CHAPTER EIGHT

CONCLUSIONS: WATCHING THE RIVER FLOW

We need to look again at the reasons for irrigation outlined in the first chapter, at the advantages over dry land gardening common to all of the diverse techniques which we have discussed. These advantages can be summarised as:

1. A greater control over environmental factors.
2. A higher yield/ha than dry land crops grown in equivalent soils.
3. A greater potential for intensification of production.

If water supply from springs and rivers can be assured, soil moisture content and other growth factors can be controlled. Thus continuous production throughout the year is possible, yield fluctuations/year are reduced and labour inputs may be regulated to avoid a marked seasonal demand. As Ruthenberg (1971: 159-60) notes, this allows relatively exact planning, with implications too for dry land gardening operations in that speculative use of rain-fed land becomes less risky. This may allow crops to be obtained from land which otherwise might not be used.

Absolute yield of taro is higher with irrigation and in some cases even relative yield/person-hour increases (Table 5). The highest yields recorded for taro in both traditional subsistence gardening and commercial production come from irrigated plots (Bayliss-Smith 1980). Linked with this factor of higher yields is the third main advantage of irrigation, its potential for intensification. A change in land use from dry land gardening to irrigated gardening clearly represents a process of intensification, a process demonstrated by the archaeological record of Aneityum (Chapter 5) and one which appears to have operated in the past on many other Pacific islands (Chapter 6).

The archaeological data from the New Guinea Highlands (Golson 1977), and the survey of traditional Pacific irrigation systems (Chapters 3 and 7) clearly show that intensification of particular techniques of irrigation is also possible. Thus on Aneityum the

cropping of swampland gardens can be indefinitely extended by continually renewing the leaf mulch and turning over the soil and yields can be increased in furrow irrigation by tillage. In various parts of Maewo pondfield garden use can be extended by cleaning out the soft mud, applying a mulch, or initially harvesting only the corms and leaving the cormels to grow larger. Elsewhere in the Pacific, exhausted pondfields are converted to island beds to extend the length of cropping.

It is in this potential for further intensification that we find the link between irrigation technology and political power. None of the irrigation systems in the Pacific is of such scale as to demand centralised direction in construction or maintenance, so the 'managerial' hypothesis of Wittfogel (1957) for the development of centralised political power does not apply (cf. Earle 1978 for a detailed examination of Wittfogel's ideas in the light of research in the Hawaiian Islands).

The potential for intensification is the potential to increase surplus production to meet the demands of the sociopolitical system. Godelier (1977: 110-111) has put the point well:

> If modern anthropology has confirmed the argument that the relationship between the development of productive forces and the development of social inequalities is not mechanical, it has on the whole shown that social competition in class societies provides the major incentive to surplus production and, in the long term, leads indirectly to progress in productive forces.

We have seen how on Aneityum prestige was gained by the mobilisation of large quantities of food for presentation at competitive feasts, by creating an obligation of the rival party to produce at least as much food at a future feast, and by demonstrating that the feast-giver had more successfully propitiated the spirits controlling agricultural production (Chapter 3). A political system of this kind is inherently 'inflationary', demanding increasing surplus production and controlled only by the limits of agricultural productivity. These limits are set by the environmental potential for irrigation (water supply and suitable land) and the labour available for agricultural production. At contact, water supply was only limiting in some areas, the area of irrigable land could have been expanded (and as shown in Chapter 5 had expanded rapidly in

previous centuries), but labour inputs did not have the same flexibility.

Given the social relations of production on the island and the particular division of labour based on sex which they entailed (which are fairly typical of much of Melanesia), increasing intensification meant increasing work loads for women. The limits of agricultural intensification were largely set by the amount of garden labour women could be forced to undertake (cf. Modjeska 1977). In the case of Aneityum there clearly was an inherent contradiction between the forces and relations of production.

