reasons why such resources were utilised. McCoy et al. (2010) also investigated the Pouerua lithics, re-examining the obsidian recovered from the original Pouerua excavations in order to investigate supply zones and procurement areas for Maori in the Bay of Islands. Finally, Marshall (1987) investigated the antiquity, form and function of the terracing on the flanks of the Pouerua volcanic cone. This work examined the role of Pouerua as a settlement by identifying the periods of settlement, and examining the changing form of terraces and their assorted uses (defence, storage, food preparation, open space) (Marshall 1987:i).

Finally, there has been a limited investigation of the micro-botanical evidence from several sources at Pouerua. The first was a study of a pollen core taken from Jack’s Lake (south of Pouerua) which indicated a significant change in the environment with extensive forest clearance after c.1400AD (Chester 1986). This highlighted a dramatic decline in forest cover in the area, which was in turn interpreted as indicative of the arrival of Maori in the inland Bay of Islands area and the impact of human agency on the forested landscape. As forest species went into decline, there was an increase in the presence of bracken fern (*Peteridium esculentum*) and grasses (*Gramineae*).

A more detailed study relating directly to the horticultural features at Pouerua involved the excavation and analysis of two stone features, and the analysis of the soil material recovered from on of these features (Horrocks et al. 2000). The project excavated a stone mound (a 20cm high, circular and hemispherical mound with stone curbing, a friable soil fill and a pasture turf covering) and a stone heap (also circular and hemispherical but approximately 1m high and containing no soil fill). Analysis of the soil recovered from throughout the mound and from near the base of the stone heap gave some new insight into the use of the horticultural features at Pouerua (Horrocks et al. 2000: 867). Analysis of the pollen and phytolith material from the stone mound indicates gourd (*Lagenaria siceraria*) was most likely to have been growing on or in very close proximity to the stone mounds. The gourd pollen identified in the sample was likely to have been deposited in close proximity to where the original plant was growing rather than re-deposited from elsewhere by the wind or insect activity. The authors also identified pollen from pine (*Pinus radiata*) in the soil samples,
inferring that the excavated was historic in origin. However, given that the soil mounds are not sealed hermetic environments, the presence of pine pollen could just as easily represent the exposure of the mound to pine pollen, and its migration down through the soils, rather than a definite historic origin. The accuracy of the identification of the pollen and phytolith material has also been questioned, given that the comparative samples for the identification of plant species were all drawn from cultivated plants (Anderson 2008:1505).

Although the archaeological investigations at Pouerua have focused primarily on identifying settlement patterns and construction and modification events in pa and kainga, there is a limited source of material relating to the horticultural systems. All of the available material relating to the original Pouerua Project has be utilised in this thesis to investigate the horticultural landscape using the methods described in the following chapter.

2.6 The Taiamai Plains

The Taiamai Plain is a large, relatively flat area of land in the inland Bay of Islands. It extends from hills 5km east of Pouerua, North-west back to Lake Omapere (approximately 10km away); and encompasses the volcanic cones of Pouerua, Maungaturoto and Te Ahuahu and their surrounding volcanic soils (Figure 2.1).

Despite the early transition of the Pouerua landscape into European hands, there is relatively limited historical information about the changing nature of cultivation in the early historic period at Pouerua. This section looks at how traditional cultivation practices elsewhere on the Taiamai Plains may have been influenced by new cultigens and technologies introduced post 1769 to New Zealand. The Taiamai Plains and Waimate North areas form the basis for this study area because they are close enough to Pouerua (within 10km) for the exchange of ideas and technologies to potentially have found their way to Pouerua.

The Taiamai Plains/Waimate North study area covers approximately 15,000 hectares of land that is similar in some respects, to that found at Pouerua. Within the boundaries of this study area (see Sutton 1982) are the large volcanic cones of Maungaturoto and Te Ahuahu, which have been gardened in a similar way (although not as extensively) as the land surrounding
Pouerua. Archaeological site recording on the Taiamai has primarily consisted of site walk recording surveys and general recordings at a distance. No other sites on the Taiamai Plains have been as thoroughly investigated as those surrounding Pouerua.

Table 2.4: Site types recorded in the Taiamai Plains/Waimate North Area (Excluding Pouerua and immediate surrounds) (Source: New Zealand Archaeological Association Site Recording Scheme)

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Number Recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticultural/Agricultural</td>
<td>21</td>
</tr>
<tr>
<td>Pa</td>
<td>20</td>
</tr>
<tr>
<td>Historic</td>
<td>15</td>
</tr>
<tr>
<td>Terraced Sites</td>
<td>11</td>
</tr>
<tr>
<td>Storage Pits</td>
<td>8</td>
</tr>
<tr>
<td>Burials/Wahi Tapu</td>
<td>7</td>
</tr>
<tr>
<td>Find Spot</td>
<td>4</td>
</tr>
<tr>
<td>Midden</td>
<td>1</td>
</tr>
<tr>
<td>Taniwha</td>
<td>1</td>
</tr>
</tbody>
</table>

One of the earliest accounts of this period that describes activity near Lake Omapere, comes from John Nicholas. The group he was travelling with passed through a wooded area which had been partially felled and burnt for the purposes of cultivation. The Maori were:

‘Collecting the stones into heaps, to be carried off, and cultivating with much care every spot as they cleared it …the soil although stony was remarkably rich…’ (Nicholas 1817:342)

Nicholas also mentioned an extensive cultivation of kumara and potato (*Solanum tuberosum*) near Waimate North, where gourds, cabbages (*Brassica oleracea*), turnips (*Brassica campestris rapifera*) and maize (*Zea mays*) were also being cultivated (Nicholas 1817:341). Furthermore, while visiting Waimate North, he also recorded that the village which they visited contained approximately 100 buildings (including storerooms) and had a population was around 300 people. Very few of these people however, were around as the majority of the population had gone to the coast to catch fish for the winter (Nicholas 1817:342). This final statement reflects the practices recorded by Sisson *et al.* (2001:40) who noted that the Ngati Rahiri hapu which controlled Pouerua and its surrounds, also migrated to the coast for several months of the year in order to collect fish and shellfish.
Other early accounts include one by Samuel Marsden who passed along the edge of the Taiamai Plains around 1820. He noted the plain had been extensively cleared in the past, and that while the soils appeared to be very rich, they were also stony. Finally, encountering the ruins of two villages, he mentions a few potatoes growing wild on the hills (Elder 1932:207).

Perhaps the most detailed account however, comes via the artist Augustus Earle, who while travelling from the Hokianga to the Bay of Islands in 1827, described the horticultural activities of Maori near Taiamai. The village of Taiamai referred to in the account is likely to describe a village in the vicinity of the town now called Ohaeawai (Anaru 1956:19). It could be a reference to pa sites such as Maungaturoto (P05/194), Manowhenua (P05/219), Te Rua Hoanga (P05/206), Taka-poru-Roku (P05/294) Tapahuara (P05/198) or Nga Pukepango (P05/230), all of which are within approximately 1km of Ohaeawai/Taiamai.

‘At midday we arrived at what in New Zealand is considered a town of great size and importance, called Ty-a-my. It is situated on the sides of a beautiful hill, the top surmounted by a pa, in the midst of a lonely and extensive plain covered with plantations of Indian corn, kumara and potatoes. This is the principal inland settlement and in point of quiet beauty and fertility... To view the cultivated parts of this country from an eminence a person might easily imagine himself in a civilised land. For miles around the village of Ty-a-my nothing but beautiful green fields present themselves to the eye. The exact rows in which they plant their Indian corn would do credit to a first rate English farmer, and the way in which they prepare the soil is admirable... The greatest deficiency which I observed in the country around me was the total absence of fences; and this defect occasions the natives a great deal of trouble which might very easily be avoided ... Hogs are the principal part of their wealth ... These animals, consequently, are of the utmost importance to them’ (Earle 1827: Chapter XXIII).

Finally, in 1830 at Waimate North, the Church Missionary Society established a Mission station where Maori could be educated not only in the Christian faith but also in European methods of agriculture. While the station had a fairly short life, the farm at Waimate North was at least initially, successful in replicating the English countryside in the colonial outpost of Waimate North. Here, on the edge of the Taiamai plains were potatoes (*Solanum tuberosum*), barley (*Hordeum sp.*), wheat (*Triticum sp.*), asparagus (*Asparagus sp.*), cucumbers (*Cucumis sp.*) and hops (*Humulus sp.*) amongst other things. In the fields
surrounding the station, clover and the ubiquitous gorse bush were also being cultivated (Darwin 1880).

While this material does not confirm that any European crops were cultivated at Pouerua, their presence on the Taiamai Plains means that the investigation of cultivation practices at Pouerua must also consider whether any archaeological features may represent the transition from traditional crops such as kumara to the introduced cultigens such as the potato.

2.7 The Archaeology of Cultivation

The preceding section has focused on providing a background for the Pouerua landscape from environmental, traditional, historical and archaeological perspectives. This section provides a basis for the investigation of horticultural systems associated with Maori crop production by looking at examples of horticultural studies in New Zealand and the wider Pacific. This section also looks at later historical influences which could have manifested themselves in specific archaeological features across the landscape.

Unlike the smaller Islands of the Pacific (with the exception of Hawaii), there is evidence of regional variation in New Zealand cultivation practices which appears to be at least partially related to regional variation in climate. The study of horticultural practices in New Zealand makes available to archaeologists, another aspect of Maori life. The study of horticultural features is not simply the study of plants cultivated, but also the study of the processes that shaped a significant aspect of Maori life. In this sense, realising the full potential of the archaeological record means utilising all aspects of the existing archaeological landscape.

2.7.1 Studies of Horticulture in New Zealand and the Wider Pacific

Some of the earliest, and perhaps most detailed accounts of Maori horticultural practices and archaeological features relating to cultivation, were recorded by Elsdon Best in his volume *Maori Agriculture* (1925). This study by Best (1925) however, mixes together examples of likely pre-contact Maori cultivation features with late 19th century accounts of traditional Maori gardening practices and ritual. Other early texts included accounts of Maori cultigens
and cultivation practices (Colenso 1880; Walsh 1902), but these also tend to discuss Maori cultivation during the transitional proto-historic/early historic period by which time new cultigens had been introduced by Europeans and some of these had been integrated into Maori growing practices (as has been discussed in section 2.4 and 2.6 of this thesis). During the early 20th century, other publications described the wetland drainage systems in the upper reaches of the Northland province (Wilson 1921; Skinner 1921), modified soils near Nelson (Rigg and Bruce 1923) and assorted archaeological features associated with cultivation from across the country (Walsh 1902; Smith 1904; Fraser 1925)
Figure 2.9 – The Mission Station at Waimate North c.1845 with volcanic cone of Pukenui/Te Ahuahu in the background. Livestock can be seen in fenced paddocks surrounding the station (Artist: Cyprian Bridge) (Source: National Library Archives).
The descriptive and sometimes anthropological accounts of Maori gardening practices in the 19th and early 20th century were later followed up by much more theoretical studies. Golson (1959), Yen (1962) and Golson and Gathercole (1962) explored views relating to the origins of cultigens and their introduction into New Zealand. However, a shift back towards the productive landscapes followed on a decade later (Barber 2004:171).

In the past four decades, there has been an increase in the study of Maori horticulture from an archaeological perspective. These later studies focussed more on the nature of the archaeological site, the types of features present, and their role within settlement and cultivation. These more recent texts include the detailed study of the archaeology of Palliser Bay (Leach and Leach 1979) and subsequent reports of cultivation features (Leach 1976; 1979a; 1979b). While the investigation of the horticultural sites resulted in a detailed record of horticultural production, Palliser Bay is somewhat marginal in terms of climate. While the investigative approach of Leach (1976, 1976b) provided guidance for this study, the conclusions reached by the authors about the development of horticultural production in Palliser Bay, is less relevant because of the environmental differences.

A study of coastal and river mouth sites on the east coast of New Zealand by Jones (1986; 1988; 1991) also provides insight into how to record and investigate horticultural areas. Again however, significant differences in the climate and general environment of the sites and Pouerua and the East Coast mean that this thesis draws more upon the methods applied by Jones (1986; 1988; 1991) in the interpretation of the site, as part of the development of methods for investigating Pouerua sites.

Other detailed investigative projects which have examined the nature and extent of horticultural features, include the study of the stone fields in the Auckland province (Sullivan 1972; 1974; 1975a; 1975b; Veart 1986; Welch 2000), and both Johnson (1986) and Barber’s (1984; 1989a; 1989b; 2001) study of wetland horticultural systems in far northern New Zealand. The Auckland and Northland areas are particularly interesting for the study of cultivation at Pouerua, because climate of the inland Bay of Islands is transitional between the subtropical far north and the cooler Auckland region (as indicated by NIWA climate summaries based on mean rainfall, mean high and low temperatures, ground frost days and sunshine hours over a 30 year period (http://www.niwa.co.nz)). Pouerua may also contain
similar volcanic features as could be encountered in the Auckland region (such as occupation of volcanic cones and cultivation of volcanic soils). Wetland crops such as taro (cultivated in the far northern field systems recorded by Barber (1984; 2001, Horrocks and Barber 2005)) could have been cultivated on the Pouerua landscape, based on its presence at sites such as P05/973 on the Taiamai Plains.

An important growth area in the last decade has been the study of horticultural features on a micro scale, with the study of botanical remains (such as pollen and phytoliths) evident in soils recovered from cultivation features (Horrocks et al. 2000; 2002; 2004). This micro-botanical investigation has been used at Pouerua to identify the use of features such as stone mounds and cultigens grown on or in the vicinity of these features (Horrocks et al. 2000). This aspect of archaeo-botanical enquiry however, has been criticised for its ability to be consistently accurate in the identification of plants given the similarity in the appearance of starch grains, pollen and phytoliths from different plant species (Anderson 2008:1505).

Finally, two important reviews of archaeological research on Maori agriculture have been published in the last decade. Barber (2004) tracked the progression of the archaeology of horticulture in New Zealand over the last 130 years. While the review describes some of the most common examples of features recorded in horticultural sites, Barber (2004) is valuable for providing a detailed comparison of the field evidence that emphasises soil, climate and landscape context and distinctions. In the most recent review, Furey (2006) draws together much of the archaeological material to help define many of the horticultural features (expanding on Walton 1999). The collated materials from sites across New Zealand highlights the distribution of horticultural features, as well as variation of form within a category, such as stone heaps and their likely role as either integral parts of a system of by products of land clearance. The fourth chapter of this study draws upon the conclusions of Furey (2006) and Walton (1999) to aid in the definition of the horticultural features present at Pouerua.
Figure 2.10 – Distribution of Northland archaeological sites with recorded horticultural features (Furey 2006:54)
In the wider Pacific, there have been two areas of horticultural study which have been particularly relevant to the development of investigative methods at Pouerua. The first of these areas is Hawaii, where the investigation of large scale horticultural systems and the adaptation of cultivation practices to variation in the environment are particularly relevant. In the Hawaiian examples (Ladefoged and McCoy 1996; Allen 2001; Ladefoged, Graves and McCoy 2002; Ladefoged et al. 2003; Allen 2004; Kirch et al 2005; Ladefoged and Graves 2008; McCoy and Ladefoged 2009), the thorough investigation of the extent and development of horticultural systems, both spatially and temporally, has been critical in the study of linear horticultural patterns at Pouerua, a concept discussed in Chapter Six.

The second area of interest is Rapa Nui, where the adaptation of garden features in response to the environment is particularly relevant to Pouerua. In particular, it is the use of stone in horticultural systems on Rapa Nui as both stone mulch and wind breaks that are of special interest to this thesis (Wozniak 1998; Stevenson and Haoa 1998; Stevenson et al. 1999; Gossen and Stevenson 2006; Stevenson et al. 2006; Baer et al 2008). In both the Hawaiian and Rapa Nui examples, the climate conditions are very different to those encountered at Pouerua. However, like the research by Leach (1976; 1979b; 1979c) and Jones (1986; 1988; 1991), the natural environment in which these studies were conducted, varies significantly from that found at Pouerua. As a result of this, it is the development and application of different investigative processes that is most significant for the study of horticultural features at Pouerua.

2.7.2 Investigative Methods – Identifying and Collecting Temporal and Spatial Data from Horticultural Systems

Chapter six of this thesis investigates the temporal and spatial development of horticultural systems at Pouerua, looking specifically at whether processes of expansion or increasing internal system development (subdivision) can be identified in examples of horticultural systems. In order to do this, this thesis project has drawn on New Zealand and Hawaiian examples of spatial and temporal analysis of horticultural landscapes to find a method which can be applied consistently to the Pouerua evidence.
In New Zealand, there has been limited investigation of the spatial and temporal nature of horticultural systems, and the few attempts at the identification of this process have been met with only limited success. In the first instance, Sullivan (1975b) attempted to use a combination of excavation and radiocarbon dating to establish a sequence of horticultural development on and around a volcanic cone at Wiri, South Auckland. While Sullivan (1975b) was able to use this information to construct a sequence of events relating to the modification and development of the horticultural area, the sequence itself was broad and related more to the series of developments of large areas of the landscape rather than of specific horticultural systems. The objective of Sullivan’s (1975b:1) research was however, to establish the developmental sequence for horticulture in the wider Auckland region rather than looking at specific individual system development.

Sullivan’s (1975b) research drew extensively upon radiocarbon dates to support the interpretations reached through the excavation of archaeological features. While this approach has potential as an aid to the investigation of the temporal aspect of horticultural system development, it is if limited use on its own as an investigative tool unless it can refine the interpretations of site occupation and development.

Other New Zealand examples include Veart’s (1986) study of the stone structures from South Auckland volcanic sites and Johnson’s (1986) study of valley horticultural systems in Northland. Although not a central part of Johnson’s research, there is a temporal aspect to the construction of the wetland drainage systems where Johnson (1986:167) notes that some features are ‘first order’ drains. Johnson (1986:166-67) also differentiates between a series of structural components within wetland systems, identifying main drains, major field drains, infield drains and plot drains. The focus of Johnsons (1986) study however is on the different roles of the features and the temporal ordering of drainage features is secondary to the role and development of the drains and wetland features. The method utilised by Johnson (1986) does however provide an approach to identifying the extent of the horticultural systems based on how boundary and drainage features relate to one other spatially.

Veart (1986) looks more specifically at the temporal ordering of boundary features, highlighting boundary features which are likely to have defined the early parts of horticultural systems. The approach utilised by Veart (1986) however, is broad and less
specific about individual elements of the horticultural system than Johnson (1986: 36-46) referring to boundary alignments as major or minor radial boundaries and major or minor cross boundaries. While this approach has the successfully identifies the different boundaries present in the South Auckland sites, it lacks the clarity of an approach such as Johnsons (1986). In this study, Veart (1986:52). hypothesizes that the temporal nature of the horticultural systems can be identified by using major boundary features. Veart argues that these major boundaries are likely to be older than smaller subsidiary boundaries. This conclusion by Veart (1986) hints at the possibility of investing the temporal development of horticultural systems in New Zealand.

Combined, the investigations by Johnson (1986) and Veart (1986) are two New Zealand based approaches provide a starting point for considering temporal and spatial change in the horticultural systems at Pouerua. The investigation by Johnson (1986) outlines the identification of spatial relationships between boundaries/drains while Veart (1986) argues in favour of the identification of the temporal development of horticultural systems based on their relationship to other boundary alignments.

Although studies such as that by Johnson (1986) and Veart (1986) discuss the ideas of spatial and temporal development of horticultural systems in New Zealand, both of these topics are secondary to other elements of their investigations. In the absence of any clear and defined New Zealand models for investigating horticultural change, this study turns towards Hawaii for a well defined example tempo-spatial development of a horticultural system. Of particular interest has been the investigation of the field systems at Kohala, Hawaii, which have been recorded in detail. In this example, the temporal and spatial development of horticultural systems have been investigated as part of a wider study of intensification of cultivation (Ladefoged et al. 1996; Ladefoged et al 2002). While the scale and motivational factors of this project and the Kohala research differ, they both share a common theme – can the process of expansion and development be identified and recorded in horticultural systems?

Where the method presented in Ladefoged et al. (2003) succeeds above the likes of Sullivan 1975b, Johnson 1986 and Veart 1986, is that it investigates the horticultural system using a clearly defined approach. This is an aspect of the systems discussed previously that has been
absent and which made it difficult to draw upon the methods utilised in the New Zealand examples (Johnson 1986; Veart 1986).

There are also similarities in the ideas about how horticultural systems developed. In this case, the Ladefoged et al. (2003) investigation of the evidence at Kohala, Hawai, shares some similarities with Veart (1986), such as the assumption that that major boundaries are likely to be older than shorter boundaries. This makes it easier to consider how the Hawaiian methods could be applied to a New Zealand context. While the size of the systems in the Hawaiian examples (Tuggle et al. 1980; Ladefoged et al 2003; Ladefoged and Graves 2008) is significantly larger than those recorded at Pouerua, the Hawaiian examples investigate single rather than multiple systems. This is a key difference from the Sullivan (1975b) and Veart (1986) approaches and means that it is possible to track a series of developments over part of a landscape because it is looking at a series of developments that are related to one other.

The method used at Kohala has also incorporated radiocarbon dates to help fine tune the chronology of system development in the Kohala horticultural systems (Ladefoged et al. 2008). This differs from Sullivan (1975b) however, because it uses radiocarbon dates in combination with an investigation of the temporal and spatial development of the horticultural systems, rather than relying on the radiocarbon dates to provide much of the context for use and development of the area. The size of the Kohala system and the investigation of the development of a large area of land (the Kohala system covering approximately 19km x 4km (Ladefoged et al. 2002:924)), more closely reflects what Sullivan (1975b) was trying to achieve with the South Auckland investigations and the development of horticulture over a wide area. At Pouerua the use of radiocarbon dates might not result in such clearly defined process of construction and modification because the horticultural systems are considerably smaller (covering only a few hectares), and are unlikely to have been operational as long as those at Kohala.

Furthermore, variation between the size and method of construction of the Kohala horticultural systems (Tuggle et al. 1980; Ladefoged et al 2002; Ladefoged and Graves 2008) and those recorded at Pouerua mean that the direct transferral and application of ordering rules (Ladefoged et al. 2002) for identifying the phases of system development is not
possible. The direct transferral of relative ordering rules (Ladefoged et al. 2002:929) is also hindered by the difference in the methods of boundary construction in the Hawaiian examples. Where Ladefoged et al. (2002) are able to differentiate paths from borders in the Kohala example, the use of trench alignments as both paths and boundaries at Pouerua means that no such consistent observations can be made.

Elements of the Kohala example (Ladefoged et al. 2002) as well as aspects of Veart (1986) and Johnson (1986) have been utilised in this study to develop and test a New Zealand specific set of rules for the relative ordering of horticultural alignments. This Pouerua specific method is presented and discussed in detail in Chapter Three.

2.8 Conclusions

This chapter has described the Pouerua landscape with a focus on the environmental, social, historical and political factors that may have influenced the way in which elements of the Pouerua landscape developed in the past. These differing influences are represented in Chapter Four of this study which presents the horticultural evidence recorded at Pouerua as part of this study.

