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INCOMPATIBLE LAND USE PATTERNS IN MAORI FOOD PRODUCTION

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In 1967 Kathleen Shawcross published an influential paper on the relationship of kumara horticulture and the gathering of fern root. Her basic contention was that even in areas climatically favourable to the production of the kumara, it was regarded as a 'luxury' item, and except for one or two months in a year immediately following harvest, was reserved for feasts. Documentation from the Bay of Islands and central Northland supports this view and corrects the notion which appears in some late 19th and early 20th century works that the kumera was the staple food of coastal North Island communities.

In examining the harvesting practices and relative productivity of the bracken fern (Pteridium esculentum) and the kumera (Ipomoea batatas), Shawcross came to regard the fern root as a semi-crop which was prepared for harvest by burning at appropriate intervals. Furthermore she stated explicitly that once fern had invaded old garden plots it was cleared again after a number of years of fern root digging and the land was restored for gardening (Shawcross, 1967:343). This notion of a cycle of land use which permitted food gathering in the fallow stage and food production in the cultivation stage appeared economically viable, even an elegant adaptation. It was repeated, though not further elaborated, in later articles (e.g. Groube, 1970:162; Green, 1975: 614). The germ of the idea had appeared before in the work of Vayda (1960:111-4) and of N.H. Taylor (1958:76) who cited Walsh (1902:15) and R. Taylor (1855:377-9) that fern land was returned to use as garden plots.

The 19th century references supporting the existence of a fern land - garden cycle are those of Richard Taylor (1855) and Angus (1847). Taylor described the following system as follows:

"The place is then abandoned, and another selected; but this abandonment is only for a certain space of time. Instead of turning up the soil, and suffering it to lay in fallow a season, their method of renewing it is to allow it to remain unoccupied until it is covered with a certain growth of wood, if situated in wood land, or of fern, if situated in fern land, which requires a period of from seven to fourteen years, when the spot is again cleared and planted."

(R. Taylor, 1855:378)

Angas described gardening operations at Orakei in 1844:

"We passed through a native plantation, or potato ground, where the inhabitants were busily employed in planting their crops. They were using the ko, a wooden instrument something resembling a spade, with which they root up the matted fibres of the fern below the surface of the soil."

(Angas, 1847, Vol. I:290)

It is important to note that both Taylor and Angas also refer to gardens made in wood land. Angas made it clear that

"The natives prefer the soil reclaimed from the decayed vegetation of the woods for their agricultural purposes, and they take infinitely more pains in clearing forest land than in rooting up the fern, as they consider the soil of the former superior."

(Angas, 1847, Vol. II:12)

Indeed there is no account that indicates that a fern land - garden system was preferred to the commonly described forest/shrub land - garden pattern (Simmons, 1975:86-7). Analysis of the literature concerning the period 1769 - 1840 leaves no doubt that the latter system, a type of swiddening, predominated. The earliest reference is that of Bayly who accompanied Cook on his second voyage. He noted that the wood on the site of a future garden was set on fire and then cut off "about knee high" before the soil was worked (McNab, 1914:213). Early visitors to the Bay of Islands and other parts of Northland all commented on the abundant acreage of bracken fern, especially on the east, and many noted how fresh gardens were being made on the edges or in the middle of woods (Nicholas, 1817, Vol. I:265, 332-3, 341, Vol. II:210; Cruise, 1823:32, 56-7, 163, 254-5, 301; Earle, 1909:30; Markham, 1963:36, 42; Wade, 1842:15, 19, 36).

In describing a visit to Lake Omapere in January 1815, Nicholas wrote,

"on our way we had to pass through another wood, part of which the natives had cut down, and were burning off, for the purpose of cultivation."

(Nicholas, 1817, Vol. I:341)

Cruise commented in October 1820 that,

"setting the heath and brushwood on fire is the usual way of clearing the ground previous to its being cultivated."

(Cruise, 1823:254)

Exactly the same reason was given by Bidwell who observed gardens on Mokoia Island, Lake Rotorua in 1839. He wrote,

"These level spots are carefully planted with kormeras, corn, etc., but are not rich enough for potatoes, which are never planted by the natives but on newly-cleared land, which they abandon after the third year's crop; it then becomes covered with fern, and in a few years more is rendered fit for nothing by the constant fires destroying whatever vegetable matter is formed by the decayed plant."

