THE DEVELOPMENT OF COMMERCIAL AGRICULTURE ON MANGAIA : SOCIAL AND ECONOMIC CHANGE IN A POLYNESIAN COMMUNITY

A Thesis Presented in Partial Fulfilment of the Requirements for the Degree of Master of Arts in Geography at Massey University

By

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FOREWORD

Since 1964 some members of staff of the Department of Geography and some masterate students have undertaken research in the Cook Islands. To date a number of academic papers have been published on the research, while within the near future a series of land use maps of the larger islands will become available. In addition, though, and as part of the policy of making available to those interested aspects of the research undertaken it is proposed to issue limited numbers of some of the theses completed. This thesis, by Mr. B. J. Allen, is the first of this nature.

B. G. R. SAUNDERS
Reader in Geography

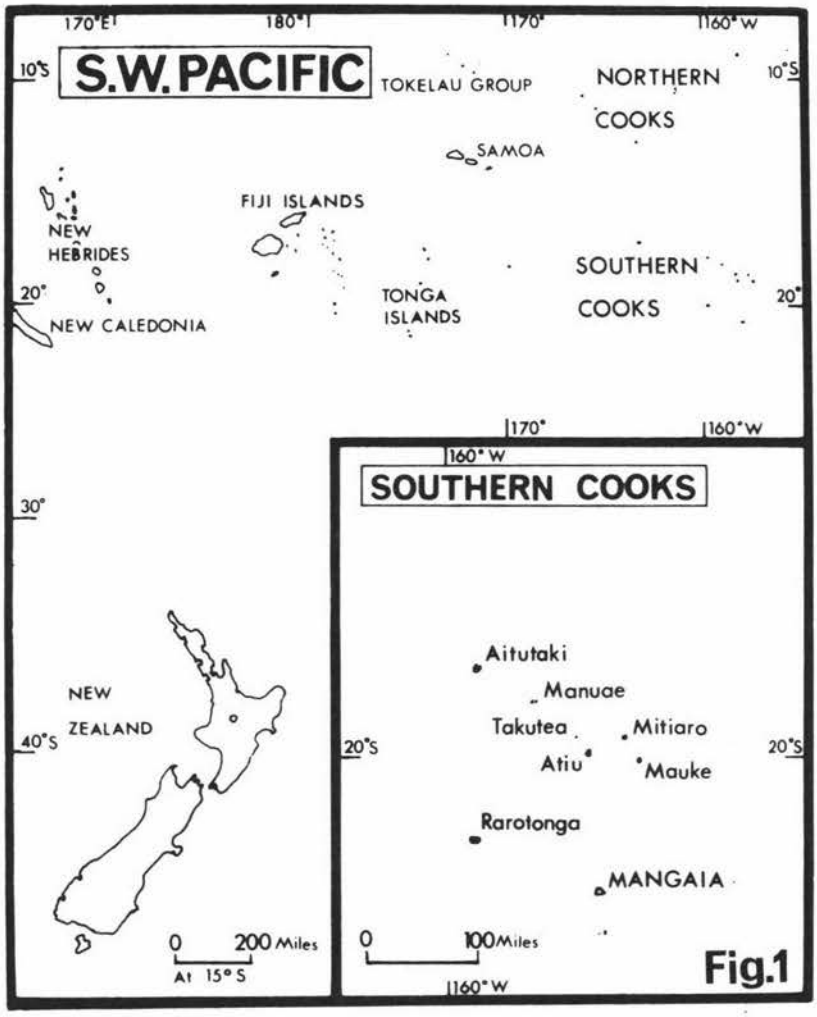
170°E
180°
170°
160°W
10°S
S.W.PACIFIC
TOKELAU GROUP
NORTHERN
COOKS
10°S
SAMOA
FIJI ISLANDS
NEW
HEBRIDES
SOUTHERN
COOKS
20°
TONGA
ISLANDS
20°
NEW CALEDONIA
170°
160°W
160°W
SOUTHERN COOKS
30°
Aitutaki
Manuae
NEW
ZEALAND
Takutea
Mitiaro
40°S
20°S
20°S
Atiu
Mauke
Rarotonga
MANGAIA
0 200 Miles
At 15° S
0 100 Miles
160°W

Fig.1

PREFACE

The problems confronting the so called 'underdeveloped nations' of the world are pressing more urgently upon mankind every year. In response there is a rapidly expanding body of knowledge associated with the technical, social and economic changes which must be brought about within such countries if progress is to be assured. Because so much of the change must occur at a village level, studies of small groups have become increasingly important. This thesis is the result of such a study based on the island of Mangaia, a small and isolated Polynesian community in the Cook Islands. The aim of the study was to trace the development of commercialisation of the agricultural system from European contact to the present day, to relate the major changes to their causative factors and to assess the present degree of commercialisation and the prospects for the future.

The research thus fell into two parts, historical and contemporary. The historical data was derived from three main sources, missionary reports and letters, administration records and New Zealand Government records, with a valuable ethnological study by Hiroa providing the basis of the pre-historical material. Contemporary data was collected firstly by the administration of a questionnaire to a sample population. The instrument included a battery of schedules dealing with details of the household, the head of the household, and the agricultural plantations maintained by the household. Secondly, a land use survey was carried out which concentrated upon a classification of land into that used for food crops, commercial crops and fallow land. (see Appendix I).

The original idea behind this study was suggested to me by Professor K. W. Thomson, Massey University and he provided continual advice and encouragement throughout the study. The fieldwork was carried out between April and September 1967, when I travelled to Mangaia, accompanied by my wife and child, with financial assistance from the Cook Islands' Research Fund established at Massey University. While on Mangaia further financial assistance was received from the Cook Islands' Government which also made available a house, free of rent. Without this assistance the study could not have been attempted and I express my gratitude to these two organisations.

I would also express my gratitude to Mr. I. G. Bassett, now of the Teachers' College, Palmerston North, who supervised the study, and who has given so readily of his time and thoughts, and to Mr. B. G. R. Saunders, Senior Lecturer in Geography, Massey University, who read the final drafts and provided constructive criticism on content, layout and reproduction.

At this point I would take the opportunity to acknowledge assistance from the following people and express my gratitude:- On Mangaia, Mr. B. Newnham, Resident Agent, Mr. J. Bourne,

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GLOSSARY OF MANGAIAN TERMS

akeke mato	a black soil lying beneath the inland limestone cliff.
ana	a cave.
ara	trad. Pandanus tectoris, screwpine. Now also generally applied to pine-apple, ananus comosus.
arapateka	lit. smooth pineapple, Smooth Cayenne variety.
arataratara	lit. rough pineapple, Ripley Queen variety.
'are	house (vare).
ariki	highest ranking ascribed title.
ariki i teua te tapora kai	a traditional title lit. translating as ruler-of-food.
ariki pa tai	traditional title; seaward high priest.
ariki pa uta	traditional title; inland high priest.
Aronga Mana	lit. men of power, traditional ascribed elite group comprising ariki, kavana and ui rangatira.
atinga	a tribute, usually food or labour, paid to tribal elite.
au	lit. bush. Specific. Hibiscus tiliaceous.
auakai	food gardens
auangaugaere	abandoned gardens. lit. garden of weeds and rubbish.
auatakere	abandoned gardens.
auatoka	garden plots surrounded by stone walls.
aua vaere ou ia	a cleared, but unplanted garden plot.
'ei	a wreath of flowers worn about the neck (lei). If worn about the head is termed 'ei katu.
Ecelasia	Cook Islands' Congregational Church membership.

karakia	chants.
kavana	lit. governor. Elite title of district chief, traditionally that of pava.
kikau	the frond of the coconut palm.
kiriau	rope made from the twisted bark of the Hibiscus, au.
ko	a digging implement.
koka	Musa sp., banana.
ku'ara	Ipomoea batatas, kumara or sweet potato.
kuava	Psidium guayava, a common shrub.
kura	Artocarpus incisa, breadfruit.
makatea	lit. white rocks. Refers to limestone rocks of the raised coral reefs. Common term in Eastern Polynesia.
mamio	var. Colocasia sp. Small round corm grown under water.
mangaia	trad. highest ranking ascribed title, or 'Temporal Lord'. Now replaced by ariki.
maniota	Manihot utilissima, arrowroot.
mapu	unmarried youth, usually male.
matavai	man-made irrigation channel.
matepi	a large knife.
maunga	lit. mountain, centre of the island.
meika	Musa sp., banana.
miko	planting material of Colocasia sp.
moa kirikiri	Pteropus sp. flying fox or fruit bat.
motu	small island.
nu	Cocos nuciferus, coconut palm.
pa'i	var. Colocasia sp. Large corm grown in raised, irrigated beds.

papa'a	lit. stranger, spec. European.
pa tai	coastal zone, between the reef and the makatea cliff.
pau	wooden, torpedo shaped traditional tool used in planting pa'i.
pava	lit. war lord, now redundant traditional title, replaced by kavana title.
pia	Tacca pinifidia, a native arrowroot.
piriaki	name of an ecological zone; narrow zone beneath the inland makatea cliff.
poke	glutinous pudding made from arrowroot, mixed with taro, banana and other vegetables and fruits and baked in an oven.
puaka	pig or pork; puaka Maori, the indigenous pig.
puarenga	Tithonia diversifolia, 'yellow flower', a tall weed.
puna	taro swamp. Tradit. a district.
puta ko'atu	lit. holes in the rocks; small areas of soil on the surface of the makatea belt.
raei	lit. wilderness; specifically, areas of extremely intricately eroded makatea, which form limestone 'deserts' in restricted areas.
rangatira	elite title associated with the tapere.
rau	thatching formed from pandanus leaves.
rautuanu'e	name of an ecological zone; the lower slopes of the central volcanic cone, the fernland, named after anu'e or Staghorn fern.
rautuitui	name of an ecological zone; the surface of the makatea formation, named after the tuitui, or candlenut.
repo taro	Tamarua Clay Loam; also vari.
roroka	the reef.

taiki	a digging implement, a spade.
tamanu	Calophyllum sp., a forest tree.
tama anga	weeding gardens.
tamu anga	the act of planting
tapere	a subdistrict.
taro	general name for plants of the Colocasia, Xanthosoma, Alocasia species.
tarua	Xanthosoma sp., non irrigated on Mangaia.
ta'u anga teita	burning, when clearing plantation areas.
tere	to go away; a tere party travels from a home village or island to another area for same purpose, sport, religious, social, etc.
toa	Casuarina equistifolia, ironwood.
toki	stone cutting tools, general term.
tui tui	Aleurites moluccana, candlenut.
u'i	Dioscorea sp., yam.
ui rangatira	the rangatira as a group.
umu	traditional oven.
utu	Barringtonia butonica, a large coastal tree.
vaere anga	cutting, when clearing plantations.
vari	alluvial soil in taro swamps, same as repo taro.

'Papa paka a inu i te vai o Marua,
Tukua kia 'aere.'

(A baked taro and a drink of the water of Marua,
And freedom to depart).

____A Mangaian saying, symbolising hospitality, food, water and freedom. (Hiroa, 1934, 138).

'Ever since our arrival here we have done all we could to induce them to improve their dwelling houses and the localities of their respective settlements. In some measure we have been successful and much good has resulted. From time to time we have urged the advantages of labour and industry by which they may be able to procure many additions to their personal and social comfort, but they are slow to improve in these respects. Their general habits and social life are too fixed to be suddenly altered or eradicated.'

____G. Gill to the London Missionary Society, December 19, 1854.

'I would like you to give me full particulars as to who constitute the Ariki's Court, and what are its functions, as I think it would be advantageous to gradually bring our own system of administering justice into the Islands.'

____C. H. Mills, Minister to the Islands, to Col. W. E. Gudgeon, Resident Commissioner, Rarotonga, 1904. (AJHR A3, 1904, 46).

'The people in most of the Cook Islands are in transition towards peasant societies in which production for subsistence is combined with production of cash crops for a distant export market.... Largely as a result of commercial impacts, the old value systems are still in a process of dissolution, but the adjustments to the new order are as yet insufficient for social integration.'

____Belshaw and Stace, 1955, 13.

'The most important problem facing humanity today is lack of understanding - lack of understanding of the cultures and values of other peoples; lack of understanding of the joys and sorrows of their daily lives, of their social and economic problems and of how they are trying to solve them; lack of understanding of the fears and hopes of others;'

____Buchanan in '<u>Out of Asia</u>', 1968, 15.

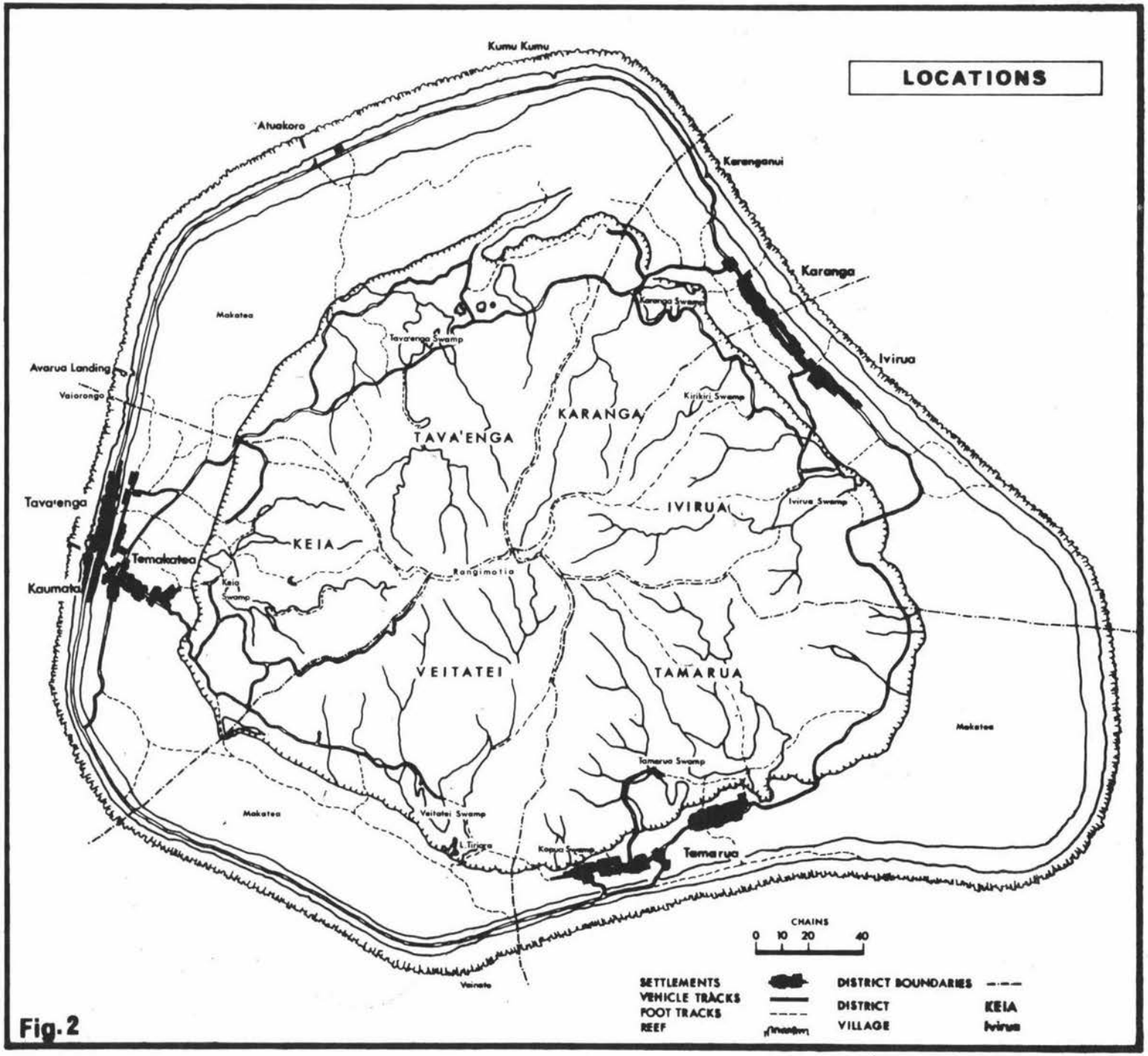

LOCATIONS
Kumu Kumu
Atuakoro
Karenganui
Karanga
Ivirua
Makatea
Tavarenga Swamp
Karanga Swamp
Kirikiri Swamp
Avarua Landing
Vaiorongo
TAVA'ENGA
KARANGA
IVIRUA
Tava'renga
Temakatea
KEIA
Kaumata
Rangimotia
Keia Swamp
Ivirua Swamp
VEITATEI
TAMARUA
Tamarua Swamp
Veitatei Swamp
L. Tiraga
Kapua Swamp
Temarua
Vaimato
CHAINS
0 10 20 40
SETTLEMENTS
VEHICLE TRACKS
FOOT TRACKS
REEF
DISTRICT BOUNDARIES
DISTRICT
VILLAGE
KEIA
Ivirua

Fig. 2

TABLE I

THE COOK ISLANDS: AREA AND POPULATION, 1966

Island	Area (Acres)	Population	%
Southern Group			
Rarotonga	16,602	9,895	51.4
Mangaia	12,828	1,994	10.4
Atiu	6,654	1,327	6.9
Mitiaro	5,500	293	1.5
Mauke	4,552	670	3.5
Aitutaki	4,461	2,617	13.6
Manuae	1,524	15	0.1
Takutea	302	-	-
	52,423	16,811	87.4
Northern Group			
Penrhyn	2,432	591	3.1
Manihiki	1,344	584	3.0
Pukapuka	1,250	851*	4.4
Rakahanga	1,000	321	1.7
Palmerston	500	85	0.4
Nassau	300	-	-
Suawarrow	100	1	-
	6,926	2,433	12.6
	59,349	19,244	100.0

Notes: Population figures provisional.

* Includes population of Nassau.

Source: Annual Report on Cook, Niue and Tokelau Islands, 1961.
Justice Department Files, Rarotonga.

INTRODUCTION

Prior to 1965, the Cook Islands comprised a Confederacy of 15 islands in the central South Pacific, dependent upon New Zealand for political and economic administration. In 1965, following United Nations pressure and agitation from local groups, New Zealand granted the Cook Islands 'internal self-government'. A free election was held on party lines and a government was formed under the leadership of Mr. Albert Henry, an Aitutakian born political leader and school teacher who had been dominant in Cook Islands' political movements both in New Zealand and in the islands. This government owes allegiance to the Queen, through the New Zealand High Commissioner who is resident on Rarotonga, the largest and most populous island, and the seat of government. Internal policy now rests in the hands of this government and its Cabinet of Ministers. New Zealand continues to provide financial assistance in the form of subsidies, services and seconded personnel.

Following their election, the governing Cook Islands' Party have followed an economic policy which has as its major objective, the attainment of financial autonomy. The government believes that true internal independence cannot be achieved while the islands are dependent upon New Zealand finances, despite the unconditional nature of the aid. (1) The decision to follow such a policy has placed the Cook Islands in a position in common with an increasing number of nations, which are presently attempting rapid modernisation in the absence of the wealth and integrated economies of the developed nations. The Cook Islands, as well as exhibiting most of the symptoms of 'underdevelopment' (2) are faced with the problems of isolation, fragmentation, a lack of physical or economic resources, a top heavy 'colonial'-type administration and a serious loss of population from the working age sectors, owing to emigration to New Zealand. (Cook Islanders are New Zealand citizens and have the right of free entry to New Zealand, subject to some health restrictions).

The Islands form two groups between latitudes 8°S and 22°S, and longitudes 156°W and 166°W. (see Figure 1). The Northern Cook Islands comprise seven coral atolls with typical atoll structures of small motus and expansive lagoons. The southern islands include one high volcanic island, Rarotonga, six raised volcanic islands, Aitutaki, Atiu, Mangaia, Mauke, Mitiaro and Takutea and one atoll, Manuae. The northern islands are 600 to 700 miles north of the southern islands, which are scattered in a semi-circle within 150 miles from Rarotonga. (see Table 1). The islanders are Polynesians, descendant from an Eastern Polynesian cultural group with its most likely major source to the east in the Society Islands. The Cook Islands' populations although conforming to a broad and distinctive cultural pattern, exhibit variations from island to island, and each island society has reacted in a slightly

different manner to the changes imposed or resultant upon European contact.

European contacts have followed the general pattern established in Polynesia, of explorer, missionary, trader and colonial administrator. Captain James Cook was the first recorded European to sight the islands of the present group between 1773 and 1779. He was followed between 1820 and 1830 by missionaries of the London Missionary Society. In 1888 the southern islands were declared a British Protectorate and in 1901 they were annexed by New Zealand, which administered the group up to 1965.

The aim of this study is to trace the commercialisation of the agricultural system of the second largest and southernmost island in the group, Mangaia. (see Figure 2). It is believed this will serve the following major purposes. Firstly, this will provide factual material on the form the development of commercialisation has taken within this community. If past reactions to changes introduced to the island are isolated, some indication may be able to be given on future reactions and hence future policy toward economic development on the island. Comparisons between the Mangaian example and other contemporary communities may also provide similar information. Secondly, when the Mangaian example is placed within its theoretical background, some small additions to the growing body of knowledge on the problems of commercialisation and modernisation of traditional and semi-traditional societies may be possible.

