NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION NEWSLETTER

CONSTRUCTION OF A RAISED RIM KUMARA STORAGE PIT

Douglas G Sutton and
Caroline Phillips
Anthropology Department
University of Auckland

Introduction

Kumara storage pits are essentially subterranean air cavities. Conditions within the cavity may therefore be expected to parallel those in unventilated caves. In these temperatures are constant and low while relative humidity is high and constant (Geiger,1965:462-467, Table 93). However, the conditions which were evidently required for successful tuber storage are the reverse of these. Temperatures must be maintained at a level which is well above outside ground temperatures during the colder winter months. Humidity should be low enough to prevent, or at least ameliorate, bacterial infestation, mould and rot.

A number of steps were taken by the prehistoric Maori to bring about this reversal. Pits tend to be found on ridges and are particularly concentrated on northfacing slopes. Ground water is minimised on ridges generally. On narrow spurs the roofing of the pit could extend to the edges of the steep slope and in this way rain water would be very effectively shed. The raised rim pit style may be seen as an alternative water shedding device. The distribution of this form and particularly the relationship between pit form and topography are not yet well understood. At least some examples of the raised rim pit type are found on flat land (see for examples Leach,1976:Fig.6 and Appendix 6). In others the raised rim may reflect the construction of a level perimeter wall upon which roofing was laid. This applies on steeper slopes.

In September 1979 four students from the Anthropology Department at Auckland built a kumara storage pit. This was done as part of course work for the Coming of the Maori paper (03208). This note reports the method of construction. It may be of interest to Newsletter readers who have contemplated pits in the field and read papers on the 'pit problem'. Construction was directed by Mr Peta Wairua who helped his father build pits in the manner described near Te Kaha in the eastern Bay of Plenty between the two World Wars.

Method of construction

A rectangular floor plan was laid out on a flat area of water-rolled shell, sand and developing soil at Umupia (Duder's) Beach, near Clevedon, Auckland. The floor plan measured about 1.60m by 3.00m with the length running north-south.

