

Suggestions for the Improvement of Indigenous Subsistence Horticulture.

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ABSTRACT.

This paper notes some thoughts on possible improvements of subsistence horticulture in the Territory of Papua and New Guinea as seen by a Geographer. It also suggests lines for future research.¹

INTRODUCTION.

AS Gourou noted, "To change the agrarian system affects the family and the whole of the rest of the economic edifice. That does not shut out necessary reform, but yet reform should be carried out in the full knowledge of its economic and social consequences and also of its repercussion on the physical environment." (Gourou 1959 : 98) This is the first requirement of reform, that the reformer should know what he is doing and should not force changes that will result in social distress between man and his environment. The second requirement is that the indigenes should be educated so that they desire improvement and realize that it is necessary : They would also be more willing to experiment themselves and to be discriminating in their selection and rejection of reforms.

"There are two principal aims in native education : One is to foster all that is worthwhile in native culture as it exists ; the other is to fuse into it, or graft upon it, various acceptable improvements from our own." (Williams 1933 : 6)

On the whole, indigenous systems of land use are better suited to local physical conditions than anything that has yet been devised to replace them, and wisely, few changes have been deliberately made. However, in a changing demographic situation in particular, and changing social, economic and political circumstances in general, progress from a purely subsistence economy is essential. Cash cropping is the obvious answer but in some areas under stresses of overpopulation or land shortage, modern technology could offer some minor palliatives within indigenous land use systems as well as serving as an introduction to commercial and scientific agriculture.

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SUGGESTED METHODS.

1. *The Upgrading of Staple Foods.*

It is well known that most species of important food crops throughout the Pacific Islands have many different varieties in small localities.² There is no doubt that some varieties have a consistently higher yield or higher protein content than other varieties. Recently it has been found that in the Highlands of New Guinea the Okinawa variety of sweet potato has a higher protein content than any other variety. (Bailey 1963) My own work in the Maprik Subdistrict also suggest that there are varieties of yam with higher protein content than others. (Lea 1964 : 178) There is also no doubt that the yields of some varieties of staple foods are consistently higher than other varieties. Trials could certainly be carried out in many areas to determine which are the best varieties : Such trials should be followed by extension work to encourage wider planting of the best varieties. Taste preferences and prejudices are very real in all societies and, in all probability, they would not be overcome with adults. Extension work should therefore concentrate on encouraging children to eat new foods : This could well be linked with education. As Williams noted, "We should aim at improving the culture of native products before we begin the scattering of unknown seeds." (Williams 1933 : 7)

¹ This brief article is based on Appendix F of Dr. Lea's thesis (Lea 1964). Although these suggestions are made with particular emphasis on the Abelam people of the Maprik area, many of them may well apply to New Guinea in general.

² There are over 100 different varieties of yam in two villages of the Abelam. (Lea 1966) Sasuke (1953 : 159) reports over 200 varieties of yam on Ponape.

2. The Introduction of New Food Plants.

This topic has been discussed extensively elsewhere (e.g., Williams 1933, Barrau 1958 : 100-102, Barrau 1960) but among the Abelam those food crops which are rich in protein and capable of being stored such as nuts, cereals and pulses are the most essential. To encourage the adoption of these crops the methods of cultivation must be easier and the returns higher than crops which are grown now or there will be no incentive to plant them. It should also be noted that "the acceptability of a new plant food is in proportion to the similarity it has to traditional subsistence crops so that it involved no change in land use technology or land holding". (Barrau 1958 : 86) Thus maize, the only cereal successfully introduced at the village level, was accepted because it resembled 'pit pit' (*Saccharum edule*) which has an edible inflorescence. (Barrau 1958 : 49)

3. Improved Hand Implements and Mechanization.

Even although labour is very cheap in the area some form of mechanization is necessary to show that the Administration is concerned with improving the indigenous way of life and also to give some incentive to the introduction of new crops. Some possibilities that immediately spring to mind are scythes instead of grass-slashing 'sarap'; the sago rasper of Malaysia instead of the labourious methods now practiced (cf. Morris 1953, Burkill 1935 : 1463); hoes for weeding and grinders for peanuts (which keep almost indefinitely when ground to a paste). If rice could be easily grown and milled in the villages, it is reasonable to suppose that unpolished rice might be eaten and that rice itself would be more widely grown. Much interesting work has been done by Pirie, Davys, Byers, Morrison and others at the Rothamsted Experimental Station in England on extracting leaf protein. Mr. Pirie believes that village units could well be set up extracting protein from 300 to 500 lb. lots of leaf.

4. Mulch and Green Manures.

The planting of legumes as green manures is probably not feasible because the necessary cultivation technique results in the soil lying exposed whilst the legumes become established.

Nye and Greenland (1960 : 136) state that "the nitrogen status maintained beneath a forest fallow is good, and there is no reason to think that short-term leguminous fallows would offer any advantage". Probably the best use that could be made of legumes would be to encourage more inter-cropping during the productive life of the garden in order to offset leaching by symbiotic fixation of nitrogen.