In order to achieve this objective the following approach has been followed. The paper is divided into two parts; in the first are three chapters dealing with the contemporary island setting, the physical environment, land use patterns, population structure, social structure and land tenure and traditional methods of agriculture. The second part is comprised of a chapter tracing the development of commercial agriculture and a chapter which attempts an assessment of the degree of commercialisation in 1967.

REFERENCES

(1) 'Speech from the Throne' 26 July, 1966 in the Proceedings of the Legislative Assembly, 1966.

(2) Johnston, K. W., 1967.

CHAPTER I

THE MANGAIAN ENVIRONMENT

When Europeans first set foot on Mangaia, Polynesians had been living on the island for not less than 500 and possibly 1,000 years. The Mangaian environment on European contact was influenced, altered and to a very small extent controlled by people who belonged to an Eastern Polynesian culture. After contact a new and more powerful group came into the environment bringing new plants and new ways of exploiting the environment, as well as new values and beliefs, which they attempted to impose upon the Polynesian residents. Today, the Mangaian environment remains largely Polynesian, but it contains within it an increasing level of West European culture. Within this environment changes resulting from the impact of the forces of commercialisation and modernisation upon the Mangaian society are occurring. To fully understand the implications of such changes for Mangaian society and the island, and to facilitate any assessment of their outcome, an attempt must be made to understand the nature of the Mangaian environment, the manner in which the Mangaian perceives of it, the way in which the Mangaian exploits it, the limitations it imposes, and the patterns of utilisation which the interaction of cultures and values is creating within it.

MANGAIA

Mangaia rises 14,000 feet from the ocean floor, one of a series of Oligocene and Miocene volcanoes which lie upon the broad crest of an undersea arch surrounding the central Southern Cook Islands. (Summerhayes, 1967, 1383). Only 12,828 acres of land appear above the surface of the Pacific Ocean, reaching a height of 554 feet at the centre of the island. Surrounding the volcanic centre is a limestone ring, (makatea), a raised Miocene coral reef. The centre of the island forms a low dome, eroded into ridges and valleys, of which the highest part, Rangimotia, is formed by a long, narrow sinuous area of flat land. Several other areas of flat land appear on nearby ridges, and ridge tops form accordant summits around Rangimotia. The total area of flat land is very small however, when compared with that occupied by ridges and valleys, and little of the original surface is left.

The limestone ring is between one and two miles in width, and 180 to 230 feet in height. Along most of its inland edge there are sheer, 200-foot cliffs with steep talus slides at the bases, continuous for long distances. At a number of places, ridges of volcanic material abut the cliff and in at least two places volcanic material overlaps on to the makatea surface. The surface of the limestone is extremely intricate. Rugged pinnacles of rock surround small pockets of red volcanic soil, and on the southern and eastern seaward edges, miniature karrenfelds of fluted and pinnacled rock form limestone 'deserts'. On the seaward edge are cut a number of raised marine benches

and cliffs, the result of Pleistocene high sea levels. (Wood, 1967, 1435).

Between the volcanic core of the island and the makatea ring are a series of irregular swampy depressions, formed by water from inland streams ponding against the bases of the limestone cliffs. Water from these streams flows beneath the limestone in subterranean caverns to reach the reef as a number of freshwater springs. At the base of the cliff, these swampy flats are only 20 feet or less above sea level. The surface of Lake Tiriara is at sea level. Three other small lakes occur in Tava'enga, probably as a result of disturbed drainage patterns following the retreat of the makatea from this area.

MANGAIAN ECOLOGICAL CONCEPTIONS [1] (see Figure 3)

Mangaians divide their island into six major ecological zones: the pa tai, rautuitui, piriaki, puna, rautuanu'e and maunga (see Figure 3). The pa tai includes the reef, roroka and the first two or three low terraces fringing the base of the first major marine cliff at about 40 feet above sea level. The rautuitui is the surface of the makatea formation, except where there is a predominance of rock, when the term raei, wilderness, or more specifically, pointed rocks, is used. The piriaki is the area of jumbled limestone blocks and volcanic soils which lies at the base of the inland limestone cliff. The puna is the whole depression between the makatea and the volcanic inland, as well as a more specific reference to the swamps themselves. The rautuanu'e is the lower inland hill slopes and the maunga or mountain designates the inner hills.

The Pa Tai

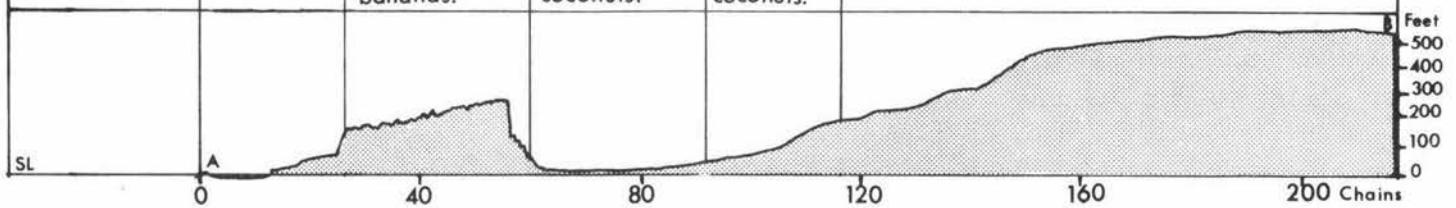
The surface of the pa tai is limestone rock covered in most places by coral sand thrown from the lagoon by storm waves. Beneath the sand a thin soil horizon has formed, comprising humus-stained sand overlying yellow compacted sand. This is the Makatea Sand. (Grange and Fox, 1953, 16). Vegetation is dominated by the coconut, nu, (Cocos nucifera), the screwpine, ara, (Pandanus tectoris), which forms pure stands in a number of places, the Barringtonia, utu, (Barringtonia butonica), a large spreading coastal tree, as well as a tall scrub undergrowth of hibiscus, au, (Hibiscus tiliaceus) and puarenga, (Tithonia diversifolia). There are no streams. In many places continuous heavy surf prevents any growth of vegetation.

The Rautuitui

The proportion of rock outcrops to soil pockets varies from area to area on the makatea surface, but in general two basic divisions can be made. The first, covering the greater part of the total area, comprises large numbers of rock outcrops with small, shallow pockets of volcanic clay. The other, a much smaller total area, comprises larger areas of soil with fewer limestone blocks and with fewer limestone outcrops occurring

MANGAIA: ECOLOGICAL ZONES

	PA TAI	RAUTUITUI	PUNA	RAUTUANUE	MAUNGA
GEOLOGY	Coral limestone; live coral on Lithothamnion Ridge	Raised coral limestone with pockets of volcanic clay. Miocene	Fine detritrus and alluvium, artificially swamped. Recent.	Weathered basaltic alluvium, pebbles and rocks.	Shoaled volcanic cone of basaltic scoria and ejectamenta with numerous dykes. Compacted, deeply weathered. Late Cretaceous.
SOILS	Makatea Sand Strongly calcareous	Oneroa Clay Loam Lateritic	Tamarua Clay Loam Recent gley	Ivirua Clay Loam Lateritic	Tuapapa Clay Loam Lateritic
NATURAL VEGETATION	Coconuts, Pandanus, Barringtonia, and scrub.	Low bush, Pandanus, au, puarenga.	Bush, including mape, tamanu, and other forest species.	Fern, au, kuava and scattered scrub.	Staghorn fern, stunted toa saplings, kuava and grass.
CULTIVATED PLANTS		Tarua, ku'ara, yam, coconuts. bananas.	Mamio, pa'i, tarua, bananas, coconuts.	Pineapples, ku'ara, tarua, coconuts.	



Sources: Marshall (1927), Grange & Fox (1953), Fieldwork, 1967.

A—B see Fig. 4

Vertical Exaggeration 2x.

Fig.3

over a unit area. Mangaians term the pockets of clay puta ko'atu. The soils are lateritic, with a typical horizon of five to six inches of dark brown, friable to granular clay loam on red-brown clay to clay loam. (Grange and Fox, 1953, 16). These areas support light forest when uncultivated, but after cultivation regenerate with au, guava, (Psidium guayava), kuava and ferns and grasses, known collectively as au, or 'bush', after the most common species.

On certain parts of the puta ko'atu, there is an established pattern of rotational bush fallow (see Chapter III). Food gardens predominate, especially near the villages, but tomatoes are also cultivated in this area, although none were grown in 1967. Garden plots are called auakai, whereas abandoned sites are called auatakere or auangangaere, the garden of weeds and rubbish. Abandoned sites may also be called after the length of the time that has elapsed since fallow began, for example, auaokotai mataiti for one year of fallow and auarua mataiti for two years. A plot cleared, but not planted, is known as a auavaereouia. In some areas surrounding the villages are stone walled plots dating from the mission period. The majority of these areas are abandoned and have been for over thirty years, but some are used. They are called auatoka. Scattered throughout the puta ko'atu are numerous coconuts, and some larger trees, which are not removed when garden plots are cleared.

The raei is devoid of almost all vegetation; only stunted pandanus trees and xerophytic shrubs grow from between the fluted, jagged rock. Similar formations occur on other raised islands in the Pacific and lithology and rainwater solution are seen as the major formative factors. (Stoddart, 1967). Only wild goats and the flying fox or fruit bat, moa kirikiri, Pteropus sp.), inhabit this desolate area.

In those areas in which limestone outcrops predominate, Barringtonia, candlenut, tuitui, (Aleurites moluccana) and larger forest trees, such as tamanu, (Calophyllum sp.), grow, but nowhere do they attain any great size. There are no streams on the makatea formation and running water is found only inside caves.

The Piriaki

Beneath the makatea inland cliffs is a narrow area of land comprised partly of talus screes beneath the cliff and partly of volcanic soils exposed by the retreat of the cliff. Where the scree predominates, huge blocks of limestone lie in disarray following massive falls of rock from the cliff. Soil has formed among them and forest trees grow up, hiding much of the cliff itself from view. In a number of places the blocks have weathered to form a steep uneven slope, covered with a thin black forest soil. In other places volcanic soils have mixed with the limestone, especially where a ridge running from the

central core abuts the limestone cliff. There are many areas beneath the cliff which are not swampy, but which are above the general level of the surrounding flats.

Known to the Mangaians as akeke mato the black soils of this area show an average profile of four inches of black to dark brown clay loam on dark brown sticky clay loam. This is the Keia Clay Loam. (Grange and Fox, 1953, 16). The entrances of large caves, ana, break the continuity of the piriaki, as do the swamplands of the puna.

The Puna

Within the swampy flat floored valleys of the puna have been constructed a series of irrigated taro fields, which in their size and organisation appear to be unique in Eastern Polynesia. The importance of the taro on Mangaia is illustrated by two semantic shifts, which have occurred in the Mangaian language. On Mangaia, 'taro' refers specifically to the irrigated plot in which the plants grow. Further, the word 'puna' is used in a specific sense to mean 'district' and in a general sense to mean 'swamp' or 'taro land'. In traditional times, control of the island was so closely related with control of the puna, the words became semantically identical.

Water from the main inland streams is diverted by artificial channels to travel down through the tiers of low terraces, before escaping beneath the makatea. Alluvial material carried by the streams is trapped in the plots and forms a sticky, grey waterlogged soil, vari or repotaro, the Tamarua Clay Loam. (Grange and Fox, 1953, 15). The extent of the taro swamps is limited by rising land on the valley sides and availability of water. Areas surrounding the swamps are also included in the puna, although they are generally covered with forest trees. Soils here exhibit the formation of a humus layer, but remain waterlogged. In the past, irrigated plots were in use up all the main stream valley sides, but most are now abandoned and covered with bush.

The Rautuanu'e

The rautuanu'e is named after the predominant vegetation of the zone, Staghorn fern, anu'e, (Glechinea linearis). This fern covers the lower and upper slopes of the central volcanic core of the island, but on the lower slopes it is thicker and mixed with low scrub and patches of forest. Slopes are not as steep as further inland and soils are more fertile. Much of the rautuanu'e soil is derived from volcanic alluvium brought down from the slopes of the maunga. A typical profile shows up to four inches of dark brown, granular clay loam on 27 inches of red-brown clay loam with ironstone nodules. Beneath this is a bright red clay loam, a yellow clay loam and a mottled yellow and red clay loam. Unweathered rock is not seen in this zone.

Vegetation is predominantly fern, with scattered patches of guava and au, with coconuts scattered among the scrub. Some ironwood saplings, toa, (Casuarina equisetifolia), dot the upper slopes.

This zone is the predominant area of pineapple cultivations, although it was little used in pre-European times. The soils here are the Ivirua Clay Loams, and these compare favourably with soils in other pineapple producing areas, although trace element deficiences are present.

The Maunga

The central volcanic mass of weathered basalt and ankaramite lava flows and intrusions is known as the mountain or maunga. Soils derived from the parent rock, the Tuapapa Clay Loams, (Grange and Fox, 1953, 19), exhibit a typical narrow three-inch horizon of red-brown granular clay loam on compact, red-brown clay loam on deeply weathered rock. Unweathered rock is exposed only where streams flow across dyke and sill formations in narrow valley bottoms, although in two locations, one in Tamarua and the other in Tava'enga, relatively unweathered rock occurs at the surface. Large outcrops of limonite occur on ridges and much of the surface of the maunga has hard, black, iron concretions scattered over it. In at least four places large blocks of makatea limestone occur in situ on the mountainside, and in Voa Roa in Karanga, there are a number of blocks deep in the valley beside the stream. In the stream bed there is an assumed contact between limestone and volcanic rock.

Vegetation on the maunga is mainly fern and toa scrub, stunted and twisted. Fires, a common occurrence over the maunga and rautuanu'e, continually destroy young trees and fern. Beneath the fern and on exposed slopes, rotational slumping and gullying is widespread, giving the maunga the characteristic slashes of red noted by James Cook in 1777.

Rangimotia, the 'centre' of the island, is a long narrow, flat topped ridge. On either side the heads of the valleys which radiate from this point drop sharply away with typical tropical valley-profiles. Traditionally, this ridge was seen as the backbone of Temanavaroa, a Mangaian god who lay buried, face down, head towards the east. From his body the districts of Mangaia took their ceremonial names, depending upon their positions relative to the body. All district boundaries meet along this ridge and run seawards down major ridges over the makatea to the sea.

SOILS[2] (Figure 4 and 5)

Although major soil types have been named and typical profiles described, there has been no discussion of their agricultural potential or limitations. The Mangaian laterite

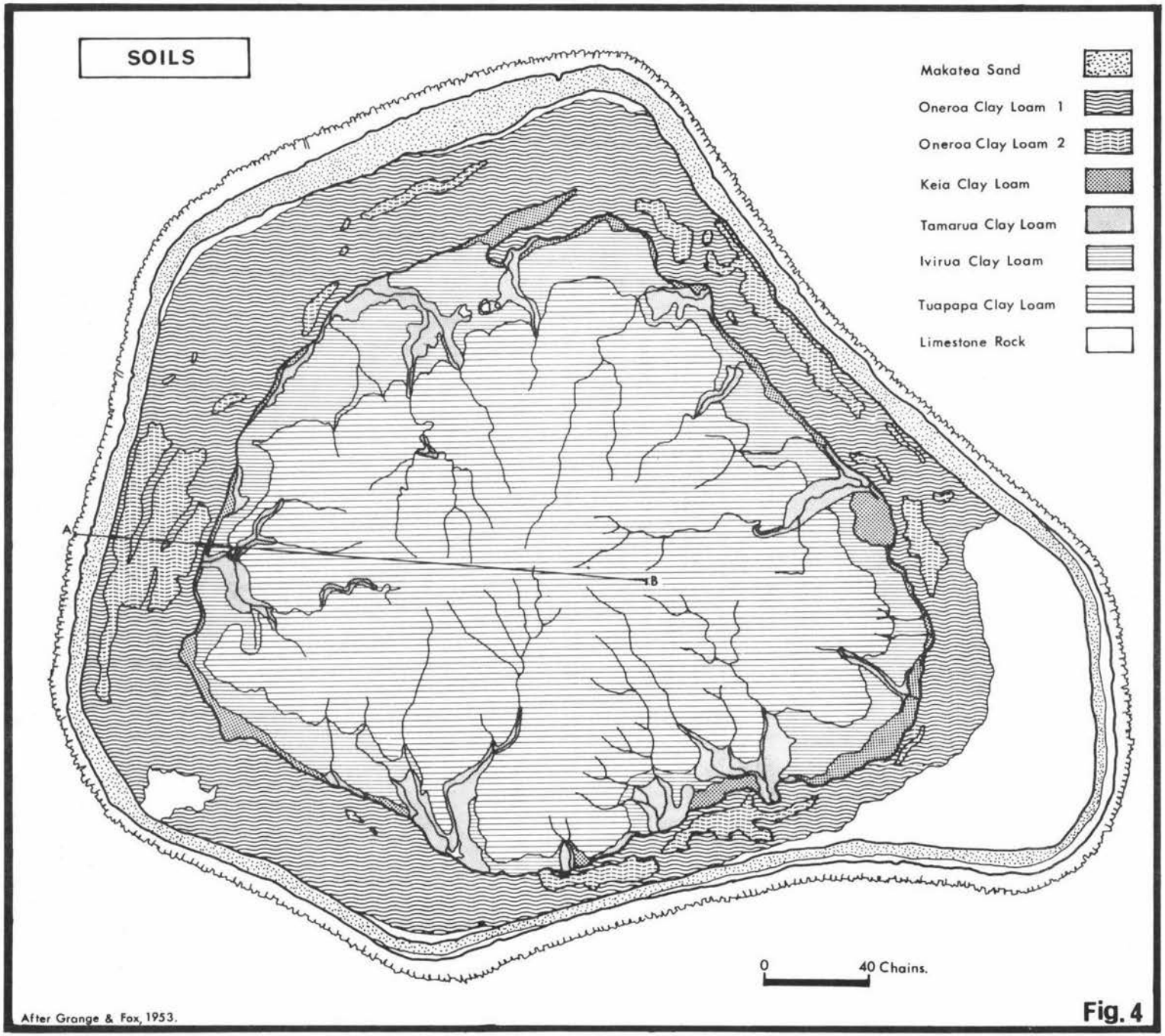

SOILS
Makatea Sand
Oneroa Clay Loam 1
Oneroa Clay Loam 2
Keia Clay Loam
Tamarua Clay Loam
Ivirua Clay Loam
Tuapapa Clay Loam
Limestone Rock
A
B
0
40 Chains.
After Grange & Fox, 1953.

Fig. 4

soils in order of fertility are the Keia, Oneroa, Ivirua and Tuapapa Clay Loams. (Table III shows their relative areas). Cultivation is restricted to the first three.

Although no chemical analysis has been carried out on the Keia Clay Loam, adequate supplies of lime and phosphate may be assumed from plant growth. All types of cultivation are carried out on this soil, but coconuts, scrub and bush protect most of the surface from direct exposure to sun and rain. On established garden sites, tarua and banana plants also protect the soil. It is possible, however, that the relatively high number of abandoned pineapple plots in the piriaki have resulted from rapid loss of fertility following exposure of the soil to the elements.