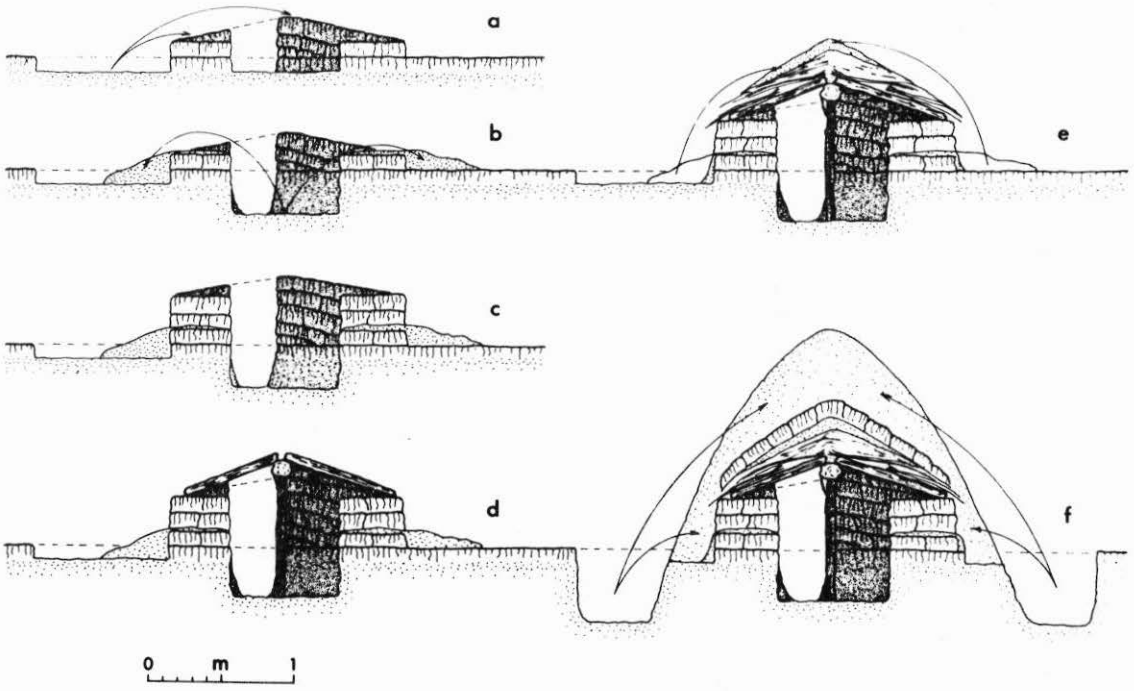

FIGURE 1. Cross-sections of stages of construction of raised rim kumara storage pit.

The turf on all but a 45cm strip around the inside of the perimeter was cut into small sods. Additional sods were cut from a strip about 94cm wide outside the perimeter on the east. These were then stacked into low walls on the unturfed perimeter on the ground plan. The end walls were domed at the centre, and a gap was left in the south end wall for the door 33cm wide (Fig. 1a). The floor of the structure was then dug out to a depth of about 20cm below ground surface. The debris was shovelled out over the side walls (Fig. 1b). Turfs were cut from a strip on the north side of the structure and these were used to build up the walls. The turfs were stacked together with the earth side of each downwards so they would bind together forming an air proof wall. The final height of the walls above ground surface at the mid-point of the end walls was 46cm, and at the side walls was 33cm (Fig. 1c).

Two sharpened stakes were then placed upright in the floor of the pit. One was placed at the mid-point of the centre line. The other was positioned on the inside corner of the door; it supported and was supported by the short end wall against which it stood. The stakes were driven into the floor until their tops were flush with the crest of the end walls, some 78cm above the floor of the pit. A ponga (tree fern, Cyathea or Dicksonia sp.) beam was then laid on the tops of the stakes and the end walls. It was lashed to the stakes and protruded about 30cm over each of the end walls. A number of other ponga beams were then split with an axe, cut into 80cm lengths and laid side by side between the ridge beam and the top of the outside walls. They formed a continuous roof over the air cavity of the pit. Some turfs and loose soil were then used to fill any obvious holes in the roofing (Fig. 1d).

Rushes were collected from a nearby swamp, tied into small bundles and laid in rows on the ponga slabs. There were two rows with the head of the first row being placed about 35cm down from the apex of the roof and the head of the second being placed at the apex, partly overlapping the first row. Further rushes were added until they formed a layer about 15cm thick.

The material which had been shovelled out over the side walls during the excavation of the pit floor was placed on the roof (Fig. 1e). Turfs were cut on a strip at the west side of the structure. These turfs were placed on top of the roof. The turfed strip around the outside was excavated to a depth below the floor level inside the pit, approximately 45cm, to form an effective drainage ditch on three sides. The final layer of the roof consisted of the shell and soil matrix dug out of the ditch. It formed a thick and stable layer which sealed the air cavity from the effects of diurnal or longer term changes in atmospheric temperatures outside the pit (Fig. 1f).