Elsewhere where similar kinds of political systems are found, based on manipulation of surplus agricultural production for political ends, this contradiction is manifested in other ways. Earle (1978) has discussed the differing degrees of social stratification found within Polynesia in terms of the environmental limits to intensification:

> Irrigation, with its potential for intensification, was the ideal economic base for an evolved chiefdom, because capital investment in irrigation technology permitted an expansion of surplus production.
>
> In summary, political rivalry (competition) in Polynesian chiefdoms resulted in a positive feedback maximizing economic system. The expansion of this system was limited either by the size of an island or the environmental potential for irrigation. In Hawaii, the relatively large land mass and extensive alluvium permitted the expansion of the social system and the financing of an elaborate sociopolitical superstructure through intensive agricultural production, especially irrigation (ibid: 173).

Friedman (1974; 1975) discusses a system where the environmental limits to intensification had been reached. In his Burmese example:

> The internal logic linking surplus production to genealogical proximity to the gods serves to convert big man status into chieftaincy. We can suggest here that any significant increase in relative, but especially absolute, surplus would merely accentuate this kind of development to a point where vertical relations were everywhere predominant. This could result from the successful intensification that might occur in lowland riverine irrigation (1975: 193).

Where access to irrigable land is not possible and hillside swiddening remains the agricultural method, however, the environmental limits are soon reached creating 'an absolute barrier to the internal tendencies

of the relations of production. Where ecological degradation occurs ... the segmentary hierarchy collapses' (ibid: 197). I will return to Earle and Friedman's argument at a later stage.

In very rich soils, such as in Tongatapu and parts of Fiji, dry land gardening is sufficiently productive to allow the development of hierarchical systems of the kind discussed. In Brookfield's terms (1972: 42-43) the environmental surface is such in these islands that there is only a very slow rate at which they must pass upward through the hierarchy of more intensive systems as demands on production increase.

A final example of the environmental and social constraints on the development of political stratification can be given by comparing Aneityum with Tanna, the large island to its north. The two islands show close linguistic and cultural links, there were exchange relations between particular districts on Tanna and on Aneityum and some intermarriage took place. Two Aneityumese products were much in demand on Tanna - red ochre and hawk's feathers. Red ochre was used as decorative body paint on Tanna and the hawk's feathers (a bird according to Inglis not present on Tanna) 'for making plumes with which to adorn the heads of the Tannese chiefs' (Inglis 1890: 136; cf. Inglis, MR, Dec. 1855: 183). It is not clear what was exchanged in return but kava and possibly pigs, both important in ritual life, were mentioned by informants as possibilities. Tannese (and Aniwans and Futunese) also sailed to certain of the chiefdoms on Aneityum to take part in feasts and dances which presumably were reciprocated on Tanna. Many early accounts (for example Vigors 1850) noted the similarity in dress, hair styles, decoration and house and canoe types between the two islands, and the 'roads' (swatu) between nakamal (An: intiptag), the men's meeting places, which mediated relations between districts on Tanna (Bonnemaison 1979: 309-14; Brunton 1979: 99-101), certainly extended to Aneityum. I suspect they operated within Aneityum as well but there is no clear statement of this in the sources.

On Tanna there is no equivalent to the natimarid (high chief) or his chiefdom, and 'chiefs' are usually yeremwanu (yrëmëra, yeremere), equivalent in some ways to the natimi alupas (district chief) of Aneityum. The traditional power of yeremwanu on Tanna is now difficult to establish (Adams 1977: 87-93). The right to wear a large feather

head-dress is the most distinctive feature of the rank. Secondary roles such as that of crop magician, or the right to cannibalism appear to have contributed more to a person's power than the yeremwanu title (Adams ibid: 91), a point also made for Aneityum in relation to high chiefs and district chiefs. The feather head-dress (to which the hawk feathers of Aneityum were presumably attached) was worn at the nekoviaar 'the most prestigious and spectacular ceremonial exchange' (Brunton 1979: 100). Just as on Aneityum the nakaro (the same word?) was intimately connected with and initiated by the chiefs, so the nekoviaar, its equivalent on Tanna, and other feasts and exchanges there, took place at the instigation of 'une aristocratie locale dont les membres les plus élevés appelés Yrëmëra, forment un réseau d'alliance dispersé sur l'ensemble de l'île' (Bonnemaison 1979: 309).