(Bidwell,1952:48)

Several later references can be cited for the practice of clearing forest for white potato cultivation (Meade in N.M.Taylor,1959:461; Johnson in N.M.Taylor,1959:120; Shortland,1854:203). One of the most interesting appears in Dieffenbach's account of Queen Charlotte Sound, where he found in 1839 that the inhabitants used the light shingly or sandy soil in the mouths of the bays for their kumara -

"for their other crops, however, they prefer the sides and ravines of the hills, where, after having burned the wood, they obtain for cultivation a new and fertile soil, where the surrounding forest preserves a continual supply of moisture."

(Dieffenbach,1843,Vol.I:25-6)

Although the white potato required richer ground than the kumara (in the absence of any applications of manure), and thereby accelerated the clearing of forest, there is still little evidence that in the early 19th century kumara gardens were made in fern land. Most observers who refer to kumara plots specifically, comment that they were concentrated in areas of sandy soil, often near the coast (e.g.Dieffenbach,1843,Vol.I: 217,292).

The question which must now be faced is why the fern land - garden cycle was so rarely documented in comparison with the forest - garden transformation. The answer can be found in the literature of early European settlement and some comments by Best (1925:159) and MacNab (1969:87-8) who stressed that deep digging would be necessary to remove the bracken which might otherwise smother the crop. Best also wrote that

"this plant seems to have an effect of rendering soil sour and unkindly; fern land needs turning up, and exposure for some time, ere this quality is lost."

(Best,1925:159)

He gives the impression that a cycle involving fern patches alternating with garden plots would be demanding of labour and not particularly productive.

The missionary/farmers had gone on to the fern lands of the Bay of Islands and Waimate with great expectations. It was believed in 1821 that fern could be easily cleared by fire and cultivation, and that if it grew six feet or higher, the land beneath was of good quality (McNab, 1908, Vol. I.:546, 553). Ten years later and soon after the Waimate Mission was established, the experienced farmer Richard Davis wrote of the difficulties caused by fern roots:

"the land has all to be broke up with the Hoe and cleared from roots before we can push a plough into it."

(Davis, ms:20/12/1831)

In November 1832 he requested "an extra strong breaking Plough" and in April 1833 two dozen "strong bean-cutting hooks for the purpose of cutting down the fern as the common reaping hook is by no means strong enough". Several residents and visitors to Waimate commented on these difficulties. Markham called in 1834 and wrote

"I witnessed the breaking up of some land belonging to the Missionaries, or one of their Sons, a Mr Davis, a Dorsetshire Farmer in Former times; the Horses [w]rung their Shoulders and there were 8 of them, each root as thick as my finger..."

(Markham, 1963:37)

William Yate described the same period:

"Breaking up the land is a most laborious work, and requires much patience: as the fern-root is so closely matted together, it checks or clogs up the plough."

(Yate, 1970:76)

Although Waimate looked like a flourishing English farm to Darwin and Fitzroy in 1835 (Darwin, 1839:507; Fitzroy, 1839:601ff), by early 1841 Dieffenbach reported that the produce of the farm was at a very low ebb:

"In fact, a great deal of the land has been relinquished, for the very sufficient reason that it yielded nothing at all. The soil is a very light dusty volcanic earth. This is the reason why the natives have no plantations here, but prefer the ravines intersecting the plain, or go nearer to the groves, or to the base of the hills which bound the table-land, where the soil is more substantial."

(Dieffenbach, 1834, Vol. I.:247-8)

A short time before his visit to Waimate, Dieffenbach had explored parts of Taranaki in 1839. He noticed that because of war with the Waikato tribe, fern had replaced cultivations over a wide area, but he then believed that "this fern is no impediment to the plough, but rather an advantage, as it can be burnt down" (New Zealand Journal, 1841(29):53). This widely held view was reversed within a year in the Wellington settlement when William Wakefield wrote,

"The experiments made by experienced farmers in this neighbourhood, during the spring, have led to the conclusion that too much stress has been laid on the qualities of the level fern land of this country; and that the glutinous properties of the fern, with its innumerable roots, exhaust the land more than the most harassing European crop; and that, therefore, several years of dressing and manure are requisite to renew its powers.

