Artefacts of Wood

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The starting point of this chapter is the catalogue compiled by Axel Steensberg on an academic visit to Canberra in 1983. As a former student of his, I had invited him to take part in the Kuk work because of his long experience as an ethnographer, historian and archaeologist specialising in peasant life and labour. His role at Kuk was to work with older members of the community in the investigation of the tools and procedures of traditional agriculture in order to provide a better understanding of relevant aspects of the evidence that was being archaeologically recovered.

The Steensberg catalogue

Steensberg came to Canberra in 1983 to make a catalogue of the wooden artefacts that had been recovered during the course of work at Kuk, the majority of which were agricultural implements, with a few of other types. He also included material from other locations of drainage with which we had become familiar after the Manton excavations of 1966 made us aware of the archaeological interest of the upper Wahgi Valley as a whole (Chapter 1, section ‘The choice of Kuk’). Items salvaged from such drainage operations tended to be the larger and more spectacular items of agricultural equipment, which were only present in small numbers in the more representative Kuk collection. The people in possession of such pieces were often happy to donate specimens to us and these were sent to Canberra with the finds made in the course of our own work.

As reported in Chapter 18, Steensberg described, measured and drew some 511 items from these sources (Table 18.1), giving each of them a catalogue number prefixed by A, from A1 onwards. In the catalogue itself, he arranged them in functional categories as set out in the Table 18.1. Within each of these categories, the items belonging to it were entered in a specific order: first the finds made at Kuk; then those from other sites, mainly in the upper Wahgi Valley and neighbouring areas; finally those with no provenance, which might include pieces from both Kuk and the upper Wahgi that had lost their labels.

There were records of other relevant material that were included in the catalogue as items without an A number because they were not sent to Canberra. They were pieces that belonged to public and private collections that Steensberg had seen in the course of his Papua New Guinea (PNG) visits, such as in the PNG National Museum and at the University of Papua New Guinea in Port Moresby and, in Mount Hagen, at the high school, the local agricultural college and the short-lived Western Highlands Cultural Gallery. The records of such items were catalogued in the relevant category after the A-labelled pieces. The total listing amounted to some 540 items.

However, the A numbers bear no systematic relationship to the overall listing of which they are part. Thus in Group I, levers and planting sticks, nos 1–6 correspond to A numbers 24, 25, 99, 137a, 137b, 154. This was a result of the scattered and often temporary nature of the storage available for the wooden items at ANU after their conservation, as described for the archaeological storage overall in Chapter 18. It meant that items belonging to the same Steenberg group sometimes came to him from different stores or the same store at different times in the course of his work and were given their A numbers in isolation from other objects of the same class.

There was a potential problem with Steenberg's interpretation of the catalogued material. In the field, his procedure was to observe the current practices of highlanders in their gardens and settlements and ask the older men to set up demonstrations of what had been done before the arrival of Europeans some 40 years before. He described these demonstrations in a book, *New Guinea Gardens* (Steenberg 1980), and included the tools that were made for them as Group XIII of his catalogue, called Modern Replicas.

The specific problem with this strategy raised by Kuk, as distinct from other places where he worked, concerned the fact that the area had been abandoned in the early 20th century by its Kawelka inhabitants following defeat in warfare and they had moved to the territory of related groups in the mountains of the Sepik-Wahgi Divide to the north (see Chapter 22, the section 'Kawelka settlement history' and Chapter 23, the opening paragraph). Ul (Fig. 19.1a) and El (Fig. 19.1b) were two older men who made the tools and demonstrated the technology of swamp cultivation at Kuk in 1975. In fact, they still lived in the mountains and were at the time visiting kinsmen at Kuk, who had themselves only moved back over the previous 10–15 years after a lifetime spent in a context of dryland agriculture. As regards the upper Wahgi Valley more widely, when the first Europeans saw it in the early 1930s, they found the swamplands on the valley floor largely unutilised agriculturally, with settlement and sweet potato and mixed crop cultivation taking place on higher ground (Brookfield 1964: 22, Fig. 2; cf. Chapter 16, section 'Different histories for different regions').