Brunton's informants (1979: 100) claimed that yeremwanu had certain privileges such as not being required to work in the fields and access to a greater number of wives than other men. Another hereditary title on Tanna was the yeniniko (yani niko, yani en dete), the 'war chief' or 'talking chief' (Adams 1979: 92-98; Bonnemaison 1979: 311; Brunton 1979: 100). In warfare he was the local leader and the role of the yeremwanu was very limited, but generally the yeniniko was his subordinate and to some extent his assistant (Brunton ibid). While pointing out that it is probably an idealised view, Brunton (ibid: 101) notes that:

> Some informants claim that traditionally, sorcery (netik) was under the complete control of yeremere and yeniniko and was used to ensure compliance with their will.

This again is reminiscent of Aneityum, but many natimarid and natimi alupas privileges were not noted on Tanna. Thus kava drinking was a regular habit of all adult men on Tanna and while the right to cannibalism was restricted and inheritable, it was not a right many yeremwanu or yeniniko possessed. The degree of veneration of a natimarid during life as well as after death is not found associated with any rank on Tanna. As on Aneityum, however:

> Soon after birth girls were set aside for a definite alliance, often between lineages of the same tribe (thus restricting land circulation to the narrowest group which would ensure a dependable source of brides)

> but sometimes between different tribes. Women represented a gift which could only be obtained in the form of a reciprocal gift (a future bride) (Adams ibid: 75-76).

Brunton describes the marriage pattern as sister exchange between cross-cousins (1979: 97). A 'tribe' in the sense used above was a collection of hamlets sharing a common territorial name (Adams 1979: 66), corresponding to the district level of organisation on Aneityum. Exchange feasts such as the nekoviaar were as important on Tanna as on Aneityum, featuring the familiar elements of reciprocity and competition. Adams has stressed the principle of reciprocal exchange as essential to an understanding of Tannese social structure (ibid: 69-82).

Comparisons between yeremwanu and natimi alupas, 'tribe' and 'district', can only get us so far, however. The natimi alupas operated within a hierarchical framework of which they were the second level, and no equivalent higher level of political integration operated on Tanna. Aneityumese social structure can be viewed in some sense as a transformation of the Tannese pattern with power and authority increasingly concentrated in the hands of a few and a stress on vertical social relationships. Brunton among others has characterised Tannese society as atomistic, creating a precarious balance between individual autonomy and interdependence (ibid: 102). This balance is maintained by an almost inflexible all-embracing network of relations between individuals and groups preventing them from forging new links or abandoning old ones. The possibilities for change lie in the hierarchical system of titles but, as Brunton points out, this system 'is unable to mobilise sufficient power to constrain the autonomy of adult males' (1979). He reflects that:

> Had there been effective foci of social power on Tanna sufficient to curb individual autonomy and provide some guaranteed range of internal peace, interaction and exchange may have been able to operate more smoothly. But there are few, if any, resources which could be monopolized to the extent necessary to provide the base for such foci (ibid:101).

The problem may well have been the limited possibilities for agricultural intensification on the island, in terms both of technology and labour. Given the topography and water resources of Tanna, irrigation systems for year-round production of taro could not have

developed. Carney and Macfarlane (1979: 1) have compared the drainage pattern of the two islands:

> The watercourses of Aneityum and the mountainous areas of Tanna are deeply dissected and perennial. In the limestone-covered areas of Tanna, however, surface water quickly drains through the overlying thick capping of soil and loosely-consolidated pyroclastic deposits; in consequence many of the rivers cease running during prolonged spells of dry weather.