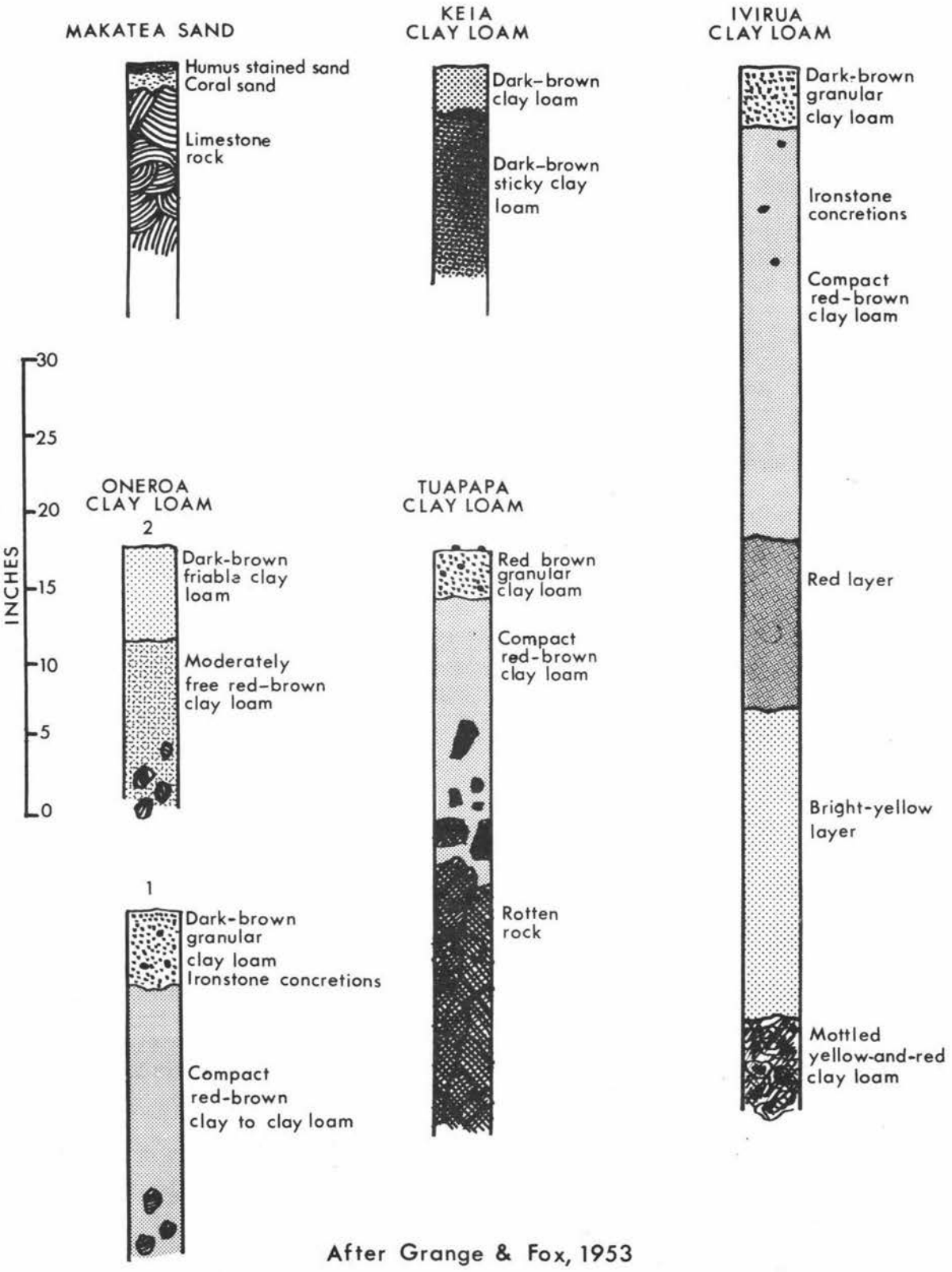
The Oneroa soils on the makatea are low in available phosphates, but an abundant supply of lime from weathering limestone is present, making them suitable for tree crops. However, the majority of these soils, in particular the deeper less rocky areas, are under shifting cultivation. (These soils are the Oneroa Clay Loam 2 soils, as shown on Figure 4). In many places regeneration has not proceeded beyond tall shrubs and weeds after ten years of fallow, whereas on the shallower soils a light timbered forest is established. It is probable the presence of many more outcrops of rock and the accompanying difficulties of cultivation has protected such areas. They have been exposed to less cultivation, or at least a type of cultivation which leaves many of the larger shade trees standing.

The Ivirua Clay Loam is regarded by Grange and Fox as a second grade soil becase of low soil fertility and low lime and phosphate levels. Fertiliser trials carried out by Nola and Bambrick have shown, however, that when a suitable mixture of ammonia, superphosphate, sulphate of potash and magnesium is applied, satisfactory growth can be obtained, particularly from pineapples. In a number of areas, iron chlorosis is affecting pineapple growth. Two causes are most common; first a high level of manganese in the soil which denies the plants available iron, and second, concentrations of limestone from makatea remnants and old house sites. Iron sulphide sprays will alleviate this problem, although spraying costs are high. Trace element deficiences, in particular zinc and copper deficiences, are causing 'Crook neck' in many areas.

The Tuapapa Clay Loam corresponds to the fernland soils common on other Pacific Islands. It is a deeply weathered lateritic soil, with iron concretions, white and cream alumina concretions and limonite rocks scattered over and just beneath the surface. Lime content is low and available potash is very low. It is infertile and will support only sparse stunted vegetation.

The remaining soils are the Makatea Sand and the Tamarua

SOIL PROFILES



After Grange & Fox, 1953

Fig.5

Clay Loam. The first is infertile except for a thin band of humus which will not support any cultivations. The second is fairly fertile although available potash is low. Traditional methods of cultivation (see Chapter III) have ensured a maintainence of fertility and production of taro continues to be satisfactory.

CLIMATE

There is an almost complete lack of reliable climatic data for Mangaia. Although rainfall figures have been recorded since 1914 no temperature or relative humidity figures have ever been collected. Most rainfall data remains in the form it was recorded and is not readily available. General data is available from the New Zealand Meteorological Service and is presented in Table II.

Of the Southern Cook Islands, Mangaia has a more even spread of annual rainfall than any other island but a 'wet' and 'dry' season are still evident. From the point of agriculture, drought risk is not great, although village water supplies are affected annually and can assume serious proportions. The driest months of the year are between May and September, the latter being typically the driest month. Fifty-two percent of the average annual rain falls between January and the end of May and January is on average, the wettest month.

The only indication of relative humidity and temperature on Mangaia is in those figures recorded on nearby islands. Rarotonga is less than 60 miles north of Mangaia in latitude, but is over 2,000 feet above sea level at a number of inland peaks. Aitutaki 114 miles north of Rarotonga is only 300 feet above sea level at the highest point and is less than half the area of Mangaia. (see Table I and Fig. 1). However, on Rarotonga temperatures range between an absolute maximum of 88 degrees Farenheight and an absolute minimum of 57; a mean daily maximum of 84 degrees Farenheight and a mean daily minimum of 65. (N.Z. Met. Notes 3B, 1953, 11). Relative humidity on Rarotonga and Aitutaki shows a definite seasonal variation, with maximums in March and minimums in September. Diurnal ranges may be as great as 25 percent. Humidity in the mornings may reach 80 percent, falling to 70 percent during the afternoons. Evapo-transpiration rates increase during the day to a maximum in the mid-afternoons and are greater during the dry season. Although direct comparisons cannot be made, conditions on these islands provide some measure of similar conditions on Mangaia.

Prevailing winds on Mangaia are south-easterlies, with some variation during the summer period, December to March. December to April is aptly called the 'hurricane season'. During this time tropical cyclones may migrate through the Lower Cook Islands, with accompanying hurricane force winds and high sea levels. Hurricanes are likely to occur on an

TABLE II

MEAN MONTHLY AND ANNUAL RAINFALL, AND AVERAGE RAINDAYS PER MONTH

1914 - 1953

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mean Monthly (in inches)	10.4	9.2	9.0	6.2	5.6	5.1	4.7	4.8	4.4	5.5	5.6	6.5
Average Raindays	14	14	14	12	11	10	10	10	9	10	11	11

Average annual rainfall: 77.01 inches

Max. fall in 24 hours: 9.00 inches

Average raindays per year: 136

Source: New Zealand Meteorological Service, Meteorological Notes 3B, 1953, Cook Islands and Niue.

average of one in every ten years. Recorded hurricanes have caused damage on Mangaia in years 1846, 1866, 1867 (2), 1869, 1888, 1905, 1934, 1944, 1946, 1962, 1967 and 1968.

In summary, although Mangaia cannot be said to experience drought conditions, lack of rainfall in September and October may give concern. In years with low rainfall stream levels in the puna may fall below that needed to supply the taro swamps and some taro may die. One informant spoke of increased plantings in the puta ko'atu on the makatea during dry years, but stated this was a most irregular occurrence. Cloud cover and continuous light rain may cause some fluctuations in pineapple production due to poor ripening or supranormal weed growth. But apart from the ever present danger of hurricanes, the climate on Mangaia does not present any serious limitations to agricultural activities.

MANGAIAN CROPS

Mangaian crops may be divided into three main categories, non-cultivated crops, crops grown for subsistence, and crops grown for cash exchange.

Non-Cultivated Crops

Non-cultivated plants which are most frequently used for subsistence purposes are the pandanus, the kapok, and the hibiscus or au. Pandanus has a multitude of uses, but is used mainly as a roofing material, rau, as fibre for mat and kit making and as a pleasant smelling decoration in head bands and garlands, 'ei. The kapok (Ceiba caseria) is used for stuffing the large matresses common in many houses and the timber is prized for its excellent canoe building qualities. Au is used in house building and in rope making, in which the inner bark of the tree is stripped and twisted. This tree grows all over the island, and is constantly used by planters for providing climbing ropes in the collection of coconuts, or twine for tying together large loads of firewood or taro.

Other plants are used less commonly for culinary and medicinal purposes, but those listed above are the most important. No attempts are made to cultivate them in any way.

Food Plants

The food plants of Mangaia are similar to those utilised on most other islands in Eastern and Central Polynesia: taro kumara, yam, arrowroot, coconut, banana, pawpaw and breadfruit. All these plants are cultivated primarily for local consumption as subsistence, although there is an increasing trend towards some becoming both cash and food crops. On other Cook Islands and in the past on Mangaia, arrowroot and bananas, with copra were commercial crops. Only two cases were noted on Mangaia, however, where any food crops were being cultivated primarily with the object of cash exchange.

Three main types of taro are cultivated, the two varieties of wet taro, mamio and pa'i, (Colocasia sp.) and the dryland taro, tarua, (Xanthosoma sp.) Mamio is a small roundish elongated corm, which is cultivated under running water throughout its period of growth, while pa'i is a larger, longer tuber, grown in a raised bed surrounded by water. Tarua is cultivated in the makatea gardens and on higher areas surrounding the puna swamps. Colocasia sp. is the most important food crop produced, both in quantity and in the area used for cultivation. The tubers take between six and eight months to mature and planting takes place all-year round, providing sufficient running water is available. Pa'i grows taller than mamio with larger leaves and a greater quantity of tuber, but the smaller mamio is valued for its quality, better taste and relative lack of glutinous material. Xanthosoma produces up to a dozen elongated tubers per plant, is easy to grow and is often established in semi-permanant groves beneath the makatea cliff, in shady damp areas. It is also common in shifting gardens, where planting usually takes place between October and December, just prior to the summer rains. The leaves of all varieties may be eaten as a green vegetable, rukau, but mamio is favoured for this purpose. All tubers must be well cooked before eating, as oxalic acid crystals contained in the uncooked tuber will cause painful irritations to the mouth and throat. Colocasia will generally produce between three and six tons of tubers per acre, and Xanthosoma an estimated eight tons to the acre. (Barrau, 1956, 7-8.) These plants are an important source of calories although their protein value is low. Although specimens of other taro-like plants, Alocasia and Cytrosperma were seen growing around the edges of the puna and beneath the makatea cliff, their utilisation as a food is not common, and is resorted to mainly during a severe drought.

A number of varieties of the sweet potato (Ipomoea batatas) are cultivated, but only as a supplementary food. No great trouble is taken in their cultivation, apart from planting at the correct time, weeding and mounding soil around the developing tuber. The ku'ara, as Ipomoea is known on Mangaia, is planted almost solely on the makatea in the puta ko'atu. It is planted in autumn, between April and May, although planting may take place at other times, particularly in late spring. Harvesting takes place about five months later. Average yields are three to six tons to the acre. (Barrau, 1956, 25.) Although a number of suitable ku'ara areas are available, most planters prefer to grow tarua, which is easier and is less likely to be damaged by wandering pigs.

Yam cultivation is common, although the method of cultivation means the plants are seldom seen. Ui, (Dioscorea sp.), is cultivated in very small, stone-wall protected plots, scattered away from the villages in the makatea. Small areas of rich soils are utilised and a solid protection from pigs is constructed around the plot. Yams are trained to grow up branches partially slashed and pulled down into the plot.

There are some instances of yams under cultivation in mixed gardens but in these cases, yams are always planted on the best area of soil in the garden, and always precede other plants in order of plant succession.

Another common supplementary food crop is arrowroot, maniota, (Manihot utilissima). This is an introduced plant and replaced the native form of arrowroot, pia, (Tacca pinnatifidia) shortly after effective European contact. Although widely grown, most plots of maniota are adjacent to or part of another single crop garden, tarua for example. There are two main reasons for its scattered cultivation: first, the tuber will not keep for more than a few hours and thus smaller plots at different stages of growth are more advantageous than large plots; and second, the plant will grow on poor soils, where other more favoured plants might not. Although on Aitutaki and Rarotonga, maniota cultivations may completely destroy soil fertility, in some areas of intense cultivations, because of the ability of the plant to grow on already over utilised and infertile soils, this problem does not arise on Mangaia, where the plant is solely a supplementary food. The starch extracted from the tubers is used in the preparation of puddings, poke, by mixing it with banana, taro or pawpaw, and baking in the traditional oven, the umu.

Coconuts grow in every ecological zone except in the raei and maunga and comprise an important food and subsistence plant as all parts of the palm are utilised. Nuts are used either for pig food or for human consumption, as all copra production has ceased. Kikau, the palm fronds, are used in roofing, as a mat making fibre and as a mulch for tarobeds. The palms themselves are owned as individual trees or as a grove. Certain trees, some over 80 years old, mark boundary lines or ownership of rights to certain areas of land. Access to palms for casual refreshment is relatively free, except during a ra'ui, or closed season, but for daily consumption, a family is expected to utilise their own trees.

Bananas, meika or koka, (Musa sp.), are very common in and around the villages, in depressions in the makatea and in shaded areas in the puna, especially beneath the makatea cliff. Although semi-permanent groves predominate, some short-term banana plots are planted beside food gardens. When the sites are abandoned, the banana plants are moved to new sites. Bananas forma common supplementary part of the diet, usually being mixed with arrowroot starch to form a banana poke. Attempts have been made to export bananas from the island, but difficulties of transhipment and inadequate handling facilities proved too great an impediment.

Breadfruit trees, kuru, (Artocarpus incisa) and pawpaw, (Carica papaya), are scattered as individual plants throughout the village areas. Inland, breadfruit trees are found only on abandoned settlement areas, but odd pawpaw trees are not uncommon in many cultivations including pineapple plots. The

breadfruit is not an important food but is used to vary the diet, while pawpaw is not greatly favoured, except as a pudding.

Commercial Crops

The sole crop grown primarily for cash exchange is the pineapple (Ananus comosus). Tomatoes were cultivated in 1966, but in 1967 the Department of Agriculture, wishing to discourage on Outer Islands, the cultivation of perishable crops suitable only for export to New Zealand, denied Mangaian planters seed or plants. Coffee groves flourish in parts of the island, some from older mission plantings and some from the more recent but discontinued Coffee Replanting Scheme. (see p. 94). Citrus trees, once the island's major export, have mostly died and only a few trees are still bearing for local consumption.

Two varieties of pineapples are cultivated. The Ripley Queen, arataratara, introduced originally before 1900 and more recently in 1946 from Queensland, and the Smooth Cayenne, arapateka, introduced in 1960 from Hawaii and Australia. The Ripley, a smaller, more hardy spiny-leafed, thick-skinned pineapple is exported to the New Zealand fresh fruit market, whereas the Cayenne, a larger, more juicy, but less sweet fruit, is more suitable for canning, and was introduced specifically to supply the canning factory on Rarotonga.

The pineapple is a perennial which does not have a natural period of dormancy. As long as environmental conditions are adequate the plant will continue to grow. The most decisive factor is temperature. If temperatures range beyond about 98 degrees and below 68 degrees Farenheight, growth stops, while a short period of very cold weather will kill the plant. Periods of lower temperatures which do not stop growth may affect the colour and sweetness of the fruit. Pineapples show a remarkable adaptation to a wide range of rainfall conditions, the range extending from 23 to 97 inches with an optimum around 35 inches per annum. Storage of water in the leaf of the plant allows it to withstand periods of drought, particularly where rainfall is seasonal. Pineapples will also grow in a wide range of soil types, the major limiting factor being drainage as the plant cannot tolerate waterlogging at root level. Most pineapple producing areas in the world are located on lateritic soils derived from volcanic lavas. Most of the disadvantageous features of these soils for pineapple cultivations, such as high manganese levels with little available iron, and trace element deficiences, can be overcome technically. Iron chlorosis is fairly marked on Mangaia as is a type of chlorosis caused by a high percentage of lime in the soil.

Recommended bed preparation differs from area to area depending upon the technological level of the country in which the cultivation is carried out. The pattern for Mangaia is based on Australian experience which recommends that cultivation should begin several months before planting, that all old plants

and rubbish should be crushed or chopped with rotary slashers and buried by discing or ploughing, and that after at least a month the land should be reduced to a fine tilth, levelled and surveyed into blocks. Planting material, made up of tops, suckers or slips must be dried out before planting by leaving in the sun for up to a fortnight. Rows should be on the contour, or at least across the slope, up to six feet apart from centre to centre and well drained.

Approximately eighteen months after planting the first fruit begins to ripen. This is the plant crop. After picking fruit must be handled with great care as it is extremely susceptible to fungoid infection, following a break in the skin. The plant continues to produce fruit at annual intervals, the first ratoon crop, second ratoon crop and so on. Fruit becomes progressively smaller, until the plant ceases production, but continues growing, becoming tall and bushy, with long slender leaves. It is recommended that the Smooth Cayenne should be replanted every two years, that is following the first ratoon crop. But many Mangaians continue production until the fruit is unacceptable, before attempting to replant. (see p.125) (4).

Fruit picked for the Rarotonga factory is picked either into sacks or cases and carried to a central location on the plot. Here fruit is graded into those below four inches in diameter and those over five inches in diameter. Tops are removed and the fruit packed into cases marked according to the size of the fruit. These are taken to the landing by truck, inspected, tallied and then tipped into cargons, large metal and wood crates supplied by the factory, holding between 40 and 44 cases of pineapples. Except when bad conditions prevent the use of Avarua Landing, fruit is shipped in bulk, but when Atuakoro is used, all fruit has to be manhandled across the reef in cases. This occurs about twice or three times a year. Some fruit is still sent to New Zealand, but only when a direct shipment is possible. No transhipments take place. Lack of care in packing, packing green or overripe fruit, crushing in cases when bulk shipments are not possible and pilfering in Rarotonga, all result in some fruit either not reaching the factory, or reaching it in a damaged condition. The canning company, Island Foods Limited, a subsidiary company of Greggs Limited, Dunedin, pays the Cook Island Fruit Control Office, which acts as agents for the growers, for administration, for losses occurring in transit to the factory from the island, for cartage from individual plots to the landing, for boating costs and freight charges and for any other costs incurred, such as the return of empty cargons and cases. In return Fruit Control pays the growers, the truckowners and the shipping company, arranges harvest estimates and wharf inspections, administers quotas, where there is a greater quantity of fruit available than the factory requirements and negotiates prices annually between the growers and the factory. (5).

ECOLOGICAL ZONES AND LAND USE (6) (see Figure 6)

In pre-European times, man's exploitation of the Mangaian environment was concentrated in the puna, an area which he had adapted to create optimum conditions for a plant of some cultural importance, and areas immediately adjacent in the piriaki. The other zones were used almost solely for foraging, and for subsistence needs other than food, building materials for example. In 1967, despite marked cultural changes and improved technology, cultivation and exploitation remains limited mainly to a narrow strip of land lying between the maunga and the makatea cliffs. The makatea and the maunga account for over 70 percent of the total land area of 12,828 acres. The maunga was completely uncultivated and the makatea was cultivated, including fallow land, on only 8.7 percent of the 4,468 acres that it covers. The pa tai, although supporting 666 acres of coconuts is infertile and was not under active cultivation at any location. Cultivated land comprised only 11.2 percent of the total land area of the island, or 1,440 acres. A total of 10,721 acres remained uncultivated, excluding coastal stands of coconuts. (see Table III and IV).

Of the 1,440 acres which were under cultivation, 569 acres (39 percent) were being actively cultivated, 790 acres (54 percent) were under various stages of fallow and 80 acres were under plantations of coconuts. Food crops accounted for 267 acres of land under active cultivation and cash crops, or more specifically pineapples, for 302 acres, 20 acres of which were under the jurisdiction of the Cook Islands Department of Agriculture (7). Of the 267 acres of food crops, 246 acres were made up of swamp taro and were located in the puna swamps, leaving only 20 acres of dryland food crops. This great predominance of swamp taro over other food crops is illustrative of the importance of Colocasia on the island. Pineapple cultivation was also concentrated into one zone, the rautuanu'e. Only 10 acres of pineapples were cultivated outside of this zone, and these were in the adjacent piriaki, where there was also a further 30 acres of abandoned pineapple plots. (see Table IV).