In an article of 1985, Golson and Steenberg looked at the agricultural implements reviewed in the 1983 catalogue in the light of the evidence about both wetland and grassland cultivation in the New Guinea highlands overall, together with evidence as to their chronology. The stratigraphy of the *in situ* finds at Kuk showed them to be restricted to Phases 5 and 6 of the sequence. There were natural timbers of greater age in the swamp, at depths where the waterlogging responsible for their preservation had not been affected by changes in the watertable associated with periodic agricultural drainage of the swamp. The alternate wetting and drying produced by such fluctuations led to the decay of any wooden artefacts of phases earlier than Phase 5. The entire area of our investigations was associated with Phase 5, as well as Phase 6, which overlay Phase 5 to a limited extent. After the abandonment of cultivation at Kuk Swamp around AD 1900 (see Chapter 16, section 'Dating Phase 6 at Kuk'), the area became waterlogged until 1969, when drainage associated with the development of the Research Station began. The effects of that drainage on the condition of Phase 5 and Phase 6 artefacts were becoming obvious by 1977. The actual digging of the major drains across the eastern half of the Station, by Station labour in 1972, to allow us to get to work also took its toll on the wooden remains because some were damaged or broken in the process.

Figure 19.1 Ul and El.

a) Ul is the older of the two men in this picture. His younger companion is Korowa, from Kuk, who appears in Figure 12.6. The men are holding paddle-shaped spades recovered from the swamp during early drainage for the establishment of the Research Station and put away in the Station store. b) Here El is felling a tree with a stone axe as part of the demonstrations and experiments organised during Axel Steensberg's visit to Kuk in 1975.

Source: Photographs by Philip Hughes in the Kuk archive, 1975.

Agricultural tools and technology at Kuk

Digging sticks and tools of clearance

By far the most common agricultural tools recovered from Kuk Swamp were digging sticks of a wide range of sizes. They could be seen as encompassing the two types commonly described in the literature of New Guinea highlands agriculture in both wetland and dryland contexts (Golson and Steensberg 1985: 370–372) and represented by Groups I and II of the Steensberg catalogue: the shorter, lighter, smaller-diameter stick used by women (Group II, see Fig. 19.2h) in weeding and harvesting the sweet potato tubers planted in the soil; and the men's longer, heavier, larger-diameter digging sticks (Group I, see Fig. 19.2i), which had roles in soil formation through the clearing of swamp vegetation and in the digging of planting holes. Mostly the tools were found in the bottom of ditches, where they had been deliberately put so that water could conserve them and lend them extra weight. The women's sticks were typically in the perimeter ditches of their houses and the men's were in field ditches.

Figure 19.2 New Guinea agricultural implements discussed in the text.

Source: After Golson and Steensberg (1985: Fig. 1), reproduced with permission.

Both sticks are simple tools made of straight lengths of timber, single- or double-bevelled at one end to form a working edge. From their descriptions, one would expect the two categories to be readily distinguishable by their length and thickness, but Golson and Steensberg (1985: 373–374) show this not to be so in the case of the collection from Kuk and other upper Wahgi sites. From a statistical analysis of 63 complete or virtually complete specimens, they suggest that 23 sticks 40 mm or more thick belong to the heavier type associated with men, while 37 sticks 30 mm and less thick belong to the thinner type associated with women. Only three of the latter group are more than 1.1 m long and only three of the former group are less than 1 m. In this situation, it cannot be assumed that double bevelling would be characteristic of men's digging sticks and single bevelling of women's. In the collection of sticks from Kuk itself, the nature of the bevelling could be seen on 28 of the 39 sticks considered to be men's and on 36 of the 49 considered to be women's. Of the 28 sticks presumed to be men's, three are bevelled with a double facet for every one with a single facet. Of the 36 sticks presumed to be women's, there are three bevelled with a single facet for every two with a double facet. It is understandable in the light of all this that there were, at times, differences of opinion among project members in the field, and even among the workmen, as to which category a particular digging stick was likely to have belonged.