The study of horticultural systems in a New Zealand context has been undertaken several times over the last four decades. However, given the variation in climate and environmental conditions encountered in the different regions of New Zealand, it is necessary to consider that the factors influencing horticultural development may vary region to region. This means that the development of a Pouerua specific investigative approach is necessary in order to analyse the data from the Pouerua landscape. The methods of investigation, shaped by the previous studies of horticultural sites in New Zealand and the Pacific, are presented in the following chapter.
3 Investigating the Landscape at Pouerua

3.1 Introduction

Archaeological investigations of the Pouerua landscape during the 1980s (and to a limited degree the 1990s and 2000s) resulted in the production of a large volume of material relating to archaeological sites at Pouerua. In most cases this material provided the locations a range of archaeological features, and in some cases it described specific detail about their construction and change over time (Leatherby and Morgan n.d; Phillips et al. 1980; Sutton 1990a; 1993; Challis et al. 1993; Sutton et al. 2003; Bell 2008). The sheer scale of the Pouerua archaeological landscape however, has meant that while so much information was recorded, so much more information was not. Past investigations focused in on specific areas, in particular the pa and kainga (Phillips et al. 1980; Sutton 1990a; 1993; Sutton et al. 2003), and while this focused approach improved archaeological understanding of many sites, it came at the cost of other. In particular, sites relating to the horticultural aspect of the Pouerua landscape were under-represented in the archaeological research undertaken at Pouerua. The consequence of this imbalance has been a detailed understanding of how some aspects of the landscape had developed and were changing over time, but limited understanding of how these changes fitted in with spatial and temporal change over the rest of the Pouerua landscape.

In order to address this imbalance, all relevant information needed to be brought together in order to define where further work needed to begin. In some cases this meant confirming exactly where sites were located, whether they even still existed, and whether they could be accessed. Other initial work included interpreting maps and excavation plans in order to see how they related to the Pouerua landscape. This chapter presents the methods applied in this thesis for the management of existing data and the collection of collation of new material as well as the analyses of the data relating to the horticultural landscape.
3.2 Field Surveys of the Pouerua Landscape

A series of field surveys were undertaken in order to identify the range of archaeological features associated with Pouerua, their frequency and their distribution. Initially, this involved gaining access to the Pouerua landscape. Given that the surviving extent of the archaeological landscape covers more than 500 hectares, this required the identification and approval of survey work by a number of landowners. While the Pouerua volcanic cone is controlled by the local hapu, Ngati Kawa, a large proportion of the land surrounding the volcanic cone, where the greatest concentrations of settlement and cultivation features survive, is split amongst four large farms. A number of smaller properties can also be found on the fringes of the surviving archaeological landscape. Access to properties was negotiated through the land owners and the hapu, Ngati Kawa, before surveys began. As a condition of entry to some properties, some areas were identified as off limits. These restrictions did not affect access to areas associated with settlement and cultivation.

The initial field surveys were large scale and focused on using large natural features (hills and ridges) and constructed features (stone walls) to help relate the detailed archaeological Leatherby and Morgan map (n.d), back to the surviving landscape. This first stage of the survey, allowed for the identification of sites which had be excavated or recorded in detail during the past surveys (Phillips et al. 1980; Sutton 1990; Sutton 1993; Sutton et al. 2003) and a basic identification of major features archaeological features recorded by Leatherby and Morgan (n.d). The latter identification method was applied primarily to ditch and stone alignments. The alignments recorded on the map could be easily related back to other major natural or constructed features because of their size. The scale of the available Leatherby and Morgan map (at 1:2000) did not allow for the use of features such as stone heaps and mounds to be used as aids to relocation as they could not be distinguished from one other on the map. Similarly, terrace features were able to be used to identify only some general features such as hills because the scale of the map meant some large stone features and small terraces looked identical.

Follow up surveys of the Pouerua landscape focussed on collecting data relating to the archaeological features that were still evident on the surface. These surveys used a combination of recording sheets (Figures 3.1, 3.2 and 3.3) and a Trimble Geo-XT GPS unit to record individual or groups of features. This simple yet comprehensive method of data collection allowed for the detailed recording of numerous features or sites within a limited timeframe. The level of detail also allowed for analysis of the feature data (through the notes) and the spatial data (through the GPS recordings) at a later date.
The use of a GPS unit such as the Trimble Geo-XT was preferred over other units such as the smaller Garmin Navigator series when conducting these field surveys. Horizontal accuracy (i.e. the position of an archaeological feature on the earth’s surface) was very important, especially given that this thesis examines the spatial relationships between features. The uncorrected data from the Trimble units used in the field had a 5m sphere of accuracy (i.e. the recorded point was at worst 5m out from where the recording indicated). Differential correction of the GPS data reduced this sphere to just 1m or less. Other units, such as the smaller Garmin examples, are only accurate to within approximately 15m of the recorded point, and the data can not be post-processed in the lab later on to increase the accuracy of the survey points. A Trimble unit was available and used for all GPS based recordings of features at Pouerua.

The recording sheets used in the survey of the Pouerua landscape were designed with the intention of being able to record the maximum amount of detail about individual or groups of features in a timely manner. The Pouerua landscape is a vast one, across which there are perhaps hundreds of archaeological sites and thousands of individual features. These recording sheets allowed for the accumulation of large amounts of field data that could be assessed later.

The list of data generated by the field surveys was used to help assess the extent of change to the Pouerua landscape that had occurred since the surveys by Phillips et al. (1980), Leatherby and Morgan (n.d) and Challis et al. (1993). In addition, the level of detail in the recording forms aided in the relocation of sites recorded or described in various texts relating to the original Pouerua Project directed by Sutton (1990a; 1990b; 1993; Sutton et al. 2003).

The recording sheets also helped to begin addressing the key questions at the centre of this research. In the first instance they recorded specific detail about the form, location, distribution and frequency of archaeological features. This provided a starting point for an investigation of the diversity of the archaeological landscape and for relating archaeological features to specific environmental features, such as the stone fields, hills and ridges, basins and valley, water sources, and soil types.

Finally, the recording of both settlement and gardening related archaeological sites provided much needed detail about the spatial relationships between areas of settlement and areas of cultivation and how sites may have existed in relation to one other in the past. While
settlement and cultivation information was available in some New Zealand Archaeological Association site recording forms, and to a limited degree in the Leatherby and Morgan map (n.d), the detail was not specific enough to begin analysing temporal and spatial development of the Pouerua landscape. In order for analysis to begin, questions such as whether settlements were associated with specific horticultural features, or whether horticultural features were just in the vicinity of settlement features, needed to be addressed.

These recording sheets (Figures 3.1, 3.2 and 3.3) were further supplemented with aerial maps and plans which were used to record specific details about the Pouerua environment. While maps such as Leatherby and Morgan (n.d) provided a detailed topographic view of the Pouerua landscape, they lacked environmental data. It was on these new survey maps that water pooling, surface water channelling, riverine deposits, swamp and lake high/low water margins, native flora species, exposed soil profiles, and drought afflicted areas were recorded. The environmental data provided possible information about what factors may have influenced specific activities in certain parts of the Pouerua landscape.

The detailed data generated by the field surveys relating to the appearance, construction, frequency and distribution of the archaeological surface features recorded at Pouerua formed the basis of the landscape assemblage described in chapter four. The processed GPS data was used to confirm the accuracy of other existing plans or surveys of areas, identify if there were features which were no longer visible (if they had been previously recorded), and record features that had not been recorded or published previously. The result was a comprehensive environmental and archaeological grounding in which the sites and their origins could be investigated.
**Figure 3.1** – Site Recording Form used for recording settlement features such as terraces and pits.
### Puerua Garden Site/Feature Record

<table>
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<th>Date:</th>
<th>E:</th>
<th>N:</th>
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**Property:**

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<th>Site/Feature Details for Gardens</th>
<th>Stone</th>
<th>Cut/Ditch</th>
<th>Other</th>
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<tbody>
<tr>
<td>Approx. Area:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>L: cm/m H: cm/m W: cm/m</td>
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<td></td>
<td></td>
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</table>

**Basic Type Identifier:**

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**Surface Visibility:**

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<th>Medium</th>
<th>High</th>
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</table>

**Preservation:**

<table>
<thead>
<tr>
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<th>Medium</th>
<th>High</th>
</tr>
</thead>
</table>

**Orientation if Aligned:** °

**Other Examples Nearby:** Y / N

<table>
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<th>Rolling</th>
<th>Basin</th>
<th>Hill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed</td>
<td>Sheltered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Soil Depth above Scoria (If exposed):** cm

---

**Description of Site / Feature:**

---

*Figure 3.2 – Site Recording Form used for recording cultivation related features*
**Plan:**

Scale:

**Photo Numbers:**

**Aids to relocation:**

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<th>Recorded on GPS:</th>
<th>GPS Site Data Downloaded:</th>
<th>Relevance to Study:</th>
<th>Revisit Required</th>
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<tbody>
<tr>
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<td>Y / N</td>
<td>High</td>
<td>Y / N</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
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</tbody>
</table>

**Next Visit Investigate:**

*Figure 3.3 – The second half of both Site Recording Forms*
3.3 Identifying the Surviving Extent of Horticultural Systems

In order to investigate temporal change within the horticultural systems, it is necessary to first identify the surviving extent of the systems. This section outlines the method applied in this thesis for identification of the total area of a horticultural system based on the surviving surface features. The identified horticultural system is assumed to represent the majority of the total extent of the original horticultural system.

This method is only applicable to potential horticultural systems which are still visible on the surface and have not been extensively disturbed or destroyed as it relies on the presence of boundary features such as trench or stone alignments. It operates on the assumption that all alignments that intersect or abut one another are likely to have been part of the same horticultural system, even though they may not have all been constructed at the same time or during the same construction events. This assumption is based on the findings reported in Ladefoged (2003), Johnson (1986) and Veart (1986).

The rules for identifying the extent of horticultural systems focuses simply on which alignment features intersect or abut one another. Earlier horticultural systems are likely to have been obliterated during the establishment of the last system. If any elements of older systems did survive and were incorporated into later systems, then they are considered part of the later system.

Method for Identifying the Extent of Horticultural Systems

Stage 1: Identify a major alignment within an area, preferably one of the longer alignments which is intersected by or abutting multiple other alignments.

Stage 2: Identify all the alignments that intersect or abut the alignment identified in stage one.

Stage 3: Identify all the alignments that intersect or abut the alignments identified in stage two.
Stage 4: Continue the process of identifying alignments that intersect or abut those identified in the previous stage. The surviving extent of the system has been recorded when no further stages of intersection/abutment between alignments can be identified.

The result, if the selected area contains well preserved and visible surface alignment features, should be a network of interconnected alignments that are likely to represent the surviving extent of the last horticultural system in this area (Figure 3.4). There may be some alignment features on the periphery of the identified system (which have not been identified as part of the system), which may once have been a part of it. However, because these alignments can not be tied in with the others, there is the also the possibility that they may represent surviving remnants of an earlier system that has been partially destroyed to make way for the later example. Consequently, these elements must not be recorded as part of the total extent of the horticultural system.

3.4 Investigating Land Clearance – Calculating Potential Arable Land

This section specifically looks at whether the presence of stone features such as heaps and mounds impacts on the total available area of potential land within a system. The formula outlined below allows for the calculation of the total area of land lost within a horticultural system due to the presence of stone heaps (as opposed to stone being cleared to the boundaries of the systems). Essentially, it calculates the total area of land not able to be cultivated because the ground is covered by stone.

Where a horticultural system has been identified, the total area of the system is recorded (in hectares or part thereof) and the total number of stone heaps within the boundaries of that system are identified. Because the size of stone heaps varies, the recorder decides if the majority of the heaps have a base area of approximately 1m² or 2m² etc. As in step one (below), this allows for the calculation of the total surface area of the horticultural system (as m²) that is covered by stone heaps.
Figure 3.4 – Illustration of the method for identifying the total surviving extent of a horticultural system.
Part two of the equation allows for the conversion of the total covered surface area, so that the figure now reflects what percentage of the overall system is covered by stone clearance heaps, and by inference, is not able to be cultivated/tilled.

Method for Calculating Total Area Covered by Stone Heaps within a Horticultural System

1) \[ \text{Number of Heaps in an Area} \times \text{Base Size of Heap (i.e. 2m}\text{²)} = \_\_\_\_\_\m² \]

2) \[ \left(\frac{\_\_\_\_\_\m²}{\text{Size of Study Area (m²)}}\right) \times 100 = \_\_\_\_\_\% \text{ of area covered by clearance features} \]

By identifying the total area of land covered by stone heaps (as a percentage of the complete horticultural system), it becomes possible to examine whether there were any significant variations in the total amount of potentially arable land in areas with high and low concentrations of surface stone features.

The use of a majority rule of 1m² or 2m² for example, as the basis for the base area for the stone heaps within a system was based on field recordings and testing of the formula. The stone heaps at Pouerua, while not exactly uniform, share common traits such as the size of base, shape and height (as discussed in Chapter Four). Stone heaps within an identified system may vary slightly in appearance but generally are quite similar in the aforementioned aspects. This allows for the grouping of the recorded features as a collective 1m² or 2m² etc. Testing of this formula found that when recorded individually, the variation of the stone heaps may have produced a slightly higher or lower total area, but that the impact of this when the figure was considered as a percentage of the complete horticultural system (compared to the figures for either 1m² or 2m²), was minimal. The variation was unlikely to have any significant impact on the on the overall conclusions for an area.

This method allows for the comparison of cultivation and clearance evidence between stony areas such as the northern and western stone fields, and less stony areas such as the land to the east, and that immediately north of Pouerua cone. The raw data is also able to be used to calculate variation between the above areas on a hectare by hectare basis. This allows for the direct comparison of different areas, not just comparison between systems.
The Temporal Analysis of Identified Horticultural Systems

The investigation of the temporal development of horticultural systems is concerned with identifying the change within an area of land over a period of time, using the surface archaeological evidence. In some archaeological sites, organic material can potentially be used to date a series of events or occupations on a site. However, that datable material must be securely associated with a particular event, such as a burning. Unfortunately, not all sites come with an undisturbed and datable organic sample. In these cases, a different approach is needed so that it is possible to continue investigating processes of land use in the absence of other forms of evidence.

An investigation of the temporal development of horticultural systems is still concerned with time per se, but it is the development of a system over time rather than a specific period. This differs from radiocarbon dating because the result is not an archaeological feature assigned to a specific period (i.e. 1600 A.D) but a series of identified archaeological events, whose construction order has been determined, but which is not connected to a specific period (again 1600 A.D for example). While radiocarbon dating and temporal development are different investigative approaches, the application of one does not exclude the use of the other. A radiocarbon date provides information about when a site was occupied or used, but little information regarding its construction or modification over time. A temporal development sequence provides the opposite, the increased detail about construction events, but there is an absence of when specifically (i.e. 1600 A.D), these events occurred.

The temporal development methods used in this thesis focus on the surviving surface archaeological features. In a sense, the approach is an investigation of the horizontal stratigraphic record, rather than the vertical record usually encountered during excavation. Both the vertical and horizontal methods are concerned with identifying evidence of ongoing events such as construction, and looking at how later developments impacted on earlier constructions, and influenced the final production. The detailed horizontal development approach used to investigate the horticultural systems is similar to the detailed vertical development technique used by Sutton et al. (2003) in their analysis of the eastern section of the rim of Pouerua cone. A focus on the identification of a series of changes is key.

This thesis uses a modified version of the method applied by Ladefoged et al. (2003). The clarity of the relative ordering rules and extent of development of methods of investigation
made the Ladefoged et al. (2003) method stand out in comparison to other methods discussed and applied by Sullivan (1975b), Johnson (1986), and Veart (1986).

The method discussed below (and illustrated in Figure 3.5) is suitable for application to both shallow trench and single/double stone alignment features. The relative ordering rules can be applied consistently across the Pouerua landscape where horticultural systems have been identified (section 3.3). Because of the variation in the size of the horticultural systems, the method of construction, levels of preservation or whether the systems are dendritic or parallel in nature, it has been necessary to ensure that this method can be consistently applied across a range of Pouerua sites.

3.5.1 Method for Investigating Temporal Development of Horticultural Systems

Relative Ordering Rules

Rule One:
If alignment C is contained by alignments A and B, then C must be younger than A and B. It is assumed that if one feature is contained by another, then it is likely to be a later addition (Figure 3.5).

Rule Two:
Alignments are assigned to the phase after the most recent alignment that they abut. If an alignment abuts alignments A and B, then it is recorded as having occurred later than alignments A and B, and is phase three of construction sequence (A and B having been constructed during phases one and two). Although it also intersects alignment A, for it to intersect/abut alignment B means that alignment B was already established (Figure 3.5).

Rule Three:
Branching alignments are younger than the alignments from which they originate (branch out from) (Figure 3.5).
3.5.2 Method for Identifying the Processes of Expansion and Subdivision within Horticultural Systems

In the previous section, the Relative Ordering Rules outlined the approach for identifying the development of the horticultural systems. This section goes one step further by discussing how to document those changes through the processes of system expansion and internal system subdivision.

Having identified the construction phases that occurred within a horticultural system, the next step is to track those changes as a series of events. In this method, a focus on the processes of expansion and subdivision provides a comprehensive insight into the developmental path of the horticultural system. This focus on these two particular aspects (expansion/subdivision) highlights the production routes that different systems may take by showing how systems were changing between construction phases. Using this method, it is possible to show that a system rapidly increases in size over all the phases, or that it may have only increased in size during the first two phases but not in any subsequent phases. It is also possible to track internal subdivision within the system in areas which have already been bounded by alignments and are being split into smaller units. By identifying these processes, it is possible to show the rate of system expansion and subdivision during each construction phase.

The formulae below highlight the expansion/subdivision of a horticultural system during each phase as a percentage of the total area covered by the horticultural system. This shows how much the system has increased in size since the previous phase (evidence of expansion) or whether the total area of the system has been subdivided within the system during a particular phase (subdivision). This allows for a comparison of expansion/subdivision processes and the identification of the management strategies of the cultivators at each stage i.e. Are they rapidly expanding the horticultural system or slowly expanding while internally subdividing?
Rule One: If alignment C is contained by alignments A and B, then C must be younger than A and B.

Rule Two: Alignments are assigned to the phase after the most recent alignment that they abut.
Phase 1: Alignments A-A' and B-B'
Phase 2: Alignments C-C' and D-D'
Phase 3: Alignment E-E' and F-F'

Rule Three: Branching alignments are younger than the alignments from which they originate (branch out from).
Oldest: Alignment A
Youngest: Alignments B and C

Figure 3.5 – Illustration of the Relative Ordering Rules
Calculating Expansion

(Total area of system during a single phase / total area of identified system) x 100 = ______
% of system at a single stage (i.e. stage one) as a portion of the total area covered by the system.

Calculating Subdivision

(Total area of a system during a single identified phase which displays evidence of internal subdivision / Total Area of Identified System) x 100 = _____% of system during a single phase that has been subdivided internally.

3.6 Investigating the Relationship between Settlements and Horticultural Systems

The identification of the relationship between settlement features (such as kainga) and horticultural systems is based on the assumption that alignments which are spatially related to settlement features (i.e. terminate or originate in close proximity to or even at features such as terraces) are likely to have been constructed or operational at the same time that the settlement features were constructed or in use.

This assumption is based on the statements by Marshall (1987: Figure 7.3) and Sutton et al. (2003:18) in reference to Pouerua cone, and Law et al. (1994), Damm et al. (1994) and Marshall (1994) in reference to the occupation of the kainga, and in Sutton et al. (1993) with regard to the occupation of one of the excavated peripheral pa. These excavation reports highlight a clear relationship between the settlement areas and the garden features nearby. Barber (2007:234) has also noted the spatial relationship between settlements and cultivations at Pouerua, and the extension of alignment features from cultivation areas on to settlement features such as pa.

Settlement features were identified during the initial field surveys and linked to previous large and small scale survey maps and excavation notes. Where possible, horticultural alignments were also relocated to confirm whether there was enough spatial and environmental evidence to indicate that these features were related and likely to have been in use at during the same period.
Having identified an initial settlement to investigate, the alignment features surrounding the terraces are used to identify the horticultural system which may partially or completely surround the settlement feature. The extent of the system was identified using the method described in section 3.2 of this chapter. Identification of the extent of the horticultural system may also lead to the identification of other settlement features associated with the same system.

The temporal analysis method discussed in section 3.5 of this chapter is then applied to the system in order to examine the development of the system as a series of construction phases. This provides information about the expansion of the system, and subdivision within it. This process also highlights whether a horticultural system had one point of origin (i.e. it radiated out from one settlement) or multiple points of origin (i.e. smaller systems radiate out from multiple settlements and expand and become united as one system).

3.7 Conclusions

In the light of an absence of excavation data for the horticultural areas, the various approaches discussed in this chapter are centred on providing a detailed starting point for the investigation of the horticultural systems. These are methods developed for a horizontal stratigraphic record rather than the traditional vertical stratigraphy. The end goal however, is the same, an understanding of the complexities of site construction and modification over time. Large scale landscape investigation, an approach necessary for the investigation of horticultural systems, requires unique adaptations because the area covered by the sites often limits the usefulness of a traditional excavation approach. The investigative techniques presented in this chapter should not be considered an alternative to excavation and radiocarbon dating, but rather as another tool for investigating change.
4

The Pouerua Landscape Assemblage

4.1 Archaeological Evidence for Settlement and Cultivation on the Pouerua Landscape

This chapter presents the evidence recorded during the field surveys of the Pouerua landscape. The descriptions and images of the cultivation and settlement features highlight variation and similarities between features and their distributions. An understanding of the features and their form is important because it is these features that will form the basis of the temporal and spatial investigations in the following chapters.

The features detailed here are grouped according to a basic morphology. It is assumed that features which are similar in appearance potentially had the same function in the past. It must also be noted however, that features may have had multiple functions, some of which may not be indicated by the surviving evidence.

While it is the surviving Maori elements that give Pouerua some of its most intriguing visual appeal, the Pouerua landscape is a mix of pre-contact Maori evidence and historic period remains from both Maori and Europeans. For this reason, the features in this chapter, where possible, have been divided between those likely to have been constructed by Maori pre-1830 (i.e. before the purchase of the land by Henry Williams), and those which are more recent in origin, and likely associated with the conversion of the land by Williams and his family (and later generations) into a large farm. As noted in Chapter Two, it is during the period prior to and just after the sale of the Pouerua land to Henry Williams that it is unclear as to the extent of Maori occupation of the landscape. During this time, it is not clear whether Maori were continuing to garden in the area, and whether there is archaeological evidence that highlights the transition between traditional Maori horticultural production and the increasing use of European crops and technologies in Maori cultivations.
The descriptions in this chapter are based on the visible surface attributes of a feature. Many of the features described here have not been investigated by excavation (or the excavations not published). Any interpretation of possible functions are based on observations resulting from the excavation of other archaeological sites such as those reported by Sutton (1990; 1993), Sutton et al. (2003), Horrocks et al. (2000) (all relating to Pouerua), or Walton (1999) Barber (2004) and Furey (2006), which draw upon multiple examples from a number of New Zealand sites to conclude possible function of some cultivation features.
Figure 4.1 – The Pouerua landscape showing the areas discussed in Chapter Four. Areas marked ‘A’ have lower amounts of surface stone, but not a total absence of surface stone. Areas marked ‘B’ indicate the locations of the northern and western stone fields.
4.2 Stone Features Associated with Cultivations Area

This section details those features which have been constructed using locally available volcanic stone. These features are primarily made from stone collected from the surface of the Pouerua landscape; however they may also incorporate large immovable boulders. The size of the stone material varies significantly, but includes smaller stones (with a diameter of 5cm or less) up to larger stones with a diameter in excess of 40cm. In areas where there is extensive evidence of stone clearance, it is only the very large boulders which appear to have remained in their original positions.