Land in fallow totalled 55.6 percent of the total area cultivated. This figure includes all fallow land, and thus land under a short 2 to 5 year fallow cycle is categorised similarly to land in a longer 15 to 20 year cycle. However, 46 percent of the fallow land was located in the makatea area, and most of this land was short fallow (up to ten years) on established garden sites, which included many abandoned tomato gardens. Of the 790 acres of fallow land, 55 acres were abandoned pineapple plots. (Because pineapple plots located outside of the fernlands are rapidly invaded by tall scrub, this figure is most likely lower than the area which actually existed.) In two locations abandoned pineapple plots, too small to figure in the accompanying tables, occurred on the lower slopes of the maunga. In both cases, local informants stated no fruit had been produced. Plants which remain growing there are stunted,

TABLE III

ECOLOGICAL ZONES, SOILS AND LAND USE

Land Use (Areas in Acres)[a]

Zone	Soil Type[b]	Grange & Fox (Area in acres)[c]	Food Crops	% of Total Area of Zone	Cash Crops	% of Total Area of Zone	Coconut Plantations	% of Total Area of Zone	Fallow	% Of Total Area of Zone	Uncultivated	% of Total Area of Zone	Total Area[d]
Reef	-	-	-	-	-	-	-	-	-	-	851	100.0	851
Pa Tai	Makatea Sand	854	-	-	-	-	-	-	-	-	906	100.0	906
Rautuitui	Oneroa Clay Loam	4406	19	0.4	-	-	10	0.2	365	8.1	4074	91.2	4468
Raei	-	-	-	-	-	-	-	-	-	-	560	100.0	560
Piriaki	Keia Clay Loam	362	9	4.1	10	4.6	-	-	95	44.2	101	46.9	215
Puna	Tamarua Clay Loam	681	236	79.7	-	-	-	-	60	20.27	-	-	296
Rautuanu'e	Ivirua Clay Loam	1275	3	0.3	292	24.8	69	5.8	270	22.9	542	46.1	1176
Maunga	Tuapapa Clay Loam	5250	-	-	-	-	-	-	-	-	5207	100.0	5207
Total		12828	267		302		745		790		11575		13679[e]

Notes and Sources:

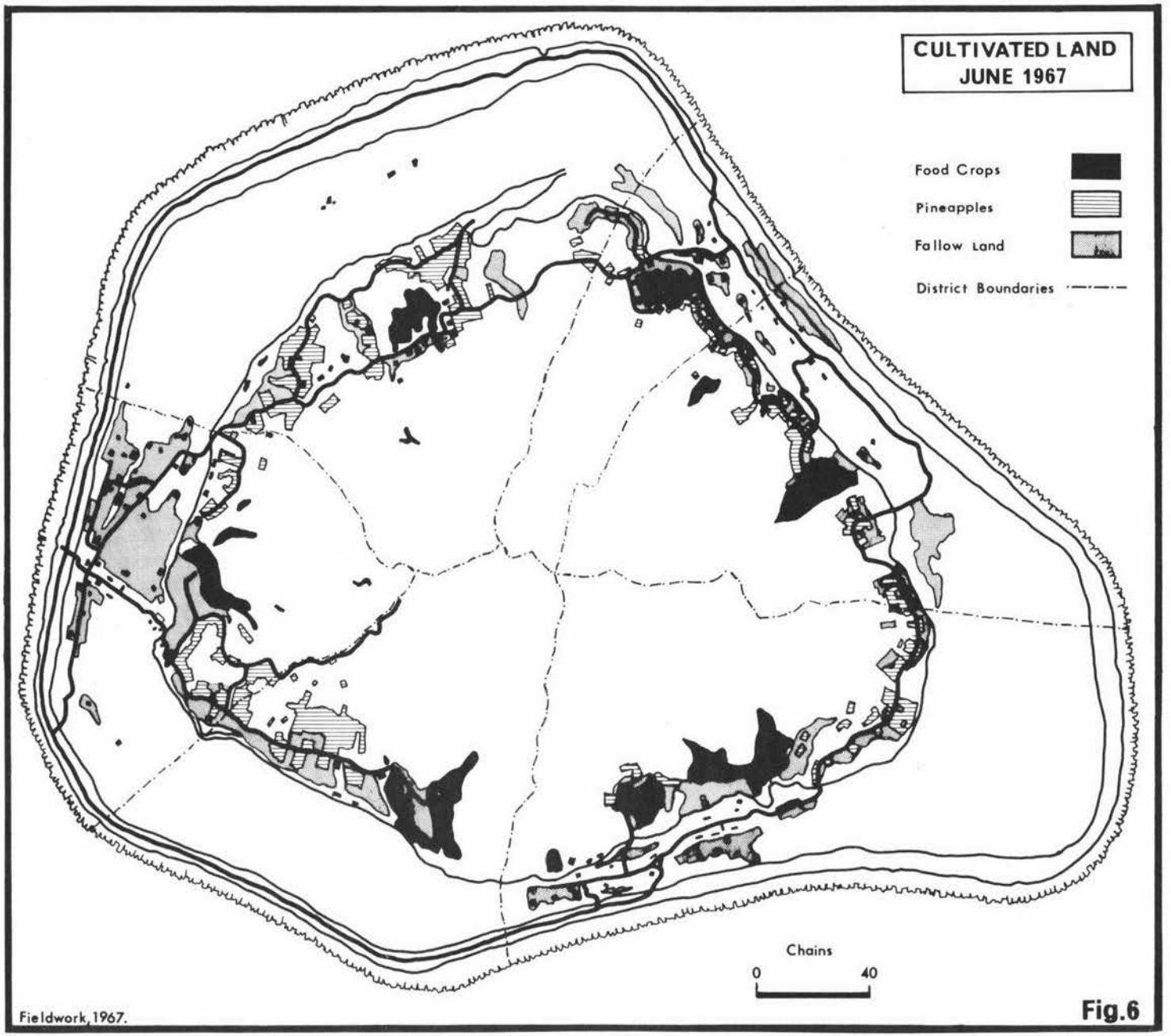
(a) Acreages are rounded off to the nearest whole number.

(b) Grange and Fox, 1953.

(c) Areas calculated by Grange and Fox during reconnaissance soil survey in 1952.

(d) Areas calculated by the writer during a land use survey, May, 1967. The major discrepancies arise because Grange and Fox were forced to rely upon a pace and compass survey dated 1930, whereas the 1967 survey was based on aerial photographs. The 1930 map exaggerates the areas of the puna taro swamps.

(e) The reef flat is included in this figure.


CULTIVATED LAND
JUNE 1967
Food Crops
Pineapples
Fallow Land
District Boundaries
Chains
0
40
Fieldwork, 1967.
Fig.6

while most have died.

District Land Use

Tables IV and V show figures for land use on a district basis. The four districts are of approximately the same area and contain similar areas of uncultivated land. Variations occur in the areas of land cultivated, that is, land under active cultivation and in fallow, and in the relative proportions of fallow to active cultivations and of food crops to cash crops.

Tava'enga district is located to the north of Oneroa Village and covers 3,284 acres, of which 202 acres were cultivated, 6.1 percent of the total area. Almost 94 percent of the district comprises makatea and coastal terraces or inland fernhills. There is, however, a relatively large area of rolling low hills and valleys, in the rautuanu'e and it is here, about two miles from the village that the bulk of the pineapples are cultivated. The puna land in Tava'enga is surrounded by higher land and the swamps do not reach the makatea cliff. One area of swamp, about three miles from Oneroa, has been completely abandoned, and other areas of the main swamp land are covered with scrub. Some Tava'enga planters also cultivate taro in Keia, under agreements with Keia planters, or through land rights held by their wives. Only 24 acres of swamp taro were cultivated in the Tava'enga, the district with the largest population, (see Chapter II), which suggests that either Tava'enga planters are concentrating on cash cropping or that a great many plots in the Keia swamps are cultivated by Tava'enga planters. Tava'enga demonstrates the greatest degree of commercialisation from an areal aspect. Forty-two percent of cultivated land was in pineapples, an area 56 acres larger than that in food crops. By comparison to other districts, in which the percentage of land in pineapples to the total land cultivated was not above 20 percent, Tava'enga shows a marked progression towards commercialisation. Other features associated with this large pineapple area are a small area of fallow land and a small area of abandoned pineapples. Pressure on good pineapple growing areas is presumably resulting in a shortening of fallow and a rapid sedentarisation of cultivation.

Keia-Veitatei comprises the two districts south of Oneroa, occupied by villagers from Kaumata and Temakatea Villages. This district is the largest, 3,662 acres and also contained the largest area of cultivated land of all the districts, 586 acres, 16 percent of the total area. Of this area, however, 63 percent was in fallow and only 15 percent in commercial crops. Food crops accounted for 89 acres of land, 75 acres of which was taro land in the swamps. Oneroa Village which lies within the district boundaries influences land use patterns. The proximity of this concentration of population is reflected in the larger area of food crops in this district and the large areas of fallow land which surround the villages. Planters

TABLE IV

LAND USE BY DISTRICTS, 1967

(Areas in acres)

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Total	
	Area	%	Area	%	Area	%	Area	%	Area	%
Food Crops	89.2	2.4	30.9	0.9	85.6	2.7	61.8	2.3	267.5	2.1
Cash Crops	88.1 (20.0)[a]	3.0	85.2	2.6	48.1	1.5	60.9	2.2	302.3	2.4
Total Area in Cultivation	197.3	5.4	116.1	3.5	133.7	4.2	122.7	4.5	569.8	4.4
Fallow[b]	369.7	10.1	56.8	1.7	167.0	5.3	197.3	7.2	790.8	6.2
Plantation Coconuts[c]	19.6	0.5	29.9	0.9	5.0	0.2	25.2	0.9	79.7	0.6
Total Fallow and Cultivated	586.6	16.0	202.8	6.1	305.7	9.7	345.2	12.6	1440.3	11.2
Coastal Coconuts	150.0	4.1	355.0	10.8	100.0	3.2	61.0	2.2	666.0	5.2
Uncultivated Land	2925.4	79.8	2726.2	83.0	2744.3	87.1	2325.8	85.1	10721.7	83.6
Total	3662.0	99.9	3284.0	99.9	3150.0	100.0	2732.0	99.9	12828.0	100.0

(a) Government Farm.
(b) Fallow land includes recently abandoned or unplanted plots, grasses, scrub, scattered coconuts and second growth bush.
(c) Plantation coconuts are distinguished as those deliberately planted in groves. Coastal coconuts are those which grow on otherwise infertile areas around the coast

TABLE V

FALLOW AND ACTIVELY CULTIVATED LAND BY DISTRICTS, 1967

(Areas in Acres)

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Total	
Food Crops	Area	%	Area	%	Area	%	Area	%	Area	%
Swamp Taro	75.4	12.9	24.2	11.9	81.5	26.6	55.2	15.9	236.3	16.4
Tarua, maniota, ku'ara, yams	10.8	1.9	3.4	1.7	3.0	1.0	4.3	1.2	21.5	1.5
Bananas	3.0	0.5	3.3	1.6	1.1	0.4	2.3	0.7	9.7	0.7
Total Food Crops	89.2	15.3	30.9	15.2	85.6	28.0	61.8	17.8	267.5	18.6
Commercial Crops										
Pineapples	88.1 (20.0)*	15.1 3.4	85.2	42.0	48.1	15.7	60.9	17.7	302.3	20.9
Total Actively Cultivated Land 1967	197.3	33.8	116.1	57.2	133.7	43.7	122.7	35.5	569.8	39.5
Fallow Land										
Abandoned and Unplanted Plots	143.6	24.6	7.7	3.8	56.3	18.4	21.1	6.1	228.7	15.8
Abandoned Pineapples	15.3	2.6	1.2	0.6	18.4	6.0	21.0	6.0	55.9	3.8
Scrub and scattered coconuts	210.8	36.2	47.9	23.6	92.3	30.2	155.2	45.0	506.2	35.2
Total Fallow Land 1967	369.7	63.4	56.8	28.0	167.0	54.6	197.3	57.1	790.8	54.8
Dense Coconuts	19.6	2.7	29.9	14.7	5.0	1.2	25.2	7.3	79.7	5.5
Total	586.6	99.9	202.8	99.9	305.7	99.5	345.2	99.9	1440.3	99.8

* Government Farm

resident in the village, from Tava'enga as well as Keia Veitatei, plant taro in Keia Swamp and cultivate tomatoes, when grown, on land near Oneroa Village. (see p. 48 for details of land tenure arrangements which make inter-district planting possible). The more intensive contact with the outside world by the villagers in this district is resulting in a move towards modernisation which is reflected to the same extent only in Tava'enga. In Keia-Veitatei, though, this move has been concentrated on non-agricultural factors like temporary emigration and wage earning. (see Chapter V).

The main area of pineapples lies along the inland track to Veitatei Swamp and around a prominent hill near the edge of the makatea in Keia. An area of rautuanu'e beyond the Veitatei Swamp, between Veitatei and Tamarua is not used because of poor access and serious gullying on the lower hill slopes. The upper and lower reaches of the Veitatei Swamp are abandoned, and are in tall reeds.

Tamarua and Ivirua-Karanga districts are isolated from Oneroa, and can be reached by foot over Rangimotia or by road by travelling around the outside of the island (although a new road was bulldozed through Tava'enga to Karanga in August, 1967). The most notable feature of land use in Tamarua is the large area of puna swamp located immediately behind the village. This influences other land use, particularly food crops, and there was only 1.1 acres of food grown outside of the swamp. Pineapples are cultivated in two main localities, one area of ten acres behind the swamps and another area near the Ivirua border of 38 acres. The second area is a continuous area of pineapples, some abandoned, between the maunga and the makatea at a point where there is no swampy land and the inland cliff of the makatea is completely covered by soil and bush. Two major swamps lie behind the villages in Ivirua-Karanga, and totalled 55 acres of taro land. Although there were over 60 acres of pineapples cultivated in the district, there were also 21 acres of abandoned pineapples and little signs of re-planting. It is more common in this district to clear a new area, rather than replant a previously used plot. Abandoned pineapples in the piriaki in Ivirua-Karanga are covered with scrub, but those areas on the Ivirua Clay Loams near the Tamarua boundary are showing little evidence of regeneration and the plots support only low grasses and stunted fern. Two relatively large fallow areas are located to the north and south of the villages, the site of former tomato gardens.

CONCLUSIONS

The interaction of environment and culture on Mangaia has resulted in a distinctive pattern of land utilisation. The original Polynesians took advantage of the conditions prevailing in the puna, where flat floored, swampy valleys with adequate water supplies, created optimum growing conditions for Colocasia, a Polynesian staple and a plant with considerable cultural

importance. Because they were so successful, they had little need to develop other complicated methods of exploiting the remaining resource zones on the island, and these remained largely zones of foraging. Only those people denied access to the puna were forced to use the makatea and lower fernlands as major area of subsistence, and they employed a rotational fallow system, which was restricted to those areas in the makatea in which limestone outcrops were less numerous. The fernlands were used only as a source of fern roots in times of famine or defeat.

The arrival of European culture at first merely accentuated patterns which had been established in the cultivation of the makatea. Villages were established there and rotational fallow and established garden sites became more extensive. Any crops exchanged for cash or goods were produced from within this system, and the major introduced export crop during this period was a tree crop, Citrus sp. which was scattered throughout the makatea and piriaki and had little effect on established patterns. It was not until after 1945, when pineapples replaced citrus as the major export crop, that agricultural exploitation entered a third ecological zone, the rautuanu'e, the lower fernland slopes of the volcanic core. In 1967, these cultivations covered a slightly larger area than traditional food crops.

Except in the area of tomato cultivation, subsistence cropping and cash cropping are now isolated from each other spatially and no integration takes place. In the puna, the original adaptations are so successful that almost no changes have taken place since European contact and this zone continues to produce the bulk of all food consumed on the island. (see Apendix II). In the rautuanu'e, the cultivation of an alien plant is taking place and a commercially exchangeable product is supplying a sophisticated and mechanised modern market. The most important link between these two elements, subsistence cropping and cash cropping, is maintained by Mangaian planters by their activities in both areas.

The changes in land utilisation which are taking place on Mangaia, are occurring under the influence of increasing contacts with the outside world. These forces of modernisation are pressing primarily upon Mangaian society, and the changes on the surface of the land are a reflection of changes within the society. At the same time the existing patterns of land utilisation, determined by past interactions of the environment and the society, continually influence the form which present changes within the society are taking.

Despite the extent of change in land use patterns, the Mangaian situation remains transitional. In only one district, is the complex relationship between subsistence cropping, cash cropping and the society beginning to become clearly evident. In Tava'enga, coincidental with an increase in commercial cropping, is a decrease in the area of subsistence cropping

and in fallow land. With continuing commercial development, this trend is likely to appear in all districts on the island. More swampland may be abandoned, a more intensive use of lower fernlands may evolve, and food crops may also begin to gain an increasing monetary value.

REFERENCES

1. Apart from those terms collected during the field study, Mangaian terms described in this chapter are from Hiroa, 1934 and personal communications with Rev. T. Pere, Pacific Islanders' Congregational Church, Newtown, Wellington. Botanical names are from Wilder, 1931.

2. All descriptions of soils are based upon the reconnaissance survey carried out by Grange and Fox, 1953.

3. Personal communications with Mr. A. Nola, Beach Haven Primary School, Auckland, formerly headmaster at Oneroa Primary School, Mangaia, from 1958 to 1960.

4. General notes on pineapples from Collins, 1960. Specific references to Mangaian pineapple growing from Bambrick, 1966.

5. Executive Committee of the Cook Islands, Appendix: Conditions of acceptance of pineapples as between the growers and Island Foods Limited. (No date).

6. Terms used in this section are defined as follows: cultivated land includes land in fallow as well as land under active cultivation. Active cultivation means a crop was being produced from the area at the time of the survey. Fallow land is that land which has been actively cultivated in the past, but at the time of the survey, was abandoned to natural regenerative species. These terms have been used to avoid the use of 'cultivable land' which implies a judgement on the part of surveyor as to whether or not, an area is able to be cultivated.

7. This farm of approximately 20 acres was established by the Cook Islands Government to provide interested planters with Smooth Cayenne planting material. Once it is considered that a sufficient number of Cayenne plants are in cultivation around the island to provide future new planting material, the farm will be disbanded and the land returned to the kavana of Veitatei and the rightholders.

CHAPTER II

THE MANGAIAN SOCIETY

Before effective contacts between Europeans and Mangaians, the Mangaian society formed an integral part of a closed relationship between the society and the island environment. Any elements entering the system from without before European contact were either very similar to elements which already existed within the system, or were too insignificant to effect any noticeable changes. Within the system internal evolutions readjusted the relationships between the environment and the society, but no major changes resulted. European contact resulted in an exceedingly powerful cultural group forcing its way into the formerly closed system and bringing it into a steadily increasing relationship with the outside world. Major changes resulted in social and cultural aspects of the society and these were rapidly reflected throughout the related parts of the agricultural system. The environment and the existing system, in return, influenced the extent and the direction of changes occurring within the society. Thus a meaningful picture of the changes which have taken place on Mangaia since European contact, and the steady intensification of commercialisation and modernisation, is not possible without a detailed examination of the Mangaian society and the components of which it is formed.

MAJOR POPULATION TRENDS, 1821-1966

The Nineteenth Century

The earliest estimates of the total population on Mangaia were made in 1821 by Williams and Bourne, who considered there were between 2,000 and 3,000 persons on the island (1). The earliest census was taken in 1845 by George and William Gill of the London Missionary Society, who recorded 3,567 persons (2). Between 1821 and 1845, however, the Mangaian population was subject to at least two severe attacks of a dysentric disease, during which it was estimated one in twelve people died (3). Nine years later, in 1854, the population began to decrease rapidly, a trend which was not altered until well into the twentieth century. By 1900 the population was reduced to almost half of the 1821 estimates. The major causes of this dramatic decrease in population appear to have been disease, emigration and depression. (see Table VI).

Although population increased during the period 1830 to 1846, so did the level of disease and in 1848 George Gill noted that disease was then greater than at any period of his residency (4). With increasing ill health and annual epidemics, deaths began to exceed births annually and after 1854, the total population decreased steadily. Although a major factor in the reduction of population, disease on Mangaia was not as significant as it was on either Rarotonga or Aitutaki, and by contrast, Mangaia was considered a 'healthy island' by

TABLE VI

TOTAL POPULATION, 1821-1966

Year	Total Population	Average Annual Percentage Change (a)
1821*	3,000	-
1838*	3,000	-
1845	3,567	+2.7
1847*	3,668	+1.0
1854	2,926	-4.0
1859	2,306	-5.0
1867*	2,237	-0.5
1872*	2,266	+0.2
1881*	2,000	-1.5
1884*	2,200	+1.1
1895*	1,821	-2.0
1900	1,541	-3.5
1903*	1,507	-0.6
1906	1,531	+0.3
1907*	1,526	-0.2
1911	1,466	-0.1
1916	1,241	-4.5
1921	1,230	-0.2
1926	1,249	+0.4
1936	1,459	+3.5
1945	1,845	+5.5
1951	1,841	-0.1
1956	1,970	+1.5
1961	1,877	-1.0
1963*	1,804	-2.0
1967**	1,994	+3.5

Notes: * Estimates
** Provisional figures.

(a) Average annual percentage change is calculated from the preceding year, as listed.

Sources: Letters to the London Missionary Society, 1821-1895.
Justice Department Records, Rarotonga.
Mangaia Administration Records.

its European inhabitants (5).

A second major factor contributing to a decrease in the total population was emigration. This was first noted in 1846, when George Gill became 'seriously concerned' at the number of youths being taken as crew on ships calling at Mangaia, particularly as many captains did not return the Islanders to their home, but put them off in any convenient port (6). Many persons, however, were departing on ships as passengers, although it was not until 1867 that it was accepted by the resident missionaries that these people would not be returning (7). By 1867 Mangaians were known to be resident in California, on Tahiti and on Rarotonga. By 1901 there were 250 Mangaians living on Rarotonga and at least 200 on Tahiti (8).

A third factor involved was a phenomenon known as 'psychotic depression'. Although considered a suspect theory by some demographers, depression is cited by a number of writers as an important secondary agent of depopulation. Beaglehole (1955, 46) and Henderson (1963) both mention the occurrence of this factor in a population subsequent to severe cultural change and primary reduction of the total population. On Mangaia it took the form of '...something like Fatalism, an extreme apathy and indifference in the face of minor sickness' (9), symptoms which are similar to extreme cases of anomie in individuals, resulting from dramatic changes in their social and cultural surroundings.