The demonstration of swamp grass clearance that was organised for Steensberg by the two older Kawelka men, El and Ul, revealed a set of tools and practices that it would have been difficult to reconstruct from existing evidence (Golson and Steensberg 1985: 355–358; cf. Steensberg 1980: 53–59). These included two uses of the stone axe: chopping cane grass at its base before removing its clump of roots with a heavy digging stick; and cutting through the swamp's short grass cover, which was then pulled back from the line of the incision by men using single-pronged long-handled wooden hooks (*mak*; see Fig. 19.2a), while others freed it from its roots by slashing them with what they called a 'wooden bushknife' (Steensberg 1980: Figs 38–41; see Fig. 19.2b here). The name for this is *yakla* in the local language, after the palm species from whose wood it was made.

The use of stone blades to cut cane grass conforms with the observations of the early missionary Vicedom, who during the 1930s lived at Ogelbeng above the Wahgi Valley on what Russell Blong (1986: 288) calls the southeastern apron of Mt Hagen, not far from the present Mount Hagen township (Vicedom and Tischner 1943–48: 185 and 1983: 209). Vicedom, however, makes no mention of either *mak* or *yakla*, presumably because they were tools of swampland clearance that had no place in the grassland operations with which he was familiar. For their part, El and Ul used both implements presumably because the Kawelka, on the occasion of their defeat in war, carried knowledge of them from the swamp at Kuk to the mountains of the Sepik-Wahgi Divide, where there may have been occasion to continue to employ them. Certainly, the two old men readily identified two *yakla* among the wooden implements uncovered during early drainage work at Kuk Station and stored at the Station. In addition, shortly after Steensberg had left Kuk in 1975, what was interpreted as a broken *yakla* was found in a Phase 5 ditch under excavation in the southeast corner of the Station (Golson and Steensberg 1985: 377). As regards the hook, while no example has been reported from Kuk or any other upper Wahgi swamp site, Ballard (Fig. 5.11) illustrates its current use in swampland agriculture in the Tari Basin in Southern Highlands Province, while Golson and Steensberg (1985: 358) report the discovery of an archaeological specimen at 1–1.5 m depth in a swamp in the same region.

Long-handled implements with paddle-shaped blades

Implements of this general description but varying form are widely distributed through the New Guinea highlands, where they are associated with wetland ditching, dryland trenching and the earth shifting that accompanies both in the preparation of gardens (Golson and Steensberg 1985: 351–355). Steensberg's catalogue deals with the upper Wahgi corpus of such tools under the name of long paddle spades and in four varieties. The first two varieties, both belonging to Group III, are either 'spatulate', where the blade tapers gently into the shaft (Fig. 19.2d; cf. also Fig. 19.3), or 'shouldered', where the top of the blade is angled into the shaft (Fig. 19.2e; cf. also Fig. 19.3). The other two varieties form two classes: Group IV, which has implements where the upper part of the long handle has some form of thickening serving as a counterweight (Fig. 19.3 shows three or four examples), while Group V has double paddle spades with blades at both ends (Fig. 19.2c).

The most common forms in the Wahgi collection are the spatulate and the shouldered paddles, though they were only found in low numbers during our own investigations at Kuk Swamp (three examples) compared to those uncovered during drainage work elsewhere on the Station and around the upper Wahgi wetlands (16 examples; see Table 18.1). A few examples from the Station store were in a good enough state of preservation to be used in a demonstration of their use and performance in ditch digging that Ul and El conducted on Station land (Steensberg 1980: 87–95). When they were asked to make replicas for us in 1975 to increase the number available for the demonstration, we were surprised when they supplied not only two single-bladed specimens, but three double-bladed ones as well.

Figure 19.3 Long-handled implements with paddle-shaped blades from the upper Wahgi, leaning against an end wall of the expedition house at Kuk Station.

There are a variety of implements on display: two or three cases where spatulate paddles (Steensberg Group IIIa), and one case where a shouldered paddle (Steensberg Group IIIb), are combined with a long handle with a thickening of the upper part to serve as a counterweight (Steensberg Group IV). Korowa's spade in Figure 19.1a combines the features of Group IIIa and Group IV.

Source: Photograph by Axel Steensberg, 1975.