The abundance of available volcanic stone means that stone has been incorporated into a number of archaeological features relating to settlement and cultivation at Pouerua. Examples include above ground or raised stone structures, stone facing and retaining, and stones being deliberately set into the soil to define boundaries.

Given that Pouerua is a volcanic cone, it is not surprising that there is a large amount of stone evident on the surface of the surrounding land. However, as noted in Chapter Two, the uneven distribution of air fall ash (Hayward et al. 1992) resulted in a landscape where the lava stone is more visible in some areas than others. These areas with greater concentrations of surface stone can be found to the north and west of the volcanic cone and are commonly referred to in this text as the northern and western stone fields. Stone features are not exclusive to these areas, only more prevalent.

4.2.1 Stacked Heap

This feature has been recorded only in one particular part of the western stone field, in an area covering approximately 1.5 hectares. A bulldozed farm track cuts through the area and the total number of features may have been slightly higher in the past.

Appearance

A square or rectangular heap (Figure 4.2), with an exterior structure made from placed or fitted stones. The feature is straight sided and the structured stone surface does not continue on to the surface of the feature. The top surface may be slightly higher than the facing or exterior sides of the feature.
Construction

The exterior is constructed from larger stones fitted together. This exterior layer or facing is approximately 25 – 35cm wide. Only the exterior surface of the feature is constructed from fitted stone. This feature differs from the box heap in that there appears to be no evidence of the fitted or placed stones in the internal portion of the structure.

All recorded examples of this feature are similar in their method of construction with a loose stone internal fill. However, the height of almost all examples varies significantly. The measurements for the stacked heaps (taking into account the variation in size) range from approximately 1.5 – 2.5m in length, 1.5 - 2.5m in width, and are generally no more than 0.9m – 1.5m in height. The exterior sides are straight edged although the corners may be squared off or rounded. The top surface of the feature is simply the exposed internal fill of the feature. The limited amounts of surface stone surrounding these features (from feature degradation), indicates that this variation in height was deliberate.

The internal fill consists of small stone material measuring approximately 10cm or less in diameter, and the exposed top surface of the internal fill may be level with, or slightly higher then, the external walls, resulting in rounded or flat topped features.

Quantity/Frequency

Only a dozen examples of this feature were recorded in this area. No similar features were identified elsewhere at Pouerua. These features may relate specifically to one clearance/construction event in this area.

Location

Northwest of the Pouerua cone on the near the northern edge of the western stone field.
Figure 4.2 - Stacked heaps at Pouerua showing the internal fill of small stone material and constructed outer layers of the examples in the foreground and background.
4.2.2 Box Heap

The box heap (Figure 4.3) is a straight sided heap that is square or rectangular in appearance. It can be differentiated from the stacked heap by its method of construction.

Appearance

Box heaps are upright stone features. Because the stones have been fitted or placed together rather than heaped, the sides are relatively flat in appearance. The heaps are constructed on top of rounded mounds and consequently some examples may have a slight lean to one side.

Construction

The base of the heaps is almost a separate feature in itself, in that the base takes the form of a rounded heap (discussed in 4.2.3), but as the base heaps are found in association with box heaps; the two components together should be considered one feature. The base heap measures approximately 0.5m in height, although the width of the base heap varies in relation to the size of the upper box section, i.e. if the top is bigger then the base is larger.

The upper portion of the feature is identified by the fitted or placed stones. This method of construction continues through the centre of the feature, which distinguishes it from the stacked heap, which has a core of loose stone material. Each side is approximately the same height and width, and the corners of the feature are roughly squared.

The size of the box heap may vary, the size of identified examples ranging from 1m x 1m (width of sides) and 1.2 high, through to 1.5m x 1.4m (width of sides) and 1.4m high. The top surface of the box heap is flat and displays the same fitted stone form evident on the sides of the feature. Stone size varies, but the diameter of the stone is generally larger than 15cm.

Quantity/Frequency

Most examples of the box heaps were recorded as individual features, however six were found clustered in an area of approximately 1 hectare.

Location

All recorded examples of this feature were identified in the northern stone field.
Figure 4.3 – An example of a box heap constructed on top of a rounded heap
4.2.3 Rounded Heap

The rounded heap (Figure 4.4) is the most common form of stone heap recorded at Pouerua. In areas with both high and low concentrations of surface stone, rounded heaps are likely to be present. An example of this type of feature was excavated by Horrocks et al. (2000).

Appearance
These features show little evidence of design or construction, the stone having been heaped together. The unifying characteristic of these heaps is their circular/oval shaped based and rounded or mound like appearance.

Construction
Stone has simply been heaped together. Base may consist of large or small stone material. Larger stones (diameter $>25$ cm) may have been used to form a ring around the base of the feature (but not set into the ground). The heap contains only stone, and has no soil fill (Horrocks et al. 2000:868).

These features contain stone of a variety of sizes, ranging from small material (diameter $<5$ cm) up to larger pieces of stone (diameter $>30$ cm). Smaller stone may be contained within the centre of the stone heap, or may form part of the outer surface. The stone heaps generally measure between 1 m – 1.2 m in diameter across the base and 1 m – 1.5 m in height.

Quantify/Frequency
In the stone fields, these stone heaps can be found every few metres in areas that haven’t been extensively modified in recent times. Elsewhere, the heaps are present but more widely distributed and less common.

Location
Commonly found in the northern and western stone fields, but also recorded in land around the base of the cone to the north, west and south, and further out from the cone (closer to Lake Owhareiti) on the eastern side of Pouerua (Figure 4.1).
Figure 4.4 – An example of a rounded stone heap
4.2.4 Pyramid Heap

The unique form of the pyramid heap (Figure 4.5) makes this uncommon feature stand out in the northern stone field.

Appearance

The base of the pyramid heap is square in form, and the feature has been constructed in such a manner, that it rises to a peak, rather than having a flat or rounded top surface. The stone in the feature has been heaped, like the rounded heap, rather than fitted or placed like in the stacked or box heap.

Construction

Figure 4.5 shows a stone structure with a defined pyramid shape. The angle between the sides and the base of the feature is approximately 45°. While a number of pyramid heaps were observed, there is some variation in the size of the features. The base of the pyramid heaps measure approximately 2.5m x2.5m and rise too approximately 1.4m in height. The size of the material used to construct these features varies greatly and includes large boulders (diameter <50cm) in the base of the heaps, right through to the smaller material (diameter <5cm) recorded on the exterior surface of the feature.

Quantity/Frequency

Limited number of examples, with only 14 recorded in the grouped example and 5 possible examples recorded individually in the northern and western stone fields.

Location

The majority of recorded examples of this feature have been identified in one part of the northern stone field. Individual examples have also been recorded in other parts of the northern stone field and western stone field. The majority of recorded examples have been recorded in an approximately one hectare area. This group of clustered features may represent a single event in this area, such as the clearing of land for gardening.
Figure 4.5 – An example of a pyramid stone heap
4.2.5 Amorphous Heap

This section covers the stone heaps whose form varies significantly, and which are not consistent in appearance with other stone heaps recorded in the immediate area.

Appearance

These generally shapeless heaps may occur as stone thrown on to the front of a scarp too steep to be gardened, around and on top of outcrops of large lava stone boulders, in cracks and exposed lava tubes (as recorded in northern areas), as well as near the edge of the recorded extent of the Pouerua field systems (Figure 4.6).

Construction

In terms of construction and content, they are similar to the rounded stone heaps in that material has been heaped together in one location. However there is no consistent structure e.g. rounded base and rounded heap, or square base rising to a peak. Stone material ranges from 1cm to 30cm in diameter.

Quantity/Frequency

These features were frequently recorded at Pouerua, and are well distributed across the landscape. However they are often recorded as individual features.

Location

Recorded everywhere at Pouerua, although most commonly found in the northern and western stonefields.
Figure 4.6 – An amorphous stone heap
4.2.6  Non-Cadastral Stone Wall

This describes a low stone wall feature (Figure 4.7) that was likely to have been constructed by Maori, or at least is not associated with European stone wall construction to demarcate cadastral boundaries.

Appearance
A low stone wall, whose height and width vary across its length. The wall curves as it follows the natural contour of the land.

Construction
Like the box and stacked heaps, the stone used in the construction of the wall has been fitted or placed. The wall measures approximately 25m in length and measures approximately 1m to 1.2m in height. The width of the feature ranges between 1m -1.4m. In some sections the wall abuts the base of a low hill, however in other sections there is a gap of 0.5m or more between the back of the wall and the slope of the hill.

The stone used to construct the feature is generally larger material with a diameter of 15cm or more. Stone has been loosely heaped on the top of the wall in some sections.

Quantity/Frequency
This is an uncommon feature at Pouerua; only one example was recorded during surveying.

Location
Only recorded in the northern stone field.
Figure 4.7 – A non-cadastral stone wall, associated with the horticultural areas and possibly relating to the Maori occupation of the Pouerua landscape
4.2.7 Stone Mound

The stone mound is a circular feature, similar to the rounded heap, but instead of the core being assorted stone material, it is instead comprised mostly of soil, perhaps with some small stone (<5cm diameter) inclusions or capping. This was the second garden feature excavated and reported by Horrocks et al. (2000).

Appearance

The low stone mounds (Figure 4.8) can often be identified by their stone curbing and turf cap. Other than some moss, stone features such as the rounded heap, do not contain the soil to support the presence of grass or turf on the feature. Generally only the larger stones (i.e. the curbing) are visible.

Construction

The mounds have been created by the placement of stones (diameter >15cm) in an upright position, in a circle form. The placement of stones in an upright position is very similar to that in the stone alignments (section 4.2.7). Mounds measure approximately 1.2m to 1.6m in diameter and at their highest point, are approximately 20-30cm higher than the surrounding surface.

Figure 4.8 shows an interpretation of the internal structure of a stone mound, as described by Horrocks et al. (2000: 867). The highest point of the excavated mound was approximately 20cm above the surrounding surface, and the same depth below the surface. The bottom and sides of the mound (below the surface), were lined with small stones (diameter 3-8cm), and a similar stone material capped the feature. The internal fill of the mound consisted of a friable brown silt with small stone (diameter 1-3cm) and macroscopic charcoal inclusions (Horrocks et al. 2000:867).

Quantity/Frequency

Commonly found in the northern and western stone fields where they are often recorded in close proximity to one other (<10m). They have also been recorded to the east of Pouerua, and on the less rocky land between Pouerua cone and the northern and western stonefields. In these areas however, they occur less frequently. No examples have been recorded to the south of the cone.
Location

Recorded everywhere but south of Pouerua volcanic cone, although most common in the northern and western stonefields.
Figure 4.8 – An interpretation of a stone mound excavated at Pouerua and described by Horrocks et al. (2000)
4.2.8 Stone Alignments

This section describes linear stone features recorded on the Pouerua landscape which may range from 10m to 100m or more in length (Figure 4.9).

Appearance
Stone alignments are a series of generally flat lava stones that have been fixed in an upright position. At Pouerua they occur as both single and double alignments, and a stone alignment feature may comprise of segments of both single and double stone alignments. Despite their raised profile, they are not always visible in rocky areas or areas with long grass.

Construction
Although no excavation was undertaken as part of this thesis, the alignments appear to have been constructed by positioning the stones upright in a trench and partially burying the stones. The depth of burial is unknown but it is sufficient to ensure that the stones remain in a fixed upright position. The top surface of the alignments is often 20-30cm higher than the surrounding soil.

Stone alignments may run parallel to one other or intersect each other, often at 45° or 90° angles. While the alignments often form a series of straight lines, both single and double stone alignments will often curve around natural features or obstructions. Particularly long alignments (over 80m in length) may also have a slight curve. In some cases alignments may incorporate natural features such as rocky outcrops or low rises. Stone alignments are most commonly recorded in low areas such as shallow basins, but they will also continue onto sloped areas, often terminating near terrace features.

In examples of double stone alignments (where two stone alignments run parallel to one other over a distance), the alignments may occasionally be connected by a short transverse row of stones extending between the two parallel alignments. These transverse alignments have been recorded halfway along the parallel alignments, but not on the ends (where the end has not been disturbed).

Quantity/Frequency
Frequently found in the stone field areas, although less common elsewhere.
Location

Most commonly recorded in the stone fields where there is an abundance of stone. Isolated examples have been recorded in areas with low concentrations of surface stone.
Figure 4.9 – An example of a double stone alignment extending through an area of horticultural systems in the northern stone field
4.2.9 Stone Rows

Stone rows are uncommon stone features at Pouerua; they are often recorded in association with stone alignments (Figure 4.10).

Appearance
Stone rows look like elongated examples of rounded stone heaps, and in many cases this is actually what they are.

Construction
Stone rows measure approximately 1-1.2m across at the base, and are 0.5-1.2m in height. The length of the features varies between 3m and 20m or more. They share the same semicircle profile of the rounded heap. There is no evidence of fitted or placed stone, and the row may contain a variety of different sized stone material (diameter 5-30cm). Stone rows may be present as stand-alone features within an area, or they may intersect one other.

Where stone rows have been recorded in association with single stone alignments, the alignments have extended out from underneath the stone row. This suggests that the stone alignments were constructed prior to the construction of the stone rows.

Unfinished examples of stone rows have been identified at Pouerua. These appear as a series of rounded stone heaps which are connected through the addition of stone to the space between the heaps. Through this addition, several individual heaps become one elongated feature.

This feature differs from the pre-contact stone wall (4.2.6) because the stone is heaped and not stacked.

Quantity/Frequency
Frequently recorded in the northern and western stone fields, although not elsewhere.
Location

Only recorded in the northern and western stone fields.
Figure 4.10 – An extended stone row
4.3 Cut or Modified Soil Features Associated with Cultivation Areas

This section describes those features recorded in areas of cultivation (areas with archaeological features relating to horticultural production, as outlined in Furey 2006). These features are primarily identified by the modification of the soil, and an absence of stone use in their construction, i.e. stone is not deliberately included in the construction of these features. This differentiates cut features from stone features such as mounds and stone alignments, which also modify the soil horizon.

4.3.1 Trench Alignments

Trench alignments have been extensively recorded on the Leatherby and Morgan map (n.d), however they are very difficult to identify on the actual landscape.

Appearance

While some examples of trench alignments survive as shallow ruts in the surface, many are only identifiable as slight linear depressions, often with corresponding colour changes in the surface vegetation (Figure 4.11).

Construction

The trench alignments are features cut into the surface of the volcanic landscape. The alignments are approximately 0.5m wide, although their depth is unknown. It is also not clear if there is any variation in width/depth of the cuts alignments between those that might have been boundary alignments and those that might have been access ways or paths.

The alignments, despite their shallow surface profiles, appear to preserve better than many examples of the stone alignments. Consequently trench alignments have been recorded at almost 200m in length. This preservation may relate to the fact that stone has been taken from alignments and other features post the Williams family purchase, and used to build stone walls. Consequently, many of the stone alignments are missing sections.

Shallow trench alignments are most often recorded in areas where there are low concentrations of surface stone. Alignments may extend from valley or basin floors, up and over ridges and hills. In many ways, the shallow trench alignments are very similar to the
stone alignments. Like their stone counterparts, trench alignments will often intersect one
other at 45° or 90° angles, may be straight or curved across their length, and may incorporate
natural features into their construction.

The alignments are unlikely to have served any drainage or water reticulation roles. The
alignments are often shallow, travel up and over hill features, and do not appear to drain or
divert any surface water or runoff

**Quantity/Frequency**

Trench alignments are a common feature at Pouerua, although they are certainly not the most
visible on the landscape. Alignments have been recorded as single features, but are often
recorded in association with other alignments.

**Location**

Although they are most commonly found in areas where there is less surface stone, shallow
trench alignments have been recorded right across the Pouerua landscape, except to the south
of the cone.
Figure 4.11 – An example of trench alignments at Poverua (Source: A. Challis)
4.3.2 Garden Soils

Garden soils are modified soils recorded in areas which have been identified as having been former sites of cultivation by Maori (Marshall 1987; Sutton 1990; 1993; Sutton et al. 2003).

Appearance

Dark black soil (resulting from the volcanic ash), which may be darker than surrounding soils because of the addition of burnt or decomposed organic material from the clearance/sequential cultivations in the area. May also include flecks of the red/brown/yellow scoria, on which the ash topsoil layer sits. Soils may contain little or no stone content or include a coarse volcanic gravel material ranging in size from <1cm to 5cm in diameter (Figure 4.12).

Construction

The limited amount of published material describing the excavated garden soils, describes them as dark ashy soils, which may include charcoal inclusions and small flecks of red/brown/yellow scoria.

These soils may be differentiated from surrounding unmodified soils by their ‘mixed or tumbled profile which is characteristic of garden soils’ (Sutton et al. 1994:91), which again appears to relate to the presence of other materials such as scoria and charcoal which may have become included in the soil through the processes of digging and turning of the topsoil.

Horrocks et al. (2000) investigated the soil contained within the stone mounds (4.2.7) at Pouerua using micro-botanical analysis as a different approach to the identification of horticultural areas. The material from within the excavated stone mound was described as a ‘friable, brown silt loam….above a reddish, brown, sandy subsoil’ (Horrocks et al. 2000:867). If these mound features were used as garden beds, then the brown loam would also count as a garden soil.

Quantify/Frequency

Garden soils are likely to be a very common feature at Pouerua, however only three separate (and published) areas of garden soil have been identified cone (Gibbs 1983; Sutton 1993; Taylor 1998).
Location

Most likely, they are present across the whole of the Pouerua landscape, including to the south of the volcanic cone. However, excavated and identified examples have only been recorded to the east and west of Pouerua cone (Gibbs 1983; Sutton 1993; Taylor 1998).
Figure 4.12: Cross section of Excavated Garden Soils at Pueerua (Source: Gibbs 1982)
4.4  Pre-contact Settlement Features

This section describes features associated with Maori settlement, in essence, sites where cooking, food preparation, tool manufacture, food storage, and sleeping/living were likely to have occurred. The features described in this section are based on surveying of sites presented in Phillips et al. (1980), Sutton (1990; 1993), Challis et al. (1993) and Sutton et al. (2003), or sites of a similar nature.

4.4.1 Terraces

These cut features are prominent along the ridgelines that radiate out from the base of Pouerua cone, and on the low hills found on the surrounding landscape (Figure 4.13).

Appearance

The appearance of terraces varies enormously. While a general descriptor might be that they are often rectangular, recorded examples of terraces were a combination elements including being short or elongated, narrow or wide. The tread of the platform may have been level or sloping towards the front or back of the platform. The front and back risers may simply be exposed scarps or they may have been faced with stone. A row of stones may also have been used to define the edges of the terrace.

Construction

Based on excavation data presented in Sutton (1990; 1993) and Sutton et al. (2003), the terraces features were constructed by digging into a hill slope and removing a section of the hillside (Figure 4.13). The result was a relatively flat surface, set up against the slope of the hill. Material from the excavated section of hillside may have been used to extend the front edge of the terrace.

The size of the terraces and the number of terraces present in any one area varies greatly. A visual assessment of the Leatherby and Morgan map (n.d) indicates that longer, narrower terraces are common on the steeper flanks of the Pouerua cone, while shorter, broader terraces are often found on the ridges and low conical hills on the surrounding landscape. This could not be confirmed by field survey, as most of the terraces on the flanks of the cone are covered by a dense layer of vegetation.
**Quantity/Frequency**


**Location**

Terrace features can be found right across the Pouerua landscape. They are most prominent on natural raised features such as ridges, conical hills or the flanks/rim of Pouerua cone. Terraces have also been recorded on areas which are only slightly higher or steeper than the surrounding landscape; however these examples are not as easy to identify as they are not as prominent.
Figure 4.13 – Terraces (A) cut into a hill slope north of Pouerua
4.4.2 Hearths

Hearths were used to help identify whether an area had been occupied or settled, when more obvious settlement features, such as terraces, were not identifiable. This section describes only stone lined hearths (which are visible on the surface) and not scoop hearths (which are not).

Appearance

The hearths are defined by a series of stones set into the soil in an upright position, in a similar manner to stone alignments (Figure 4.14). Recorded examples of hearths were square or rectangular in appearance, although they may also be circular (as indicated by NZAA records). In square/rectangular examples, the hearths may be edged with stone on three or more sides. Examples of two sided hearths have been noted, but it is difficult to confirm (without excavation) whether these are actual hearths or simply natural features.

Construction

As noted above, stones have been set into the soil in an upright position. Unlike the stone alignments however, the stone is only approximately 10cm above the surface of the soil and is a less prominent feature than the stone alignments.

In square/rectangular examples, it is not clear whether the absence of one side of the hearth is deliberate or simply poor preservation of the features.

Quantity/Frequency

Few examples of these features were identified during the surveys. This may relate to the difficulty of identifying a feature with such a low profile, in an area with increased vegetation or an abundance of surface stone. Other hearths (not relocated) have been recorded in the NZAA records for Pouerua and indicate that there are more across the Pouerua landscape.

Location

Recorded examples were found to the north and west of Pouerua cone. NZAA records indicate that they are also present to the east of Pouerua.
Figure 4.14 – An example of a stone lined hearth on a terrace north of Pouerua cone
4.4.3  L and C Shaped Structures

These are stone features which may be associated with hearths in some cases.

Appearance
As the title indicates, these features are ‘L’ or ‘C’ shaped in appearance. The features were recorded on raised areas such as low hills/mounds and in basins/low flat areas (Figure 4.15).

Construction
The stone in these features has been recorded as both stacked and heaped. The area partially enclosed by these features is mostly clear of surface stone. The walls or rows that form this feature may be straight sided or rounded (figure 4.15). The size of the stone material varies from 5cm to 40cm plus in diameter.

The structures are low in height, generally about 1m at their highest point. The base of the ‘C’ shaped examples measures 1m-1.2m in width. The ‘L’ shaped examples also measure approximately 1m in width, although some sections were up to 2m wide.

Quantity/Frequency
These are not common features. Examples were only recorded in the northern stone field.

Location
Only recorded in the northern stone field, and in areas approaching the margins of the recorded/surviving Pouerua archaeological landscape (beyond 900m – 1km from the base of the cone).
Figure 4.15 – An example of an ‘L shaped’ stone structure recorded in the northern stone field (Source: I. Barber)
4.4.4 Stone Retaining and Facing

Evidence of stone retaining and facing has been recorded on some terrace features at Pouerua (Figure 4.16).

Appearance

May occur as a single stone alignment in terraces with only a small/low front scarp. In other cases the stone facing/retaining may cover the entire front of the scarp. The terms facing and retaining are both used here because it is not clear whether the purpose of these features is visual or functional. The use of stone facing/retaining has been recorded on larger terraces measuring as small as 3m x 4m.

Construction

Larger stones may be set into the soil (in the case of the single alignment edging), stone may have been stacked to form a low wall of varying thickness, or stone may have been put down as a single layer on the front of gently sloping scarps.

Stone size is generally over 15cm in diameter, and the stone is closed packed together. Soil/turf is present in some examples but it is not clear whether this was an original part of the feature or just something which accumulated over time.

Some examples include the use of stone on the sides of the terrace and back of the tread. In these examples, stone is more likely to be a single alignment than a layer or wall of stone. No examples of facing/retaining were recorded on the back scarp above the terraces.