Apart from the decline in total population, imbalances in structure may be assumed, but cannot be verified by any contemporary records. Changes in racial composition almost certainly occurred, for as early as 1852 two shipwrecks marooned 25 American sailors at Oneroa for six months, while trading ships often stayed at the island for several days (10).

1900-1945

The pattern of a steady decline in total population, an imbalance in age/sex structures, selective emigration and high infant mortality and mortality rates established in the nineteenth century, were not significantly altered until the mid-1930's. The total population continued to decrease, infant mortality was constantly in excess of 150 deaths per 1,000 live births and although detailed records of emigration are not available, internal migrations continued to other islands in the Cook Islands and to the Society Islands. (11)

Improved medical and social services which became effective in the 1930's brought about noticeable changes in the population. The total population, which reached its lowest point in 1921, began to grow steadily. (see Table VI). Infant mortality rates, although slower to respond, fell below 100 infant deaths per 1,000 live births between 1932 and 1941 for the first time since 1917, when the records begin. (see Table VII).

TABLE VII

INFANT MORTALITY, 1917 - 1966

Period	Total Births	Total Infant Deaths[(a)]	Deaths per 1,000 Live Births
1917-21	257	50	194.55
1922-26	205	42	204.80
1927-31	239	38	158.99
1932-36	284	28	98.60
1937-41	359	31	86.35
1942-46	392	55	140.30
1947-51	391	53	135.54
1952-56	398	64	160.80
1957-61	428	29	67.75
1962-66	408	8	19.60

Notes: (a) Infant deaths are those occurring on or before the infant's first birthday. Early registration was poor.

Source: Mangaia Births and Deaths Registers, Mangaia.

TABLE VIII

ESTIMATED NET MIGRATION, 1921 - 1966

Period	Total Births (a)	Total Deaths	Nat. Increase	Actual Increase/ Decrease	Net Migration	Av. Annual Migration (b)
1921-26	252	245	7	19	+12	+2.0
1927-36	623	272	351	210	-141	-15.6
1937-45	658	299	359	386	+27	+3.0
1946-51	391	198	193	4	-189	-31.5
1952-56	398	168	230	129	-101	-20.2
1957-61	428	82	346	-93	-439	-87.8
1962-66	408	61	347	117	-230	-46.0

Notes: (a) Early birth registration was poor. Since 1957, however, almost all births have taken place at the Cottage Hospital.

(b) Lacking any other reliable figures, this calculation produces an estimate of migration. It does not, however, account for those persons returning to the island.

Source: Calculated from figures located at the Justice Department, Rarotonga, and Administration Records, Mangaia.

At the same time, emigration of Mangaians to Rarotonga, New Zealand and Tahiti slowed down. As Table VIII shows, emigration in the period 1900 to 1945 appears to have been marked from 1900 to 1915 (12), but after this period does not seem to have seriously affected the Mangaian population until 1947. Age/sex figures support this argument, as the greatest imbalances in structure previous to 1956, occurred between 1906 and 1916. Such imbalances indicate selective emigration.

1945-1966

Between 1945 and 1966 there were major structural changes in the Mangaian population. (see Table IX). While the total population fluctuated around a mean of 1,900 persons, the proportion of children to those persons in the working age groups of 15 to 59 years grew rapidly. Table IX shows this change occurred sharply between the census years of 1956 and 1961, when the percentage of children under 15 years of age in the population increased from 47 percent to 54 percent and the working age groups decreased from 48 percent to 39 percent, a drop of almost 10 percent in five years. Over the same period a notable imbalance appeared in the sex ratio, which fell from a ratio of 112 men to 100 women over 15 years of age, to 93 men per 100 women, a fall of 17 percent, compared with a fall of only nine percent over all age groups. (see Table X).

Although it is suggested by McArthur (13) that sexual imbalances in Pacific Island populations will lead to a decrease in fertility, on Mangaia between 1945 and 1966, despite a 15.9 percent decrease in women aged between 15 and 44 years, there was a 53.8 percent increase in the number of live births, which increased the fertility ratio from 35.04 to 64.10 live births per 1,000 women in the child bearing age groups. This meant a greater burden was thrust upon those males in the working age groups, as the number of dependents increased and the number of working age males decreased. (see Table X). This burden of dependency did not improve over the subsequent intercensal period, 1961 to 1966, for although there was a 0.05 percent increase in the number of persons aged between 15 and 59 years, there was a 0.83 percent decrease in numbers of males in this group. A continually high fertility ratio, caused mainly by increased numbers of births in the period 1956 to 1961, further aggravated the dependency ratio between 1961 and 1966. (see Table XI).

In summary, between effective European contacts in 1840 and the present day, the Mangaian population has experienced three main periods of change. In the period 1840 to 1900 disease and emigration caused a rapid loss of total numbers, an upset in age/sex ratios, and an increase in mortality. These trends continued until the second decade of the twentieth century, when a period of relative stability was reached. Although infant mortality remained high, general mortality and emigration decreased, and the total numbers of people in

TABLE IX

POPULATION STRUCTURE, 1945 - 1966

Age Group	1945		1951		1956		1961		1966	
	No.	%	No.	%	No.	%	No.	%	No.	%
0-4	310	16.8	333	18.1	346	10.6	438	23.3	455	22.8
5-14	561	30.4	560	30.4	580	36.5	548	31.1	692	34.8
0-14	871	47.2	893	48.5	926	47.1	1022	54.4	1147	57.6
15-59	897	48.6	869	47.2	949	48.1	742	39.5	744	37.3
Over 60	77	4.2	79	4.3	95	4.8	113	6.1	103	5.1
Total	1845	100.0	1841	100.0	1970	100.0	1877	100.0	1994	100.0

Source: Justice Department Records, Rarotonga. Administration Records, Mangaia.

TABLE X

SEX RATIOS, 1906 - 1966 (a)

Year	Total Males	Total Females	Males Per 100 Femal
1906	391	429	91.1
1911	449	467	96.1
1916	330	412	80.1
1926	-	-	-
1945	461	436	105.7
1951	460	488	94.3
1956	553	446	123.9
1961	413	442	93.4
1966	392	455	86.2

(a) Ratios calculated on persons aged over 15 years.

Source: Justice Department Records, Rarotonga. Administration Records, Mangaia.

TABLE XI

DEPENDENCY RATIO, 1945 - 1966

Year	Children 0-14 Years of age	Males 15-64 Years of Age	Ratio of Children 0-14, per 1,000 Males 15-64
1945	871	440	1,979.5
1951	893	467	1,912.2
1956	926	461	2,008.7
1961	1,022	406	2,517.2
1966	1,147	411	2,790.8

Notes: Males between the ages of 15 and 64 years have been included in the calculation to give a more realistic ratio. A Mangaian does not retire at 60 years, but is capable of sustained labour for many years after that age.

Source: Justice Department Records, Rarotonga. Administration Records, Mangaia.

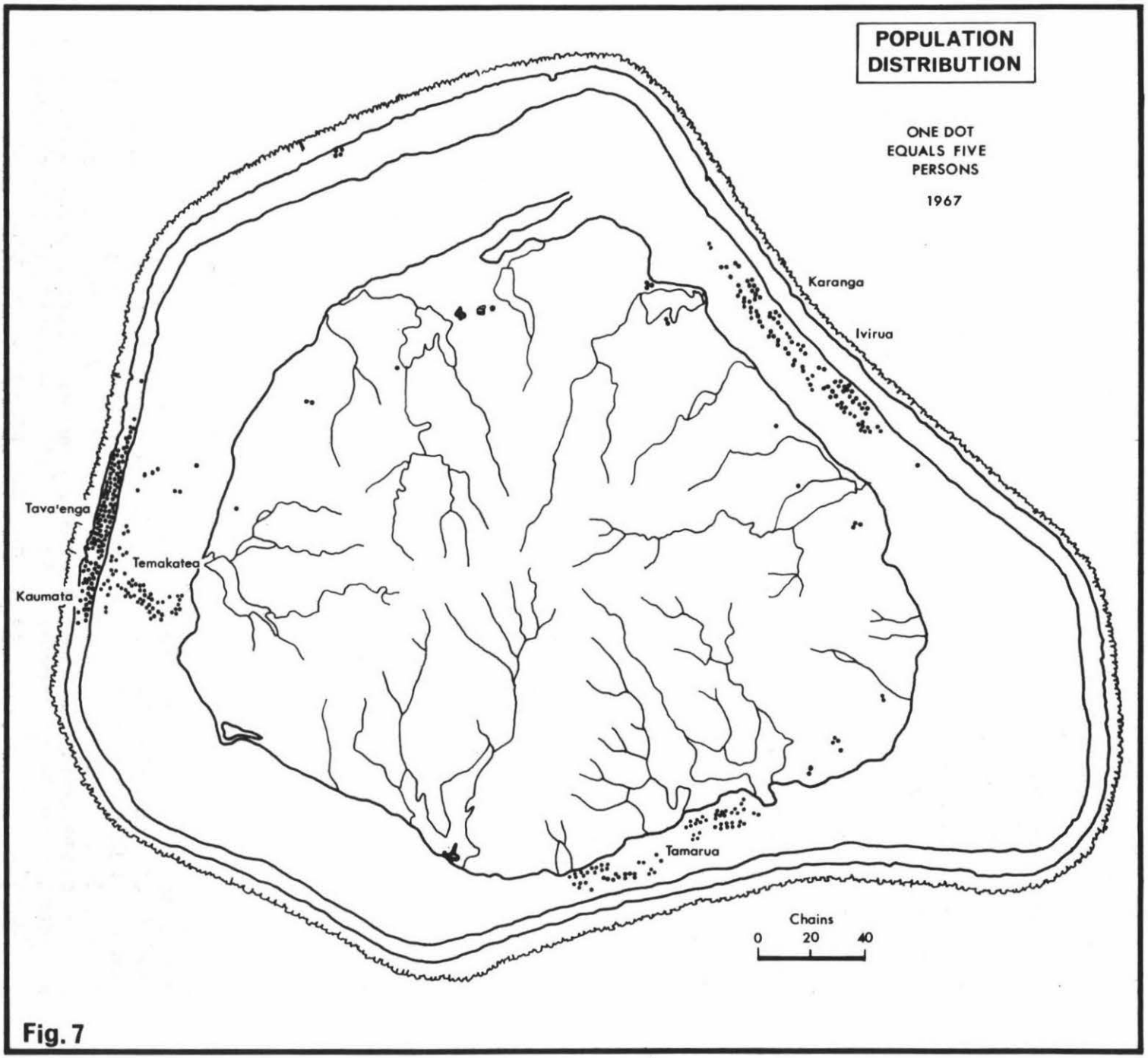

POPULATION DISTRIBUTION
ONE DOT EQUALS FIVE PERSONS
1967
Karanga
Ivirua
Tava'enga
Temakatea
Kaumata
Tamarua
Chains
0 20 40

Fig. 7

the population slowly began to increase. Following the Second World War, the population experienced another period of rapid change. During this period, two opposing forces were at work within the population: first, emigration reduced the total number of persons in the population, but in particular, the younger adult males; and second, infant mortality rates declined and fertility increased resulting in an increased number of children. These forces reached a peak between the census years of 1956 and 1961. Over the last five years, 1961 to 1966, the intensity of emigration has abated, but declines in infant mortality and increases in fertility resulted in a 1966 population which exhibited very marked imbalances, namely predominance of children and old people, and a shortage of working age males. (see Figure 8).

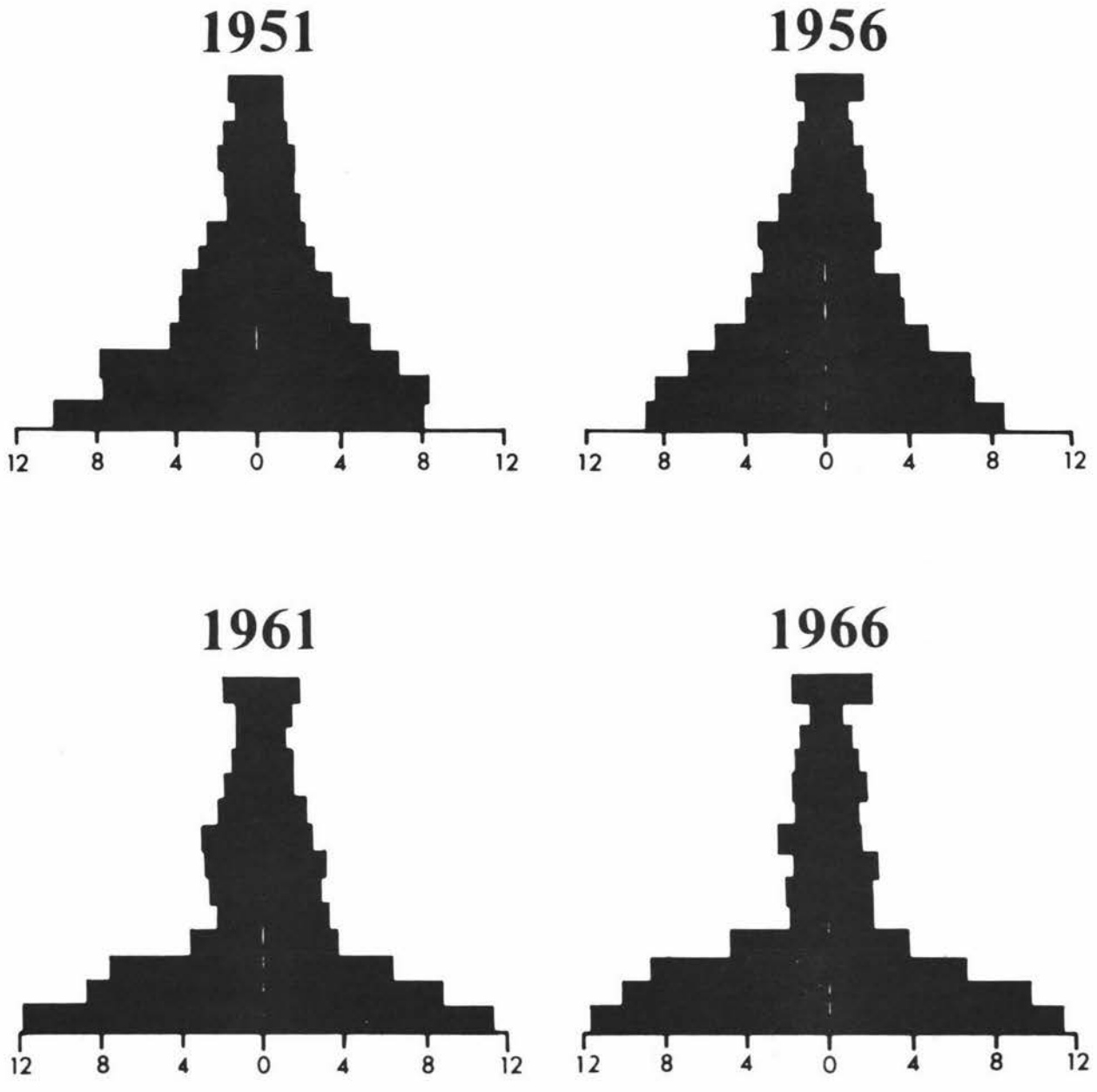
DISTRICT POPULATIONS (see Table XII)

In 1967, the population of Mangaia was concentrated into three main village areas, from which people moved during the day to the districts in which their plantations were located. Within these three areas were six autonomous villages, Tava'enga, Kaumata and Temakatea comprising Oneroa, on the west coast, Tamarua on the southern coastal edge of the makatea and Ivirua and Karanga on the northeastern edge. Although each village population tended to belong and to work within the district of the corresponding name, villagers from Kaumata and Temakateabelonged in Keia and Veitatei. The six villages varied in size from Tava'enga with a total of 527 persons to Kaumata with only 175. (see Table XIII).

Before European contacts the population was distributed inland. (Hiroa, 1934, 135). Definite and scattered resource zones tended to give rise to small scattered hamlet type settlements along the edges of the puna swamps and in inland valleys. (Sahlins, 1958, 205). There were no distinct village concentrations. In an attempt to more effectively influence the population, the missionaries persuaded those Mangaians who had accepted Christianity to move into more compacted settlements. Originally these were located inland on flat areas in the puna, but later were moved to their present positions in an effort to improve the rapidly deteriorating health of the Islanders (14). Oneroa village began in this manner, but quickly developed as a 'port village' and attracted population. By 1854 there were 143 Tamaruans and 29 Iviruans living permanently at Oneroa, but no persons from Oneroa were resident outside of Oneroa (15). With the eventual conversion to Christianity of lineage heads, the majority of the population moved into the villages. In 1967 approximately four percent of the total population lived permanently outside of the village areas, although at various times during the year villagers lived inland in temporary shelters to carry out a major task, such as clearing and planting new taro plots, or harvesting pineapples.

Changes in district populations since 1945 reflect the

MANGAIA: AGE-SEX STRUCTURE



LEGEND

Males | Females

Percentage of Total Population

NOTES

Quinquennial Groups Between 0 and 65 Years of Age.

Source: Justice Department Files, Rarotonga.

Fig. 8

TABLE XII

DISTRICT POPULATIONS, 1966

Age Group	Keia-Veitatei						Tava'enga						Tamarua						Ivirua-Karanga					
	Male	%	Female	%	Total	%	Male	%	Female	%	Total	%	Male	%	Female	%	Total	%	Male	%	Female	%	Total	%
0-4	61	11.1	66	12.2	127	23.3	70	13.2	68	12.9	138	26.1	39	10.6	43	11.7	82	22.3	53	9.5	55	9.9	108	19.4
5-14	92	16.8	96	17.7	188	34.5	85	16.1	81	15.3	166	31.6	63	17.1	66	18.0	129	35.2	117	21.1	92	16.6	209	37.7
0-14	153	27.9	162	29.8	315	57.7	155	29.3	149	28.2	304	57.7	102	27.7	109	29.7	211	57.5	170	30.6	147	26.5	317	57.1
15-59	75	13.7	117	21.5	192	35.2	91	17.3	101	19.3	192	36.4	63	17.1	77	20.9	140	38.1	118	21.2	102	18.4	220	39.6
Over 60	17	3.1	21	3.8	38	6.9	16	3.0	15	2.9	31	5.9	8	2.3	8	2.3	16	4.4	4	0.7	14	2.5	18	3.2
Total	245	44.7	300	55.3	545	100.0	262	49.7	265	50.3	527	100.0	173	47.1	194	52.9	367	100.0	292	52.5	263	47.4	555	99.9

Source: Administration Records, Mangaia. Justice Department Records, Rarotonga.

TABLE XIII

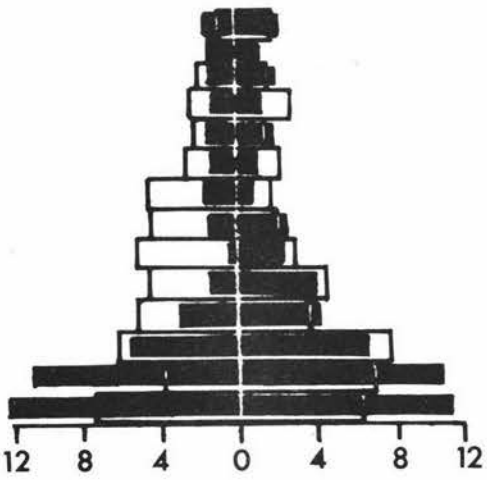
VILLAGE POPULATIONS, 1966

Village	Males	Females	Total	Percentage of Total Island Population
Temakatea	159	211	370	18.56
Kaumata	86	89	175	8.78
Tava'enga	262	265	527	26.34
Tamarua	173	194	367	18.41
Ivirua	185	174	359	18.00
Karanga	107	89	196	9.82
Total	972	1022	1994	99.91

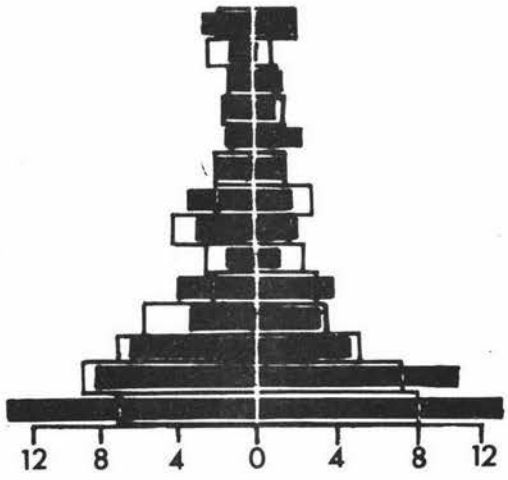
Source: Mangaia Administration Records. (Provisional Figures only).

