An Ancient Land Management Practice in Raga, North Pentecost, Vanuatu

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THE RAGA PEOPLE of North Pentecost, northeast Vanuatu, are discussed by Joël Bonnemaison at many places in *L'Arbre et la Pirogue* (Bonnemaison, 1996). The people and the land are distinctive in a number of ways. Outstanding is their matrilineal social organization with its basis in scattered land holdings claimed by each *vara* (matrilineage), claims which themselves remain constant through time, although their users change. The Raga have a relatively high population density within the general context of northern Vanuatu, and are cultivators primarily of yams. By contrast, the other relatively close-settled people on Pentecost, the Apma people of the centre of the long island, grow principally taro. Raga, the name its people give to the land as well as themselves, is an uplifted plateau of limestone, 140 to 400 m above sea level, about 10 km in length from south to north, and is only 2-3 km in width except in the south where it widens to join the main island. Slopes to the sea on each side are steep, often more than 30°, and the plateau has two distinct levels separated by gentler slopes. The whole plateau is mantled by several metres of volcanic ash, late-Pleistocene to Holocene, which is the basis of the fertility of its soils (Mallick and Neef, 1974).

The matrilineal system for management of society and its territorial rights is the aspect of the Raga most fully explored by Bonnemaison (1996 : 205-27). He devotes a whole chapter to it and its history. Raga is one of his most distinctive cases of *"région-territoire"*. Because of a general population density now around 100 per km^2, it is also a striking example of his « *îlots humanisés* » of managed land among a general dominance of forest characteristic of northern Vanuatu. The permanence of territory and its management is our point of entry into this short report, which we hope will add a small new dimension to Bonnemaison's detailed work in Vanuatu. Bonnemaison quoted the Raga themselves on the permanence of their system of land holding : *"ground i stap, be man em i move (la terre reste, les hommes bougent). La terre, ses routes, ses lieux, ses territoires sont permanents"* (Bonnemaison, 1996 : 209).

Our evidence suggests a close link between this cultural practice and the manner in which land has been managed for farming. We studied only a part of Raga, the slopes around and within the plateau. Although it has deep soils and retains some areas of long-enduring crop cultivation, much of the plateau land has for most of this century been planted under

coconuts, and the greater part of the arable farmed area is probably now on the slopes. We found evidence to suggest that farming on these slopes has a very long, and even ancient, history.

We went to Raga in 1992 and 1993 specifically to look at the slopes, reporting for the International Board of Soil Research and Management (IBSRAM). IBSRAM's "Pacificland" network were and still are experimenting with alley-cropping as a means of slope management at a site in Raga, on a hillside at Sara near the airstrip (Brookfield, 1992 ; Librecht, 1992, 1993 ; Billoneau, 1995 ; Humphreys, 1996) (1). The site had been chosen because there is a much older system of apparent slope management in this area. On these slopes is a set of steps or accumulation terraces, of a type that we have elsewhere referred to as *taluds* (Humphreys and Brookfield, 1991), produced by long-continued agricultural use. They had been described simply as "terraces", but we soon saw that they are the longer cross-slope members of the boundaries of mainly oblong-shaped fields. Trees planted on these boundaries have, on the cross-slope sections, created sediment traps that have held up the downslope movement of a very loose and friable soil. Human recollection gives them an age of at least a century.

Raga agriculture

The present mixture of crops grown on Raga farms continues to be dominated by yams (*Dioscorea alata*), but also includes sweet potatoes (*Ipomoea batatas*) and manioc (*Manihot esculenta*), supplemented by banana (*Musa* spp), papaya (*Carica papaya*), maize (*Zea mays*), taro (*Colocasia esculenta*), grown without irrigation, and a large number of other edible crops. Coconuts (*Cocos nucifera*) are only grown as scattered individuals on the slopes. Of major importance are patches and isolated specimens of kava (*Piper methysticum*), including different varieties of this potent narcotic. Several of the food crops are New World plants of relatively modern introduction, and among the present crop mix we can only be certain that the yams, taro and kava have endured from pre-colonial times. Crops are interplanted everywhere except in those few plots where they are grown for commercial sale. In 1992 cash cropping was increasing for supply of the "roadside market", where produce is left to be picked up and paid for by passers-by, and for the small-scale supply of root crops and kava to the urban markets by the infrequent ships. At the time of our visit the price of copra was unrewarding, and coconuts were being collected almost solely for domestic use.

On the plateau, some land is densely-planted in semi-continuous arable use, but on the slopes fields are cultivated for from one to three years, then fallowed. The normal fallow period is stated as seven years, and this was the actual reported period on all fields we surveyed. Elsewhere the fallow period is said to have been reduced to as little as three years. Fields not in use are browsed by domestic pigs, and nowadays all adult pigs are tethered. Formerly, the fallow fields were separated from the cultivated fields by live hedges of long-enduring life. The hedge trees were interlaced to form effective barriers against the passage of pigs. Today, those hedges that survive are open, and the barrier often consists of no more than a line of cane grass, or is even altogether absent. When land is returned to cultivation, Vanuatu farmers generally clean a plot completely of weeds, reportedly in order to reduce infestation by

1. We were accompanied in the field by Sebastian Librecht and Harry Salong of the Vanuatu Department of Agriculture, Livestock and Horticulture. Sebastian Librecht, who wrote up a part of the material we collected and also added his own, was of major assistance. We are also grateful to Sol Ala, John Atkins, Harbeit, Thomas Liu, Seilas Liu and John Riu for guidance and information in the field.

pests. On slopes, they pile the trash on the lower edge of the plot, where it adds to the barrier.