These features can be differentiated from amorphous stone heaps through the size of the stone material present and also whether the stones are set into the ground and form a layer. Some examples of facing/retaining may have clearly defined edges with stones set in an upright position like stone alignments (Figures 4.9 and 4.16).

Quantity/Frequency

While a number of examples of these features have been recorded, these are not common features when considered in relation to how many terraces have been recorded at Pouerua.
Location

These features have been recorded to the north and west of Pouerua cone. In the north this includes the area from the base of the cone out into the northern stone field. In the west the features have only been recorded near the base of the cone.
Figure 4.16 – A stone faced scarp identified by Phillips and Hilton (1980) east of Pouerua cone.
4.4.5 Storage Pits

Appearance
Well preserved examples have been recorded as rectangular depressions with clearly defined corners (4.17). In other examples, the sides or the corners of the features may have slumped making it difficult to conclusively determine whether a feature was a storage pit.

Construction
These are cut features that measure approximately 0.5m in depth at the centre. Pits may occur as singular or grouped features, which may be similarly aligned or orientated.

Although 10m² or more of soil (based on the current size of some recorded pits) may have been removed during construction, no evidence of soil mounds or ridges was recorded on the edges of or near the pits.

There is no clear association between the size and number of storage pits in an area, and the amount of evidence for cultivation.

Quantity/Frequency
There are dozens of recorded storage pits at Pouerua, particularly on the cone or within close proximity of the base of it. While some of these are definitely storage pits, there are a number of examples in NZAA records which have been recorded as pits but which may just be natural features.

Location
Assuming that all recorded examples are actually storage pits, then these are widely distributed features which have been recorded right across the Pouerua landscape. There is a concentration of pits on and around Pouerua cone (noting of course, that the concentration does not indicate that all pits on and around Pouerua were in use at the same time.
Figure 4.18 – Storage pits recorded during a survey by Challis and Walton (1993), to the northwest of Pouerua cone (Source: A. Challis)
4.5 Historic Period Pastoral Features

This section refers to features which can be readily identified as relating to historic period farming practices. Archaeological features described elsewhere in this chapter may also have been constructed during this period but there is no direct evidence for differentiating between pre-contact and contact period features. While contact-period archaeology may refer to the cultural and economic exchange that became increasingly frequent following Cook’s 1769 A.D trip to New Zealand, much of historic period evidence at described in this section will be post-1830. As noted in chapter two, it was during the 1830s that Henry Williams began to purchase land at Pouerua/Pakaraka, and settle the area with his family. However, because little is known about Maori occupation of this area c.1769 – 1830, and because historic artefacts were recovered from excavated sites at Pouerua (Sutton 1993; Sutton et al. 2003), it is likely that there are a number of contact period sites scattered across the Pouerua landscape.

4.5.1 Pastoral Stone Wall

Appearance

Fitted or placed stone walls that are wider at the base and taper in the higher they get. They are generally the same height and width across their length (Figure 4.18).

Construction

Larger rocks (diameter >20cm) form the base of the features, although boulders may also been included. Despite stone for the walls having been sourced from stones heaps in the vicinity of the intended wall, much of the caller stone often found in stones heaps (diameter <10cm) is absent. At their base the walls are approximately 70cm wide, tapering to 30cm at the top.

The walls are generally 1.4m high, although that may change in areas of steep relief where the wall fluctuates in height (and to a lesser degree width) in order to maintain strength/stability. Length varies, as noted earlier; many of the walls follow cadastral boundaries.

The walls are generally straight across their length, extending over features such as hills rather than going around them. Where walls do turn and head in another direction, the angle of the turn is around 90°. Walls constructed at the same time can be identified by the fact that
at the point where they intersect, the walls are interlinked. When a younger wall intersects an older example, the walls will abut another.

**Quantity/Frequency**

In the stone fields, the Pastoral Stone Walls have been used along many of the cadastral boundaries. Beyond these areas, where surface stone is less abundant, they are either short in length or absent altogether.

**Location**

Because these features are often quite long, they cover a lot of ground and technically extend over many over much of the Pouerua landscape. The are however, more common in the northern and western stone fields, and have been utilised to a lesser degree to the south of Pouerua cone.
Figure 4.18 – An example of an historic period stone wall demarcating a cadastral boundary in the northern stonefield near Pouerua cone (Source: I. Barber)
4.5.2 Pastoral Clearance Heaps

Appearance
Pastoral clearance heaps are often large isolated stone features, whose height, length and width varies in relation to the concentration of stone in an area i.e. pastoral clearance heaps near the northern stone field are larger than those closer to Pouerua cone.

Construction
These features have been constructed using stone cleared from the surrounding area. As these features are often found in close proximity to other Maori settlement and cultivation features (100m-200m distance), it is highly likely that this stone came from Maori cultivation related features. Heaps may be up to 1.8m high, 15m long and 10m wide.

There is a general absence of smaller stone material (diameter <10cm) in pastoral clearance heaps, and they may contain historic era products such as iron or wire.

Quantity/Frequency
These are not common features at Pouerua, however they are associated with large scale clearance of what were likely to have been Maori settlement/cultivation features.

Location
Recorded right across the Pouerua landscape.
4.5.3 Corrals/Cattle Yards

Appearance
These features appear as open areas of land cleared of stone. They are characterised by the presence of numerous stone features around the outside of the corral feature.

Construction
Stone has been cleared away from an area. Large open area (approximately 0.25 – 0.5 hectares)

Natural features such as boulder covered slopes partially encircle these areas. There is no other surviving surface evidence for these area having been used as a cattle yard. However the pattern of land clearance is uncharacteristic of Maori horticultural practices in this area. This is also an unusual clearance pattern for areas which are to be ploughed, as the cleared areas are still surrounded by stone features.

Quantity/Frequency
An uncommon feature at Pouerua.

Location
Possible examples recorded north of the Pouerua cone, although historic documents allude to the construction of similar features near the early Williams settlements on the northern edge of the Pouerua landscape (Williams 1839).
This chapter has focused on presenting the archaeological features at Pouerua as they were recorded. This means that detail regarding form and distribution have taken precedence over possible function in order to draw focus onto what the features actually consist of and away from assumptions about what their role may or may not have been in the past. However, given that the following chapters are focused on interpreting the use and development of the landscape there is a need for some interpretation of function.

Table 4.1 below highlights the roles that the horticultural features discussed in this chapter could have fulfilled. These functions are based on interpretations presented in Furey (2006), Walton (1999), Barber (2004), and supported by investigations of horticultural sites and features as presented in Best (1925); Mitcalfe (1970); Sullivan (1972; 1974); Phillips et al. (1980); Leach (1984); Marshall (1987); Jones (1988; 1994); Barber (1989b); Challis et al. (1993) and Horrocks et al. (2000). While this thesis takes into account these previous works, it is not assumed that similarity in form necessarily equates to similarity in (interpreted) function.

As is clearly indicated in Table 4.1, it is possible that a single archaeological feature could have had multiple functions or even possibly multiple simultaneous roles. For example, a box heap could have acted as a repository for stone cleared from the surrounding land. At the same time however, the box heap could have been specifically positioned so as to define the edge of a horticultural system or boundary. At one point in time, that one feature has two roles – clearance and boundary definition. Furthermore, the same box heap could be used as a windbreak for plants in the garden or even as a climbing frame for plants such as gourd, keeping the fruit off the soil. At one point in time, it is now possible that one feature had three simultaneous roles or three different roles over an extended period.
Table 4.1 – Features recorded in horticultural areas could potentially have fulfilled multiple roles including their initial intended use before being reused or incorporated into later settlement or cultivation systems

<table>
<thead>
<tr>
<th>Boundary</th>
<th>Land Clearance</th>
<th>Paths/Access</th>
<th>Cultivation</th>
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<tbody>
<tr>
<td>Box heaps</td>
<td>Box heaps</td>
<td>Single stone alignment</td>
<td>Stone rows</td>
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<tr>
<td>Non-cadastral stone wall</td>
<td>Non-cadastral stone wall</td>
<td>Double stone alignment</td>
<td>Rounded heaps</td>
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<td>Single stone alignment</td>
<td>Single stone alignment</td>
<td>Shallow Trench alignment</td>
<td>Pyramid heaps</td>
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<td>Double stone alignment</td>
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<td>Amorphous heaps</td>
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<tr>
<td>Shallow Trench alignment</td>
<td>Shallow Trench alignment</td>
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<td>Stacked heaps</td>
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<tr>
<td>Stone rows</td>
<td>Stone rows</td>
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<td>Stone mounds</td>
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<tr>
<td>Rounded heaps</td>
<td>Rounded heaps</td>
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<td>Garden soils</td>
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<td>Pyramid heaps</td>
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<td>Box heaps</td>
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<td>Amorphous heaps</td>
<td>Amorphous heaps</td>
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<td>Non-cadastral stone wall</td>
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<td>Stacked heaps</td>
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The Nature and Function of Cultivation Features

5.1 Introduction

While the previous chapter described the form and distribution of horticultural features, this chapter looks to provide some insight into their possible function within the Pouerua landscape. The potential function of the Pouerua features is based partly on the nature of the Pouerua evidence and partly on the interpretation of similar horticultural features described in the texts by Phillips 1980, Phillips et al. 1981, Sutton (1983; 1990a; 1993), Marshall (1987), Challis et al. (1993) and Horrocks (2000) with regards to the Pouerua landscape, as well as Walton (1999), Barber (2004) and Furey (2006) which describe horticultural features from a range of New Zealand sites.

This chapter explores how factors such as environment, feature frequency or distribution, method of construction, or form could be used to assist in the interpretation of the horticultural features discussed in the previous chapter. This is the second step in interpreting what processes may have shaped the landscape and examining spatial and temporal change in the wider Pouerua landscape.

5.2 Alignment Features

This section looks at the how alignment features (both stone and trench) have been utilised at Pouerua. It explores ideas about the role of alignment features within horticultural systems, drawing on investigations such as Barber (1989) and Furey (2006) and examines ideas about the use and distribution of these features at Pouerua.
5.2.1 Trench Alignments – Boundaries or Drains?

It has been noted that the alignments at Pouerua, based on their location and orientation, and presence on the free draining volcanic landscape, more closely resemble boundary than drainage or water diversion features (Phillips et al. 1980, Furey 2006). However, given that water has been witnessed by the author, pooling on the surface of the soils at Pouerua, the comment by Peters (1975:178) that ‘each field system must be looked at and interpreted in relation to the pattern it forms and its physical location’ seems pertinent.

An examination of the landscape and the Pouerua literature (Phillips 1980, Phillips et al. 1980, Sutton (1983; 1990a; 1993), Marshall (1987), Challis et al. (1993), Horrocks (2000), and Sutton et al. (2003)) highlights the eastern aspect of the Pouerua landscape as an area most likely to have required features such as drainage channels. It is in this area that horticultural systems extend much further up onto the steeper flanks of the Pouerua cone than elsewhere. This is probably owing to the uneven distribution of air fall ash when Pouerua erupted, and the deeper ashy soils on the eastern flanks of Pouerua (Hayward et al.1992). It is in this eastern section of the landscape where horticultural systems would have been most at risk of erosion and where stabilising architecture, such as trench alignments, could have been used as conduits for surface water (Barber 1989; Allen 2004).

In the preparation of an area for gardening, it is assumed that much of the primary vegetation would have been removed from the area to be cultivated. Depending on how the land was cleared, the vegetation may also have been removed from the area beyond the intended garden site. Before planting, the soils would most likely have been broken up and loosened before the seed was sown. In an area of steep relief then, there exists the very real possibility that heavy rainfall could wash away topsoil or even growing beds in garden areas. The consequences of this could range from the loss of topsoil and the eventual relocation of the garden to a new area through to the loss of crop seed and the crop.

Shallow trench alignments could be employed in these areas to catch water running down slope (from above the garden areas), and divert it out to the sides of the horticultural system, thereby reducing the effects of the erosion on the horticultural systems. Alignments within the system could fulfil a similar task (Peters 1978:175). Examining the Pouerua evidence however, there is very little to suggest that shallow trench alignments were employed as any sort anti-erosion tool. In fact, the layout of some alignments would most likely direct any surface water into a system rather than away from it.
The fact that garden soils have been identified at Pouerua (near the base of the cone), buried beneath a layer of slope wash (Figure 4.12), suggests that the soils from the cone and the steep areas near the base of the cone, were eroding. However, the level of erosion appears to have not been significant enough for Maori to warrant adapting their horticultural systems to minimise the effects of water run off on their gardens.

That the alignments at Pouerua have been recorded extending not only down slope, but up and over the top of slope areas, has been argued by Furey (2006:40) as evidence that these were boundary features rather than drains. Despite the shallow nature of some of the trench alignments, it is likely that within a cleared and operational horticultural system, both stone and trench alignments would have been visible. The visibility if the alignment features may even have been heightened by the presence of plants with gardens beds and their absence along alignment boundaries.

Furthermore, there is evidence that horticultural alignments continued out beyond the systems and into areas of settlement. In these cases it was on single trench alignments and double stone alignments that continued ontowards areas of settlement. Plots and bounded areas were not attached to these sections of the systems. This suggests that the alignment features not only demarcated certain areas of cultivation but acted as paths that connected the settlement and cultivation areas.

It remains unknown whether the function of the boundary related to cultural factors or ideas of ownership and control over an area of land. However the extensive use of boundary features in demarcating areas of cultivation indicates that the use of boundaries was a significant part of the development of horticulture at Pouerua.

5.2.2 Defining Space – The Use of Alignments in Horticultural Systems

The idea that these alignments were paths or boundaries was proposed during the initial surveys of the Pouerua landscape (Phillips 1980, Phillips et al 1980).

Furey (2006:118) noted that ‘Within the overall system of gardening, there are some common features, in particular the physical definition of boundaries’. At Pouerua this idea certainly seems to hold true. While the form of the horticultural systems, their size, and range of
features present varies between examples, the most common feature within all recorded examples is the presence of either trench or stone alignments which define the area of cultivation.

While it remains unclear what the reason for the use of boundaries was which can range from ideas of ownership or control, division of rewards and responsibilities, and spiritual or cultural factors associated with gardening), it is evident that Maori considered the use of alignments as boundary feature significantly important enough to use these features extensively at Pouerua. Alignment features extend over much of the volcanic area of the Pouerua landscape, although it is not yet known whether they represent a late stage development or whether alignments and the definition of boundaries in horticultural systems was present right from the first occupation of the Pouerua landscape.

Whether that purpose varied between alignments is much harder to tell. In the case of stone alignments, it could be argued that single stone alignments functioned as boundaries while double stone alignments indicate both paths and boundaries. In the case of shallow trench alignments however, it is much harder to differentiate between alignments used for boundaries and those which were used as paths.

The use of boundaries to define space within the gardens (for what ever reason), seems to be a reflection of practices which archaeologists have observed during the excavation of pa and kainga at Pouerua. The organisation of space within settlement areas for housing, and assorted domestic activities has been suggested by Sutton (1990a; 1993) and Sutton et al. (2003) to be a reflection of the social requirements of the occupying group. It seems likely also that horticultural systems were likely exposed to the same influences as the settlement areas, and that the systems may have undergone changes to order and define space in a similar way to the way settlements were modified and organised internally. That the horticultural systems were exposed to the influences of the occupying Maori group is supported by the variation in horticultural system size, orientation, and extent of development.

5.2.3 Shifting Boundaries – New Season, New System?

As noted in this thesis, the Pouerua landscape is a patchwork of former horticultural systems that abut and overlay one other. What is unclear however is whether these horticultural systems reflect a single season’s cultivation, or a succession of seasons? The interpretations
for this are important, because it has implications for how Maori were using the landscape, and in turn how the wider landscape was being modified to accommodate its inhabitants.

In a New Zealand context, single use horticultural systems are most likely to be the result of general abandonment, or the colonisation of the former cultivation by bracken fern, a plant whose thick rhizomes Sutton (1990b) has suggested was one reason Maori may have sought new cultivation areas in the inland Bay of Islands area. That this was the case at Pouerua has even been argued by the excavators of site P05/859 (Damm et al. 1994). In this example, the authors concluded that Maori would most likely have been occupying site P05/859, on and off over the course of the growing season. This would have meant that the area was occupied from approximately July of one year through till the following March (1994:22). Following the harvesting of the crops, the gardens would have been overgrown by bracken fern and the subsequent season’s gardens would need to have been heavily tilled to remove the bracken rhizomes (Damm et al 1994:22). This would result in the destruction of the previous season’s boundaries. This argument is supported by the idea that bracken fern was the great coloniser of the fire swept lands, and that its rhizomes could potentially limit the way in which an area of land was utilised again (Leach 1980).

The destruction of earlier horticultural systems in order to cleanse the land of bracken rhizomes would result in a new horticultural system at the start of every growing season. For investigators of horticultural systems, this could mean that the recorded archaeological systems represent only the final season’s activities, rather than the accumulated actions of a group. This in turn has implications for the way in which archaeologists interpret change within horticultural systems. This is especially significant for the investigation of temporal and spatial development of horticultural systems as presented in Chapter Six.

Based on the conclusions by Damm et al. (1994), it is possible that Maori were active within the horticultural landscape for perhaps three quarters of the year. It is possible then, that one horticultural system could be sustained, and perhaps even expanded upon over the course of more than one growing season. If social or political factors are removed from the equation, and the soil in an area gardened was capable of supporting another season’s cultivations, then it is possible that there was no need to clear another part of the Pouerua landscape for gardening. That horticultural systems can be reused could be argued on the following:
1. There is no traditional evidence of gardens being abandoned at the end of a single growing season (i.e. post-harvest).

2. Gardens were maintained for perhaps nine months of the year (Damm et al. 1994). Three months of general maintenance (i.e. weeding) over the late autumn and winter months may have been preferable to the clearance and preparation of an entirely new area of land.

3. Mature stands of bracken were unlikely to have been present in areas currently being cultivated or most recently cultivated by Maori. Thick underground mats of bracken rhizomes are unlikely to have been taking hold alongside crops such as kumara or gourd, particularly if crops were shading the soils and making it difficult for plants such as bracken to become established.

4. New bracken growth (i.e. emergent shoots) may have been limited by the cooler weather of autumn and winter (McGlone et al. 2005). This means that rampant regrowth of bracken fern may not have been occurring in the cooler, non-horticultural months.

It is possible ongoing maintenance of garden areas could have kept in check any bracken growth in garden areas during the periods when deliberately planted cultigens were not present. Cultivation of the field systems would then extend from the preparation of the soils for crops, and the planting, maintenance and harvesting of crops, to include the maintenance of field systems between the harvesting of one crop and the sowing of another. In theory, an area of garden could have been maintained for more than one growing season without the need for heavy tilling of the soil. The implication of this is that gardens and their boundaries may have not be continuously on the move and being altered every season, as has been suggested elsewhere (Damm 1994:22), and that the temporal and spatial development of horticultural systems may have occurred over one or more seasons.
5.2.4 Garden Plots

While at first glance there may appear to be similarities in the size of individual garden plots (the bounded units within a horticultural system), closer inspection reveals that these plots may measure from anything as small as 10m x 10m right through to 80m x 50m. Plot size varies greatly between systems, and even within individual horticultural systems there is variation in the size of the plots.

While the shape of the garden plots is generally rectilinear, this does not mean that they are adjoining regular square or rectangle plots. Plots are generally four sided although three and five sided examples have been noted. In flat or open areas, the garden plots appear to be more regular in shape and rectangular or square plots are more common. On the slopes or in areas where plots are condensed in a small area, plots are often trapezoid-like in appearance. Plot shape appears to be influenced by the nature of the surrounding terrain. The relationship between the sizes of the plots and the surrounding settlements is not as clear however.

The role of bounded plots has generally centred on the idea that they are related to individual plantations (Nicholls 1965; Furey 2006). What is not understood however is the actual role of the plot within the larger horticultural system (i.e. collection of plots). Again, following the conclusions in section 5.2.2 of this chapter, plots seem to be associated with the more general idea of defining space. Beyond this however, it impossible to do more than speculate about the role of the plots within ideas of land occupancy or control by individuals or groups because there simply isn’t enough information to support such claims. The only general conclusions that could be made is that there appears to be a certain degree of communal activity in many other aspects of life at Pouerua (Sutton 1990a; 1990b; 1993; Sutton et al. 2003), and this idea of communal actions or activities may extend through to the horticultural systems.

From the wider New Zealand context there is literary evidence from local histories, traditional accounts, and Maori Land Court Records which highlights the extended community aspect of Maori cultivation (Furey 2006:120; Ballara 1998:196-197). Clearing of the land for gardens (especially areas previously forested), planting and maintenance of large areas of crops, and harvesting and preparation of crops for storage would all have been labour intensive activities and suggest extensive community participation within garden practices. However, there is some evidence which suggests that rights to areas of cultivation could be passed down to individuals (Ballara 1998: 196-197), and so there exist both communal and individual aspects to Maori gardening.
5.2.5 The Orientation of Alignment Features as Indicators of Activity and Settlement

It has been suggested by Veart (1986) in his study of horticultural systems in South Auckland; that groups of related alignments may have radiated outwards from a single point such as a small hill feature, or even a larger feature like a volcanic cone. In terms of interpretation, Veart (1986) argued that alignments may radiate outwards from points on the landscape which were important to the Maori cultivators. If a group of alignments radiate outwards from a terraced hill feature for example, then the occupation of that terraced hill may have been associated with the use of the surrounding garden features.

Alignment features originating at the base of the Pouerua cone, often extend straight out in the same direction, i.e. alignments on the western side of the cone extend out in a westerly direction. However, because systems will often contain multiple linear alignments, systems to the west of Pouerua may also extend to the north or south as well as the west. While the orientation of single major alignments may provide insight into the development or expansion of the system into an area of land, the orientation of the system as a whole provides limited information with regards to the development or use of the horticultural system.

While there is evidence to support Veart’s idea ideas of points of system origin being focal points for Maori settlement, there idea itself needs to be considered in relation to the local horticultural evidence. In the case of Pouerua, the topography and nature of the surrounding environment appear to have had some influence on the form of the final horticultural system, and while alignments do radiate from some settlement features, they appear to terminate rather than originate, at others.

5.2.6 The Use of Dendritic and Parallel Systems

After examination of the Pouerua evidence, there appear to be two broad terms that could be used to describe the overall appearance of the horticultural systems. This is one less than used by Phillips et al. (1980), because examination of the system patterning identified no reason for not grouping pattern variety under two more broadly encompassing terms. In this case, parallel is used to describe systems where there is evidence for a series of parallel alignments extending over an area, where as dendritic is used to describe a branching horticultural system, whereby multiple shorter alignments may branch of one or more central alignments.
The identification of different system formats should not be interpreted as the identification of altogether different horticultural systems. The terms dendritic and parallel essentially describe the same features (intersecting series of trench or stone alignments), but differentiate between the different ways in which those alignments have been laid out. The terms are also general descriptors of the environment, as parallel systems are most likely to be recorded in flat, open areas, where as dendritic systems are found in areas of varying relief such as basins or gullies.

Beyond the way the systems are laid out, there is little variation between the two different types of systems. They contain a similar collection of features associated with settlement and cultivation and display the same variations in size and number of plots. Both systems may have one or more central alignments and contain a number of smaller bounded plots. Plots in parallel systems are more likely to be rectangular or square; however this does not mean that only trapezoid plots are recorded in dendritic systems. Like plot shape, the nature of the surrounding terrain appears to have influenced the shape of dendritic and parallel horticultural systems.