DISTRICT AGE-SEX STRUCTURE

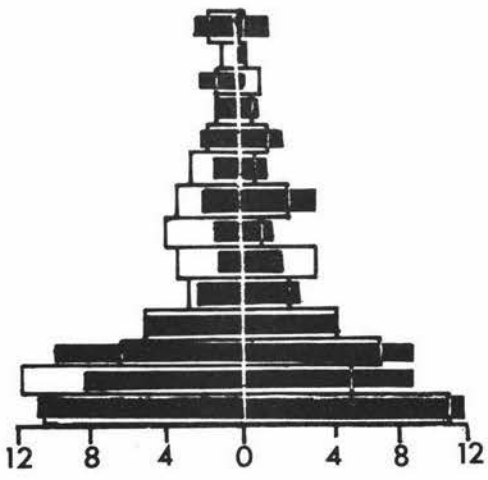
KEIA-VEITATEI



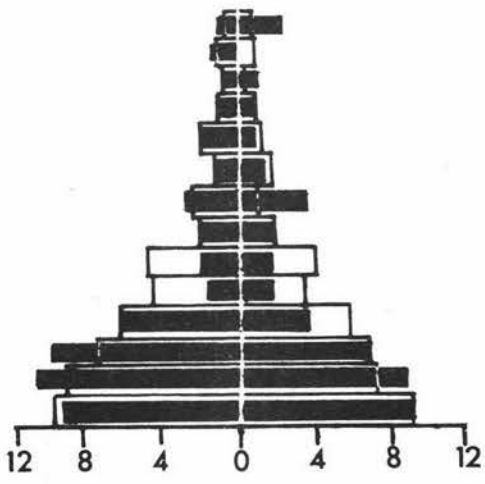
TAVA'ENGA



TAMARUA



IVIRUA-KARANGA



LEGEND

1956 1966

Males | Females

Percentage of Total Population

NOTES

Quinquennial Groups Between 0 and 65 Years of Age

Source: Administration Files, Mangaia.

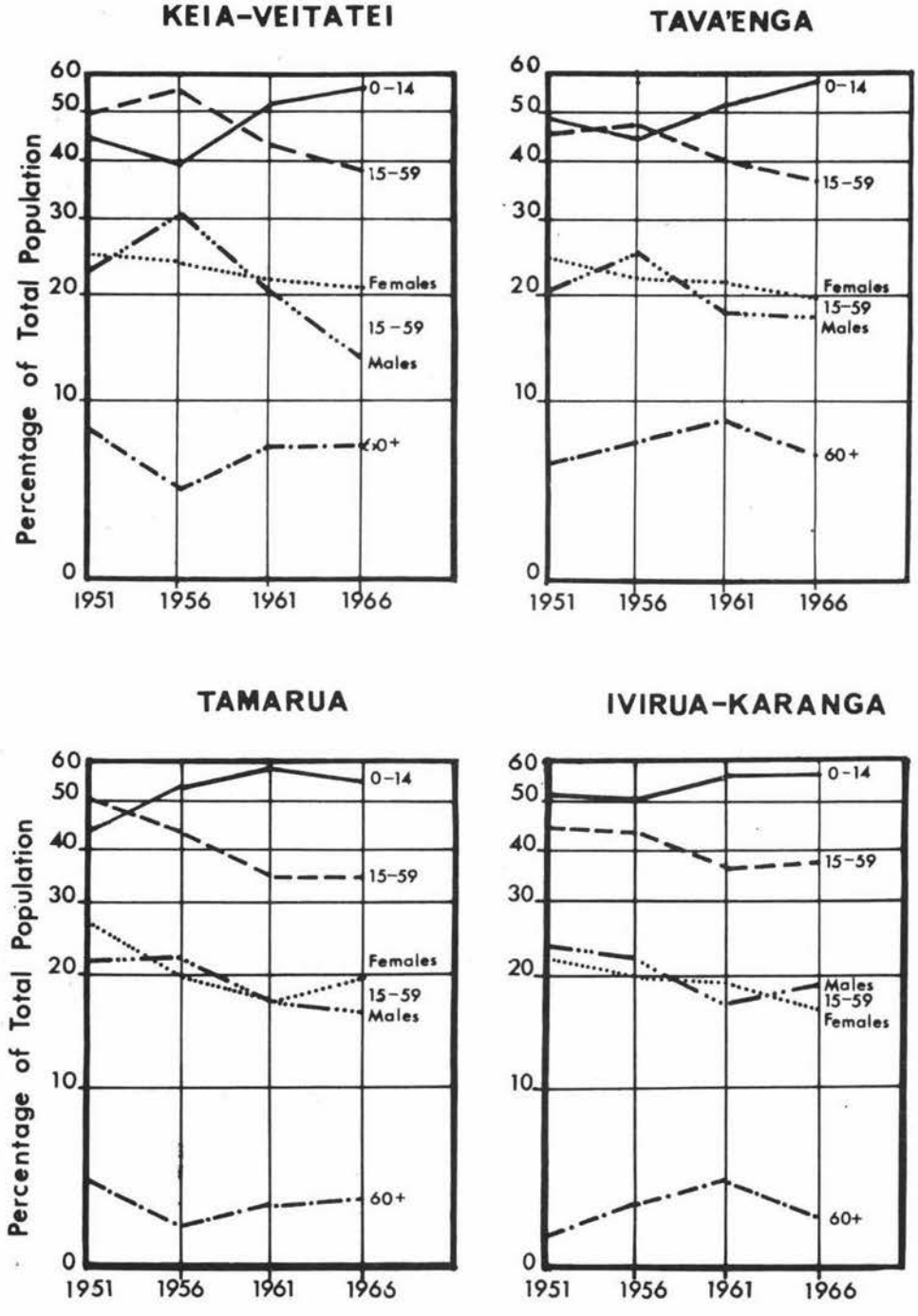
Fig.9

major structural changes described earlier in this chapter, but variations occur in intensity and in the time of occurrence. The most satisfactory method of representing these variations is graphically, as in Figure 9 and 10. Between 1956 and 1966 all districts exhibited a marked loss of population in the adult age groups and an increase in the proportion of children in the population. The loss of adults, however, was less serious in Tava'enga, than in other districts for Tava'enga maintained most adult age groups near the 1956 levels, with some increases, while at the same time experiencing an increase in the age groups below 15 years, especially in children born since 1961. Keia-Veitatei, Tamarua and Ivirua-Karanga, by contrast, lost a large proportion of their adult populations, in particular males between the ages of 25 and 44 years. Although decreases occurred in Tava'enga and Keia-Veitatei in the numbers of persons in the 20 to 24 age group and overall in those persons aged between 15 and 59 years, in Tamarua and Ivirua-Karanga both these groups maintained their 1956 levels.

The developments described above did not follow a similar pattern in all districts. In Figure 10 the major age groups have been plotted for census years since 1951. It is evident that trends in the changes of the structure of the population in Tamarua and Ivirua-Karanga began prior to 1951. In Tava'enga and Kei-Veitatei changes began after 1951. In these districts the 15 to 59 year age groups were growing between 1951 and 1956, but fell sharply after 1956. This loss involved more males than females and in Keia-Veitatei the trend has continued up to 1966. In Tava'enga, losses of males aged between 15 and 59 years slowed down between 1961 and 1966. Less fluctuation in sex ratios has been experienced in Tamarua and Ivirua-Karanga, and the latter district was the only district in 1966 with more males than females in these age groups.

Variation in the intensity of selective emigration is the most likely cause of the variations in structural changes in district populations. The early appearance of structural changes in Tamarua and Ivirua-Karanga is thought to be linked to the system operated by a French company mining the guano deposits of Makatea Island in the Society Islands between 1943 and 1955. Mangaians from all districts took part in the scheme, which involved terms of one year labouring on Makatea for a fixed wage, most of which was held by the company until the contract was up, and the labourer was returned to his home island. Labourers from Tamarua and Ivirua-Karanga were returning to villages in which the opportunities for wage labour were nil and traditional authority and communal responsibilities were more stringent. By contrast, at this time wage earning opportunities in the Oneroa villages were increasing and traditional ties becoming more tenuous. As a result, labourers returning to Tamarua and Ivirua-Karanga after experiencing one or two years of comparative freedom from community obligations and a steady monetary income, left their villages to seek wage employment in Rarotonga and Auckland, some using the money

DISTRICT POPULATIONS 1951–1966



Source: Justice Department Files, Rarotonga.

Fig.10

earned on Makatea for their passages. In Oneroa, it was not until between 1956 and 1961, when prices for pineapples and oranges fell sharply depriving villagers of monetary incomes, that a marked pattern of emigration emerged. Although at first concentrated in Oneroa, emigration at this time soon spread to include villagers from Tamarua and Ivirua-Karanga.

Two further factors, interdistrict movement and infant mortality are thought to have had an insignificant influence on district population changes. There is little evidence of frequent interdistrict population movements and although individual district infant mortality figures are not available, variation may be assumed to have been small, with slightly higher mortality occurring outside of Oneroa.

Twenty years of selective emigration from the Mangaian population has had many secondary effects on the island society. They include an obvious shortage of labour during peak agricultural production periods, such as the summer pineapple harvest, a subsequent inability to cultivate more than one major exportable cash crop, a difficulty in maintaining a balance between food cultivation and cash cropping, a deterioration in village living conditions and a loss of the more innovative and energetic members of the community. If, however, emigration had not provided an outlet for the potential population following the rapid increase of children in 1956, serious overpopulation could have resulted. Further, a large amount of money, $33,801 in 1966 (17), comes into Mangaia from New Zealand, sent by expatriate Mangaians to relatives. This money could not have been earned on Mangaia. Much of it was being used to raise living standards, in particular, in building new houses. More difficult to assess is the effect on the community of returning migrants, especially those who have spent some time in New Zealand. The great majority who return have been resident in New Zealand cities, labouring in factories, freezing works or paper mills, occupations far removed from the agricultural pursuits on Mangaia. They may provide, however, raised aspirations for the village and an increase in the knowledge of the place of Mangaia in the Pacific and the world.

To summarise, in 1966 children under the age of 15 years comprised about 57 percent of the population of all districts. In all districts, with the exception of Ivirua-Karanga, the 15 to 59-year old age groups included between 2 and 5 percent more females than males. In general all districts presented age/sex pyramids in which the central portions of the population were small and ragged, and were mounted upon a rapidly widening base. This broad base could be interpreted as a source of rapid potential growth and there are indications, especially in Tamarua and Ivirua-Karanga, that the swelling childhood age groups are pushing into the adolescent sections of the population. If, however, emigration continues at a similar rate to that which has been in operation over the last five years, these increases will be neutralised, and the

population will continue to increase slowly, carrying with it increases in its imbalances.

SOCIAL ORGANISATION

The Family

The basic organisational unit in the Mangaian society in 1967 was the nuclear family. As Table XIV indicates, 56 percent of the sample population were the heads of nuclear families, and a further 15 percent the heads of nuclear families including a third generation comprising illegitimate children, usually belonging to females in the household, but sometimes males. Eight percent of the sample lived in the same dwelling as a sibling and family. Of the remaining sample families, 14 percent were three-generation extended families and four percent contained the head of the household, his wife and their grandchildren, the parents of the children in most cases having emigrated temporarily or permanently.

The Household

A less formal structure at the family level is the household. Formed around the family core, the household contains other relatives, and 'feeding children' (18), and is the more common resource utilising unit. The situation where the family is being replaced by the household as the resource utilising unit is being brought about partly by the high mobility of the Mangaian. As Table XV shows, 28.8 percent of the children of the heads of sample households were living away from Mangaia, and a further 10 percent were living away from their parents' homes on the island. Although 72 percent of informants had four or less offspring living in their own home, the average size of the Mangian household was 7.6 persons, (see Table XVI). Allowing for two parents, at least one person in an average Mangaian household comes from outside the nuclear family.

The Tribe

Prior to European contact, the Mangaian population was organised on a tribal basis. In 1967, the tribe to which an individual belonged appeared to be relatively unimportant, and over half of sample population seemed to be unsure as to which tribe they belonged. As the writer's only guide to major tribal groupings on the island was Hiroa, (Hiroa, 1934), it is possible the questions put to informants were misunderstood. Those persons belonging to the tribal group dominant on European contact were in little doubt as to their tribal allegiance, however, as membership of these tribes, the Ngati Tane and Ngati Manaune, gives a person status and advantages in land rights.

TABLE XIV

FAMILY STRUCTURE, 1967

Family Type	Number	Percentage of Total	
Extended:			
Patrilocal	6	6.8	
Matrilocal	7	7.6	
Two generation (a)	4	4.7	19.1
Nuclear:			
Simple nuclear	51	56.7	
Sibling nuclear (b)	8	8.7	
Cognatic nuclear (c)	15	15.5	80.9
Total:	91		100.0

Notes: (a) Family consists of head of family, wife and grandchildren.

(b) Head of family, wife and children, living in the same dwelling as a sibling and family.

(c) Head of family, wife, children and grandchildren, without any affinial relations present. This type of family is more likely to become a nuclear family upon the marriage of the children.

Data based on sample.

TABLE XV

LOCATION OF OFFSPRING, 1967

Offspring Remaining in Residence	Number of Informants	Present Location of All Offspring					
		Home	Elsewhere on Mangaia	Rarotonga	Other Cook Is.	New Zealand	Elsewhere	Total
Nil	14	0	6	7	1	10	1	25
One	14	14	2	2	2	14	2	36
Two	9	18	3	2	1	13	-	37
Three	13	49	3	12	2	10	-	76
Four	16	64	18	9	5	9	-	105
Five	9	45	10	3	-	5	-	63
Six	7	42	6	4	3	10	-	65
Seven	-	-	-	-	-	-	-	-
Eight	4	32	1	-	1	4	-	38
Nine	5	45	3	5	-	8	-	61
Total:	91	309	52	44	15	83	3	506

Notes: Offspring are defined as the biological children of the informant, the head of the household sampled. Data is arranged on the classes of the number of offspring of the head of the household who remain in residence in his or her household.

Source: Data based on sample.

TABLE XVI

SIZE OF HOUSEHOLDS,[a] 1967

Persons per Household	Number of Households	Total No. Persons
One	0	0
Two	4	8
Three	1	3
Four	7	28
Five	11	55
Six	13	78
Seven	15	105
Eight	13	104
Nine	4	36
Ten	10	100
Eleven	2	22
Twelve	3	36
Thirteen	1	13
Fourteen	2	28
Fifteen	1	15
Sixteen	3	46
Seventeen	0	0
Eighteen	0	0
Nineteen	0	0
Twenty	1	20
Total	91	699

Average Number of Persons in the Household:	7.6
Median Number of persons	6.75
Most Common Number of Persons in the House	7.0

(a) Household is defined as a group comprising those people who eat from a common kitchen. In some cases two or three sleeping houses accommodate the household.

Data based on sample.

The District

The major unit of social organisation is the district, puna. At one time each tribal group occupied a separate area of the island, and these areas became delineated as districts by boundaries which were drawn down ridges between the major watersheds on the island. As each group grew, warfare began to blur the distinctive tribal pattern, until in the eighteenth and nineteenth centuries, it became possible for one tribe to dominate the whole island. Parallel with this development, was the evolution of a rank above that of ariki or tribal chief. This became known as the title of mangaia or Temporal Lord of Mangaia. The Temporal Lord claimed allegience of the heads of the major families in his tribe and after a successful battle, those who had served him particularly well were awarded large areas of food land. The mangaia remained as the supreme temporal power only as long as he could ensure support from his chiefs, the pava, for if skirmishing broke out and blood was spilt, the title was again in jeopardy until force of arms decided the issue. Oral history records 42 changes of title, according to Hiroa, of which only three were achieved without bloodshed.

By 1823, two tribes in alliance, the Ngati Tane and the Ngati Manaune, had achieved control over all six districts and each district pava was a member of one or other of the two tribes. The mangaia, was taken on by a man who renamed himself Pangemiro. Beneath him, Pangemiro had six pava, who were in turn supported by the ui rangatira, the heads of families occupying the various sub districts or tapere. The island's resources were exploited under the control of the pava and ui rangatira, who were coordinated by one man, the ariki i te ua te tapora kai, the ruler of food. All these titles were held either by Ngati Tane or Ngati Manaune tribesmen. Religious titles, however, were hereditary and were held within families of the Ngariki tribe. Two supreme spiritual titles existed, those of shore high priest, ariki pa tai, and inland high priest, ariki pa uta. Beneath these, each tribe had its own tribal priests(19).

Developments immediately prior to effective European contact have a direct bearing on the system of district administration in existence today. After Pangemiro gained supremacy, the inland high priest, refused for political reasons to carry out his role in the ceremony proclaiming Pangemiro as mangaia. Pangemiro thus dismissed the inland priest from his office and combined the two priestly titles by conferring both upon Numangatini, the shore high priest. Three months later two Tahitian missionaries were landed by Williams. Their work resulted in the nominal conversion of many of the Tane-Manaune leaders including Numangatini. These men proceeded to enforce a number of new 'laws' upon the unconverted and this sparked a short lived 'religious war' in 1828 in which the 'Christians' under Numangatini's leadership, defeated the 'heathens'. Following the battle,

Numangatini was proclaimed mangaia and spiritual and temporal titles were thus amalgamated. Land was redistributed among Tane-Manaune leaders and the titles are held by these families today.

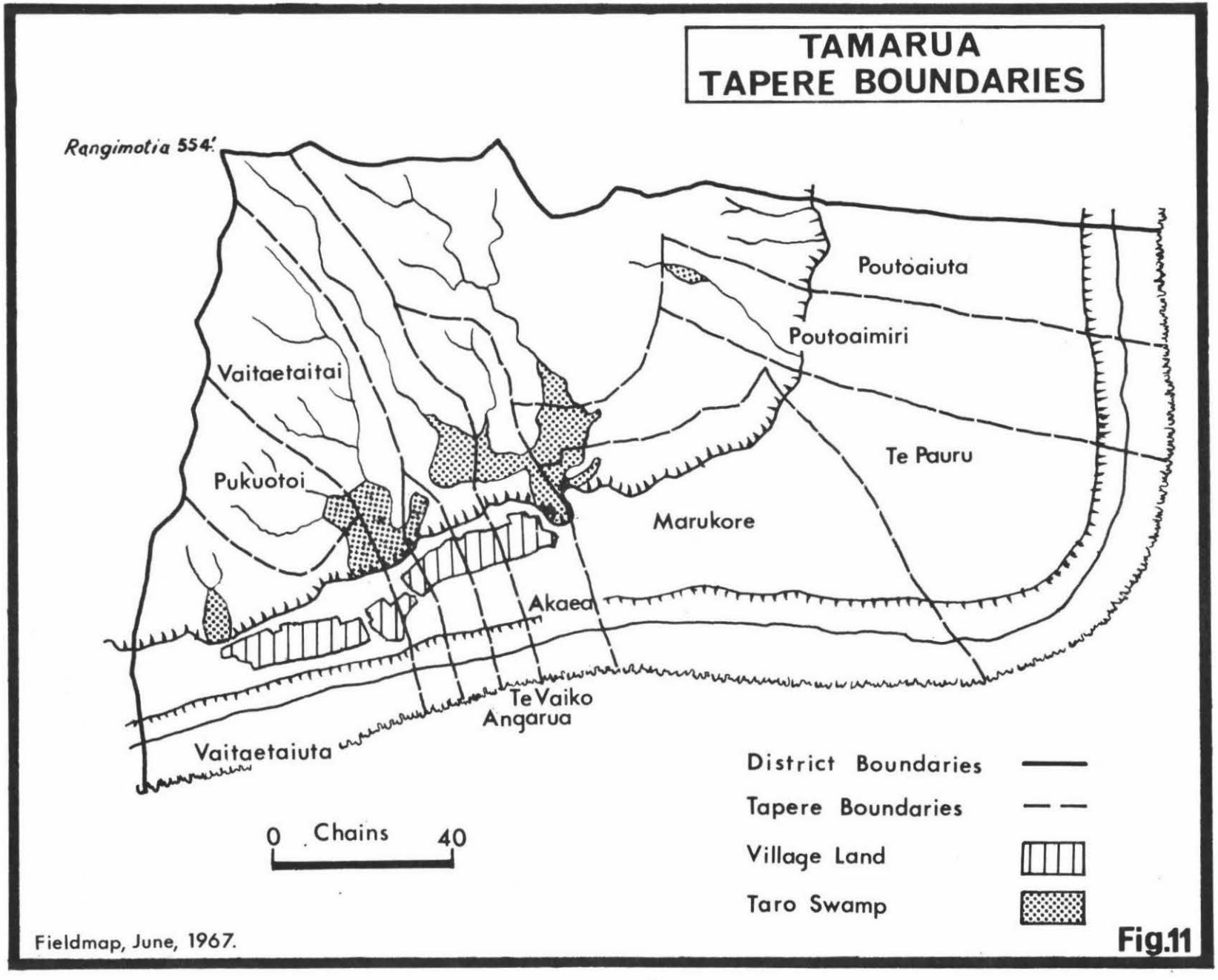
The title of ariki has now replaced that of mangaia. The title is held by the great grandaughter of Numangatini, Louisa Numangatini Ariki, the first female to hold supreme nominal power. She is, however, little more than a figure-head and six kavana (governors), descendants of the pava of 1828 are the dominant traditional authority on the island. Each kavana oversees the administration of one district and beneath them the ui rangatira administer the tapere. The ariki, kavana and ui rangatira form a body known as the Aronga Mana, (men of power) who although holding no legal authority, except where they are members of the Island Council (20), administer all land transaction on Mangaia. Although Mangaians have equal rights before the Native Land Court to other Cook Islanders, the Court has surveyed and investigated titles only to those pieces of land purchased by the London Missionary Society or the Administration. Some applications for investigation of title have been filed with the Court, but most have been withdrawn at a later date, many under local duress. It is administration of land by the Aronga Mana which has been of the greatest importance in preserving their traditional status. It is now their raison d'etre.