The result of this reasoning has been to induce many to turn their attention to the wooded lands, and to be inclined to follow the example of the natives, who chiefly cultivate the most thickly timbered hills."

(New Zealand Journal, 1841(35):126)

Thus the early agriculturalists found that the bracken fern not only made cultivation difficult, but that the soil it had grown in was left in poor heart. Horticulturalists began to realise that unless every root was removed the fern would spring up and smother the garden. Its vigour was tested in 1886 following the mid-winter eruption of Mt. Tarawera:

"During the following summer it was noticed that the bracken-fern was the plant which appeared to be able to penetrate the greatest thickness of ash. When this was 2 ft. in thickness the fern was able to force its way up to the surface, though it appeared rather later in the season than it would otherwise have done."

(Thomas, 1888:65)

Eventually farmers had to come to terms with vast blocks of land in the North Island which were covered in bracken fern, and they had to devise techniques for eliminating it. When H. Guthrie-Smith took over Tutira in Hawkes Bay in the early 1880s, he found that 58,000 acres were covered in bracken:

"This plant, against which the station has been battling for more than forty years, delights in loose humus, sandy soil, and pumice-grit. Into such soils - never dry, yet never water-logged - its rhizomes penetrate many feet. It is perhaps the only fern which thrives on manure. Year after year it will invade garden plots;

it will persist season after season in sheep-yards. On ploughed grounds fed with artificials its fronds spring taller, thicker in stem, and of a deeper green."

(Guthrie-Smith, 1953:104)

At Tutira they had plenty of opportunity to observe the growth sequence of the bracken. Early in November new fronds pushed their way up out of the soil, later rising above previous years' old growth and then uncurling. If left untouched the plant makes little more growth until the following spring. Unlike the British bracken whose fronds rot away each winter, the New Zealand variety carries fronds several years old in a tangled mass. This accumulation, when dry, is sufficiently thick to burn every fourth or fifth season (ibid.:63,105,165). On rich stiff soils in a dry climate, the method of eradication is to burn in autumn, and sow immediately with grass and clover. One to two weeks later young fronds begin to appear (using up the nutrients stored in the rhizomes for the spring growth) and large numbers of sheep are then brought in to eat the fronds before they uncurl and become unpalatable. This gives the pasture plants a chance to establish themselves once the sheep are withdrawn, and to cover the ground. At the end of the second season with careful management and good growing conditions, the pasture has become dominant over the weakened bracken. Guthrie-Smith stressed that this was only possible on good land (ibid.:165) and that on porous land in a wet district, bracken was "almost ineradicable" (ibid.:138).

Of course fern-grinding or fern-crushing as this practice was known, required stock and the sowing of pasture plant seed, neither of which were available to the prehistoric Maori. There was one place on Tutira, however, on which Guthrie-Smith was able to observe a more 'natural' succession. The block known as the Sandhills was swept by fire in 1883 "except for an oasis of moist ravine" which contained tall fern, small tutu, koromiko, and kanuka (Leptospermum ericoides). Gradually other shrub and tree species appeared, such as the wineberry, kowhai and rangiora. The original tutu and koromiko grew into trees, kanuka stiffened into poles, and an under-scrub of tree ferns, lawyers and supplejacks appeared. The bracken fern was finally stifled as seeds of podocarps began to establish themselves. He wrote

"In forty seasons it has been transformed from fern to scrub and from scrub to light bush."

(ibid.:63)

A second block, the Hanger (ibid.:321-5), was burnt in the spring of 1882 but was again covered by thick bracken in 1887. It was burnt again that autumn, grazed for two years and then left until 1893. During this time a few manuka had become established. A poor burn in

that year was followed by grazing which knocked back the bracken and allowed millions of manuka seedlings to grow. Within three years the manuka was knee-high, and after five years was level with the remaining bracken. In the early years of this century it reached 10 - 12 feet in height. Ferns appeared and stem borers attacked the manuka. Where these snapped off, sufficient light was let in to allow the seeds and spores of trees, creepers and tree ferns to germinate and grow. Guthrie-Smith wrote of this succession in his third edition:

"Sixty seasons will have sufficed to metamorphose a solid block of bracken into a solid block of leptospermum, which has in its turn given place to a mixed woodland..."