5.2.7 Other Natural and Constructed Boundary Features

As discussed in the conclusions of Chapter Four, some features may have served more than one purpose within areas of cultivation, either when originally constructed or when incorporated into later horticultural systems. One of the most likely secondary roles for a number of features was as a boundary marker within horticultural systems.

In some cases, where a stone heap has been constructed along an already defined alignment, it is possible to argue that the presence of the heap could have served a secondary function in highlighting the alignment (Veart 1986:30). In areas where there are numerous stone heaps however, the visual effect of this (unless the heap is especially distinguished) may be reduced.

Uncommon examples of some stone features (such as the box or stacked heap) may have also served as boundary markers within landscapes, and because of their rarity, may have stood out more on the landscape. These features have yet to be recorded at Pouerua however, in association with an existing boundary alignment. This means that there is no way to confirm this possible function of the heaps, because there is no surviving boundary framework in which to tie these features into.
In terms of the natural environment, it is possible that features such as hills, ridges, rock outcrops, and streams could have been used to define areas of activity, occupation or control. At Pouerua there is sufficient evidence to support this idea, with numerous natural features serving as both the originating and termination points for a number of horticultural systems. This conflicts with Veart’s evidence from South Auckland (1986:55), which noted that natural features such as ridges were used as the basis for cross walls, but were never points of origin for major boundary alignments, suggesting that these originated at the cone itself.

5.3 Land Clearance

The northern and western stone fields contain thousands of stone features representing the clearance and cultivation of the volcanic soils in these areas. While some of these stone features have been attributed to European era pastoralism (Lawn 1963; Bell 2008), the majority of these are likely to relate to Maori clearance of land.

5.3.1 Clearance Heaps

Most, if not all the variations on stone heaps identified in Chapter Four, could be interpreted as evidence of clearance of stone from areas of intended cultivation. Variation in the form of the features can be somewhat attributed to the environment (range of material available), the intentions of the cultivators (using them as clearance heaps as well as boundary markers for example), and just general individuality. As Furey (2006:118) notes ‘Just as modern gardener’s plant and nurture crops by their own idiosyncrasies…Maori gardeners must also have exhibited some individuality’. It seems highly likely that this individuality accounts for some of the variability within the range of clearance heaps.

However, it seems clear that while clearance of the surrounding soil was the most likely function of these features, it is also possible that they played a secondary role as climbing frames for plants such as gourds (keeping the gourd above the moist ground) or perhaps even to provide shelter for cultigens planted in the lee of the stone heaps. However, given the lack of reported evidence for the excavation of garden features, there is insufficient archaeological evidence to support the idea that stone heaps were used for anything else but clearance.
5.3.2 **Structured Stone Features**

It has been suggested by Veart (1986), that evidence of construction in a feature, can be interpreted as the feature having an intended use that extends beyond stone clearance. Theoretically, any of the stone features could be utilised in a manner beyond just stone clearance regardless of the method of construction. Veart (1986) however, was most likely arguing in favour of structured features, along the lines of the box heap (Figure 4.3), being used as boundary markers. The structured features seemingly being distinguishable from the heaped features on the landscape.

While this idea works in theory (structured features do stand out on the landscape), there is no supporting evidence to tie these features in with any other aspect of the landscape to support an argument in favour of structured features. As it stands, structured stone features such as the pre-contact stone wall, box heap, or stacked heap could just as easily be argued as evidence of individuality being expressed in the stone features (Furey 2001:118). What is needed is investigation of some these features in a similar manner to that conducted by Horrocks et al. (2000), with the excavation of some stone structures.

5.3.3 **Stone Mounds as Garden Beds**

The idea of mounds as garden bed, has in the past, been explored by the likes of Sullivan (1974); Coates (1992) and Horrocks et al. (2000). The use of these features as a mini raised garden has more often been a suggested use rather than an interpretation supported by evidence (Furey 2006:32). Beyond interpretation of function, the hypothesized benefits of these features has centred around the idea that the raised garden beds could help regulate soil temperature, regulate soil moisture evaporation, and possibly even variation in the chemical composition of the soil within the mound (Coates 1992:59; Furey 2006:33).

The presence of stone mounds with a soil fill not only Pouerua, but other volcanic sites such as Wiri (Sullivan 1974), supports the idea that the use of mounds was a widespread and accepted method for cultivating plants in the past. The distribution of these features across the Pouerua landscape highlights how widely utilised they were. What is unclear is what the actually benefits were, if indeed plants were being cultivated in the soil mounds.
There is only one reported example of a stone mound being excavated at Pouerua, and that provided limited detail about the actual structure of the feature, or how it compared to others at Pouerua (Horrocks et al. 2000). Using the available evidence, it is possible to draw comparison with the mounds investigated by Coates (1992), and by inference their perceived benefits. Still the role of these features beyond a possible raised bed function has scarcely been explored. It is also possible that features such as these may be the evidence of adaptive changes to cultivation methods, along the lines of environmental bet-hedging as argued by Allen (2004).

In the case of Pouerua, perhaps the most insightful explanation as to the use of these features is a brief note by Sutton (1983:10), in which he notes that the stone mounds were present along the edges of the bottom of gully features and on areas of land where the soils were thin. For Pouerua, this could mean that these features were employed in places where the soils were considered to shallow to cultivate some plants, the use of mounds thereby potentially enhancing the likelihood of the plant surviving or producing a better crop.

Other aspects of the stone mounds may further support the idea of mounds being used to encourage cultivation in marginal areas (i.e. exposed areas or an area with shallow soils). Mounds recorded at Pouerua (Bell 2008) had a layer of small stone material (diameter 1cm-5cm) across the top surface, a stone capping similar to that described by Coates (1992) and Furey (2006). This has been suggested by Lightfoot (1994) to have affected the temperature and moisture levels of the soil, and is similar to the argument of Coates (1992). This stone capping may also have played a role in controlling the growth of weeds in the mound, such as rock mulch in garden areas on Rapa Nui as described by Baer et al. (2008:103).

It is interesting to note that stone mounds are most commonly recorded in the stone fields, but have been noted right across the Pouerua landscape. Further investigation is needed in order to identify whether another method has been adapted in areas where surface stone is less prevalent. This may highlight variation in the methods of cultivation in stony and less stony areas, and aid in the investigation of Maori cultivation adaptations (Allen 2004).

5.4 Intensification or Innovation – The Use of Stone Mounds

Were stone mounds constructed with the intention of increasing production or sustaining production? In addition, do the cultivator’s intentions for the feature have any impact on archaeological interpretations? While the creation of stone mounds could be viewed as a
capital investment along the lines of landesque intensification (aimed at increasing production), they could equally be viewed as an adaptive strategy intended to minimise the risk of crop failure.

Drawing on Sutton’s conclusion that stone mounds may occur in areas with shallow soils (1983:110), it is possible that stone mounds could have increased the area of land available for cultivation. If the soils in an area were too shallow to cultivate, then the construction of a number of soil mounds in the area may allow for cultivation where formerly cultivation had not been possible. Theoretically, these permanent capital investments increase the area of land available for cultivation, and potentially the amount of food a group can produce within a fixed area. In this sense, stone mounds could be considered elements in the intensification of production.

On the other hand, stone mounds could be considered an innovative tool aimed at reducing the risk of crop failure. Again, drawing on Sutton’s (1983:110) comments, the same stone mound on shallow soils may have reduced the risk of a crop being exposed to reduced nutrient levels or dry soils. Stone mounds with stone capping, organic inclusions (i.e. burnt material as indicated by Horrocks et al. 2000), and potentially reduced rates of soil moisture evaporation (because of the stone capping), may have positively impacted on the plants chance of survival. If this were the case, and the stone mounds only aided in maintaining current levels of production, rather than increasing production, the mounds are best considered an example of innovation or adaptation (Allen 2004:207).

The problem remains thus; the evidence for either point is insufficient in order to argue either way. It may be that mounds in some areas are evidence of intensified cultivation practices and in other areas, examples of innovation and environmental adaptation. The evidence however, from Pouerua and elsewhere, is not substantial enough to do anything more than hypothesize.

Given the frequency of the stone mounds in the stone fields, it seems possible that there is some support for Sutton’s (1983:110) suggestion that these are features associated with shallow soils. After all, the northern and western stone fields are visible because they did not receive the same deposits of air fall ash as areas to the east did for example (Sutton et al. 2003).
The frequency of the mounds across the Pouerua landscape indicates that these were not just features being trialled by Maori gardeners. The fact that they are so numerous and so widely distributed suggest that they did serve a purpose. Whatever the purpose of the mounds was, it must have been considered significant by Maori as the mounds occur in a number of gardens. This means that stone mounds may have been employed by Maori gardeners over a number of growing seasons, perhaps years, decades or centuries worth of cultivations.

5.5 Evidence of Post-1830’s Activity on the Horticultural Landscape

Henry Williams began purchasing land and settling his family at Pouerua/Pakaraka during the 1830s. It should be expected then that during the first half of the 19th century, there were a number or changes to the Pouerua landscape relating directly to the Williams families use of the land, and the possible early historic period Maori use of the Pouerua landscape.

While it is clear there are a number of early to mid 19th century constructions on the northern fringe of the Pouerua landscape, in and near the village of Pakaraka, there is less evidence for early activity in the rest of the landscape. While historic era stone walls define the extent of early pastoral activities in some parts of the Pouerua landscape, in only a few cases can those stone walls be associated with early cadastral boundaries.

There is no historical or archaeological evidence to indicate that Maori gardening practices changed (assuming Maori were still using the Pouerua landscape to a limited extent through to the middle of the 19th century, as argued in Chapter Two), with the presence of Europeans at nearby Pakaraka. While it is highly likely that Maori had access to new tools and new crops (as evidenced by the metal adze excavated by Sutton et al. 2003 at Pouerua), it seems more likely that these new technologies were incorporated into existing practices, rather than practices changing considerably to incorporate new tools.

Investigation of change in the use of the horticultural landscape by Maori during the 19th century is likely to require a more fine tuned investigative approach examining things such as gardens associated with known historic Maori settlements, and micro-botanical analysis to determine if new crops are being cultivated. Beyond this however, the changes in the cultivation practices following European introductions are unlikely to have been so dramatic as to have left a vastly different archaeological record.
5.6 Stone Clearance of Garden Areas – An Investigation of Land Utilisation

Stone heaps representing land clearance are common features in the northern and western stone fields at Pouerua. To the east of Pouerua, and near the base of the western aspect of the cone however, these features may be uncommon or absent altogether.

This section looks at whether the presence of stone clearance heaps impacts on the total area of land available for cultivation in a specific area. This comparison of areas with high and low concentrations of surface stone uses the surface evidence to see whether the presence of large amounts of surface stone could have required a different approach to cultivation in stony areas compared to less stony areas.

5.6.1 Calculating the Total Area of Land Unavailable for Cultivation

Having debated the role of stone features earlier in this chapter, it is necessary to note that this section investigated all heaped stone features which were identified as clearance heaps in Table 4.1.

Following detailed GPS recording of the sample areas, the data was used to investigate the total area of land by system and per hectare using the formula presented in Chapter Three, and outlined below:

1) \[ \text{Number of Heaps in an Area} \times \text{Base Size of Heap (i.e. 2m}^2) = \text{m}^2 \]

2) \[ \left( \frac{\text{m}^2}{\text{Size of Study Area (m}^2)} \right) \times 100 = \% \text{ of area covered by clearance features} \]

By identifying whether the stone heaps impacted on the total area of land available for cultivation, it becomes possible to investigate whether horticultural systems were likely to have developed differently if they were constructed in stony areas rather than non-stony areas.
5.6.2 An Example of Land Clearance in an Identified Horticultural System

The example presented below is of a stone alignment horticultural system on the western edge of the northern stone field. The system is contained on three sides by several large boulder outcrops, and although an historic stone wall is present nearby, this area does not appear to have been robbed of stone. The extent of the investigated system was determined by the presence of stone alignments in the area.

The system covers approximately 1.2 hectares of flat land across which are distributed numerous rounded stone heaps as well as an unknown number of stone mounds. Assuming that each of the rounded stone heaps at its base covered 1m² of land, the total area of potentially cultivatable land lost to stone clearance would be 153m². However, there are examples of stone heaps which have base measurements larger than 1m². As a comparative example, the total area covered by stone heaps if they all had a base measurement of 2m² was also calculated. In this case an area of land totalling 306m² would be rendered unavailable for cultivation.

If the stone heaps had a base measurement of 1m² then the total area covered by stone heaps accounts for only 1.3% of the total area of land within the boundaries of the system. An increase in the size of the base of the stone heaps to 2m² increases that figure to only 2.6% of the total area of the system.

The evidence suggests that the total loss of land in areas where stone heaps have been utilised was minimal. Small adaptations to the size of the horticultural system during the initial construction stages could easily have ensured that any area lost was replaced by the extension to the overall size of the system. It seems unlikely that Maori gardeners would have invested extra time and energy in the clearance of stone to the margins of the garden areas, as the reward for such an effort would have been very limited.

5.6.3 The Economics of Land Clearance

As indicated in the previous section, the percentage of the total area of land covered by stone heaps in the example is small and is unlikely to have had a significant impact on the potential productivity of an area of land. As a comparison to the example above, analysis of two other
areas in the northern stone field and two areas of land in the western stone field are presented here.

Although the stone heaps are prevalent features on the Pouerua landscape, especially to the north and west of the cone, the actual area of land rendered unavailable by the presence of the stone heaps is very limited. From the four examples, it was found that land covered by stone heaps accounted for no more than 5% of the total available land for cultivation (Table 5.1).

Table 5.1: Total area covered by stone heaps in study areas (each one hectare areas)

<table>
<thead>
<tr>
<th>Study Area</th>
<th>% of Total Area Occupied by Stone Heaps (1m² Base Measurement)</th>
<th>% of Total Area Occupied by Stone Heaps (2m² Base Measurement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Stone Field</td>
<td>1.8%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Northern Stone Field</td>
<td>1.4%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Western Stone Field</td>
<td>1.7%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Western Stone Field</td>
<td>2.4%</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

Table 5.1 shows the potential total area of land rendered unavailable for cultivation by the presence of stone heaps. This total has been calculated for both 1m² and 2m² to show the likely minimum and maximum combinations of cultivatable land to land lost to stone clearance. In a one hectare block of land, this would result in the gain of an area measuring at most approximately 20m x 25m or as low as 10m x 14m. Given the area of volcanic land potentially available to the cultivators at any one point in time, there would need to be significant pressures on the cultivators (which could include anything from changes in the political situation, to changes in population size, or even an unknown cultural factor) to warrant the extra investment of time, labour and energy required to clear the system of stone heaps (assuming the heaps had no secondary benefit).

Furthermore, if bounded units within a horticultural system did represent group interests (i.e. each family cultivated one unit), then the impact of the stone heaps is lessened even further. The total area covered by stone heaps – whether in an actual system on in a one hectare block, is in reality spread over one large area. The area of land unavailable for cultivation land was not borne by any one gardener, but spread across a series of plots. Any single plot within a system may only lose a few square metres of land.

The archaeological evidence indicates that construction of horticultural systems within stone fields may have required an initial increased outlay of resources such as time and labour in
order to clear the land of stone in preparation of cultivation. After this clearance however, the system was potentially equally as productive as an area without numerous stone heaps present. Continued clearance of the land to remove all stone heaps from the garden areas would have resulted in only limited gains in total arable area, and would have required significant resource investment. Furthermore, as indicated in Table 4.1, the clearance features could have served secondary purposes within the horticultural systems, sheltering plants or defining boundaries, further lessening the value in clearing stone to the margins of the gardens.

5.7 Conclusions

The evidence from this chapter highlights some of the similarities in interpreted function of the horticultural features to those described by Furey (2006). The archaeological evidence from Pouerua does reinforce Peters (1975) comments with regards to considering the archaeological evidence for cultivation, within the environment in which it was developed. While there are physical similarities in the appearance of features, some aspects of those features appear uniquely adapted to the Pouerua environment.

A thorough investigation of the wider Pouerua landscape has identified that while there may be differences in the environments between areas, overall, the horticultural systems, and the range of features from the horticultural assemblage they contain, are similar. This means that different aspects of the landscape can be further investigated, interpreted and compared to one another.

It is clear that there is room for further investigation in the study of the archaeological features of cultivation, particularly in how some features relate to the landscape (i.e. boundary features) and how other features, such as stone mounds, were being incorporated into cultivation systems. The level feature preservation and distribution makes Pouerua an ideal location for examining how horticultural systems developed in relation to specific aspects of the surrounding environment.
6

The Temporal Development of Horticultural Systems

Emphasis to date has been on identifying the physical characteristics of gardening and not on the change in garden systems through time. Identification of the base system and any subsequent subdivision into smaller units could be the next phase in the analysis of a major garden system (Furey 2006:118).

6.1 Introduction

As the above quote by Furey (2006) notes, identifying change within horticultural systems is the next step needed to advance the one aspect of the investigation of Maori horticulture beyond descriptive accounts of features. Although this is not a new concept, in New Zealand, the actual investigations of temporal and spatial development in horticultural systems have had limited successes. The most notable of these investigations include Sullivan’s (1972; 1975) and Veart’s (1986) studies of volcanic landscapes in South Auckland Johnsons (1986) examination of wetland systems in the far north of New Zealand.

These previous investigations (Sullivan 1972; 1975; Johnson 1986; Veart 1986) have all investigated the alignments that form the boundaries of the horticultural systems in order to identify a sequence of change within the horticultural landscape. This study takes a similar approach, in focussing on the boundary alignments, but draws on the method and theory applied by Ladefoged et al (2002) to the horticultural systems in Hawaii instead of the methods applied by Sullivan (1972; 1975, Johnson (1986) and Veart (1986), for the reasons outlined in Chapters Two and Three. The method applied by Ladefoged et al. (2002) to sites the Kohala sites in Hawaii, was used to develop the framework for the investigation of horticultural sites at Pouerua. Unlike the New Zealand examples mentioned previously, the method applied to Kohala focussed on the identification of temporal and spatial change in the horticultural landscape and investigated the features using a clear and concise approach that could be applied to more than one site. While the rules for investigating change in this thesis (Chapter Three) draw upon the Ladefoged et al (2002) approach, they have been modified
slightly to ensure that the method is applicable to the similar, but distinctly New Zealand archaeological evidence, recorded at Pouerua.

Building on the comments of Furey (2006:118), this study considers the problem of investigating the horticultural systems, and examines whether the application a new and more rigidly defined method could help realise the archaeological potential of the horticultural features. A temporal and spatial investigation of the horticultural systems can potentially not only provide insight into how the rate and extent of development of the horticultural systems at Pouerua, but also provide some context for the settlement features, by highlighting what patterns of development are occurring in the wider landscape.

A focus on the horizontal stratigraphy of the horticultural systems at Pouerua aims to create what is essentially, a map of change. Using the methods discussed in Chapter Three, the following examples chart change within horticultural systems from the first stages of initial construction, through a series of expansion and subdivision based-modifications.

6.2 Areas of Investigation

From across the Pouerua landscape, five horticultural systems were identified for further investigation using the relative ordering method discussed in Chapter Three. These examples were selected because they make use of both stone and/or trench alignments and are found in a range of different aspects of the volcanic landscape (i.e. flat or sloping land, valleys and basins, exposed or sheltered areas, or areas with high or low concentrations of surface stone).

System One: Located to the east of Pouerua on the flat land between the base of the eastern aspect of Pouerua cone and the edge of Lake Owhareiti. This system was constructed using trench alignments; there is minimal surface stone in the vicinity of this garden (Figure 6.1).

System Two: Located on the steep slopes of a small hill and extending on to an area of flat land east of Pouerua. Close to the shores of Lake Owhareiti. Constructed using trench alignments, there are low to medium concentrations of surface stone in this area (Figure 6.1).

System Three: Located north of the Pouerua cone and extending into the northern stone field. This system was constructed using a mix of trench and single and double stone alignments.
The area is rolling, but sheltered to the east by a ridge and Pouerua cone to the south (Figure 6.1). Surface stone concentrations vary from low to high.

System Four: Located in a shallow basin north west of Pouerua, surrounded on three sides by low hills/rises. System four is located between the northern and western stone fields, but the proximity of this area to the northern stone field means that stone features are present (Figure 6.1). Surface stone concentration ranges from low to medium.

System Five: Located in a valley which extends out from the base of the western aspect of Pouerua cone. This area continues out and becomes part of the western stone field. Stone concentrations vary from medium to high, as indicated by the presence of stone heaps, mounds and alignments within parts of the system (Figure 6.1).
Figure 6.1 – Map showing location of horticultural systems discussed in Chapter Five
6.3 Examples of the Temporal Development of Horticultural Systems at Pouerua

This section presents the evidence from each of the five case studies. Each example consists of a breakdown of the identified changes within a system, a detailed breakdown of change during each phase of modification, and an examination of the processes of expansion and subdivision within each stage. This approach ensures that not only are the changes within a system clear and identifiable, but that rates of change within different systems can be compared and contrasted, rather than the resulting information simply being limited to the investigated system.

6.3.1 The Relative Chronology of System One

This system covers approximately 4.5 hectares of flat land between the base of the eastern flank of the Pouerua cone and the edge of nearby Lake Owhareiti (Figure 6.1). The southern and western aspects of this horticultural system are defined by steep changes in elevation associated with the Pouerua cone. The system is dendritic in pattern and the southern aspect of the system has been subdivided to a greater extent than the rest of the system. The shallow trench alignments that define the surviving extent of this system range in length from 10m to 200m. The alignments are orientated both east/west and north/south. There is limited evidence of other horticultural features (described in Chapter Four) on flat land nearby. The identified extent of the horticultural system likely reflects that which was formerly in use.
Figure 6.2 – The Relative Chronology of Horticulural System One

- Phase One
- Phase Two
- Phase Three
- Phase Four
- Phase Five
- Phase Six
Interpretation of the Chronology of Area One

Six construction phases were identified in this horticultural system (Figure 6.1). During the first phases of system construction, the focus appears to be on the expansion of the horticultural system, which initially extended along an east/west axis with extensive later additions to the south of the original alignments. The initial horticultural system was linear in nature, a series of long (200m or greater) alignments extending out from the base of the eastern flank of the Pouerua cone. The addition of several alignments orientated north/south during phase two changed this into a dendritic system. The dendritic pattern was expanded upon significantly during the third phase with the construction of alignments orientated north/south and east/west which branched off the phase two additions. Although the system is dendritic in nature this example has maintained the large rectangular plots, despite the branching of the system. The regularity of features evident in this system (size of the small and large rectangular plots, length of parallel alignments, and distance between alignments) is uncommon in dendritic systems at Pouerua.

A significant portion of this system was divided into plots smaller bounded plots in the southern section of the system during phase three. The original bounded blocks of land, orientated east/west show only very limited evidence of subdivision into smaller plots like the southern portion of the system. This system is situated on flat terrain; therefore the alignments are unlikely to have diverted surface water. It is impossible to rule out however, that the alignments did not have a sink effect for water sitting in this area. In times of high rainfall, this area could have acted as a catchment water running off the slopes of the Pouerua cone.