At the time, there were no double-bladed tools on the published record or in the material recovered from Kuk and other upper Wahgi sites. However, at the end of the 1972 season, Golson had asked one of the workmen, Ivan Kuri, an Elti man from Baglaga (on the edge of the eastern apron of Mt Hagen just west of the North Wahgi Swamp and 6–7 km north-northwest of Kuk) to get his father to make a set of traditional gardening tools before our return in 1973. The only two that were produced were both double-bladed paddle spades. This was one of the reasons why initially we thought of them as tools of dryland cultivation (e.g. Steensberg 1980: 80–84). However, evidence was soon forthcoming to suggest their use in both dryland and wetland cultivation (Golson and Steensberg 1985: 359), including an example from Kuk Swamp itself (Gorecki 1978), though outside the boundaries of Kuk Station and too close to the swamp margin to be put decisively in the wetland sphere.

The replicated double-bladed tools of the 1970s and fossil specimens subsequently reported are broadly similar in dimensions. They fall in the middle range of the upper Wahgi archaeological collection of single-bladed tools, where the spatulate and shouldered forms are considered together because they are not separable in terms of their dimensions (Golson and Steensberg 1985: 363–367, Tables 4–6). Their size range is so wide as to suggest that implements of different function are represented, though plots of total length, blade length and blade width, separately and together, failed to isolate any groupings. The data show a strong relationship to exist between blade length and total length, a much weaker one between blade width and total length and none between blade length and blade width (Golson and Steensberg 1985: Tables 5 and 6).

Figure 19.4 Long-handled paddle spades in use at an early stage in the preparation of garden beds with spoil from the grid of garden ditches whose pattern is marked out on the surface in the foreground. There is what seems to be a hafted axe on the ground in the middle of the picture.

Source: M.J. Leahy collection, 1933–34, general Kuk-Baisu area, courtesy of John Black, reproduced with permission.

Forty-eight of the 62 complete specimens in the total upper Wahgi collection (meaning all catalogued items whether accompanied by an A prefix or not) fall between 1.5 and 2.5 m in length, as do both of the single-bladed implements made in 1975, while 18 of the 48 are between 2.0 and 2.2 m, as is one of the 1975 pieces (Golson and Steensberg 1985: 365). The upper Wahgi examples are thus clearly longer than those ethnographically recorded for other highlands locations of swamp drainage (Golson and Steensberg 1985: Table 4)—the Huli of Southern Highlands Province of PNG and, in Indonesian New Guinea, the Kapauku of the Paniai (formerly Wissel) Lakes and the Dani of the Grand Baliem Valley. It seems reasonable to suggest that the differences in length reflect differences in use, the Huli, the Kapauku and the Dani slicing the swamp mud into blocks for removal by hand (Golson and Steensberg 1985: Table 4, notes 7–10), while in the upper Wahgi, by the evidence of the 1975 demonstrations, the implements were used as shovels (see Steensberg 1980: 87–95). This suggestion is supported by the fact that the blades of the fossil examples have cross-sections approaching the plano-convex (Fig. 19.2c–e), which is typical of the implements made for the demonstration, single-bladed and double-bladed alike. The flat or slightly hollowed face of these was used for defining the sides of the drain being dug and removing the earth when digging it. Such implements can be seen in use in photographs of dryland agriculture taken in the early days of European contact with the upper Wahgi (Fig. 19.4).

The gridiron pattern of raised bed gardening, whose operation is shown in such photographs, is typical of recent upper Wahgi agricultural practice, whether wetland or dryland, where the grassland sod is not turned over to produce the garden soil, but is instead provided by the spoil from the digging of the intervening grid (Fig. 19.5). This is characteristic of the sweet potato and mixed cropping of Kuk Phase 6, but goes back beyond the arrival of the sweet potato, with

evidence for gridded patterns of dryland trenching paralleling the wetland practice of Kuk Phase 5, when *Dioscorea* yams are suggested as the staple crop (see Chapter 15, section ‘Phases 3, 4 and 5 compared’). One of the long-handled paddle spades thought to have been the main tool in cultivation of this sort was found in the fill of a Phase 5 ditch cut across by the digging of Station drain B12c/d (for location see Fig. 17.3) during one of the demonstrations of wooden tools in use that were set up for Steensberg in 1975. He was so delighted that when a piece of wood was excavated in association with the spade, he offered to have it dated at the Copenhagen Radiocarbon Laboratory. The radiocarbon age was reported as 370 ± 70 BP (K-2643), which calibrates to between 300 and 520 years BP (Before 1950) at two standard deviations, making the spade in question the oldest dated wooden artefact found at Kuk Swamp.