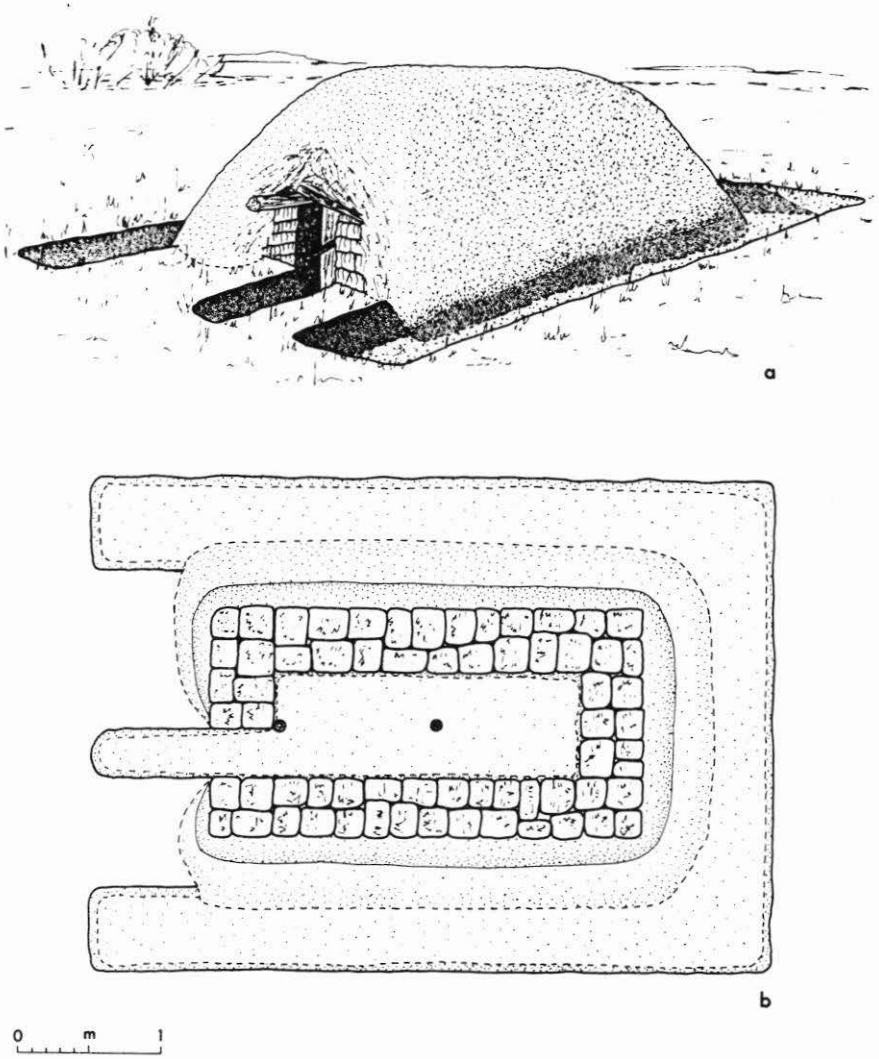

FIGURE 2. Perspective view and plan of finished kumara storage pit.

A narrow slab door formed by two 8 x 1 inch (20 x 2.5cm) planks nailed together was placed in the entrance, packed in with rushes and held in place by a short piece of timber which was keyed into the end wall and braced across the outside of the door.

When the store was completed it appeared to be a dome shaped mound of soil and shell (Fig. 2a). It was subrectangular in both long and transverse sections, approximately 2.25m wide, 3.60m long and 1.4m high externally and 0.75m wide, 2.12m long and 0.7m high internally. Only the protruding ponga beam and the small door indicated its function. A plan view is shown in Figure 2b.

Discussion and conclusion

There has been some discussion of the time and labour required to construct storage pits. In this instance a pit with an internal cavity of approximately 1.24 cubic metres was built by two men and two women in four hours. The older man supervised the construction, the younger one did the heavier work such as cutting ponga and shovelling etc. The women collected some of the materials used. One of the women took the photographs upon which this report is based. In view of the fact that this was an experiment in the sense that the construction simulated a method last used, at least by any of the participants, about 50 years ago we may expect that larger pits were built as a matter of course in similar or shorter periods by the prehistoric Maori. Unfortunately, it was not possible to monitor the temperature and humidity inside and outside the pit, although this was initially one of the objectives of the exercise. It is hoped that this report will stimulate further work in experimental archaeology, particularly on the physical properties of storage pits.

Acknowledgements

The authors and those who built the pit wish to thank Mrs Zister for the use of her property. Thanks are also due to Justine Rea, Audiovisual Centre, University of Auckland, for printing a very difficult roll of negatives.

Bibliography

Geiger, R. 1965 The Climate Near the Ground. Harvard University Press, Cambridge (Mass.).

Leach, B.F. 1976 Prehistoric Communities in Palliser Bay, New Zealand. Unpublished PhD thesis, Anthropology Department, University of Otago.