During phase three, the addition of a number of parallel alignments on the southern side of the system saw the system increase in size by 172%, increasing from 1.44 hectares in size to 3.92 hectares. After this significant increase in the total area of the system there was limited further expansion, with the system increasing only 12.5% in size to 4.41 hectares. A steady increase in the internal subdivision of the horticultural system through the addition of short (less then 30m) transverse alignments was noted during phase three. A maximum of 25.3% of the system had been subdivided internally by phase six. By the end of the last construction phase, a total of 4.41 hectares had been bounded by shallow trench alignments.

Phase 1: Construction of several parallel alignments east/west across a large open area of flat land.
Phase 2: Lateral expansion of the system to the south with the addition of a long northeast/southwest alignment.


Phase 4: Extensive subdivision along the south-eastern aspect of system.

Phase 5: Continued subdivision of the southern end of the system into bounded plots.

Phase 6: Limited internal subdivision of system.

Figure 6.3: Graph showing the rates of system expansion and subdivision of the system in each identified phase.
6.3.2 The Relative Chronology of System Two

This is a small horticultural system covering approximately 2.5 hectares of land near the shores of Lake Owhareiti (100m to the east). The system extends down off a gently sloping plateau, down a steep hill slope and on to flat land. The system is linear in format, having been constructed from a series of parallel shallow trench alignments. There are concentrations of shorter transecting alignments in the parts of the horticultural system that are least affected by the steep slope.

Interpretation of the Chronology of System Two

The earliest construction phases show the development of the two main sections of the horticultural system as quite separate features. Two long (130m or more) trench alignments are constructed from the plateau on the western side of the system, down to the lower flat land on the eastern side. To the north of these are four trench alignments approximately 50m in length which start at the base of the steep slope and extend east towards Lake Owhareiti. By phase two, the addition of several transverse alignments means that all the phase one alignments are now united and there has been some subdivision of smaller northern alignments. Phase three sees the continued expansion of the system particularly around the flat areas to the north and west and the expansion of the system to the south. While this southern addition increases the size of the system by approximately 0.2 hectares, the majority of this southern addition is located on sloping terrain. The development of the flat/gently sloping portions of the system continues during the remaining two phases. While expansion of the system continues in the later stages, there is a steady increase in the internal subdivision of the bounded system.

Between phase one and phase five, the system increases in size from 0.73 hectares to 2.46 hectares (a 236% increase in overall area). The subdivided and most actively developed areas (as evident in the identified phases) account for 33% of the total area of the system in the final phase. Much of the remaining total area of the system is associated with the land positioned on the steep sloping area in the middle of this system.

Unlike the previous system there are no sudden expansions or periods of internal subdivision of the system. Instead the evidence indicates a steadily expanding system which continues to increase in size across all phases, with the internal subdivision maintaining a similar pace of growth during each phase.
Figure 6.4 - The Relative Chronology of Horticultural System Two

- Phase One
- Phase Two
- Phase Three
- Phase Four
- Phase Five
Figure 6.5 – An aerial photograph showing the shallow trench alignments (at point A) that demarcate the boundaries of horticultural system two (Source: Furey 2006)
Apart from the long (100+m) linear alignments, there appears to have been little further development of the slopes in the centre of this system. The subdivided and enclosed plots on the flats at the bottom of the system are somewhat regular in that they are similarly oriented and of similar shape and size. Those at the top of the slope however, do not display the same regularity, alignment orientation or plot shape. This may reflect the limited availability of flat land suitable for cultivation on the western aspect of this system.

**Phase 1**: Construction of several linear alignments down slope and across flats.

**Phase 2**: Connection of phase one alignments through a series of transverse alignments. Limited subdivision.

**Phase 3**: Expansion of the system to the west and south, development and subdivision concentrated around flat land.

**Phase 4**: Further unification of the phase one alignments through additional linear alignments. Internal subdivision of the system on the hill slope

**Phase 5**: Continued internal subdivision. Limited expansion laterally.

![Expansion and Subdivision of System Two](image)

**Figure 6.6**: Graph showing the rates of system expansion and subdivision of the system in each identified phase.
6.3.3 The Relative Chronology of System Three

The third system is located to the north of the Pouerua cone. It extends out from the base of the cone across a rolling terrain, and the system is split around a number of low rises/knolls. Single stone alignments and shallow trench alignments have been used to create this dendritic system. A network of plots branch off several long linear alignments, and the result is an elongated and complex system. The earliest alignments range in length between 90m and 200m or more. Like elsewhere, the use of shorter transverse alignments results in a series of bounded plots, however the size of these plots varies greatly across the entire system, perhaps reflecting the variation in the terrain in this area. During investigations of the horticultural landscape it was noted that many trench and stone alignments appeared to radiate from knolls or low rises and intersecting other horticultural systems as well as terraced hill slopes. In this area the alignments extend out from the base of the volcanic cone and track around hill features rather than intersecting them.

Interpretation of the Chronology of System Three

A five phase construction sequence was identified in this northern area. Initial expansion saw the system spread out over an area of approximately 3.9 hectares, with the construction of a series of long shallow trench and single and double stone alignments. These alignments were orientated north/south and extended north from the base of the Pouerua cone. Phase two constructions extended the length of the overall system with additional alignments also orientated north/south branching off earlier constructions. Transverse alignments connected two of the three separate sections of the system. During this phase, the separate sections of the horticultural system grew closer together rather than expanding out away from one other. During phase three, the system was expanded to the north with a series of rectangular bounded units being constructed in an area with very limited amounts of surface stone (compared to the rest of the system). The unification of the different aspects of this system resulted in an increase in system size of approximately 48%. In phases four, the expansion of the system began to level off and an increase in the internal subdivision of the system was noted. However this pattern was then reversed during the final construction phase. The result of this five phase development was an expansive system that developed in area which included the bottom slopes of the base of Pouerua cone and rolling terrain further out from the cone. Concentrations of subdivision have occurred in areas where the contour of the landscape is less varied. The continuing rate of expansion may be explained by the development of these areas which may have been considered more suitable to cultivation, and the unification of these areas of extended development.
Phase 1: Construction of a series of parallel alignments northwards through a shallow valley. Expansion constrained by ridge on eastern side and a series of low hills on western side.

Phase 2: System continues to expand northwards and long linear alignments join on the northern end. Limited subdivision of the system.

Phase 3: Limited internal subdivision of the land enclosed during phases one and two. Significant expansion of the northern end of the system with a series of parallel alignments.

Phase 4: Systems continues to expand along eastern and northern margins. Activity focused on internal subdivision at southern and northern ends of system.

Phase 5: Limited expansion of system. Continued subdivision of northern and southern ends, particularly in areas previously subdivided. Limited subdivision of the land enclosed during phases one and two.

Figure 6.8: Graph showing the rates of system expansion and subdivision of the system in each identified phase.
6.3.4 The Relative Chronology of System Four

The fourth study area is located in a shallow basin to the northwest of the Pouerua cone. A series of low hills almost completely encircle the study area. The presence of the hills in this area does not imply any localised microclimate, though they may afford the gardens in this area limited protection from the wind. They study area falls between the northern and western stone fields and so there is a very limited amount of surface stone in this area. Stone features, such as rounded heaps and mounds have been recorded here.

Interpretation of the Chronology of System Four

The phase one sections of the system originate along the eastern and western sides of the basin where, perhaps not coincidentally, the greatest concentrations of terraced settlements (kainga) are located. Phase one alignments are long (100m or more) but could not be described as linear, following the natural curve of the basin. Phase two developments see the expansion of the system along these two sides of the basin. On the western side of the basin transverse alignments create a series of plots incorporating the natural slope into the systems as a boundary. On the eastern side however, the system expands further to connect with some of the southern elements. Phase three sees continued expansion of the system, and the unification of east and west through the addition of a 100m long transverse alignment. Subdivision occurs along the edges of the basin, alongside the phase one constructions. In phase four however, there is limited subdivision, as the system is expanded further in to the central area of the basin.

It appears that the system developed as two separate horticultural systems which were united through a series of expansions. Despite the system being constructed in an open shallow basin, the development of the system appears to be concentrated near the base of the terraced hills. It is not until the later stages of development that expansion into the middle of the basin begins to occur more extensively. The final construction phases also show a concentration of development along the southern end of the basin where the hills are lower and not as steep. While much of the basin appears to have been enclosed in boundaries by phase four, there is no direct evidence for the expansion of this system beyond the basin. The presence of other horticultural systems just outside the investigated basin however, means that this possibility can not be excluded.

Although the system expanded rapidly in phase two, incorporating much of the shallow basin within the horticultural system (at that stage, two smaller systems), there was little
subdivision within the system internally. In System Five in the valley to the south of this system, as the available land was incorporated into the system, there was a spike in the level of internal subdivision within the system just prior to the system expanding out beyond the valley itself. Here, the area of internal subdivision accounts for less than 10% of the total system, where as in System Five, it accounts for 80%. As noted above, there is no confirmed evidence for the expansion of this system beyond the confines of this basin, perhaps suggesting that there were greater pressures on resources (i.e. available land) in System Five than on System Four.
Figure 6.9 - The Relative Chronology of Horticultural System Four

- Phase One
- Phase Two
- Phase Three
- Phase Four
Phase One: Construction of system begins along eastern and western margins of basin.

Phase Two: Continued expansion of the systems along these margins. Along the western edge, expansion occurs as a number of parallel alignments extending out from a central alignment. Along the eastern edge, expansion joins two areas of activity.

Phase Three: Expansion of the system joins both sides of the basin system. Much of the expansion and subdivision activity is focussed on the eastern side of the basin.

Phase Four: Increasing expansion of the system at the southern end, limited subdivision of the system. Continued expansion of the system into the middle of the basin.

Figure 6.10: Graph showing the rates of system expansion and subdivision of the system in each identified phase.
6.3.5 The Relative Chronology of System Five

The system is located in a valley to the west of Pouerua. The longest alignments associated with this system extend outwards from the base of the western flank of the volcanic cone, oriented east/west along the valley floor. A number of transverse alignments intersect these, extending either between the long parallel alignments or right across the valley floor (orientation north/south). The result is a cluster of approximately 49 bounded plots within the confines of the valleys as well as approximately 10 further plots beyond the valley entrance. The base of the valley is flanked by the steep sided valley slopes. These valley slopes have the same dark topsoil surface however there is no evidence of small bounded plots on these sloping sides of the valley.

Interpretation of the Chronology of System Five

The earliest of the six phases associated with this valley system show the construction of a series of four alignments across the valley floor near the entrance to the valley, near the western most extent of the final system. This initial small development is followed by a rapid expansion of the system through the addition of several long linear alignments along the edge of and through the centre of the valley. These new additions are orientated east/west and connect the garden system to the base of the steep western flanks of the Pouerua cone. The long alignments terminate at the western entrance to the valley, but there is some evidence to suggest that developments occurring beyond this point were associated with the construction of the valley system. While there is continued expansion during phase three, the most noticeable developments are the construction of numerous short transverse alignments across the valley floor (orientation north/south). These extend between the phase two alignments and the result is a series of plots or units covering the length and breadth of the valley. The final construction phases see an increasing development of the land beyond the valley entrance and continuing, although limited subdivision of the valley horticultural system.
Figure 6.11 – The Relative Chronology of Horticultural System Five
This system is marked by a significant increase in the total area covered by the horticultural alignments during phase two. By incorporating the rest of the valley into the horticultural system, there is a 280% increase in the size of the system between phases one and two. This increase continues right through out the development of the valley; however the rate of expansion slows as the majority of the valley is incorporated into the system. The system expansion rate begins to recover as the system starts to develop beyond the confines of the valley.

The incorporation of the entire valley into the system is also associated with a rapid rate of internal subdivision of the bounded area within the valley. This system stands out as an unusual example of extensive subdivision. By the end of the construction phase in the valley, approximately 80% of the bounded area has been further subdivided into smaller plots (less than 30m x 30m). In the other four areas of investigation, the total area of subdivided land represented no more than 33% of the total system.

There is evidence to suggest that the expansion beyond the valley continued further than what area was defined in phase six. However, confirmation that these other alignment features were part of the same system was not possible and therefore they were excluded from this investigation. Based on maps by Leatherby and Morgan (n.d), if they were identified as part of the valley system, it is likely that further phases would show continued expansion of the system to the north until it intersected another existing system. Subdivision would continue to occur, although expansion seems to be the primary construction activity.

**Phase One:** Initial construction begins with a series of parallel alignments extending north/south across the valley floor. Activity occurring near the entrance to the valley.

**Phase Two:** Significant expansion of the system east into the valley, incorporating much of the valley into the system using several long linear alignments.

**Phase Three:** Extensive subdivision occurring within the enclosed area of the valley, particularly along the edges, but also in the middle of the valley. System extending beyond west beyond valley.

**Phase Four:** Continued subdivision of the system within the valley. Increasing activity beyond valley.

**Phase Five:** Expansion continues beyond valley, with subdivision of recently enclosed areas. Limited subdivision activity in valley. Expansion north, south and east restricted by valley walls.
Phase Six: Subdivision of land west of the valley entrance.

Figure 6.12: Graph showing the rates of system expansion and subdivision of the system in each identified phase.

6.4 Factors Influencing Expansion and Subdivision of Systems

The five examples presented in this chapter clearly highlight the different ways in which horticultural systems have developed across the Pouerua landscape. The following section looks at the landscape for answers as to what factors may have influenced the variability within the horticultural systems.

6.4.1 Topography

The evidence indicates that subdivision occurs most frequently in flat areas of land, but not exclusively. Subdivision does occur on the hill slopes, although not as frequently or as extensively as in the flat land of the recorded examples. However, just because the land is flat does not mean that it has been subdivided. Comparing Systems One and Five for example shows almost complete subdivision of the flat land in the valley in System Five, but only a quarter of the flat land in System One.
Topography certainly impacts on system expansion, influencing the pattern rather than the rate of expansion. In flat, open areas, long, relatively straight alignments are recorded more frequently. Expansion across an open area is more even across phases of construction, compared to systems constructed in hilly areas. In areas where the land is sloping, alignments are likely to be shorter and the system expands into open areas such as short gullies. This results in clusters of expansion activity.

6.4.2 Shelter/Exposure

Because of the undulating nature of the Pouerua terrain and the presence of only a few of the horticultural systems on the steeper flanks of Pouerua cone, many of the systems are not exposed to any major variations in environment. At most, some parts of the landscape may be occasionally affected by strong wind gusts, but this is not a significant problem. The cone itself, offers some protection to the horticultural areas depending on the direction of the wind.

Some areas may offer some increased shelter, such as the high sided valley in which System Five is constructed. However, while the valley slopes may offer shelter from wind and rains, they also shade the valley in the morning and evening. The fact that many horticultural systems (such as Systems Three, Four and Five) do use shallow basins and valleys around the Pouerua landscape would suggest that these were aspects of the landscape that were deliberately sought out. However it is not clear whether the presence of hills and slopes by the garden areas was for the benefit of the gardens (i.e. providing shelter) or the benefit of the gardener, as many of the ridges and hills were also terraced for settlement.

Across the Pouerua landscape, there is evidence of subdivision of gardens located in sheltered sites such as the valleys or basins, or even just around low hills. However, subdivision is not found exclusively in sheltered sites nor is it recorded in all sheltered areas. It would seem that sheltered areas may have offered some perceived benefit, but that shelter was not crucial to the location of the gardens nor was it a single influencing factor in the extent of system subdivision.
6.4.3 Orientation of System

There does not appear to be any consistent indication from any of the investigated systems that orientation of the system affected the level of subdivision. The small scale of the Pouerua landscape (in that the majority of activity is confined to the volcanic area – Figure 2.2) means that the orientation of a system in any particular direction is unlikely to increase the chances that a particular area would receive any environmentally derived benefits (i.e. increased shelter).

System orientation seems to be greatly influenced by the topography of the immediate area as well as the location of settlement features (Veart 1986). Deliberate orientation of the system within features such as valleys or basins (during expansion phases) may further support the idea that some environments were sought out. While it may seem that this is because some features such as basins have better productive benefits, it is impossible to rule out any social influences being the cause of such practices. This may include for example, organising system construction so that the system is surrounded by settlement features (as is the case with system four), which could potentially offer an extra level of protection for the garden area from outside parties.

6.4.4 Distance from Pouerua Cone

While there is some evidence to suggest that distance affects the rates of expansion and subdivision within horticultural systems, it appears that it is not solely a matter of distance from the volcanic cone. Changes in rates of system development in the peripheral systems at Pouerua are most commonly associated with areas which have limited evidence for settlement, and limited areas for the construction of larger settlements in the common Pouerua fashion (on low hills and ridges).

It is not so much the distance from Pouerua that may have brought about these changes in development of the landscape, as the distance from any major substantial kainga or pa.

6.4.5 Settlement

The evidence from the investigated systems at Pouerua suggests a clear relationship between the rates of system subdivision and expansion, and the presence of settlement features near
these garden areas. Systems may expand outwards from one settlement and intersect directly with another system or another area of settlement altogether. Systems with high rates of subdivision are commonly found in close proximity to areas of settlement. These areas of settlement are generally either the terraced flanks of the Pouerua cone, or terraced ridges and hills near the base of the cone (within 300m). In saying this however, the most distant examples of horticultural systems recorded at Pouerua are between 1.2km and 1.4km from the base of Pouerua, and so all sites are essentially only a short walk from main cone.

It is also worth noting that in the early stages of some horticultural systems, expansion (and to a lesser degree, subdivision) occurs in close proximity to the settlement features (i.e. terraced areas). This is most evident in Systems Three and Four. In other systems investigated at Pouerua, this pattern of early development is most noticeable in separate systems which have joined in later phases of construction.

The evidence supports Veart’s (1986) theory that gardens may radiate out from points of occupation. While this applies to Pouerua, systems expand outwards from points of settlement rather than radiate. The term ‘Radiate outwards’ implies that the settlement area is the centre point of the horticultural system, and that all or most of the system expands out from one central point. In most cases, it is one starting point, and other topographical or settlement features may form part of the system or act as more of a focal point for the system.

6.4.6 Soils

It is possible that cultivators sought out specific areas for cultivations based on the nature of the soils in different aspects of the landscape. As noted in this thesis, the varying rates of air fall ash deposits resulted in a range of different soil profiles at Pouerua (Hayward et al. 1992). Maori cultivators may have considered some areas more desirable for reasons such as depth of soil or soil fertility.

There is certainly evidence for extensive horticultural activity on the areas which Hayward et al. (1992) identified as those which have deeper soil deposits above scoria base. However, there are also large and extensively developed horticultural systems in areas where less ash fell (such as the stone fields). The soil profiles recorded by Gibbs (1983), Sutton (1993) and Taylor (1998) do provide limited insight about the depth of soil deposits at Pouerua but the examples represent only three small aspects of a landscape that covers more than 500 hectares. The comment by Sutton (1983:181) that some of the soils in an identified garden
area were shallow suggests that deep soils were not a necessary requirement prior to the construction of a horticultural system.

While there has been some recording of the soil depths at Pouerua, there is insufficient evidence to argue that extensively subdivided gardens are concentrated on areas with desirable soils. Further investigation is needed to see whether some gardens were developed in areas because the soil was considered beneficial to the cultivation process and what aspects of the soil matrix gardeners may have been targeting e.g. soil depth, friability, free draining or mineral composition and fertility.

6.5 Identifying Socio-Political Influences on a Cultivation Landscape

Inevitably, the focus of the factors behind these changes turns from an investigation of landscape towards an investigation of socio-political influences. While there is no doubt that factors such as political change, population fluctuation, or social organisation influenced the way a system developed, it is almost impossible without a comprehensive ethnographic history, to investigate how these factors influenced modification of the landscape. There is a fine line when investigating the material from the socio-political perspective, between insightful archaeological advances and pure speculation.

The ethno-historical account *Nga Puriri o Taiamai* by Sissons et al. (2001) does to a certain degree highlight the changing nature of the socio-political landscape at and around Pouerua. However, as Marshall (1987:234) notes ‘the absence of any mention in the tribal history of the factors which promoted intensified occupation and defensive structures at Pouerua is perhaps instructive. Tribal history is retrospective; it is the culling of significant people and events from the broader, finer tapestry of everyday life’. One has to be careful of drawing a long bow when it comes to applying the material within the Sissons et al. (2001) text, to the Pouerua landscape. There is certainly room for broader conclusions about change on the wider Pouerua area, but this is of little assistance in explaining why specific developments were occurring within systems, or even individual parts of the landscape.

The issue is perhaps compounded further still because of a genuine limit in the knowledge of the ethnographic aspect of Maori cultivation in the pre-contact period. The solution then is not to avoid investigations of the socio-political influences on landscape development, but encourage further incorporation of existing ethnographic materials into archaeological texts, as well as encouraging new research so that the material is available for consideration.
In their conclusions, Ladefoged *et al.* (2002:938) note that they are able to identify ‘a subsistence change in the Kohala Field System from a reliance on a relatively low-density expansive agricultural productive system to use of an increasingly intensified one’. While there is clear evidence of intensified use of some areas of land at Pouerua (as opposed to intensification), it is debateable whether this could be interpreted as a subsistence change, as the changes are not consistent between systems (a factor evident, even in the absence of chronometric data for individual systems). If there was intensified use of land then there should be a certain degree of consistency in horticultural evidence. The evidence however, points towards a variable set of changes rather than a constant change and so it would be misleading to interpret the Pouerua evidence as a change in subsistence patterns. In order to argue that the Pouerua landscape itself was part of a larger pattern of economic change, further research is required into the use and management of other food resources (Ladefoged *et al.* 2002:939). Without such evidence, it is impossible to argue that changes within the Pouerua landscape were not influenced by anything other than the immediate socio-political landscape. As it stands however, the evidence from the horticultural systems appears to be a reflection of the variable development identified in the pa and kainga at Pouerua (Sutton 1990a; 1993; Sutton *et al.* 2003). Whatever the influencing factors may have been at Pouerua, it seems they at least affected the way in which both the settlement and cultivation landscapes were constructed and modified in the past.

In his examination of Polynesian production systems, Kirch (1991:130) remarked that if population pressures were one of the central factors influencing change in the way a system developed, then archaeologists should expect that sites within the wider landscape undergo the same sort of population driven changes. For Pouerua, this would mean the patterns of change within the systems should be also found elsewhere on the Taiamai Plains and even within the Bay of Islands area, if population was a critical contributing factor to change. Crucially however, this requires the changes within the horticultural system to be chronologically defined, so that comparisons can be made between systems as population pressures begin to influence system development. These data are still not available for the Pouerua horticultural systems.

It is this problem of period of use, which limits the extent to which Pouerua evidence can be further utilised. Without dated material from archaeological sites to identify when the system was used, comparisons of the changes are limited to spatial rather than temporal analysis. While we may be able to identify two completely different horticultural systems at Pouerua,
it is so far impossible to tell whether they were constructed hundreds of years apart or only a few. This inability to monitor change over time, between different systems has implications for how archaeologists interpret change in the landscape. While the radiocarbon dating methods may have their limits, they do allow differentiation between features of different periods. This is what is needed at Pouerua in order to advance the analysis of major garden systems further still (Furey 2006:118).

This does not mean however, that investigations of spatial change should only be undertaken when there is existing temporal evidence for the horticultural systems. While investigating the horticultural systems at Kohala, Hawaii, Ladefoged et al. (2003:939) were able to use the comparison of sequences of construction to identify two different modes of production. The spatial data are still incredibly valuable for highlighting the way in which part of the landscape is changing and what may influence those changes, even without a defined period of occupation.

