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MADE SOILS IN THE WAITARA RIVER VALLEY, TARANAKI

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Made soils are man-made soils containing deliberately added sand or gravel. In May 1980 during a site survey of part of the Matarikoriko Block, site of the proposed gas to methanol plant, a number of large irregular shaped pits were identified as borrow pits - source sites for the sand and gravel that was used to provide improved growing conditions for kumara or taro. Subsequently test pits were dug in adjacent areas and soils identified that had been altered to a depth of up to 50 cm by the addition of sand and gravel. This paper discusses the form and setting of these soils.

Environmental setting

The Waitara River valley (see Fig. 1) lies in a deep, narrow valley that is flanked in places by sets of river terraces that mark former valley floor levels. Matarikoriko Block lies on the true left bank of Waitara River some 5 km from the coast and encompasses a large area of river terraces where there are some 70 hectares of soils formed on alluvium.

The survey area (Fig. 2) may be divided in two: the river terraces (intermediate and lower terraces) and the surrounding terrace land (high terrace) through which the Waitara has carved its course.

The soils of the river terraces are largely a product of the parent material in which they formed, their position in the landscape, and the time that has passed since soil formation began. The alluvium in which the soils have formed is largely coarse-textured (sands and gravels) but conditions of deposition of the alluvium give rise to variations in the texture of the soils which range from sands and gravelly sands through loamy sands to sandy loams. At the back of the intermediate terrace, at the foot of the valley side escarpment, is an area of impeded drainage which was only drained some fifty years ago (see survey plan MS 738). Otherwise the soils are free draining and susceptible to drought in periods of sustained fine weather.

The soils of the surrounding higher ground are formed in andesitic ash.

Made soils (N109/143)

Made soils are found on well drained parts of the intermediate terrace and on one of the immediately adjacent lower terraces. There are no made soils on the lowest river terrace which has a young soil with raw sandy silt texture.

Borrow pits are found on the top of the scarp that separates the intermediate terrace and the lower terraces, on the intermediate terrace, and on one of the immediately adjacent lower terraces. The pits are dug into gravelly sand or sand

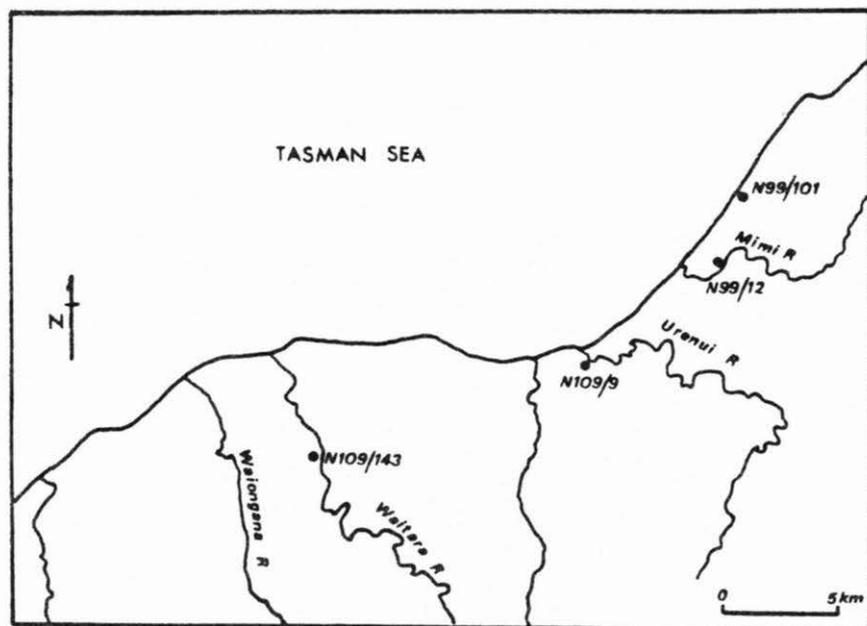


FIGURE 1. Locality map: north Taranaki.

deposits. In and around some of the borrow pits are numbers of stones apparently discarded during quarrying. Discarding of the larger stones from borrow pits has been reported at Clarence River mouth (McFadgen, 1980:11) and on Waimea plains (Rigg and Bruce, 1923:87).

Identification of made soils on the intermediate terrace was difficult because the naturally occurring soils have a high sand content with a varying content of gravel. When sand and gravel are added to such soils this produces no marked change in texture that could be used to identify them as made soils. In theory, of course, there should always be a marked disparity between the texture of the made soil and that of the underlying parent material. This is because the conventional explanation of made soils relies on the assumption that sand and gravel were required to correct the physical properties of soils and so provide improved conditions for growing kumara. In this instance, however, sand and gravel were used to modify the texture of soils that did not differ appreciably from the material being added. In various places there was clear stratigraphic evidence of disturbance up to 50 cm deep and occasionally the original topsoil was found buried beneath the added sand and gravel:

Depth (cm)	
0-20	topsoil formed in added sand and gravel
20-40	raw added sand and gravel
40-60	buried original topsoil
on	sand and gravel - many metres deep

The depth of the added material is exceptionally thick but it is only in places where there has been a considerable layer added that the interference with the original soils is clear. On most parts of the terrace subsequent cultivation has obliterated all identifiable traces of sand and gravel addition.