The unsatisfactory aspect of such demonstrations set up for Steensberg lay in trying to use them to compare the performance of wooden spades with that of steel spades (Steensberg 1980: 87–95). The main difficulty was that the wooden spades were being asked to dig a steep-sided drain to specifications of the Station management based on the use of the steel spade, i.e. some 0.9 m wide at the top reducing to some 0.4 m at the base about 1.6 m below (Golson and Steensberg 1985: 361–362), whereas the larger prehistoric ditches in the swamp, dug with wooden spades, tended to be as wide as they were deep. For discussion of the matter of performance, see Chapter 5, section ‘Social contexts for wetland drainage’, and Chapter 14, section ‘Digging the major disposal channels’.

Figure 19.5 Fully formed garden beds made from the spoil produced by the digging of the garden grid.
Source: M.J. Leahy collection, 1933–34, general Kuk-Baisu area, courtesy of John Black, reproduced with permission.

Shorter paddle tools

One of the implements made for the demonstration of agricultural tools and techniques in 1975 was a short paddle spade of spatulate form and plano-convex cross section (Fig. 19.2f), said to have been used by women for breaking up the clods of earth that the men threw on to the surface when digging the garden grid with their long paddle spades (Golson and Steensberg 1985: 367–368). Of the few upper Wahgi archaeological examples of this kind listed in the Steensberg catalogue there was only one definitely from Kuk Station (1983: 54, no. 228, A328), recovered from an old ditch that was cut across when Station workmen were digging the south drain of E–W Rd 3 at the beginning of our work in 1972. The place where it was found, we came to realise, had in Phase 6 been an area of women's housing at the northwest corner of block C9 (for location see Fig. 17.3). However, another example (catalogue 1983: 55, no. 236), not taken to Canberra, was said to have come from gardenised land just beyond the southern Station boundary at its western end.

These three short paddle implements, one replicated, two archaeological, are joined by a small number of other archaeological examples from upper Wahgi sites to form Group VI, short paddle spades, in the Steensberg catalogue. With lengths of up to about 1.5 m, they fall at the lower end of the range for the upper Wahgi archaeological collection of Steensberg's category of long paddle tools (Group III). Only 14 of the 62 complete implements in that collection are less than 1.5 m in length (Golson and Steensberg 1985: 365), so it is possible that these in fact belong in Steensberg's short paddle spade category.

The 1983 catalogue category of short paddle spades includes a few that Golson and Steensberg (1985: 369–370) regarded as a separate type, following Jocelyn Powell (1974: 21). Powell used the botanical term 'hastate-shaped' or 'hastate' for two short paddle spades in a small archaeological collection of wooden agricultural tools from the Mount Hagen region that she was putting on record. The distinctive feature of these was the combination of short overall length with a blade both longer than the shaft, the opposite of all other single-bladed paddle tools, and wider in relation to total implement length than normal in such tools (Powell 1974: Fig. 3, C1 and C2). One of the Powell spades (C2) came from Tibi Plantation immediately east of Kuk, the other (C1) from the Minjigina Tea Estate some 15 km north of Mount Hagen town at an altitude of 1900 m. The example shown here as Figure 19.2g is a drawing by Steensberg of a spade in the former Western Highlands Cultural Gallery said to have been found in the Kuk village area, but there is confusion in the Steensberg catalogue (1983: 56, no. 237) about when it was found and when Steensberg drew it.