Mulching, especially when localized to yam mounds, would probably be far more successful.³ If dead organic matter and ashes from the burn were concentrated in yam mounds there is no doubt that yields would increase. By providing organic matter, plant nutrients would be supplied and the structure and moisture holding capacity of the soil improved. Yams could probably then be planted in the same holes for a number of successive years. With some mulch around the top of the yam mounds the soil would be protected from the pounding of the rain and the breaking down of the crumb structure of the soil.

5. Soil Conservation.

Soil conservation is closely connected with mulching. If ground is to be used for several years before it reverts to fallow, the practice of exposing the soil for long periods and sweeping it clean before planting would have to cease.⁴ Cover crops would have to be planted as soon as possible and vegetable waste from the fallow and the garden could be used as a protective cloak over the soil. It would certainly be better to plant yams much closer together in order to get higher yields per given area as well as providing cover for the soil, even though this may result in individual plants having smaller tubers. This would be difficult to encourage because large yams are so ritually important and are a status symbol. As far as yams are concerned many yam growers are megalomaniacs and one's gardening ability is judged by the size of each tuber rather than by the total yields from each garden or even from each hole.

³ Mulching is not unknown in the Pacific area: For examples see Defugin (1959 : 53), Meggitt (1958 : 305), Barrau (1961 : 68) and Brookfield (1962 : 244-5).

⁴ Often ash from the burn is swept behind logs or stumps for aesthetic reasons and I have even seen some Abelam gardeners removing ash mixed with top soil and garden rubbish from the garden.

Some form of terracing is also possible, even if it is only the very simple form at present practised by the West Woseras where logs are placed horizontally to the slope for the expressed purpose of 'holding the soil'. Also where rainfall is excessive some form of drainage is often essential. Most people who have been into gardens are familiar with the sight of ash and top soil piled up against fences at the bottom of gardens.

6. Improved Storage Methods.

It is difficult to imagine a more effective method of storing whole yam tubers than that used by the Abelam for the large ceremonial yams. (*Dioscorea alata*) Each tuber is suspended from a pole by cane ropes, tied so that it is supported every 9 in. of its length. The pole is lashed to the rafters of a house where the tuber is off the ground, safe from vermin, well shaded and surrounded by circulating air. Tubers stored in this way keep well for periods of up to nine months. The smaller yam tubers (mainly *D. esculenta*), although they keep well in the yam houses, do lie at least in part on the ground. Probably storage would be better if the tubers were lifted off the ground or stored on a raised cane floor permitting a better circulation of air around them.

As it seems that a surplus is regularly produced in most villages (Lea 1965 : 203), it is important that all means of preserving this surplus should be investigated. Possibilities include pit storage methods (cf. Morgan 1959 : 61), flour or meal making (Burkill 1935 : 816), dehydration and other drying techniques, the use of chemicals which would aid preservation or stop sprouting (cf. McKee 1957 : 20) and finally by preserving food in ensilage or in the ground. (cf. Williamson 1912 : 198)

7. More Intensive Tree Cultivation.

Many trees and palms and their products are securely integrated into the Abelam economy. However, there is still plenty of scope for more intensive planting of nut, leaf and fruit bearing trees, and timber trees could be more intensively planted around hamlets and along ridgetops to provide shelter and to control runoff. Research should also be done to see whether it is worth leaving corridors of trees between gardens to aid

reseedling and to act as firebreaks and into the merits of planted fallows⁵ and of the possibility of the 'taungya' system. (Allsop 1953)

8. More Intensive Use of Livestock.

Pigs and fowls are the only productive animals used by most of the indigenous people in New Guinea. Better use could be made of the products from both these animals⁶ and the quality could be vastly improved by better breeding and selection. On the Sepik grasslands and along paths and roads there are considerable areas of grass. If stock, particularly cattle (Zebu crosses) and goats, could be put onto these areas they could provide work, manure and protein-rich foods and they would only occupy what are at present waste areas. Goats are a problem with their destructive eating habits but with peg and chain they could be controlled.

Many other improvements are possible such as fertilizers, irrigation,⁷ more intensive use of the floodplains by growing wet rice, use of pig manure, better cooking methods, but as Barrau notes, "the only real progress possible is through developing cash crops". (Barrau 1958 : 91) In conclusion we could again quote Barrau—

"It is absolutely essential that technical officers and agricultural assistants be thoroughly convinced that their purpose is to adapt new crops and methods without upsetting and destroying traditional agriculture. They must always take into account the merits of former horticultural techniques which have the advantage of being based on a profound knowledge of the natural environment and its requirements". (Barrau 1961 : 77)

(Received 13th December, 1965)

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- ⁵ Some examples of planted fallows are *Casuarina* in the Central Highlands of New Guinea (Brookfield and Brown 1963 : 50-1) and *Acioa barteri* in West Africa (Nye and Greenland 1961 : 136-7).
- ⁶ cf. Conroy 1953.
- ⁷ Irrigation is not unknown in New Guinea (cf. Williams 1933 : 33) and the old irrigated taro terraces of the New Hebrides and New Caledonia bear witness to its widespread use in these territories.

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