A clear disparity between the texture of the made soil and that of surrounding soils was apparent however in two other areas. Between the high terrace and the intermediate terrace is a small bench where the soils are formed in colluvium derived from volcanic ash. These soils had been altered by the addition of sand and gravel quarried from a near continuous set of borrow pits on the intermediate terrace immediately adjacent. A typical soil profile recorded was:

0-25 cm	topsoil formed in added sand and gravel
25-35 cm	raw added sand and gravel
on	loam derived from volcanic ash

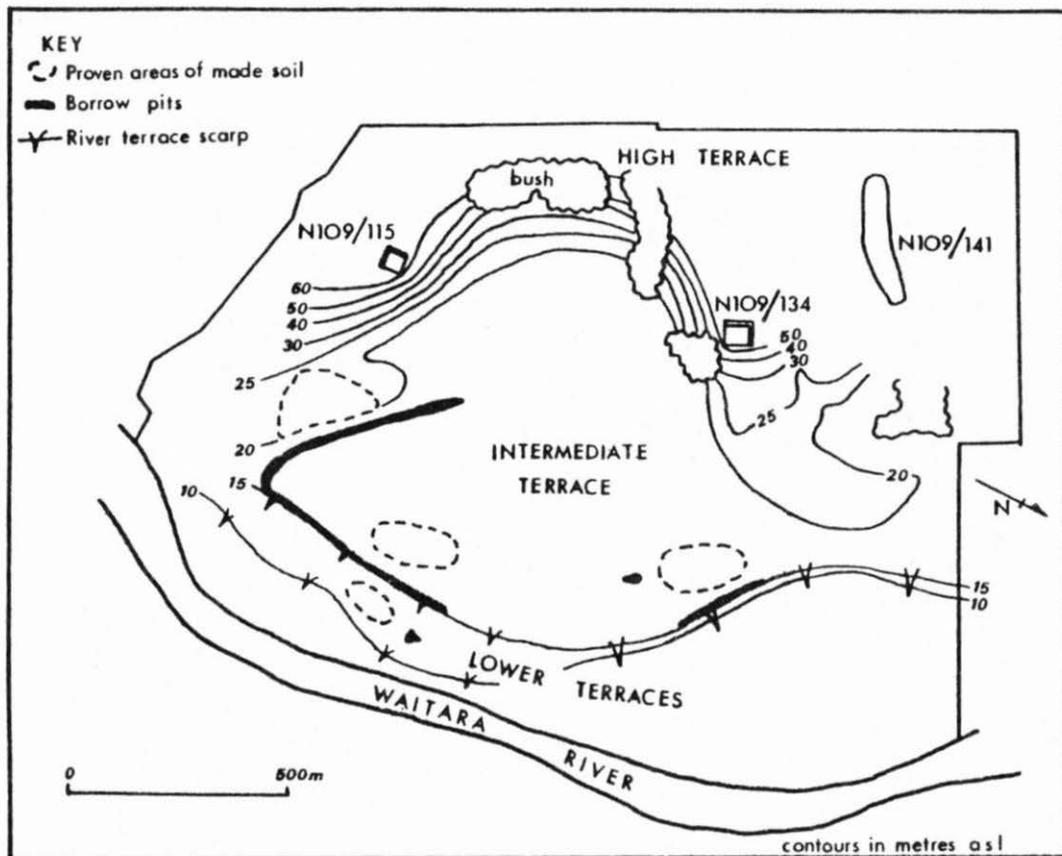


FIGURE 2. Made soils at Matarikoriko (N109/143).

No trace was found of the original topsoil and it is assumed that the added sand and gravel had been well mixed in, erasing it completely.

The other area where a clear disparity in texture was apparent was on one of the lower terraces, that immediately adjacent to the intermediate terrace. Here the parent material and original topsoil had a considerable silt content and the difference in texture between unaltered soils and made soils was immediately apparent when digging test pits.

The archaeological context

Prior to the present survey two pa sites (N109/115 and N109/134) had been recorded. One further pa (N109/141) was located during the 1980 survey. All three pa are situated above the river valley on the edge of the escarpment. Two of the sites have been damaged over the years and many of their surface features are now indistinct. The third was set aside as an urupa in the 1920s and its earthworks are mostly well preserved.

N109/115 (814950). The escarpment provides natural defences on two adjacent sides and there are transverse and lateral earthworks on the other two sides enclosing an area of some 360 m². The site has been ploughed and the 27 m long transverse ditch is shallow while the 15 m long lateral terrace is known only from air photos taken in 1950 (RN 1784/14). There are a small number of shallow circular pits, assumed to be rua, in the interior.