Powell (1974: 22) was given a list of uses for the hastate spade in cultivation, none of them a function exclusive to the type (cf. Golson and Steensberg 1985: 370). An additional function (Powell et al. 1975: 13) was its use in straightening trench walls and Golson and Steensberg (1985: 370) refer to an illustration of a young man working the sides of a dryland trench with an implement of short-handled and long-bladed type at a Kapauku village at the Paniai Lakes in the highlands of Indonesian New Guinea (Ishige 1977: 103, top right; Fig. 13.14). This was interesting in the light of the find of a hastate spade in 1976 during the drainage of swampy ground at the High Altitude Experiment Station of the Department of Agriculture, Stock and Fisheries at Tambul in the upper Kaugel Valley 45 km west of Mount Hagen town (Golson 1996; cf. the preliminary notice in Golson and Steensberg 1985: 369–370, 376). Steensberg included the tool in his catalogue (1983: 54, no. 231, A2), concluding from the use wear on the blade and the balance of the tool that it must have been used with the right hand at the top of the handle and left hand holding the edge of the blade and he made a schematic drawing of the

tool to this effect. This was before I had introduced him to the Ishige photograph, which shows the young man's hands deployed in precisely this way. He later (1986: 96–98) published his schematic drawing with the Ishige photograph to make the point.

The Tambul spade is the oldest agricultural implement of wood yet dated in New Guinea, with a radiocarbon age of 3930 ± 80 BP (ANU-2282) and a calibrated age range at two standard deviations of 4564–4130 BP. In terms of the Kuk Swamp sequence, this is early Phase 3, which sees the first appearance of rectilinear ditch networks at the Kuk site. These are characterised by substantial ditches with steep sides and flattish base like those of Kuk Phase 5, when they are associated with the use of long-handled paddle spades. The ditch in which the Tambul spade was found is of the same type, as much as 0.7 m below the surface from which it is thought to have been dug and with a slightly sagging base some 0.25 m across widening to 0.5 m above (Golson 1996: Figs 3a–3c). The hastate type of spade, of which it is an example, evidently had a role in the making and maintenance of such ditches.

As seen in Chapter 13, section 'Regional processes in the upper Wahgi Valley and beyond', the Tambul evidence, from 2240 m above sea level, indicates the expansion of agriculture into altitudes marginal for many of the known cultivars (cf. Table 4.1). Golson (1996: 163–167) discusses the issues arising from a proposition that the most likely candidate is *Colocasia* taro, *Colocasia esculenta*, with its greater altitudinal tolerance than other potential staples and its appropriateness for swampland cultivation.

Other artefacts from the swamp

I now turn briefly to other upper Wahgi swamp finds in the Steensberg catalogue that are present in such small numbers and/or come with such poor information as to have only a limited contribution to make. They include:

- a. nine pieces from the wooden hafts of stone axe or adze blades (catalogue Group VII);
- b. eight headrests (Group VIII), five from Kuk, one find predating the archaeological project, the others found during its first season; and
- c. five or six clubs (Group IX), of whose agricultural purpose, if any, Golson and Steensberg (1985: 379) could not be certain, though they cite the use of specific clubs in an agricultural context.

Somewhat more informative are the items listed in Group X, weapons, though they are few in number. They include an arrow tip of black palm found in the fill of a late ditch at Kuk and an arrow shaft of bamboo found at Kindeng, 20 km east down the Wahgi Valley from Kuk. Missing from Steensberg's catalogue, and from the surviving Kuk wooden artefact collection, are two arrowheads found in 1974 in the early Phase 5 stage of a composite ditch dug in the fill of the Phase 3 palaeochannel we called Joseph's Baret (Denham's 107 of Fig. 13.7), which crosses the southern margin of a small ash hill cut through by Station drains A10f/g and g/h. In the Phase 6 stage of the same ditch, lying horizontal directly above the arrowheads in drain A10g/h, there was a man's digging stick, which survives as no. 28 (A344) in Steensberg's catalogue (1983: 10). They are all presumably linked with male use of the small hill in the past, as during the final occupation of Hed Mound (Fig. 17.3, marked H, and Fig. 17.17F) and, less clearly, Blong's Nob (Fig. 17.3, marked B), which had the earthworks of a men's house on it before their destruction during early Station development (cf. Chapter 17, section 'Lampert and a men's round house excavation of 1972').