LAND TENURE (21)

In the past territorial occupation was an areal expression of social organisation. Each status level was associated with a unit area of land, the family with a section of the tapere, the rangatira with the tapere, the pava with the district and the mangaia with the whole island. The development of a third status level was related, in part, to the island replacing the district as the largest resource unit. It is this relationship between land tenure and social status which is preserving the strength of traditional status in the society.

The basic adminstrative unit is the tapere. The land within the tapere is vested in the rangatira title and the rangatira is variously said to be 'the owner of the land' or to be 'responsible for the land'. The kavana also has a tapere vested in the title and most informants agreed the kavana has no greater authority outside of this tapere than any other rangatira. But traditional prestige and a jealously guarded knowledge of genealogies and past land transactions account for the higher status of the kavana title. The kavana also acts as district representative in meetings of the Aronga Mana.

Within the tapere land is occupied under three main types of rights, hereditary rights, usage rights and short-term usage rights. Hereditary rights are of two types. First, there are those rights which were distributed by the Ngati Tane and Manaune families among themselves in 1828, and second, there are rights which have been gifted to other families by


TAMARUA
TAPERE BOUNDARIES
Rangimotia 554'
Poutoaiuta
Poutoaimiri
Vaitaetaitai
Te Pauru
Pukuotoi
Marukore
Akaea
Te Vaiko
Angarua
Vaitaetaiuta
0 Chains 40
District Boundaries
Tapere Boundaries
Village Land
Taro Swamp
Fieldmap, June, 1967.
Fig.11

Ngati Tane and Manaune families after 1828, and which the recipient families now pass on from generation to generation (22). Usage rights are those under which an individual or a family has access to land which in the past was not claimed by any other family. In general most of these rights are held within the rautuanu'e, much of which was not used prior to European contact and was thus never allocated to any Tane-Manaune families. With the permission of the rangatira or kavana a family can cultivate a piece of unused land falling into this category, and has security of tenure for as long as the land is in use. Over two or more generations these rights can become hereditary, especially if coconuts or a permanent tree crop is planted. Short-term usage rights are rights 'loaned' by a right holding family to a non-right holding family. The right holding family is obliged by custom, to allow another user access to land which is not in use (excluding fallow periods), for the cultivation of a specified crop for a specified period of time. Over a long period of time, short-term rights have become usage rights, but generally this is uncommon (23). If the user breaks the conditions of the agreement by planting a permanent crop for example, the right holding family can evict the user summarily and reclaim the land.

Figure 12 shows the tapere of Maro in Tava'enga (24). The land occupied under hereditary rights is cultivated by families descended from the rangatira of Maro in 1828, Karomatangi. Further hereditary rights are held by members of the Numangatini family, who occupy land given to the ariki family by Karomatangi at some time after 1828, a common occurrence at that time. Some hereditary rights are claimed by women, whose husbands cultivate the plots. A number of individuals are in occupation of land under short-term rights, loaned to them by hereditary right holders, while one family has a one-generation occupation of a plot of land, the rights to which are held by the ariki family, because of a feeding child relationship between the two families. Further land is occupied under usage rights, but there is less of this type of occupation in Maro than in most other tapere, as Maro was supporting a relatively large population prior to contact, and most of the tapere inland from the lakes was occupied at this time.

All disputes over land are referred to either the rangatira or the district kavana. If neither can solve the dispute it is referred to the Aronga Mana who decide the issue. Decisions are based on custom but are arbitrary and final. No records are kept but those which are held in the heads of the Aronga Mana (25). Informants were uncertain whether disputes had increased since the introduction of more intensive commercial cropping, most stating they thought disputes over food land and pineapple land to be approximately equal in number. Two typical disputes which were settled by the Aronga Mana during the last three years will serve as examples.

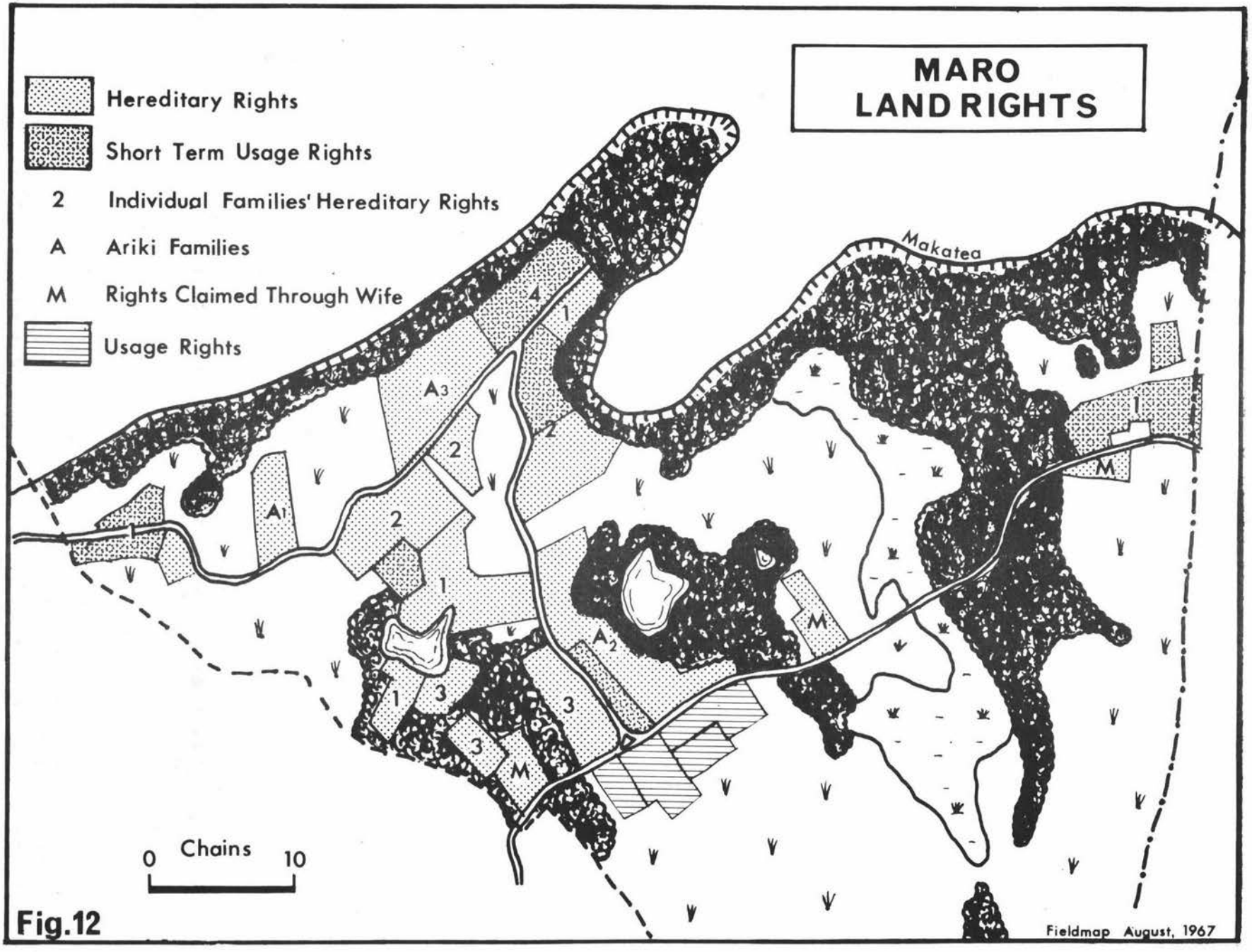

MARO
LAND RIGHTS
Hereditary Rights
Short Term Usage Rights
2 Individual Families' Hereditary Rights
A Ariki Families
M Rights Claimed Through Wife
Usage Rights
Makatea
A1
A2
A3
M
0 Chains 10
Fieldmap August, 1967

Fig.12

The first, involving hereditary rights to puna taro land, began when sons from Family A began to clear and plant a taro plot which Family B, although not using the plot, claimed as theirs, as they said it had been constructed by the grandfather of the head of the family. An older woman from Family B went to the plot, and, after waiting for the sons from Family A to finish planting the taro shoots, pulled them out and planted her own. The next day Family A returned to the plot and did the same thing with Family B's taro shoots. At this point the rangatira stepped in to arbitrate the quarrel. He had insufficient genealogical knowledge and the case was referred to the Aronga Mana. (The families were two branches of the same family, both descended from the same great grandfather.) After hearing submissions from both groups, the Aronga Mana gave the plot to Family A to plant and harvest one crop of taro, after which rights returned to Family B.

The second dispute involved usage rights to pineapple land. Ten years previously Family A had gained the permission of the rangatira of the tapere to plant pineapples on a piece of land under usage rights. After a number of years part of the area had been abandoned. Family B then gained permission from Family A to replant the abandoned area, but after two years Family A suddenly attempted to evict Family B. Family B took the case to the rangatira who, because of his original involvement, referred it to the Aronga Mana. After consideration, the Aronga Mana withdrew all rights from both families and gave the land back into the care of the rangatira. He in turn gave Family A usage rights to the area they were cultivating, and similar rights to Family B for the area, formerly abandoned, which they were cultivating.

Although exhibiting much internal flexibility the system is flexible only as far as semi-permanent crops are involved. Many disputes begin when coconuts, a permanent crop, are planted on land to which the planter has only short-term rights or ill-defined usage rights. This is because coconut palms may be owned as individual trees, and in the words of one old man: 'This man's children might come back after he is dead and say, "Our father planted that tree, therefore you must let us onto your land."' Because the pineapple is a semi-permanent crop, it has been easily integrated into the system. Citrus trees, however, have not been as acceptable. In 1953 and again in 1964, the Aronga Mana refused to allow the Citrus Replanting Scheme to come into operation on Mangaia because first, the scheme involved surveying proposed citrus blocks, and second, the citrus trees were permanent and were owned by an individual. The 1964 scheme was a revised scheme, designed to suit local conditions, but it remained unacceptable (26).

There are a number of inherent weaknesses within the land tenure system. The system which had evolved up to the time of the arrival of European missionaries involved the land and the society in a multitude of intricate spiritual and temporal ties. After contact a great many changes took place within

the society, but relatively few within the system of land tenure, and it is doubtful if the system as it exists can adjust to further changes which appear certain within the next few years. Land is beginning to acquire a monetary value in the minds of a minority of planters, and when this attitude to the land becomes more widespread disputes are almost certain to increase. Many younger planters fear that because their knowledge of their family genealogies and the history of the family's occupation of their land is inadequate, larger and higher ranking families could force them from their land on to inferior areas. One of these young men expressed the desire to '...have a piece of paper saying, "this is my land."' Although it was common in the past for disputants to gift food to the Aronga Mana before a meeting to settle land problems, and there is a traditional precedent (27), in two recent cases these gifts were bordering on bribes. If this trend develops families with greater resources will have an advantage over smaller groups. It is apparent that one or two higher ranking families have in the past taken advantage of this situation, but there have been few complaints from the balance of families of the island.

THE VILLAGE

Despite the dominance of district administration, the villages form the focus of life on Mangaia. In form they follow closely the pattern of a linear English village, centred on the village church. These massive limestone buildings stand amidst a long straggle of cooking and dwelling houses, strung out along the single coral sand track through each settlement. Opposite the church is the village green and cricket pitch, with undulating and rock strewn outfields. (Figures 13 and 14).

Oneroa, the contiguous villages of Tava'enga, Kaumata and Temakatea, functionsas the administrative and service centre for the island. The Post Office, which combines the functions of radio station, agricultural office, police station, resident agent's office, with the normal postal and telegraphic duties of a Post Office, is located in the centre of the settlement. The two largest trading stores, a picture theatre, the Junior High School and the Cottage Hospital are also within Oneroa. Almost all social functions, including those arranged by outer village sports and social clubs, are held in Oneroa, and trucks are arranged to travel around the island to pick up those who wish to attend. Within Oneroa, Tava'enga is the dominant village, with the picture theatre, dance hall and largest trading store, as well as the ariki's 'palace' although in urgent need of repair, still demanding respect from the populace. The villages of Tamarua, Karanga and Ivirua function only as a focus of district organisation and at the centre of this focus lies the district meeting house and the church.

The great majority of the population belong to the Cook

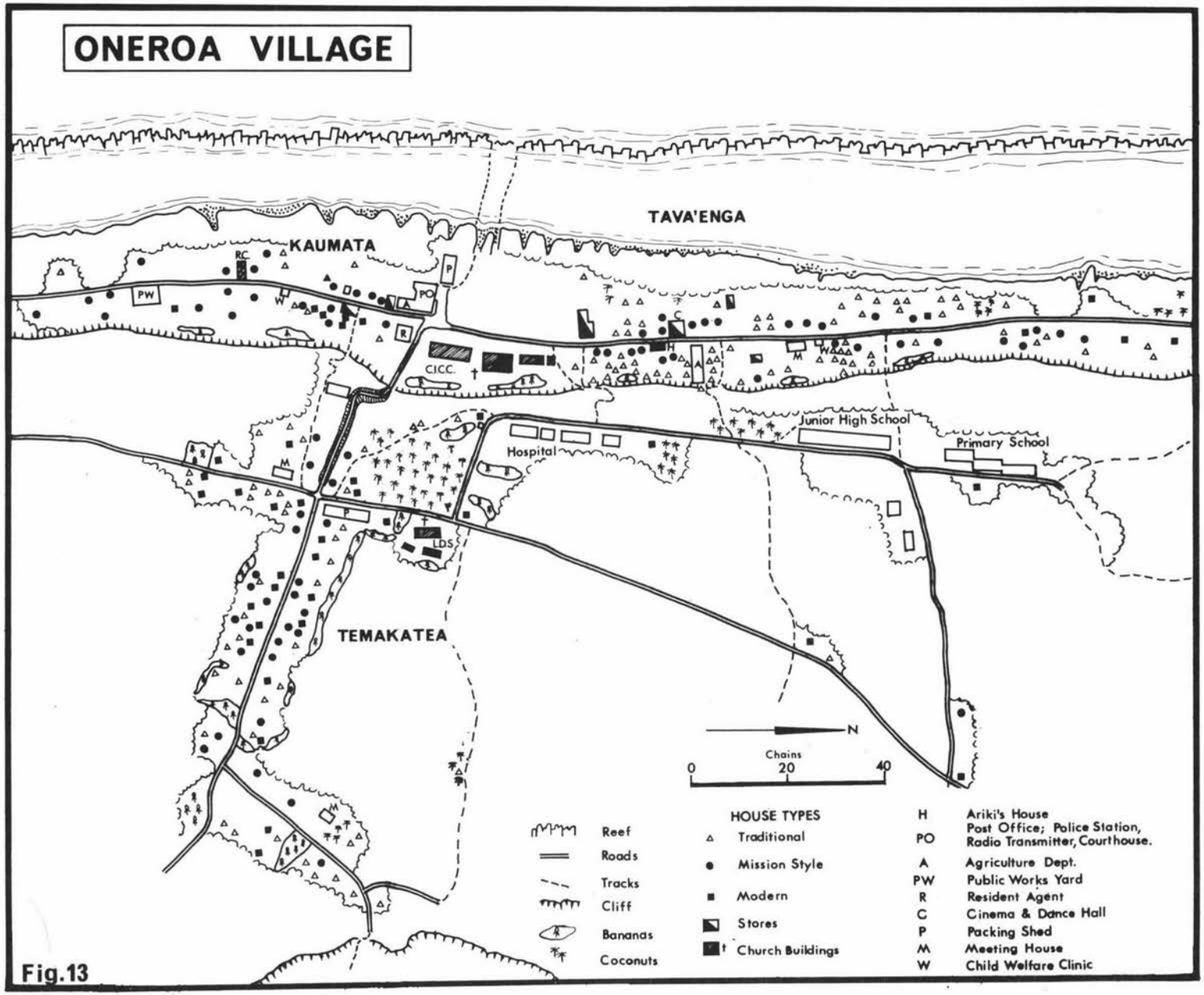
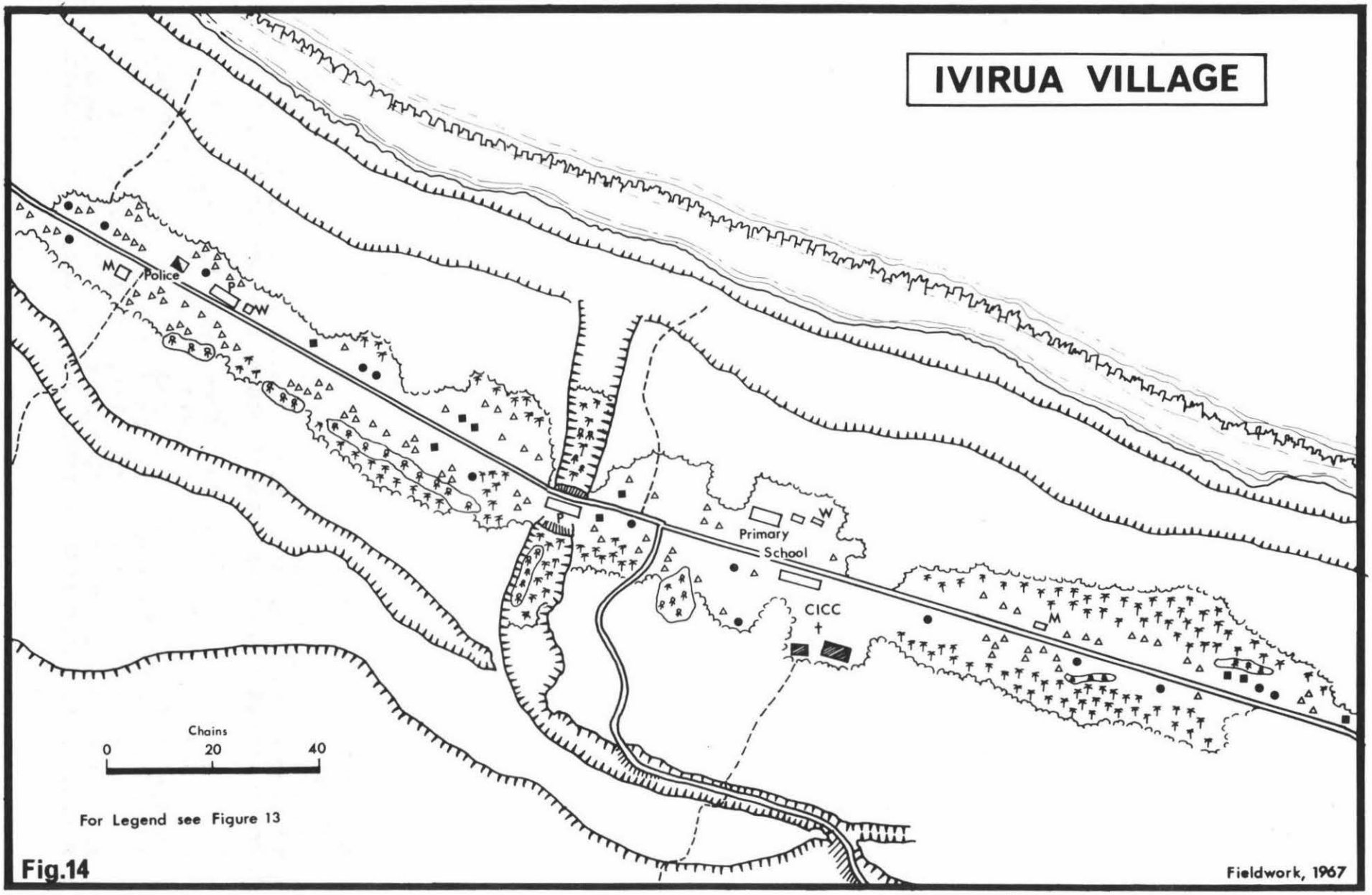

ONEROA VILLAGE
TAVA'ENGA
KAUMATA
RC
PW
PO
P
R
CICC.
H
C
M
W
Junior High School
Primary School
Hospital
LDS
TEMAKATEA
N
Chains
0
20
40
HOUSE TYPES
Traditional
Mission Style
Modern
Stores
Church Buildings
Reef
Roads
Tracks
Cliff
Bananas
Coconuts
H Ariki's House
PO Post Office; Police Station, Radio Transmitter, Courthouse.
A Agriculture Dept.
PW Public Works Yard
R Resident Agent
C Cinema & Dance Hall
P Packing Shed
M Meeting House
W Child Welfare Clinic

Fig.13


IVIRUA VILLAGE
Police
M
W
Primary
School
CICC
M
Chains
0
20
40
For Legend see Figure 13
Fig.14
Fieldwork, 1967

Islands Congregational Church (C.I.C.C.), formerly the church of the London Missionary Society. Although Roman Catholic, Mormon and Seventh Day Adventist missions are working on Mangaia, they attract only small congregations. The C.I.C.C. is strongly supported by the traditional elite, many of whom hold the office of deacon, while the ariki and kavana occupy special pews alongside the pulpit. It is the responsibility of the kavana and ui rangatira, to maintain church buildings and each tapere has a certain part of the building as its special responsibility. All men within the tapere, regardless of their religious affiliations or beliefs, are expected to assist in maintaining the village church. Organisations closely allied to the C.I.C.C. church are womens' village organisations and youth movements, Girl Guides and Boys' Brigade. Despite this element of youth, the most important feature of the church is the refuge and status it offers to older members of the community, a refuge which in many cases is jealously guarded against any intrusion from without. For older members, Sundays are fully taken up with church services which have changed little since the 1880's. For younger people, one morning and perhaps one evening service completes Sunday church going. The youth movements hold church parades at main morning services, but despite attempts by pastors to liberalise attitudes held by older members, young church members are not being taught karakia and few take part in inter village tere parties (28), and the oratory and debate which accompanies them. The inability of the church to modernise is a contributing factor in the decline in numbers of church members, Ecelasia, as distinguished from nominal members. There is a noticeable movement of young people from the C.I.C.C. to the Mormon mission, staffed by young American missionaries and accommodated in a modern building, with indoor sporting facilities (29). As a result of the threat of excommunication from the C.I.C.C. church is rapidly losing the former public disgrace which once accompanied it and the Congregational Church has a waning influence over the community. There remains, however, a strong and integrative force. Although much church going is probably the result of force of habit, rather than deep beliefs, (no activity from council meetings to cricket matches can begin without a long prayer), the church is an important social institution. In a society where almost all administration is being carried out by a few well educated public servants, or by Government departments on Rarotonga, the church provides an opportunity for the average person to participate, and possibly lead, in the organisation of an established and respected institution.