Where rivers of permanent flow occur they are generally in deep gorges and unsuitable as irrigation sources. In addition, relative to its size, Tanna has a very limited area of alluvial plains, the prime locations where irrigation might be expected. The poorly developed fringing reef does not form the barrier against coastal erosion which allows the development of such plains. An interesting parallel can be seen with the situation in Greece as described by Plato over 2000 years ago:

> ... there has been a constant movement of soil away from high elevations; and, owing to the shelving relief of the coast, this soil, instead of laying down alluvium as it does elsewhere, has been perpetually deposited in the deep sea around the periphery of the country or, in other words, lost ... (quoted by Butzer 1974: 66).

On Tanna, however, there is reasonably fertile land for dry land agriculture (Quantin 1979: 54). Thus instead of taro it is the seasonal dry land yam crop on which attention was focussed. As a dry land crop, yam needed no appeal to resources beyond the immediate planting area and so no supra-district polity was necessary to allow the intensification of its production. The possibilities for intensification on Tanna were in fact limited. The irrigation systems of Aneityum represented capital works which could be continually re-used and added to piecemeal. The yam mounds of Tanna, on the other hand, had to be remade before each planting and similar advantages did not accrue. While on Aneityum land use in many areas could be intensified from dry land untilled cropping, to tilled cropping, to canal-fed irrigation with increasing yields obtainable per hectare, the productive limits of Tannese gardening systems were much narrower.

A final limit to productivity could have been hours of labour. Following a typical southern Melanesian division of labour, yam

gardening on Tanna was traditionally a male task (cf. Barrau 1965: 336-39). Thus male labour may have set the limits to intensification rather than female labour. Given the autonomy of adult males as noted above, there were clear limits to the accumulation of surplus. To the extent that intensification was predicated on male control of female labour, an effective foci of social power on Tanna could not be established with the division of labour which existed and yam as the main crop.

On Tanna there were both environmental and social constraints to political stratification, whereas on Aneityum the constraints were largely social.

The detailed investigation of agricultural production on Aneityum, comparative study of irrigation methods elsewhere in the Pacific and a brief inspection of contrasts with neighbouring Tanna have led to similar conclusions as suggested themselves to Earle and Friedman in their own particular researches. The greater potential for intensification of agricultural production sets irrigation apart from many of the dry land gardening techniques of the Pacific and gives it thus a more than purely technological significance in Pacific prehistory.

The conclusions here go beyond Earle and Friedman in two important respects. While Friedman does discuss the division of labour, neither he nor Earle seem to consider it as a limiting factor. Building Modjeska's conclusions about the limiting role of women's labour into the Bayliss-Smith model, I have sought to quantify the contribution of women's labour in Aneityumese agricultural production at contact, where it clearly represents a major limiting factor to further intensification. Using the calculations of labour inputs in irrigation for other areas of the Pacific given in Chapter 7, similar questions of limits to intensification through aspects of the division of labour could be examined.

Both Earle and Friedman have stressed the potential for intensification given by access to alluvial plains where the largest areas of irrigable land can be found. This access allows accelerated demands for surplus to be met in situations where ecological limits would otherwise have been reached. On Aneityum and elsewhere in the Pacific, not only has humanly-induced landscape change created the alluvial plains, but that landscape change was due to initial use of the hill-

slopes for swidden agriculture. There are thus historical processes at work of which both Earle and Friedman were unaware and which only archaeological research can investigate. The stratified political systems of Hawaii and elsewhere in the Pacific, to the extent that they are based on exploitation of the rich alluvial land of valley bottom and coastal plain, can only have come into existence within the last few hundred years at most, during the time that these environments have existed in a form manageable for agriculture. Prior to this a different economy and different social relations must have existed. For Burma too, it is worth considering whether the same processes of humanly-induced ecological degradation, leading to the collapse of hierarchical systems based on hillside swiddening, did not in the same way, through erosion and deposition, make the pre-conditions for the establishment of highly stratified political systems based on irrigated agriculture in the lowland riverine plains. The limits of one kind of agricultural system may thus in this case as well have created the possibility for another, as we have seen it did on the island of Aneityum.