Steensberg's catalogue (1983: 62) also has in Group X, as no. 266, A427, a long billet of black palm, the raw material for arrowheads and spears. This was found in the fill of a highly surface-visible Phase 6 ditch running across the northern margin of Blong's Nob where it was dug through by Station drain A9c/d in mid-1972 (see Baret 3 of Fig. 16.12, where the absence of drain A9c/d itself from the drawing is explained). The billet, recorded by Steensberg as 3.38 m long, 30 mm wide and 20 mm thick, was lost to the 2003 fire discussed in Chapter 18.

House timbers and fence stakes

Group XI is by far the largest of Steensberg's categories (Table 18.1), numbering 195 pieces from Kuk alone, while there are fewer than 50 in total in the Wahgi and unknown columns because these are items that attract little interest. Besides the matter of discriminating between house timbers and fence posts, which is considered below, there is the more difficult one of separating fence stakes from digging sticks, which are often made of lengths of timber of similar thickness. In principle, digging sticks are bevelled at the end on one side to produce the appropriate edge for their particular functions, while stakes are worked around the circumference to make a point for sticking in the ground. Even when ends have been lost or damaged or do not conform to the 'rules', a distinction between stake and digging stick may still be possible when the piece is from a split timber unsuitable for a handheld tool. There is also the consideration that while digging sticks were normally found lying horizontally in ditches, it is the lower part of vertical posts and stakes that was likely to be preserved, the upper part being above water. Thus, while the 66 digging sticks in the upper Wahgi archaeological collection for which a length measurement is available range between 0.49 and 1.85 m (Golson and Steensberg 1985: Table 12), the 195 posts and stakes from Kuk in the Steensberg catalogue fall between 0.11 and 1.4 m, with 143 below 0.4 m and only 10 above 0.6 m. The possibility of separation by preserved length, however, was considerably reduced by the circumstances of recovery, where, during drain digging, objects were easily broken and their findspot was uncertain.

All house posts and fence stakes will have been pointed to serve their purpose, but the timbers of central posts that bore the weight of the structures built around them or from the less bulky posts used in the walls should be distinguishable from stakes by being thicker or wider. In the house timber/fence stake grouping of Steensberg's catalogue, besides one item identified as a ridgepole, there are 44 thicker or wider items for which he used the terms 'pole'/'post' or 'plank'/'board' compared with 195 items for which he used the term 'stake'. By this criterion, fence stakes are five times as common in the Kuk wood corpus as the next most common object, women's digging sticks, and three times as common as men's and women's digging sticks combined. This does not seem unreasonable given that digging sticks were personal items cached in ditches for maintenance, while stakes formed the infrastructure of fencing that controlled the movement of pigs that were stalled overnight in women's houses and let out to forage during the day in fallow land outside the cultivations.

In a discussion of fencing against pigs, Steensberg (1980: 120) makes the point that topography and subsoil are among the factors determining the type of fencing used. In the case of the soft subsoil of the drained swamp at Kuk, the main evidence is of fences consisting of a single line of stakes set into the ground at intervals (Fig. 19.6). On the ethnographic evidence, the gaps between such stakes might be filled with other stakes not appreciably penetrating the ground and held in place by stringers of vine or cane grass (Fig. 19.7). We do not have much archaeological data because few fence lines were discovered during excavation, they were not systematically followed, unlike ditches, and, again unlike ditches, there were sporadic gaps in the evidence for their course.

Figure 19.6 Part of the fence line running parallel to Simon's Baret.

a) with the bottom ends of stakes preserved in place (length of tape exposed, plus the case, 0.46 m); b) stakeholes with little wood preserved (length of tape exposed, plus the case, 0.3 m).

Source: Photographs by Jim Rhoads, Kuk archive, 1974.