N109/134 (811958). Now an urupa, this site has natural defences on two adjacent sides but on both the north and west sides the approach is on almost level ground. Defences consist of a double line of ditches and bank that run around the two vulnerable sides but the outer ditch is discontinuous. A short length of ditch occurs where the ground begins to slope away to the valley on the eastern side. The platform measures some 30 x 30 m and, allowing for a terrace flanking the platform on the eastern and southern sides, there is an area of some 1,100 m² within the defences. As with pa elsewhere in Taranaki (Prickett, 1980:46), there is a large bank on the platform at the vulnerable eastern end of the site. Survey plan ML 1114 gives the name of the site as Tokitahi.

N109/141 (807958). This is a large site but the outlines have been obscured by ploughing. There are steep slopes on the north and east sides and part of the south side where there is

a small gully. The vulnerable side is the south side where there is no break of slope, nor, apparently, any artificial defences.

The site is 180 m long and is divided into a number of units by three transverse ditches. At the western end of the site is a platform some 45 x 20 m. It is possible that the platform is a later construction dating from the 1860s, a possibility that is suggested by contemporary plans held by Taranaki Museum (Taranaki Museum 95, 96). These maps locate the pa where the platform is, rather than further north where the rest of site lies.

A number of shallow circular pits, assumed to be rua, were noted in the interior and a 2B adze has been found on the surface and is now in the Taranaki Museum.

Cadastrals published by Lands and Survey give Whatamataruru and Tamarumaruru as possible names for the site(s).

Apart from the pa and the borrow pit and made soils in the valley below, no other sites were recorded. None of the pa were affected by the subsequent construction of the gas to methanol plant on the river terraces below. The construction has, however, destroyed many traces of borrow pits and made soils.

Discussion

Borrow pits and made soils are known from a number of other places in North Taranaki (Fig. 1). Buist (1964:24) describes large irregular pits in sand dunes near Waititi stream: two on the south side (N99/101) and a third on the north.

The transport of coarse grey sand derived from river beds has been noted in two places. The excavation of Kumara - Kaiamo (N109/9) revealed a layer of coarse river sand sealing the earlier occupation layer (Buist, 1964:25,96). Coarse grey river sand has been reported in soils in Mimi River area particularly adjacent N99/12 (Buist, 1964:25; N.Z.A.A. Site Record).

In the Waiongana River valley there is evidence of quarrying of alluvial sands and gravels similar to that at Matarikoriko.

The antiquity of these soils is not known. The Kumara-Kaiamo made soil is of prehistoric antiquity but in the absence

of radio-carbon dates it is difficult to say how old it may be.

The notion that sand and gravel were used to modify heavy soils is long established and on the surface appears to make some sense. The assumption that such treatment was 'necessary' to render heavy soil more suitable for kumara growing leaves numerous questions unanswered, however. Why select a soil that is unsuitable and have to invest large amounts of energy in correcting the problem? Was there a shortage of suitable soils? (The question of what constituted a 'suitable' kumara growing soil is far from clear).

As the made soil on the intermediate terrace at Matarikoriko demonstrate, the possibility that sand and gravel might be added to a sand and gravel soil cannot simply be dismissed as ludicrous. The situation at Matarikoriko is not without parallels in other parts of the country. The situation in the Waikato, with made soils formed on Waikato series soils is comparable. Grange and others (1939) have mapped made soils in the lower terraces along the Waikato River where they are formed on soils described as "coarse textured - gravelly sands, sands and sandy loam" (Grange *et al*, 1939:39). Bruce (1978) also maps made soils on recent soils of flood plains of Waikato near Huntly. Again made soils are formed on soils described as having variable textures ranging from sandy loams to loamy sand, with latter predominating (Bruce, 1978:46).

Made soils do not seem, therefore, to represent unsuitable soils being brought into production: the soils being modified are soils that had potential for kumara growing, including soil intermediate in texture - loams and sandy loams, between the clays and the sands. It would seem at least as sensible to argue that made soils were an attempt to improve production on soils with potential as to argue the 'necessity' of such treatment to get production on 'heavy soils'. (The argument is complicated by the constraint arising from the need to have a readily available supply of sand or gravel. In many instances, sand and gravel addition simply was not an option).

Conclusion

As one of the archaeologically more visible gardening practices, sand and gravel addition to soils has often figured prominently in discussions of prehistoric horticulture. As an option that was available only in restricted areas it is doubtful if it is more important than any number of other practices, most of which are archaeologically invisible, that were in use in prehistory.

Acknowledgements

The survey of the area was done at the request of, and with the financial assistance of, Petralgas Chemicals N Z Ltd. Roger Fyfe assisted with fieldwork and Bruce McFadgen was instrumental in sorting out the detail of the made soils. N109/115 and 134 were originally recorded by B. Hartley.

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