The soil is an Andosol, derived from the volcanic ash over the limestone, having a brownish-black humic topsoil consisting of a pedal silty clay about 15-30 cm thick on the slopes (2). It is underlain by brownish, weakly pedal layers of sandy clay loam and silty clay that form the subsoil. Raga farmers identify these respectively as *tan meto* (topsoil) and *tan memea* (subsoil), and clearly understand the much higher quality of the former (3). On parts of the slopes, *tan memea* is now at the surface, all the topsoil having gone. Although rainfall is high, the climate is extremely windy so that soils dry quickly. On steep cleared slopes, small clods of soil can slide downhill after disturbance even when dry, and are easily moved by water. Finer fractions are also lifted and moved by the wind when the land is bare.

The hedges and their effects on the soil

The hedges are all composed of fast-growing small trees, about half being identified (in local and botanic terms) as *Burao* (*Hibiscus tiliaceus*), a species common in secondary bush. Others were *Adomai* (*Piptutus argenteus*), *Venue* (*Macaranga tanarius*), *Nanaara* (*Emilia sonchifolia*) and *Vilide* (*Ficus subulata* (4)). Those hedges planted across the slope quite soon accumulate a bench of soil behind them, derived from the slope above. While a proportion of the eroded soil passes through the barriers, a significant amount is held. Many of the benches, or *taluds*, have almost-level sections close to the hedges. These benches vary in width from one to as many as ten metres. They are used for more demanding crops, and a high proportion of the yams are planted on these benches, at a much closer spacing than on the eroded slopes above. We measured spacing of yam mounds, finding that on the steps they are as close as 75 cm x 75 cm, whereas on the slope yam mounds are commonly a metre apart horizontally and 1.25 m apart in the vertical dimension. The escarpment below the bench, sometimes as steep as 40-50°, varies from one to five metres in height. Where trees or their stumps continue to exist, some still sit on the top of the escarpment, while others grow almost horizontally out of its face, pressed down by the weight of soil accumulated above them. *Talud* benches rarely occur on slopes gentler than 10°, or steeper than 28-30°. A normal spacing of between 20 and 30 m tends to be closer on the steeper slopes.

When asked the purpose of the live hedges, Raga farmers describe them as land boundaries, and call them by the name for such boundaries, *bwalena*. They recognize that the cross-slope *bwalena* hold a good deal of the moving soil, and create good planting land, but this was not the purpose of their construction. Few Raga farmers still plant living hedges, and some have cut them down; tethering is now sufficient to manage the pigs without them. Moreover, the *taluds* are well consolidated, and the grass banks seem to be sufficient to hold

2. Quantin (1985) identifies four major groups of andosols in Vanuatu. The Sara site conforms to the saturated (*i.e.* high base saturation) or eutric andosol group.

3. Soils were analysed by standard soil chemical analysis. Results are based on a detailed profile sampling to 1.5 m by Humphreys, but also include results for surface samples collected for Ian Webb of the Pacific Regional Agricultural Programme, reported by Librecht (1993, Appendix 2). These volcanic ash soils are afflicted by high phosphate-fixing capacity (71-91 per cent), and hence the higher fertility of the *tan meto* soils is controlled by organic matter which in 13 samples averaged 8 per cent in the upper 15 cm (SD 0.9 %). In contrast, organic matter declines to about 0.7 per cent at a depth of 60 cm, in the *tan memea*.

4. Botanical identifications against local names are from Cabalion and Morat (1983) and Cabalion (1984). We were greatly assisted in making these identifications by Darrell Tryon of ANU.

most of them. There is little evidence of rapid breakdown, though they can disappear ; farmers pointed out a minor ridge 2 to 4 cm in height across one cultivated slope (on the IBSRAM experimental site) between the *taluds*, a minor ridge we would not have noticed unaided. They said this was the remains of an old *bwalena*. If the two present banks, above and below, had been there at the same time, its addition would have halved the intervening space.

Evidence of history in the soil

We obtained more detailed information on cultivation history from a trench 8 m long, dug through an intact *talud*. Six layers were identified using a soil-stratigraphic approach, measuring soil morphological, chemical, sedimentological and micromorphological features (Figure 1). Layer 1, the uppermost cultivated layer, thickens across the *talud* from 10 cm at the base of the adjoining hillside to about 20 cm at the downslope side of the *talud* front. Layer 2 also thickens across the *talud* and, like Layer 1, forms a continuous mantle. Layer 3 is a thin transitional unit between the two topsoil layers and the brownish subsoil in Layers 4-6 below. Dates from two pieces of charcoal sampled from between 5 and 20 cm in Layer 1 returned modern ages, but a date of 980 ± 80 years before present (Beta-67297, AMS-9890) was obtained from 24-28 cm, near the base of Layer 2 near the front face of the *talud* on the downslope side. This could represent the onset of *talud* development, but in view of its position it is more likely that it represents the original topsoil and pre-dates *talud* formation.