6.7 Conclusions

There is strong evidence for variation in cultivation patterns at Pouerua. It is not clear whether this is the by-product of a change in inputs (i.e. variation in the size of the occupying population) or part of a larger process of change (i.e. the same patterns of land use are occurring over successive seasons, with any changes flowing through to successive cultivations). The primarily spatial analysis approach used in this chapter then should be considered one part of the investigative approach. While this chapter has been successful in highlighting how the landscape has been utilised in different ways, there is insufficient evidence to show how different systems relate to each other temporally. An investigation of the period of use for systems would be the next step in clarifying change on the Pouerua landscape.

Although this thesis has raised some concerns about the use of ethnographic material (or lack thereof) in interpretations of socio-politically influenced change in horticultural systems, it is clear that there are cultural rather than environmental factors being represented in numerous part of the horticultural systems. While it could be argued that there is more value in guessing at the socio-political factors that influenced change (in the absence of any evidence), it really must be debated whether taking a stab in the dark contributes more to the study of New Zealand archaeology, than not guessing at all. A better approach would be to incorporate ethnographic accounts or traditional histories into the archaeological investigation if
discussion of the human agency aspect of production, settlement or any other system is to contribute to archaeological interpretation.

In addressing the concerns of Furey (2006:118), as presented at the start of this chapter, the method applied in this chapter, and the results of its use, have advanced the way horticultural landscapes can be utilised by archaeologists. In saying this, there is still most definitely room for further research, especially in the temporal investigation of the garden systems.
7

Pa, Kainga and Cultivations

Settlements... must be understood as part of the landscape and agronomic systems of which they were an integral and vital component (Damm and Sutton 1994:22)

7.1 Introduction

In reviews of the final volume reporting of the Pouerua project, both Leach (2004) and Barber (2007) note that despite the intentions of the authors, Sutton et al. (2003), make little reference to the horticultural landscape at which Pouerua is considered the centre. The Archaeology of Pouerua is the most detailed of the three volumes with respect to archaeological data for the area of the Pouerua cone. However, as with previous Pouerua publications, the third volume provides limited landscape context for the identified changes and developments that are occurring in the excavated pa settlement. This is despite the authors discussing the importance of the wider landscape in influencing the archaeology and interpretations (Sutton et al. 2003:10).

Building on the horticultural evidence presented in the previous chapters, this section of the study presents an investigation of the spatial relationships between settlement and horticultural features at Pouerua. In this chapter, the existing evidence for both the settlement and horticultural sites is used to investigate the nature of the relationship between these two aspects of the landscape, and then whether there is sufficient evidence to identify an example of a horticultural system and settlement feature. This approach not only looks at how to provide a settlement context for the horticultural sites discussed in this thesis but also whether the identification of related settlements and gardens can contribute to archaeological interpretations of sites at Pouerua.

7.2 The Relationship between Settlements and Cultivations at Pouerua

In order to investigate the relationship between settlement and cultivation features, this section examines the evidence for the different settlement types at Pouerua with reference to the details published in Sutton (1990a; 1993) and Sutton et al. (2003). This means examining
the relationships between the peripheral pa and gardens, the cone pa and gardens, and the kainga and gardens. This approach is followed in order to compare the relationship between cultivation and the different settlement types.

This section draws on a wide variety of data including environmental, topographical and archaeological, to examine the evidence for a relationship between settlements and cultivations and review earlier interpretations of some aspects of the Pouerua settlement and cultivation landscape.

### 7.2.1 The Peripheral Pa and the Horticultural Evidence

Sutton (1993:3) identified six peripheral pa relating to the use and occupation of the Pouerua landscape. These pa were identified as significant firstly, because geographically they are in close proximity to Pouerua cone (within 2.5km) and are on the fringes of the volcanic landscape and secondly, because the peripheral pa occupy an intermediate position in terms of elevation (between kainga and the central cone pa). Finally, chronologically, the peripheral pa post-date the first kainga at Pouerua, but pre-date the construction of the pa on the eastern aspect of Pouerua cone (Sutton 1993:1).

Unfortunately, despite several of the pa being mapped in detail, unlike the rest of the Pouerua landscape, much of the land surrounding the peripheral pa was not recorded in plan during the surveys by Leatherby and Morgan (n.d.). The effect of this on the interpretation of the spatial relationship between the horticultural landscape and the peripheral pa is that only one example has been sufficiently recorded to begin investigating spatial relationships. This single example is the Cattleyards pa site (P05/408) that falls within the boundaries of the area recorded in detail by Leatherby and Morgan (n.d.) and published in Sutton (1993).

As indicated in Figure 7.1, there is evidence for surviving horticultural alignments within the vicinity of the P05/408, as well as evidence for horticultural soils in very close proximity to the outer defences of the pa. Based on the strategic profiles revealed during excavation, Sutton (1993:91) concluded that gardens were associated with the use of the site, but that this was probably during the period in which the site was a kainga rather than a pa. In terms of evidence for continuation of gardening on the fringes of the pa site, there is no further mention of horticultural activity associated with the site.
This means then, looking at how to explore the idea of a spatial relationship between peripheral pa and kainga through other means. In this case, the development of some kainga into pa (as outlined in Sutton 1993) may provide a guide for how to advance the study of the relationship between the two site types further. By identifying some peripheral pa (such as P05/408) as at the very least, an extended development of the original kainga, Sutton concludes that archaeologists should expect to see a continuation of some elements of the kainga being represented in the peripheral pa (1993:97). Sutton applies this logic to the open spaces and terrace organisation within both kainga and the peripheral pa (1993:97-103).

It could be argued then that if there is evidence for a relationship between kainga and cultivation features, then there is a possibility that the same practices may have continued as the site transitioned from a large kainga into a pa. If horticultural production continued to be practised around pa, then there should be evidence for such practices. In the example of the Cattleyards pa (P05/408), there is evidence of shallow trench alignments, stone heaps, and possibly stone mounds within close proximity to the pa site (<25m). There is at least, a case for further consideration of the idea that horticultural activity may be related to the use of the peripheral pa.

7.2.2 Pouerua Cone Pa, Kainga and Cultivations?

In her investigation of terraces on the flanks of the Pouerua cone, Marshall (1987) raised the possibility that terraces near the rim had been used for cultivation. This was an idea covered again in the third Pouerua volume by Sutton et al. (2003:158, 164). These conclusions were based on the suggested lack of suitability of these terraces for structural features (Marshall 1987), the presence of soil with a tumbled profile and charcoal inclusions, and the limited amount of artefactual evidence recovered from the terrace excavations (Sutton et al. 2003).

As discussed earlier in this chapter, there is clear evidence for close spatial relationships between settlement features and horticultural features at Pouerua. Evidence for this has been presented in section 7.2.1 of this chapter, and is further explored in section 7.2.3. In this section, Marshall’s (1987) arguments for horticulture on the terraces on the flanks of Pouerua cone are examined as an alternative relationship between horticultural sites and settlement features. This section is presented as an alternative example because the majority of the horticultural features recorded at Pouerua have been recorded on flat to gently sloping or rolling land. Any horticultural sites on Pouerua cone would have been constructed on the steep flanks of the cone.
This section is presented as an investigation of the possible relationship between terrace gardening and the cone pa and kainga, because the section of the rim of the cone excavated and reported on by Sutton *et al.* (1993:217-227) was, during its history of use, both a pa and a kainga. There is no clear evidence at this point for arguing that Marshall’s (1987) terrace gardens, related to a particular period in the occupation of the rim of the cone.

Cultivation on the flanks of the cone is suggested by Marshall (1987) to have occurred early on in the Pouerua settlement sequence (although there is no mention of just how early), with horticulture moving further down the slopes of the cone over time. As indicated in Figure 7.2, there is certainly evidence to support the idea of cultivation activity on the lower slopes of Pouerua cone; however it is in the form of a series of alignments rather than as cultivated terraces.

Given the variable depth of the ashy deposits on the flanks of Pouerua cone, any cultivation activity would require not only the construction of a terrace, but also the introduction of a sufficient amount of suitable soil to ensure the plants had a medium in which to grow, and which would retain enough moisture (as the underlying material is a free-draining scoria material). An examination of excavated terraces on the flanks of the cone, as reported in Sutton *et al.* (2003: 98-108; 133-182), indicates that the soil depth on terraces can range from less than 20cm above the scoria up to more than 1m. In some cases this would be of sufficient depth to act as a potential garden bed. However the depth of the soil is inconsistent, often shallow at the back of the terrace and deeper at the front. This evidence is more consistent with the conclusion that the terrace area was being widened.

While Sutton *et al.* (2003:158) did identify a soil matrix that they suggested could indicate gardening activity on a terrace, other excavated terraces were also identified as possible garden features in the absence of such evidence (Sutton *et al.* 2003:181). It was concluded that these garden terraces could also have functioned as short term living spaces (Sutton *et al.* 2003:158). Alternatively, soil mounds similar to those described in Best (1925:78) could have extended the depth of the growing bed without having significantly impacted on the appearance of any of the terraces on the flanks of the cone in terms of vertical or horizontal stratigraphy. However no features similar to these were recorded during excavation of the terraces (Sutton *et al.* 2003)
Figure 7.1 – An example of a horticultural system near the Cattleyards pa (top) and a profile of an excavation from the same pa showing the soils identified by Sutton (1993:91) as garden soils (Sources: Leatherby and Morgan n.d.; Sutton 1993)
A thorough examination of the evidence however, raises doubt about the use of terraces for cultivation of several grounds. In the first instance, several environmental factors bring the practice into doubt:

1. The terraces are exposed to the elements on the flanks of the cone.
2. In the summer time, especially during the drought periods, the Pouerua landscape dries out early (as witnessed during the drought in 2009/2010).
3. The soil matrix on the flanks of the cone may have needed to be supplemented with additional suitable material.

Furthermore, the use of terrace gardening does not conform to other horticultural practices at Pouerua:

1. There is no evidence of alignments or definition of space between or within terraces, as there commonly is in the horticultural areas elsewhere at Pouerua.
2. The size of the terrace reported by Marshall (1987:57) has a surface area of only 40m². This is much smaller than many of the enclosed areas within other horticultural systems found on the land surrounding Pouerua cone.
3. Cultivations elsewhere at Pouerua occur as a series of plots, not just one. More terraces in the immediate area should theoretically also be cultivation terraces.

Finally, the social reasons for planting on the flanks of the cone are even less convincing:

1. Even in such an elevated position, any garden on the flanks of the cone would not have been particularly visible to surrounding groups (as a display of wealth or strength). Especially if the rest of the cone was vegetated.
2. If the group was occupying the cone when it was a pa, the terrace cultivations would still have been outside the fortified area and potentially no more protected than if they had been located elsewhere on the Pouerua landscape.
The evidence supports the interpretation that it is both impractical to cultivate terraces on the cone and that the process does not conform to the extensive evidence for alignment based horticultural systems recorded at Pouerua. However, with insufficient subsurface or micro-botanical evidence, it can only be concluded that if terraces were cultivated, this was not on a scale comparable to the horticultural systems found on the flat to rolling land surrounding Pouerua cone, and was unlikely to have been as extensively utilised as the horticultural systems both spatially and temporally.

Furthermore, it must be noted that during the phase when Pouerua was transitioning between kainga to pa and back again, the rim of the cone was being utilised differently depending on what settlement type currently characterised the top of the cone (Sutton et al. 2003:217:227). A change in the settlement patterns could explain why (potentially) the flanks of the cone may have been used in a different manner.

7.2.3 The Peripheral Kainga and the Horticultural Systems

The relationship between settlement and cultivation is most clearly represented at Pouerua through the kainga and the gardens. Sutton (1990a:91) suggests there at least 312 settlements sites at Pouerua that can be identified as undefended kainga. With so many kainga on the Pouerua landscape, there are more opportunities to investigate the spatial relationships between kainga and horticultural systems.

Following excavation of the kainga during the early stages of the Pouerua Project, the excavators noted a close spatial relationship between kainga and garden sites (Marshall 1994; Law et al. 1994; Damm et al. 1994). Investigation of how these features tie in archaeologically to the investigated settlement features however has been very limited. The identification of this close relationship between settlement and cultivation is important however, because it establishes the close proximity of the settlement and cultivation features to one another, as well as highlighting that this is a pattern which is being observed right across the Pouerua landscape. In the first Pouerua volume, The Archaeology of the Kainga (Sutton 1990), the authors note the close spatial relationship between kainga and horticultural sites. This evidence includes:

‘Site surveys at Pouerua, both preliminary and at a much more intensive level, identify the open settlement as the predominant habitation component integrated into and closely associated with an extensive system of structural features related to gardening’ (Green 1994:4)
'The path bypassing the site shows the ridge to have been an access route at the time the site was occupied...The connection of the path to the valley garden area suggests that the use of the latter was contemporary with the occupation of the site' (Law et al. 1994:13)

'We note, however, that the prehistoric horticultural trench boundaries are only metres north of this excavation (Site P05/859)' (Damm et al. 1994:21)

'There was plentiful surface evidence of prehistoric habitation and of gardening activities on the volcanic soils surrounding theses site' (N15/255 and N15/505) (Marshall 1994:57)

'N15/507 was excavated because of its location on a prehistoric pathway which ran from the cone out to the vast area of horticultural stone heaps...to the northwest. The pathway is evident as a double boulder alignment in the stony area. As it proceeds out of the stony field systems, up the ridge to N15/507, and on to the base of the cone it appears as a damaged and discontinuous single boulder alignment' (Marshall 1994:23)

Not only do kainga occupy a position within the landscape which spatially results in the settlements being much more closely positioned to the garden features, but they are also connected to the horticultural systems by the alignment features that extend up from the gardens and terminate at or near the kainga.

Archaeological interpretations of the kainga have often associated these settlements with seasonal activities related to gardening, such as planting, tending and harvesting (Sutton 1994). The effect of this has been to effectively identify the landscape surrounding Pouerua as a seasonal production centre that contributes to other more significant settlements, such as those on Pouerua cone. In effect, the conclusions of the Pouerua trilogy (Sutton et al. 1990a; 1993; 2003) have portrayed Pouerua cone as not only the physical centre of the landscape, but also the economic and social centre.
Figure 7.2 – Cultivation features on the flanks Pouerua cone (Source Leatherby and Morgan n.d.).
Kainga are the most widely distributed settlement features at Pouerua, present in every aspect of the volcanic landscape. While the most visible examples are cut into the slopes of hills and low ridges, there are many examples which are less visible. These mostly include kainga on flat plains on low and flat rises where little if any re-contouring of the ground surface is needed in to be suitable for living. Other less visible examples include low hills or knolls with only a small or single terrace present. All settlement features at Pouerua that are not classed as pa, are by definition (Sutton 1994:90), kainga. This includes the most basic single terrace settlements through to the more complex arrangements of numerous terraces and storage pits.

Closer to the cone, kainga are more prominent and feature on most hills and ridgelines. Further out however, kainga are found on flat land and low flat hills. This is particularly evident in the northern and western stone fields. The effect of this is to make it appear as if settlement is concentrated around the base of Pouerua cone, while the horticultural features continue further outwards from the base. This effect is highlighted in the Leatherby and Morgan (n.d.) map of the Pouerua landscape, whereby the scale of the map means that many of the settlement features in the stone field areas do not feature as prominently on the map as those on hills near the cone.

The majority of kainga are defined by the presence of terrace features and the assumption that at least some of the terraces were likely to have been used for housing; this is based on the conclusions of Sutton (1990). Where terraces features are absent or less obvious, other indicators of settlement may include hearths, or structures defined by stone, such as the ‘C’ and ‘L’ shaped structures discussed in Chapter Four.

In many cases, kainga are located within the garden systems, that is, the hill on which the kainga is constructed is surrounded by boundary alignments which may radiate out from the hill or originate elsewhere and terminate at the base of the hill. There are also examples of kainga being significantly elevated above garden areas (along features like ridges) but still connected to the horticultural systems by one or more single or double alignments (trench or stone) that extend up from the horticultural area to the settlement, in a similar manner to the example described by Marshall (1994:23).

While there are recorded examples of stone heaps on or near kainga, it is difficult to conclude that these features relate directly to horticultural activities. As discussed in Chapter Four,
features such as stone heaps could have served numerous purposes, and may simply relate to the construction of the kainga rather than cultivation up to the very margins of the settlement.

As indicated in Figure 7.3, the close association of kainga and gardens is not limited to one particular size of kainga or aspect of the landscape. However, as the rocky volcanic environment to the south of the cone has resulted in less horticultural activity there, kainga with associated settlements are more likely to be recorded to the north, east, and west of the cone. Figures 7.3 and 7.4 show how horticultural systems, like those identified in Chapter Six may extend on to kainga and terminate at or near the settlement features. The position of the alignments, in some cases interpreted as paths, indicates not only a close spatial relationship between the features but also a temporal one, as the horticultural features would be expected not to align with or terminate at the kainga if the kainga had been absent at the time of the construction of the horticultural systems.
Figure 7.3 – Closely aligned settlement and cultivation areas. A terraced knoll with radiating garden alignments to the north of Pouerua cone (top) and east of the cone (bottom)
7.3 House and Garden – Application of Theory and the Investigation of a Kainga and Associated Settlement

While the above sections have examined the evidence for a relationship between the horticultural and settlement features on the Pouerua landscape, this section presents a case study of how the evidence could be utilised to provide greater depth to archaeological interpretations of life on and around Pouerua cone. This example draws upon a rather rare combination of factors at Pouerua. It is a site which has been both excavated and had the findings published, has had the wider landscape recorded in detail by Leatherby and Morgan (n.d), and was investigated by the author during surveys of the area. It is therefore, the best example on which to examine the extent of the relationship between kainga and cultivation on the Pouerua landscape.

The kainga P05/859 (N15/501) is located on a knoll to the west of Pouerua cone, approximately 250m out from the base. The site was excavated by Damm et al. (1994) in 1982, as part of Sutton’s Pouerua Project, Phase One (Sutton 1983). Site P05/859 was one of four sites excavated in this area during this phase. This site and three others were chosen for excavation, because they represented the ‘range of variation in domestic settlement sites present in Area I’ (Sutton 1983:112). This section takes the next step beyond the excavation of site P05/859, investigating how the kainga relates to the garden features in the area so that ‘settlements within the study area (may) be understood as part of the landscape and agronomic systems of which they were an integral and vital component’ (Damm et al 1994:22).
Figure 7.4 – An example of a double stone alignment extending through an area of extensive horticultural activity. The double stone alignment/pathway extends off the top of a low hill where there is evidence of settlement, including a stone lined hearth. The double stone alignment can be seen at the centre of both images.
Figure 7.5: An example of a kainga with associated gardens. This is the illustrated version of site P05/859, as discussed in Chapter Seven.

A) Horticultural alignments and settlement features in the vicinity of the site.
B) Aerial photo showing the location of the site within the Pouerua.
C) Excavation plans from P05/859
7.3.1 The Archaeological Site and Surrounds

The knoll (E: 25947/N: 66476) on which site P05/859 is positioned, is located in an area which includes ‘steep cone slopes, undulating land, hillocks, gully bottoms and flats’ (Sutton 1983: 110). The site consists of five terraces, four of which are small and located on the sides of the knoll, while the fifth terrace (measuring approximately 5m x 8m) is positioned near the northern end of the hill.

This is an area with an extensive record of cultivation activity (Figure 7.4). This includes shallow trench alignments, as well as assorted stone clearance features such as rounded stone heaps and stone mounds. While this area is close to the western stone field (which begins approximately 250m west of P05/859), the concentrations of surface stone are considerably lower than those found further west. This may relate to variation in the levels of air fall ash deposited here during Pouerua’s eruptive phase some 30,000 to 60,000 years ago (Hayward et al. 1992; Sutton et al 2003:13; Phillips 1980:151).

In the area surrounding the site, Sutton notes ‘trench boundaries and tillage margins are conspicuous in the gully bottoms, with stone mounds occurring there across slope bases or as concentrations on small areas of thin soils’ (1983:110). Alignment and stone features have also been recorded on the slopes of the hills in this area. In this area (Area I of Sutton 1983), there are 17 small hill features, 12 of which have been modified and show evidence of terracing or in some cases, storage pits.

7.3.2 Settlement on the Upper Terrace

Excavation of the largest terrace (Figure 7.4) at the northern end of the knoll identified two distinct house features, representing two different occupations.

House One (Source: Damm et al. 1994:17)

This is identified as the first structure to be built on the northern terrace. A lens of charcoal above the palaeosol was interpreted as evidence of construction on the hill top shortly after the area was cleared of vegetation.
The second house is suggested to have been constructed sometime post 1700 A.D. based on radiocarbon dates from material retrieved from a hearth within the second house. Although similar in size, the second house was orientated 10° east of the first.

### 7.3.3 Domestic Activity Evident Within the Site

Heat fractured stones and a lens of charcoal rich soil indicate that cooking was an activity undertaken on one of the smaller terraces below the main excavation. Evidence for stone working within the site (or by its inhabitants) is inferred by the presence of hammer stones, while wood working is suggested through the presence of a nephrite adze (Damm et al. 1994:20). A small sample of ochre within the site may also hint at its preparation or use. Shellfish of (unidentified) saltwater and possibly freshwater species also, suggest access to coastal resources, and the transportation and possible consumption of these products on site (Damm et al.1994)

### 7.3.4 Settlement and Cultivation

The horticultural system surrounding this settlement was identified using the methods applied in chapters five and six of this thesis. A horticultural system with a total area of...
approximately 4.5 hectares was identified (Figure 7.4). This dendritic network of alignments weaves through the shallow basin areas between the low hills in the study area, often abutting the base of the hills. Some alignment features extend up and on to the hills, or in one case, onto a ridge which extends out from the base of Pouerua cone. There are ten hill features associated with this identified horticultural system, five of which show evidence of settlement features, although the evidence is more distinct on some hills than others.

The extent of this horticultural system was identified by the network of interconnecting shallow trench and stone alignments that have been used as boundary features. This is not a particularly stony area however, and the trench features predominate. The dendritic patterning of the system reflects both the undulating nature of the terrain, and the likely multiple points of origin of the horticultural system. Elements of the garden originate at several terraced hill features before becoming intertwined as the alignments radiate out further from the original points of origin.

While the area within the identified system appears to have all been subdivided by transverse alignments, there is considerable variation in the size of the bounded plots across the system as a whole. In open areas, where there is more space between the hills, plots appear to be larger; this contrasts with the narrow valley to the east of P05/859, where the plots are smaller and closely clustered together.

While P05/859 may represent multiple short phase occupations (Damm et al. 1994), other settlement sites associated with the use of this garden area may indicate longer term settlement. Several of the other terraced knolls associated with the same horticultural system as P05/859 have storage pits present, suggesting extended residency within the horticultural area.

7.3.5 An Interpretation of Settlement and Cultivation at P05/859

In their conclusions regarding the use and occupation of P05/859, Damm et al. (1994:22) suggest that the archaeological evidence indicates that the site, during both periods of occupation, was only occupied for a short duration, probably when the gardens surrounding the site were being planted, tended or harvested. However, when the site is considered as part of a more complex arrangement of settlement and garden features, the evidence suggests the kainga is much larger, contains a greater number of features (including storage pits) and potentially may contain evidence for a greater range of domestic activities within the site.
This is important, because it is the limited amount of domestic evidence recovered from P05/859 that led Damm et al. (1994) to conclude this was a short term habitation site.