Our fullest evidence comes from the fence lines found at various places along, and about a metre east of, the east bank of Simon's Baret, as described in Chapter 16, section 'Fences in the swamp'. In all of these cases, the single line of holes, typically retaining the pointed ends of stakes, is often irregular and interrupted, the stakes and their holes varying in thickness, typically between 30 and 60 mm, and in distance from their neighbours, typically between 0.1 and 0.2 m. The indications are that the fence line along Simon's Baret was put in place after the fall of Tibito Tephra and thus belongs to Phase 6. It is argued in Chapter 16, sections 'Is Phase 6 a separate drainage phase?', 'Fences in the swamp' and 'Ditches in the swamp', that this phase was the time of the arrival of the sweet potato and its adoption as the staple crop. Gardening largely gave way to the grazing of pigs in the area of Station land to the north and east of Simon's and Wai's Baret, with the fence providing protection against them for gardens south and west. However, we do not know whether or how far the fence continued beyond where Simon's Baret joined Wai's Baret near Station drain B10b/c (see Fig. 16.3).

Figure 19.7 Stake fencing on dryland at Kuk, combining different styles but including known or likely features of fence lines erected in Kuk Swamp: wooden stakes separated from their neighbours and held together by a stringer of vine.

Source: Photograph by Paul Gorecki, 1977.

The great majority of the stakes recovered at Kuk came from fence lines discovered and displaced in the process of drain digging, particularly during the most intensive period of that activity that took place in 1972. While the information provided under these circumstances is limited, it appears that fences were being widely installed, with NNW–SSE and ENE–WSW orientations like the ditches of both Phases 5 and 6. Though it is impossible to attribute these stakes to the phase to which they originally belonged, it may be suggested that during Phase 5, when the whole of the eastern half of the Station shows evidence of a continuous history of localised drainage and cultivation (see Chapter 15, section ‘Reasons for disintensification’), fencing became an integral part of the system because pig-keeping had definitely been incorporated in it by late Phase 5. During Phase 6, when drainage and cultivation had largely withdrawn to the south and west of Simon’s and Wai’s Baret, there was still need for fencing in the localised areas of housing and associated drainage that were maintained to the east on the borders of the pig-grazing land (see Fig. 17.3).

Our assumption has been that the fence at Simon’s Baret was a stand-alone defence against pigs, backed by a ditch but not associated with an earthen rampart of ditch spoil enclosing the fencing, as seen in Paul Gorecki’s photographs from his ethnographic research of the late 1970s (Gorecki 1982: Plate 23; see Fig. 19.8 here) and, indeed, others from the contact period nearly 50 years earlier. In the field there was no reason to suspect the presence of large mounding on either bank of Simon’s Baret (cf. Fig. 15.8 cross-section) or indeed of Wai’s Baret (cf. cross-sections in Figs 15.6 and 15.7, respectively). The fact that the fence line along Simon’s Baret was built after the fall of Tibito Tephra indicates that there was no fence line there in Phase 5. This is understandable in view of the fact that in that phase, when there were cultivated blocks on both sides of Simon’s Baret (Fig. 15.13), there may have been no pigs in early Phase 5 and in late Phase 5, when there were, anti-pig measures took a different form from that instituted in Phase 6.

Figure 19.8 Swamp fencing at South Kuk.

This image is similar to an example reproduced in Gorecki's 1982 thesis as Plate 23, which is described as being built to enclose a future communal garden, with the land across the ditch used as pig land.

Source: Photograph by Paul Gorecki, 1977.

The role of *Casuarina*

A comprehensive programme of timber identification carried out on the wooden artefacts from Kuk by Laurie Lucking in 1975 and 1976 showed that overwhelmingly the fence stakes were made from *Casuarina* and the same was true of the great majority of the agricultural implements that she inspected. Jocelyn Powell (1974: 21, Table 3) had reported similar results for a collection of gardening tools from the Hagen area, in which 18 of the 25 tools in question were made of *Casuarina*. The genus shows a marked rise in importance in upper Wahgi pollen diagrams around 1200 years ago. This may have been due to its deliberate planting, with that of other fast-growing trees, to provide supplies of timber in the conditions of deforestation that accompanied the agricultural process. There is also its possible role in a system of tree-fallowing that is important in some highlands areas today. These issues are discussed in Chapter 14, section 'Dryland agriculture after Phase 4'.

This text is taken from *Ten Thousand Years of Cultivation at Kuk Swamp in the Highlands of Papua New Guinea*, edited by Jack Golson, Tim Denham, Philip Hughes, Pamela Swadling and John Muke, published 2017 by ANU Press, The Australian National University, Canberra, Australia.