(ibid.:325)

Obviously the type of plant formation which follows the clearance of forest depends on the presence in the vicinity of particular invasive species, the climate and soil types, and the amount and timing of interference by man as a source of further fires and/or grazing animals. The botanist, Leonard Cockayne, noted that in some parts of the country, forest when burnt is succeeded by shrub-heath in which *Leptospermum* species are dominant. Repeated burning of this shrub-heath alters the relative abundance of the component species and may transform it into fern-heath. If bracken is present in the original shrub-heath it can put out new leaves so rapidly after a fire that the *Leptospermum* seedlings are smothered (Cockayne, 1921:149-51). This might have happened at the Hanger block on Tutira, but for the grazing of the young fern fronds immediately after the second and third fires. Climatic factors are also relevant, and Guthrie-Smith (1953:109) believed that some upland areas were too high and therefore too cold for bracken fern.

On the basis of the historical and botanical information reviewed above, we can suggest that once *Leptospermum* species had been suppressed by repeated burning of the heath by the prehistoric Maori, an almost pure formation of bracken fern-heath would remain, which would persist as long as it was subject to occasional fires. Provided that the soil was fertile, such a stand would be a reliable source of food able to be dug perhaps every 3 - 5 years. The depth and density of the root system would require would-be gardeners in fern land to dig very deeply and remove all the rhizomes to prevent serious competition to a kumara crop. They might also encounter the problem of poor yields, as noted by European farmers. Economically they were probably better off leaving the land in bracken fern.

The Maori were obviously aware of the fertility of land newly cleared from forest, and of alluvial soils on the lower reaches of streams or rivers. The best approach was to clear plots within forest

or mixed shrub land so that there was a ready source of seeds to colonise the plots after cropping. However in areas where bracken thrived, there was a serious danger that nibbling away at the edges of forest with slash and burn horticulture would allow the plots to be invaded by bracken fern rather than by *Leptospermum* species and later other shrubs which would restore fertility. If bracken fern became established, through proximity to existing stands, but was left unburnt, the return to shrub land and secondary forest would be much slower, possibly taking many decades as at Tutira. If the bracken was burnt in order to be harvested, it might be delayed indefinitely. Thus the practices of the fern root gatherer led to the perpetuation of his food supply, while the practices of the slash and burn horticulturalist could in certain areas eventually deprive him of both forest and shrub land and force him to become a fern root consumer. The two activities were thoroughly incompatible, and to regard them as alternating parts of a single system is not justified by the evidence.

There are several important cultural implications which follow from the progressive and sometimes irreversible transformation of forest and shrub land into fern. A relatively sedentary group faced by a steady loss of suitable garden plots might eventually abandon horticulture entirely and adopt the bracken rhizome as their sole source of starch. Given the high value of the kumara and its role in feasting, such an economic shift would probably have been accompanied by loss of status, unacceptable to a powerful group. Their alternative would have been to acquire new areas of lowland forest, initially by migration and later by conquest. Their original fern-covered land might then be largely abandoned.

The horticultural requirements of the kumara are already well known, especially the need for light well-drained soils free of frost for at least five months of the year. As a result, not all blocks of forest were suitable for clearing. When the difficulties of making gardens in fern land are added to these limitations, we can see that it was not cleared land that was at a premium among horticulturalists (c.f. Vayda, 1960; Groube, 1970; Green, 1975), but forest and shrub land occupying light soils in warm regions. Once cleared, however, these soils appear to have been the most susceptible to invasion by bracken, thus exacerbating the problem.

We already have some evidence for a decline in horticulture and an increase in fern root consumption. Although entangled with the effects of climatic deterioration in the South Island and southern North Island where kumara horticulture was marginal (Leach and Leach, 1979), in the northern regions there are abundant records of vast, sparsely inhabited fern lands in the 19th century, palynological

evidence for the decline of forest species and increase of bracken over the last five centuries (McGlone:pers.comm.), and the evidence of increasing tooth wear attributed to a harsher diet (Houghton,1980). If gardening and fern root gathering had been alternating activities in a long-established stable economic cycle, such marked trends would not be expected. They become explicable only by accepting the theory that for the prehistoric inhabitants of many regions the transformation of forest or shrub land into bracken fern was in practice irreversible.

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