At the most basic level, what the evidence highlights is the role of this site within a much larger landscape. The lithic evidence suggests the utilisation of local materials as well as direct sourcing or exchange network access to materials from much further away (such as Mayor Island for obsidian, or the South Island for nephrite)(Damm et al. 1994:20). The faunal evidence from the site supports this idea, and builds upon the observation by Sissons et al. (2000) that Maori had traditional links to the coast near Waitangi, in the Bay of islands.

The implication of the conclusions by Damm et al. (1994) that the site was occupied only for short periods and lacked any substantial storage facilities, has been to direct the focus of settlement within this landscape back at the Pouerua cone, where there is a great number and variety of storage features and terraces for housing, cooking, and tool manufacture. By these conclusions in effect, Pouerua cone stands at the centre of a vast kumara production landscape: A sweet potato factory.

However, if the single knoll excavated by Damm and Sutton (1994), and identified as a kainga, was only one part of the actual site (e.g. more than one terraced hill was part of the settlement), then it could be argued that settlement was occurring on the Pouerua landscape that was related to but not focused around the Pouerua cone. There is certainly evidence for storage features on terraced knolls associated with the same horticultural system as P05/859. What is required is further excavation to examine firstly the relationship between the different terraced knolls, and secondly, what archaeological features are present. In their investigation of settlement in the South Island, Walter et al. (2006) discuss the idea of a transient village, the conclusions of which, highlights some of the fluidity and flexibility of prehistoric Maori settlement. A similar approach needs to be considered at Pouerua, where the number of sites and range of feature combinations suggest that settlement patterns are not as consistent as the Pouerua volumes indicate (Sutton 1990a; 1993; Sutton et al. 2003).

In any instance, any outcome of further investigations could have positive results for understanding Maori life at Pouerua. If it was concluded that many kainga at Pouerua were much larger, and that at times activity focused on the land surrounding the cone rather than the cone itself, then the result provides greater understanding about how the landscape was being utilised. If however, it seems that at least some of the kainga were individual features, essentially satellite communities, that fed their resources back to a central settlement, then
this too has implications for archaeological interpretations, especially those relating to centralised organisation and the rise of the northern Maori chiefdom (Sutton 1990b).

7.4 Conclusions: Reconsidering the Pouerua Landscape

It is difficult to examine how the excavated Pouerua cone pa, the other pa on the rim of the cone, or the peripheral pa, fit into the horticultural landscape at Pouerua. While Sutton (1993) highlights the position of these features with the settlement patterns of the wider landscape, there is insufficient surface evidence available to provide these pa sites with any actual horticultural context. The sites on the cone are often elevated above and separated from, the horticultural features. Several of the peripheral pa are also located right on the fringes of the horticultural landscape, and away from the Pouerua horticultural systems. It is difficult to draw conclusions about the relationship between pa and settlement when there is no clear linking factor between pa and gardens. Given the position of the cone pa and peripheral pa in relation to the horticultural landscape, there is, as Sutton et al. (2003:10) highlight, an argument to be made for the likely influence of horticulture on pa settlement, but without further evidence that connection is yet to be demonstrated.

As the evidence stands, the best way to investigate the relationship between settlement and cultivation at Pouerua is through the kainga and gardens. The site surveys associated with this thesis and with the original Pouerua research, indicate that the open settlement or kainga is the dominant form of habitation at Pouerua, and one which is ‘integrated into and closely associated with an extensive system of structural features related to gardening activity’ (Green 1994:4). There is also a chance that by investigating the kainga in detail, archaeologists can develop a better understanding of the relationship between pa and cultivations because of the similarities in the way the two settlement types have developed and been utilised (Sutton 1993).

This study has highlighted the fact that horticultural features not only abut areas of settlement but also extend onto those areas and intersect settlement features. This suggests a much stronger relationship than just a spatial one, with the evidence indicating that the settlements and horticultural features were likely to have been contemporary and giving a temporal aspect to this investigation of settlement and cultivation relationships. Furthermore, by identifying the extent of the horticultural system associated with one settlement, the evidence indicates there may be other settlement sites also associated with the use of the garden area. The identification of groups of spatially and temporally related settlement sites opens the
Pouerua landscape to further investigation as to the role of the kainga and the pa within the settlement patterns at Pouerua.

Where the original investigation of the kainga at Pouerua focused on the structure and use of the dwellings within the identified boundaries of the living area of the settlement, perhaps a more inclusive investigation could provide further insight into what the settlement meant to those who occupied it. The close spatial relationship between kainga and gardens is distinctly different from the cone pa and many of the peripheral pa and suggests that horticultural activity was a contributing factor in the occupation of the settlement aspect of the kainga. It seems that understanding how horticulture and settlement developed and changed over time at Pouerua, will need to start with an investigation of kainga and cultivations, as this appears to be the most direct route for investigating how the two site types existed and operated in relation to one other.

A focus on the combination of kainga and gardens is the most sensible approach for looking at how the gardens relate to other settlement types at Pouerua, but also how to examine temporal change across the wider landscape. While there is a detailed record of change for one of the pa on the rim of Pouerua cone, there is a less well defined understanding of how the wider landscape changed over time, and how the wider landscape may have influenced or have been influenced by changes occurring on the Pouerua cone. Understanding the role of dispersed but large kainga centred on individual horticultural systems is critical to being able to interpret how Maori were utilising different aspects of the Pouerua landscape and how different elements of that landscape developed. While the identification of large kainga does not mean that all kainga on the Pouerua landscape were constructed and used in the same way, it does mean that there needs to be a shift of focus away the idea of the Pouerua cone as a large, centralized, controlling pa.

In conclusion, the horticultural landscape is not only a significant part of the total assemblage of archaeological features at Pouerua, but also a key part in understanding how the landscape developed and changed over time. The evidence indicates that Maori moved into the Pouerua area c. 1400 A.D and began to change the landscape to meet their needs (Sutton et al. 2003:217-227). This means that for a period of approximately 400 or more years, Maori occupied different aspects and developed them accordingly. Pouerua and the surrounding volcanic landscape, rich with Maori settlement and garden sites, may represent one of the largest and most intact New Zealand landscapes within which archaeologists may examine many aspects of early New Zealand society, through the remnants of pa, kainga and gardens.
The Archaeology of Pouerua – Discussion and Conclusions

8.1 Introduction

The Pouerua landscape has been the focus of much archaeological research in the past. This research has primarily focused on the settlement features which include the central cone pa, peripheral pa, and numerous kainga. Despite the intentions of the authors (Sutton 1990a, 1993; Sutton et al. 2003), the role of the horticultural landscape in relation to the construction, occupation and modification of the settlement features has been largely ignored (Leach 2004, Barber 2007).

Any investigation of the horticultural landscape therefore, could not just describe the horticultural features but needed to also discuss how they existed as components of a much larger archaeological landscape. In this case, this means considering how the horticultural systems and individual features relate to the construction and occupation of the pa and kainga at Pouerua.

Although there is a great deal of existing information about the Pouerua landscape, there is a lot of specific detail that is missing and limits further interpretation of the landscape. In order to address this issue, the research focus of this thesis was designed to build upon the existing Pouerua data and refine archaeological understandings about the form and distribution of features related to horticultural production and allow interpretation of the evidence.

The focus of the study of the Pouerua horticultural landscape can then be summarised thusly:

1. Are there discrete areas of cultivation at Pouerua?
2. Is the concept of spatial and temporal change in the settlements an idea also reflected in the horticultural systems?
3. Can the horticultural evidence be used to assist in the interpretation of settlements?
In the first instance, this involved the identification of numerous discrete areas of horticultural activity. That these discrete areas of activity exist has highlighted the fact that the Pouerua landscape is the result of an innumerable number of constructive and destructive events of a period of approximately 400 years (Sutton et al. 2003:217-227).

The second stage of this thesis sought to investigate whether similar processes of temporal and spatial change were reflected in the horticultural systems. Investigations of the pa and kainga settlements as part of the original Pouerua Project (Sutton 1990a; Sutton 1993; Sutton et al. 2003) revealed the complex nature of settlement on the Pouerua landscape. The way features are positioned within a kainga may become increasingly complex, kainga may be developed into pa, and may be present in one period and absent in the next. This highlights the fact that the settlement features can be modified in a number of complex ways to reflect the wants and needs of the society that constructed the pa and kainga. The evidence from the investigation of the horticultural systems indicates that the cultivation landscape was also exposed to the same ideas and influences that shaped the settlements at Pouerua.

Finally, in order to understand why the cultivations may have been constructed in the first place, the cultivation evidence needed to be considered in relation to the detailed settlement evidence resulting from the original Pouerua Project (Sutton 1990a; 1993; Sutton et al. 2003). In essence this means providing a settlement context for horticultural investigation. The horticultural landscape at Pouerua, has for the most part, been excluded from past archaeological interpretations. As noted throughout this thesis however, archaeologists have on numerous occasions referred to the importance of the horticultural features for understanding settlement at Pouerua. This final section examined the evidence for a relationship between settlements and cultivations investigated whether the horticultural systems on the Pouerua landscape could be used to assist in the interpretation of settlement.

8.2 The Pouerua Landscape

Past archaeological research has focussed on the features present within the identified boundaries of the peripheral pa, cone pa and kainga. By understanding the position and orientation of structural features such as houses and storage pits, and the presence or absence of materials such as stone or shell, archaeologists investigating settlement at Pouerua have been able to put together a chronology for the use of a number of settlement features.
In order to investigate the horticultural landscape, an understanding of the components this landscape was needed. The first section of this thesis investigated the horticultural aspect of the Pouerua landscape, first recording the types of features encountered in the horticultural areas, and then looking at factors such as their distribution and orientation. It was concluded that there was sufficient evidence to identify discrete areas of activity within the Pouerua landscape based on not only whether features were unique or distinct, but also whether they shared common traits.

In the case of variation, some types within the horticultural assemblage, such as stacked or pyramid heaps, were features which were only identified in specific parts of the landscape. Furthermore, they were not only limited to certain areas but they were also recorded in clusters. It could be argued then, that the balance of probabilities falls in favour of these features having been constructed at or around the same time. If it was simply that these were the preferred way of constructing features, then they should be expected in other aspects of the landscape with similar environments. Identification of features such as these allows for early recognition of possible discrete areas of activity.

In order to further refine the identification of discrete areas of activity, it is also necessary to look at similarities between features. In the first instance, this is well represented by the stone and shallow trench alignments found right across the Pouerua landscape. Alignment features may be similarly oriented, of similar length, may originate from the same topographical feature (such as a hill or ridge), and may be constructed in the same manner. They may also be connected by a series of shorter transverse alignments. By identifying these similar traits in groups of alignments, it becomes possible to start identifying patterns or similarities amongst related features and narrowing down the size of a potential horticultural system.

Investigating the horticultural landscape in the first instance is about identifying the evidence and looking for similarities in form. Essentially, the archaeologist dissects the landscape based on the presence of individual features and reassembles it based on the presence or absence of common traits. This does not result in the final identification of discrete areas of horticultural activity but it does help to begin breaking down the Pouerua landscape into a series of construction events. This then means groups of related features can be compared and contrasted with other sites of the same type and in the case of this study, horticultural systems can be investigated in relation to settlement sites. Before this, the cone pa, peripheral pa and kainga were a series of settlements positioned within a sea of horticultural alignments and stone mounds, with no one area of activity discernable from the next. It was this lack of
individual context which made it difficult to relate settlements to areas of horticultural activity.

The investigation of the form and distribution of features also raised another interesting point about the commonality of some features, specifically the rounded stone heap and the stone mound. In both cases, these are features which have been recorded across much of the Pouerua landscape, even in less stony areas. In the case of the rounded stone heaps, although they may have some unknown benefit for the gardener, they could be argued as simply the most efficient method for storing stone cleared from the fields. Stone mounds on the other hand, while also being widely distributed, lack the same simple explanation. In order to construct them, the builder is required to set a circle of stones into the soil in an upright position. The centre is filled with soil, and the soil mound may be covered with small stones. If the conclusion of Horrocks et al. (2000) that the mounds were used as garden beds is correct, then it could be argued that the stone mounds were considered sufficiently valuable to cultivation that they were replicated around the Pouerua landscape.

The results of the survey identified dozens of discrete areas of horticultural activity based on the recorded horticultural features. The significance of this is that it suggests that the Pouerua landscape is the result of numerous construction events. This fact, combined with variation in the size of the areas of horticultural activity and the extent of development within those areas supports the conclusion that the horticultural landscape was exposed to the same influences as the settlements at Pouerua, and that the horticultural areas may be utilised for further research into how Maori modified the landscape to suit their requirements during different periods in history.

8.3 Spatial and Temporal Change at Pouerua

The survey of the horticultural aspect of the Pouerua landscape confirmed that there was sufficient evidence to warrant investigating whether patterns of change could be identified in the horticultural systems. The conclusions of all three Pouerua volumes argued in favour of spatial and temporal change within pa and kainga (Sutton 1990a; Sutton 1993; Sutton et al. 2003) particularly in the way space within the settlements was developed and managed for living, domestic and social activities. Considering how prominent and widely distributed the horticultural features are within the landscape, it was necessary to investigate whether the horticultural aspect of the Pouerua area was subject to temporal and spatial change.
As the results from Chapter Six indicate, there is certainly evidence for change over space and time within the horticultural systems. This was the case for all systems investigated. An interesting outcome of this particular investigation however, is the variability in the way each system is developed spatially and temporally. Although there are some similarities, overall, the way each system develops is distinct and the by-product of several factors including environment, but also a potential raft of unknown social influences including population fluctuations and centralised organisation.

Although this study uses terms such as ‘rates of expansion’ and ‘internal subdivision’ to describe the processes of change within the horticultural systems, it should not be confused with the identification of process of intensification of production. The focus of this thesis was in identifying the process of change within the horticultural systems and whether the use of space within the horticultural systems changed over time. This is where the Pouerua research diverges from the Hawaiian investigation presented by Ladefoged et al. (2002) and has more in common with the earlier New Zealand examples (Johnson 1986, Veart 1986). In this instance, there is simply not enough evidence from the horticultural systems to identify more complex processes of development, more tightly refined periods of use for horticultural systems, or whether Maori were making specific modifications to the cultivation environment with the intention of stabilising or modifying production. These are however, areas for further research at Pouerua. All the evidence from this study indicates that while some aspects of the horticultural systems were consistent (such as the use of boundaries), the variability of rates of expansion and system subdivision indicate that the factors influencing the construction of horticultural systems at Pouerua were not consistent throughout the occupation of the Pouerua landscape.

The result of this aspect of the study has been to highlight the different ways in which horticultural systems at Pouerua were developed. Because each system was investigated with a close focus on the environment within which it was created, it is possible to argue that not all aspects of the development of the horticultural systems are purely practical. While this is certainly an element of the development of horticultural systems (targeting specific soils, shelter, and sun exposure for example), there is some evidence, particularly the rate of internal system subdivision and the spatial development of some aspects of the systems, that points towards cultural rather than environmental influences. If this is the case, then it could be argued that the organisation of space within the settlements as identified by Sutton et al. (1990a; 1993; 2003) is a concept which was extended to the horticultural systems in the sense that systems space within systems was well defined (by alignments) and plots within some systems were extensively organised.
8.4 Settlement and Cultivation at Pouerua

Finally, this thesis has considered the spatial relationship between the horticultural evidence and settlement patterns to understand how the two may have developed over time and space at Pouerua.

Although there was a detailed record of the excavations of both pa and kainga at Pouerua, there was little reference to how these settlement features related to the horticultural evidence around them. Essentially, where the contribution of horticulture sites to the development of the settlement had been considered previously, it was the contribution of the entire horticultural landscape rather than a specific horticultural system.

Following on from the conclusions of this research, there is evidence that the identification of the extent of a horticultural system may result in more than one settlement feature (e.g. terraced hill) being associated with the use of that system. In the example presented in Chapter Seven, it was concluded that the settlement identified by Damm et al. (1994) may not have represented the true extent of the settlement as it existed at the time, but rather one aspect of it. While this is an area requiring further investigation, it highlights the importance of considering the settlement features in a horticultural context. The absence of specific features within the settlement (P05/408) led to the conclusion by Damm et al. (1994) that the site was one which was occupied seasonally by a small, mobile group. The conclusion of this study however, is that the excavated site may only have been one part of the occupation, and other terraced hills may form part of the same settlement. Potentially the kainga may have been much larger and much more complex than the initial excavations indicated.

One problem identified during this research was how to identify the relationship between cultivations and settlements such as the cone pa, which are often separated by some distance. This is an issue which this study was not able to resolve using the existing evidence. However, the conclusion by Sutton (1993) that elements of kainga, in particular their development and spatial organisation, are also present in the construction and use of the pa, means that the aspects of the relationship between kainga and cultivations may be transferable to the pa. A focus on understanding the relationship between kainga and horticultural production, as undertaken in this study, may provide further insight on how to investigate the relationship between pa and cultivation.
The significance of cultivations in relation to settlements is also important for understanding the degree of mobility and settlement within the Pouerua landscape and whether the rates of mobility/settlement changed over time. As has been argued in this thesis, there is evidence for variation in the rate and extent of the development of both horticultural systems and settlements. This variation suggests that in the past there must have been variations in the social and economic inputs into the settlement features and horticultural systems over time. By identifying this variation, it may be possible to investigate further and discuss how Pouerua was used in the past. Understanding the extent of mobility and sedentism at Pouerua is also key to understanding how Pouerua, as a settlement landscape that was in use for perhaps 400 years (Sutton et al. 2003:217-227), fitted into the general colonisation and occupation of the wider Northland region, and in the Bay of Islands area in particular.

Finally, the outcome of the investigation into the relationship between settlement and cultivation has been to highlight the importance of the kainga as not just a peripheral settlement occupied only periodically. The evidence from the Pouerua landscape suggests that some kainga were substantial in size and were associated with extensive horticultural systems. On the basis of the evidence, it could be argued that at times, the kainga themselves may have been the more substantial settlements and that the focus of occupation may not necessarily have been on the Pouerua cone. This idea does not detract from the idea of Pouerua cone as a culturally significant landscape feature for the Maori who lived on or around it, but it does mean that archaeologists need to consider that Pouerua may not always have been the central focus of settlement. This is a point reinforced by the fact that the major defensive features on the rim of Pouerua were at times abandoned and replaced by small scale domestic activity areas (Sutton et al. 2003:217-227).

8.5 Evaluation of Methods and Future Directions for Pouerua

Both the original Pouerua investigators (Sutton 1990s; Sutton 1993; Sutton et al. 2003) and reviewers of the Pouerua publications (Leach 2004, Barber 2007), have noted the importance of the horticultural features surrounding the Pouerua cone to the overall interpretation of settlement at Pouerua. The quote by Sutton et al. (2003) at the very start of this thesis highlights this fact. How the horticultural landscape actually relates to the settlement features identified and discussed in the three Pouerua volumes (Sutton 1990s; Sutton 1993; Sutton et al. 2003) has been the central focus of this thesis.

In the first instance, extensive surveying resulted in a detailed understanding of the spatial aspect of both the settlement and horticultural features, including their locations within the
landscape, their proximity to other cultural and environmental elements, and their orientation. The level of detail allowed for the marriage of the original Pouerua survey data (such as the Leatherby and Morgan map) with the surviving Pouerua landscape, successfully bridging two projects undertaken almost 30 years apart. It was this level of detail that also allowed for the identification of discrete areas of activity using the horticultural features.

Although temporal-spatial analysis of horticultural systems had been attempted in a New Zealand context before (Johnson 1986; Veart 1986), it had only been met with limited success. The decision to undertake such an approach again at Pouerua was based on the availability of detailed recordings of the wider landscape by Leatherby and Morgan (n.d.), the success of large scale temporal-spatial investigations of horticultural systems at Kohala in Hawaii (Ladefoged et al. 2002) and the identification of a complex record of settlement development in the cone pa, peripheral pa, and kainga at Pouerua (Sutton 1990s; Sutton 1993; Sutton et al. 2003).

As the evidence presented in Chapter Six highlights, there is a clear indication of the horticultural systems being developed and modified over time and space. These are changes which can be both identified and analysed for further insight into what factors may have influenced the changes in any given phase. While the temporal aspect did allow for the grouping of developments to a particular construction phase, there is a definite need for further refinement of the temporal aspect of the investigation in order to identify when a particular horticultural system was in use and over how long a period the identified construction phases took place.

Finally, with a focus on the horticultural landscape, this thesis research provided a unique opportunity to investigate just how the settlement and horticultural aspects of Pouerua could have co-existed in the past. With only limited subsurface evidence it is difficult to draw conclusions about the role of the peripheral pa and cone pa in relation to horticultural production at Pouerua. However, in the case of the kainga, there is sufficient evidence to highlight the close relationship that existed between the undefended settlements at Pouerua and the horticultural systems. Chapter Seven presented a case study that reinforces the importance of cultivation in explaining the Pouerua settlement patterns and landscape. It is only a start however; there is certainly room for further investigation of the relationship between gardens and kainga, and it is unthinkable to consider that the use and occupation of the cone pa and peripheral pa was not also linked to the cultivation of the surrounding volcanic loams.
The obvious future direction for research at Pouerua is to continue examining the relationship between cultivation and settlement and the role that horticultural production played in the development of the Pouerua landscape. There is a detailed understanding of how settlement features at Pouerua developed, and in the investigation of all three settlement types, the Pouerua Project investigators noted the increasing complexity in the development and use of space (Sutton 1990a; Sutton 1993; Sutton et al. 2003). Investigations of the horticultural systems then should also look at whether there is complexity in the development of the landscape around the settlements that may be a by-product of changes within settlements, or perhaps even influencing those changes. The results of the temporal and spatial analysis presented in Chapter Six supports the idea that complexity of development extended to the horticultural systems.

8.6 Conclusion

The Pouerua horticultural landscape displays evidence of discrete development of settlements and gardens within an area defined by the presence of friable volcanic loams. The landscape is the culmination of a series of individual developments rather than the continued expansion of an initial construction. In their conclusion of the investigation of the cone pa at Pouerua, Sutton et al. (2003) note that the modified form of the rim of the cone of Pouerua is the likely result of a series of smaller constructions and modifications over an extended period. The Pouerua horticultural landscape reflects a similar pattern of development, with a series of small developments over an extended period resulting in an extensive and highly modified horticultural landscape. As this study has highlighted, it is possible to identify those individual developments with the landscape and investigate them as individual components.

In the investigation of the peripheral pa, Sutton (1993) argued that over time, the organisation of space within settlement features became increasingly complex. While it is clear that there is variation in the extent of spatial organisation of horticultural systems, it is yet to be seen whether the more complex horticultural systems at Pouerua are those associated with later periods.

Finally, in addressing the concerns raised by Leach (2005) and Barber (2007), with regards to the exclusion of the horticultural landscape from the interpretation of the settlement features, this thesis highlighted the importance of the horticultural landscape on interpretations of settlement use and development. While not all settlements will have a clear and well defined relationship with areas of cultivation, it is clear that where they exist the evidence for settlement should be considered in relation to the horticultural features.
The horticultural landscape was a significant aspect of settlement at Pouerua in the past. Therefore, the horticultural assemblage should occupy a central position in the interpretation of Maori settlement at Pouerua.


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