Four cylindrical structures were found beneath Layer 1, penetrating the base of Layer 2 and into underlying layers. Two are shown on Figure 1. They are 10-30 cm in diameter and penetrate 55-125 cm below the surface into the subsoil. The infill is dominated by loosely packed aggregates of topsoil and some subsoil, and the organic matter content (2.8 %) is higher than in the underlying layers (< 1.6 %), and only slightly lower than that in the upper part of Layer 2 (3.0 %). It is clear from the stratigraphic relationship that they post-date layers 3 and 4, but are older than Layer 1 which covers them completely. Charcoal from one of these cylinders, sampled at 55 cm depth, returned an age of 390 ± 60 years before present (Beta-67298, AMS-9890). The stratigraphic relationship indicates that the holes are younger than at least the upper part of Layer 2.

These structures could be infilled postholes (Humphreys 1996). But they resemble planting holes for taro we saw made on the plateau during our visit. An elderly woman gently crushed clods of soil between her fingers to fill the holes after planting the corms. Although we found no more charcoal despite a careful search in all layers, we can with confidence conclude that the *talud* studied is, at the end of the 20th century, at least 400 years old. It is very likely that it is somewhat older.

In the context of the Raga matrilineal system with its fixity of land claims there can be no reason to doubt farmers' statements that the purpose of the *bwalena* is to mark and secure field boundaries. The fact that the cross-slope *bwalena* create *taluds* by soil accumulation is, and probably always was, a by-product of field demarcation. None the less, it has also been important in sustaining farming on an easily eroded steep-slope environment, and the fact that we are able to give it an age of at least 400 years demonstrates this sustainability. It also prompts questions about the continuity of the Raga matrilineal system. It should be recalled that all Vanuatu people suffered severely from population decline in the 19th and

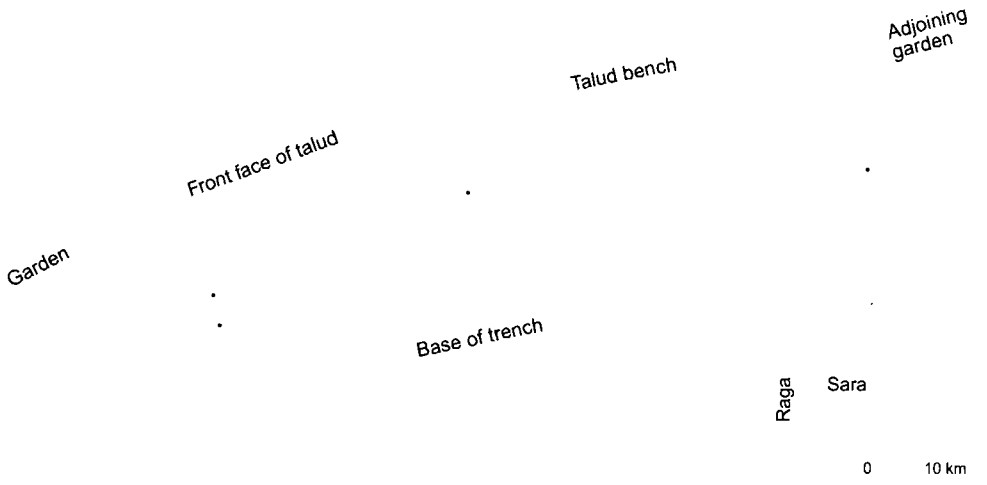

Figure 1.
Stratigraphy through a talud, Sara, Pentecost Island, Vanuatu.
Source : Field survey by Humphreys, July 1993.

early 20th centuries (MacArthur and Yaxley, 1968). Raga may have suffered less than did many other parts of the archipelago (Bonnemaison, 1996 : 469), but by how much less is not known. It would be remarkable if an intricate social system for the allocation of defined spaces of land, down to field-plot level, survived the many shocks of the colonial period intact, but our evidence suggests that this may have happened.

Raga farmers told us that *talud*-like features extend well to the south of their present homeland, in a region that is now only sparsely populated, though being re-colonized. What has been created by the land management system is an enduring modification of the landscape. It is now surviving a period of neglect due to the rising importance of cash cropping, leading to extension of the cultivation period which is probably the real reason for the "lack of time to plant trees" remarked on by the farmers (Librecht, 1992).

We went to Pentecost to report on a modern experiment setting out, with hedgrows of introduced *Flemmingia*, to achieve much the same soil-conservation result as did generations of

Raga farmers with *Burao* and other local species. Recalling this, and the fact that the farmers are thoroughly familiar with the value of soil accumulated in *taluds* behind live barriers, we can hope that this by-product of an old system of field-plot demarcation and livestock management can acquire a new « raison d'être » in the future. But this would probably require the land to be rendered more valuable by improved future returns for work on these fertile but vulnerable soils.

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