Within the villages, dwellings generally reflect four major influences in building styles. The traditional influence is apparent throughout all villages, in dwellings in which local materials, hibiscus and pandanus in particular, make up the majority of the dwelling. Extraneous material such as ridge iron or hardboard sheets are often added, sometimes resulting in a bizarre and tumbledown effect. The mission

influence is apparent in dwellings constructed of thick, coral lime walls, with small glass windows or board shutters. Some of this type of dwelling are thatched, but most have iron roofs, many in advanced stages of deterioration from salt spray corrosion. The New Zealand administration period is reflected in a minority of dwellings. These are constructed of wood, with iron roofs and a verandah running part way around a large box-like central room or rooms. The most recent influence is that of the new housing scheme and of modern New Zealand housing which has been copied in miniature by some islanders, returned from New Zealand. Figure 15 shows a selection of houses, those on the left being considered in a poor condition, and those on the right in a good condition. However, judgement of the standards of a building in an Island situation is fraught with difficulties, and was thus not attempted.

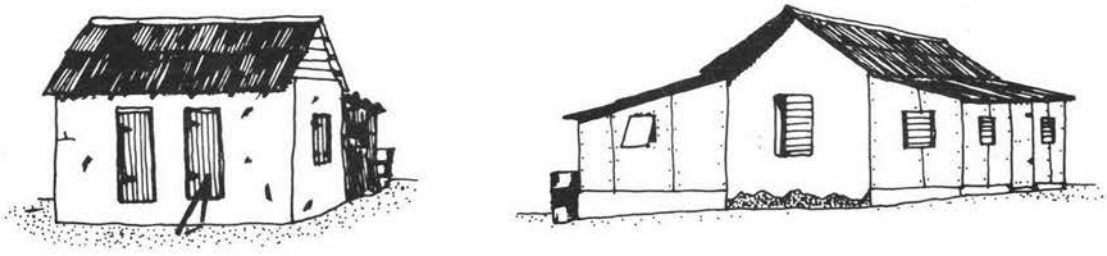
Of the 424 buildings in the villages, 264 or 62 percent were traditional style, 23 percent mission style and 15 percent modern style or Housing Loan dwellings. A greater percentage of traditional style buildings were located in Ivirua-Karanga, 80 percent of village buildings, than in the other three village areas. In the Keia-Veitatei villages, only 42 percent of the buildings were traditional in style, and in Tamarua and Tava'enga approximately 62 percent of all buildings were of traditional materials. Of the new houses, constructed of concrete block with iron roofs and concrete floors, 40 percent were located in Keia-Veitatei and only 11 percent in Ivirua-Karanga, with 25 percent in Tamarua and Tava'enga respectively. Of those houses which came within the sample, the average number of rooms per house in Keia-Veitatei was 3.6 compared with 1.6 in Ivirua-Karanga, 2.2 in Tamarua and 2.8 in Tava'enga. Seventy percent of houses sampled in Kei-Veitatei had serviceable radios and only 25 percent in Ivirua did so. Almost all houses sampled had a traditional oven (umu), but only 45 percent contained a kerosene or oil type cooker. Of those which did contain an oil cooker, 92 percent were within houses in the Oneroa villages. It is readily apparent that living conditions in the outer villages are not as good as those within the Oneroa villages. The ownership of a new house, however, does not necessarily mean better living conditions. It is especially noticeable in Ivirua village, that islanders are moving from traditional style houses with gravel floors beneath mats, on to concrete floors with no additions to their furniture. Cooking continues to be carried out in outdoor cookhouses, which appear in many cases, to be dirty and unhygenic. This impression is borne out by the high incidence in the villages of infantile gastro enteritis and associated dysentric diseases, especially among children. (see also Page 140)

CHANGING SOCIAL STATUS

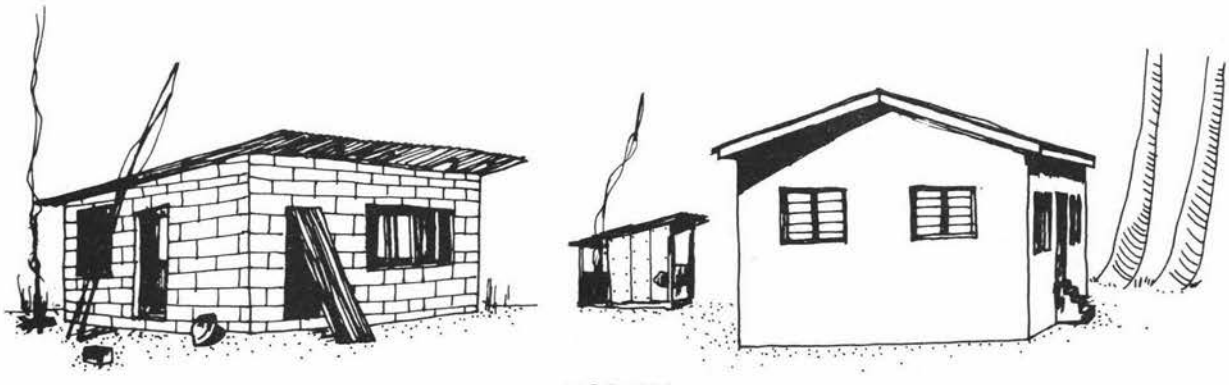
It should not be assumed from what has preceded, that traditional status leaders are dominant. Since before 1945 there has been a steady growth in the number of achieved status positions, this element is now the most dynamic force for change

HOUSE TYPES

TRADITIONAL



MISSION STYLE



MODERN

Fig.15

Mangaia, 1967

within the community.

School teachers, public servants, traders and storekeepers make up the majority of this element, with a minority of full time planters. As a group these people have a number of factors in common; they all receive substantially larger incomes than most of the population, (see P.106), they generally have a better educational background and they exhibit a noticeable non-traditional achievement orientation. Outstanding members of the group are school teachers, who are prominent in agricultural innovation, in village social functions and in sporting activities. The four dominant traders and storekeepers, two of whom are members of the Cook Islands Legislative Assembly are retired school teachers as is the leading member of the Cook Islands Party on the island. Despite these factors, this group cannot be said to comprise a distinct socio-economic group within the society. The bulk of teachers and public servants do not lead through recognised island institutions such as the church or the Island Council. Some teachers are deacons and youth leaders in the church, but none are members of the Island Council, apart from the Legislative Assembly Members. The 'vacuum' left on other islands by the 'complete collapse of a traditional authority system' has not yet appeared on Mangaia (30). Rather there has been a covert withdrawal of respect for ascribed status, which has not appeared openly in the community, and is thus effectively blocking the way for the advance on non-ascribed status individuals into positions of leadership. It is notable that present and past school teachers who have achieved status within the society have also been members of , or married into, families with ascribed status.

This situation results in a number of younger men and adolescents, mapu, experiencing frustration, most of which is not publicly manifested, but is often the topic of informal discussion among themselves. Within the mapu, particularly in the immediate post school group, there is an overwhelming desire to emigrate. Where this ambition is frustrated by an authoritarian father, individuals tend to become idle and shiftless, some even stating that this is what the community expected of them. ('We are only mapu. When you are mapu nobody expects you to do work.') Young married men with family responsibilities cannot emigrate so easily and are faced with a more complex problem. Some have achieved occupational status, but this does not apply in all social situations and there is an uncertainty in this group as to their place in the community (31). The result is a timidity to become figures of renown. In public meetings young married men hesitate to speak, although their better educational backgrounds often put them in a good position to understand the problems under discussion. In sporting activities they follow older and less agile men rather than leading them, and in agricultural activities they neither pubicly state their ideas, nor boast of good production. Two informants expressed this uncertainty in the following way: 'They (the older men) just

wait for you to climb up, and then they will knock you down. It is better not to climb up.'

In summary, the most notable feature of Mangaian social organisation is the strong residual traditional elements which operate within it. After visiting Rarotonga, Aitutaki, Manihiki and Mangaia in 1964, Kolff noted that in Mangaia, '...a much stronger adherence to traditional social patterns than in the other islands was clearly visible.' (32). The strength of these patterns is seen to lie in the relationships between the system of land tenure and the existing social structure, in which each status level is associated with a distinctive area of land. This situation has not prevented the development of an achievement status group, however. This group, comprising school teachers, traders and public servants are gaining status at the expense of ascribed status groups, but the withdrawal of respect for traditional elite is a subtle, slow process, which is creating confusion among younger men and adolescents, who experience frustration and bewilderment. These changes can be traced to a common cause, the erosion of traditional values and their replacement by monetary values. Land is beginning to be viewed from a monetary attitude. The desire for steady wage labour and increased incomes is resulting in continued emigration to Rarotonga and New Zealand, and this in turn is causing changes in the functions of the extended family. To a certain extent, the nuclear family too, is under change, and the household is beginning to form the most important resource utilising unit. Achievement status positions are also basically a result of increased incomes among those individuals comprising the group.

REFERENCES

1. J. Williams and R. Bourne, 1823.

2. G. Gill to London Missionary Society, 1845, Mangaia Census. There were three Gills involved in missionary work on Mangaia. William Gill, who arrived in 1838, was followed by his brother George in 1845, who became the first resident European. In 1855 William Wyatt Gill, no relation of the brothers took up his residency at Tamarua. The latter was responsible for the mass of ethnographic material on traditional Mangaian society.

3. An estimate by Davida, one of the two Tahitian missionaries landed by Williams in 1823. Recounted by G. Gill to the London Missionary Society in 1849.

4. G. Gill to London Missionary Society, 1848.

5. After a term on Rarotonga, Harris, a later missionary who spent some time on Mangaia, considered this island, '...one of the healthiest islands in the Pacific, certainly in this Group. (The Cooks).' Harris to London Missionary Society, 1874.

6. The missionaries were, perhaps, more concerned at the 'horrifying worldliness' of those returning.

7. Until 1867 Mangaians who were known to be away from the island were included in census figures as if they were away only temporarily. Thus it is likely emigration began to take effect earlier than census estimates reveal.

8. AJHR A3, 1901, 47.

9. G. Gill to London Missionary Society, 1855.

10. McArthur, 1966, discusses the relationship between the number of mixed blood births and the duration of stay of European sailors on Polynesian islands.

11. The incidence of disease also remained high. Yaws, syphilis, ringworm, filaria, diptheria, typhoid, tuberculosis and other respiratory diseases were found to be almost endemic in 1913, when a medical team from Rarotonga carried out a survey on Mangaia. AJHR A3, 1913, 21.

12. A major difficulty in working with Cook Islands census material is the irregularity with which information has been collected. Because certain data was collected during one cencus is no reason to expect it to have been collected in a subsequent census. Details of persons living on Rarotonga whose island of birth was elsewhere falls into this category. In 1911, however, there were 303 Mangaians on Rarotonga.

13. McArthur, 1966, 394, states, '...ultimately marriage is no less relevant to the bearing of children in these populations, that it is elsewhere and a girl's chances of marriage depend on the number of males available.' On Mangaia, however, formal sexual relations between unmarried persons were accpted as normal, although attitudes expressed by the churches, and by islanders to visiting Europeans, would indicate the contrary. When a boy obtained permission from a girl's father to have a relationship with the girl, the children which often resulted from the relationship were accepted by either family, usually the girl's. Such a relationship, including the birth of one or more children, did not necessarily lead to marriage. In one case, a father was refusing permission to marry to his daughter, who had borne two children to her 'boyfriend'. Cases were observed where men who had emigrated for a long period had allowed their wives to live with other men in the village. One woman had borne two children under this arrangement. The community accepted these relationships as practical, but were generally unwilling to discuss them with Europeans as they assumed Europeans would 'think

it a bad thing.'

14. Wyatt Gill to London Missionary Society, 1894.

15. G. Gill, 1854, Census Report to London Missionary Society.

16. Curson, 1968, notes that 15 of his sample of 151 Cook Islanders in the Auckland area, earned their passages from the Islands to New Zealand by working on Makatea Island.

17. Mangaia Administration Records. The figure is for twelve months from April 1966 to March 1967.

18. The term 'feeding child' refers literally to a child fed by another family. Such feeding may entail official adoption, but often does not. On Mangaia 'feeding children' often transferred back and forth between their parents' and their feeding parents' houses, more or less at will, although in many cases, the arrangement was permanent. There was normally an informal relationship between families involved in a feeding child exchange.

19. Hiroa, 1934, 112.

20. The Island Council is a body of village representatives, elected triennially by secret ballot. Included on the Council were the Legislative Assembly members for Mangaia and the ariki, who was an ex-officio member. Prior to 1946 the Aronga Mana comprised the Island Council, but in free elections in that year, some kavana lost their seats. In 1967 only the kavana of Ivirua and Keia were Island Councillors. The Council was concerned with internal island administration and had no dealings in land tenure transactions.

21. Mangaians in general and the Aronga Mana in particular were extremely sensitive about any outsider investigating land tenure practices. The material within this section was collected in the latter stages of the fieldwork so as to avoid prejudicing the main body of the research. Material was collected from ui rangatira who were considered reliable and who understood better than others the reasons for the study being undertaken. For a general discussion of Cook Islands land tenure see Crocombe, 1964.

22. It appears that following the 1828 battle much land was returned to defeated tribes as a gift. This was probably the result of missionary influences. In the villages each family, regardless of tribe, was given rights in perpetuity to their dwelling house sites by Numangatini.

23. A good example of the lack of security this arrangement afforded was provided by a Karanga planter who said: 'This land that I plant was given to my grandfather by a

man who said, "You can plant this land for money or for food, but you can never be the boss of this land, you can never be the boss." So I only plant ku'ara and ara (pineapples) at this place. I plant nu (coconuts) on my mother's land up there, and will plant anani (oranges) there one day. That land is ours.' This planter was afraid that after two generations the relatives of the original benefactor might claim back the land, and by custom they had the right, although the Aronga Mana could judge otherwise.

24. Information provided by Atingakau Tangatakino and Nga Kavea.

25. The great majority of judgements were accepted by the community as just and correct. There remained a belief in the spiritual relationship between the elite, the society and the land. As one aged informant said, 'When the ariki is bad, the land is bad and the food becomes poison.' He was referring to the death of a former ariki known for his acceptance of bribes prior to land judgements. He considered this man had caused his own demise by breaking sacrosanct procedures.

26. Mangaia Administration Records, File8/6.

27. Food was often gifted to the elite as atinga, a voluntary or obligatory tribute, although the practice was not as marked on Mangaia as it was on Rarotonga or the Society Islands.

28. A tere party, in this case, was a party of church members who travelled to another district meeting house for a religious meeting. The meetings followed closely a revivalist pattern in which bible passages were read and members offered interpretations. Karakia were chanted between speeches. At one meeting, for example, those attending were asked: 'How does the Holy Spirit enter your body?' Answers were humerous, anecdotal and theological, including quotations from almost forgotten colloquialisms and traditional stories.

29. Strong disapproval was voiced against people joining the Mormon Church. For example, when Metekeiti Ariki died, his daughter, who was nearest in line for the ariki title, was passed over in favour of a younger and more distant relative, because she had joined the Mormon mission.

30. Johnston, K.W., 1967, describes 'a vacuum in the rank system' on Aitutaki which was being filled by an 'incipient group of new leaders.'

31. A good example of situational status is that of the Chief Clerk at the Mangaia Post Office. Although this man is not a noted community leader and tends to ignore many

communal activities, he is well known for his actions in evicting a past ariki from the Post Office, following a heated argument, an act without precedent in the community.

32. Kolff, 1965, 267.

CHAPTER III

TRADITIONAL AGRICULTURE AND THE CULTIVATION OF FOOD CROPS

Traditional agriculture on Mangaia was primarily concerned with subsistence. The variety of food plants cultivated was influenced: first, by the selection of plants which were carried to the island by migrant Polynesians, second, by the suitability of the island environment to support the plants which were carried, and third, by the ability of the migrants to adapt certain parts of the environment to create optimum growing conditions for those plants. The outcome was a system in which one species of plant, Colocasia, dominated all others and relegated them to the positions of supplementary food plants. In a similar process of selection to that carried out by Polynesians in New Zealand in their adaptation of Ipomoea to temperate conditions, the Mangaians selected taro as the plant best suited to their subsistence needs. So successful were their adaptations that today taro species provide the bulk of all food consumed on the island, despite upsets in social organisation and settlement patterns and the cultivation of cash crops.

PRESENT PATTERNS OF CULTIVATION

Prior to European contact most Mangaians lived and cultivated land in the puna. In the rautuitui and rautuanu'e cultivations were small and scattered and were usually those of families of tribes defeated in warfare. In the puna a wet field system was employed for taro cultivation and a bush fallow system for ku'ara, yam and tarua on alluvial soils near the swamps. After villages became nucleated and relocated on the coasts by missionaries (see p.36), the swamps were isolated from the main settlement areas by up to three miles with difficult accesses across rugged makatea tracks. Dry land gardens in the makatea became more common and some parts of the swamps, especially the more distant, including the intricate system of valley-side plots, were abandoned. The puna, however, maintained its predominance as a source of food. Wet field taro cultivations predominate in area among other food crops (see Table IV), and in the pattern of individual cultivations (see Table XVII). Every planter interviewed had at least one mamio and pa'i plot, whereas less than one-third had at least one plot of tarua or any other single or multi-crop dry land garden.

When the number of plots cultivated per planter is examined (see Table XVIII), some variations between districts is apparent. The greater interest in pineapple cultivation in Tava'enga is influencial in the proportionately low number of food plots cultivated per planter. Planters in Keia-Veitatei and Ivirua-Karanga, however, concentrate more on traditional food gardens. In the latter district this is a reflection of strong traditional leadership and a lesser reliance upon imported foodstuffs, but in Keia-Veitatei reasons for the larger number of plots per planter are not understood. Access to the swamp is very easy, but imported foods are freely available, incomes are higher in

TABLE XVII

FOOD CROPS: THE PATTERN OF CULTIVATION, 1967

Garden (a)	No. of Planters	% of Total No. of Planters	No. of Plots		% of Total No. of Plots	
Mamio	91	100.0	372		45.8	
Pa'i	91	100.0	330	702	40.6	86.4
Tarua	28	30.7	37		4.5	
Ku'ara	5	5.4	5		0.6	
Maniota	6	6.5	6		0.7	
Yam	10	10.9	11		1.3	
Banana	19	20.8	21	80	2.5	9.6
Multi-crop gardens of tarua-banana-maniota-ku'ara-yam	25	27.4	29	29	4.0	4.0
Totals	91	100.0	811		100.0	

(a) See Chapter I for a description of Mangaian food crops.

Data based on sample.

TABLE XVIII

FOOD GARDENS CULTIVATED PER PLANTER, BY DISTRICTS, 1967

	Keia-Veitatei	Tava'enga	Tamarua	Ivirua-Karanga
Wet Field Plots	5.3	3.2	2.7	4.1
Bedded Taro Plots	4.2	1.7	3.6	4.5
Total Swamp Plots	9.5	4.9	6.3	8.6
Dryland Garden Plots	1.4	0.6	1.1	1.4
Total Plots	11.9	5.3	7.4	10.0
No. of planters	24	30	17	20

Data based on sample.

this district than in either Tamarua or Ivirua-Karanga (see p.106) and traditional leadership is lacking. Although traditionally the greatest taro producing district, much of the Tamarua Swamp is now semi-abandoned and Tamarua planters are beginning to concentrate their attention on pineapple growing. (see p. 102)

For convenience the cultivation of food crops can be divided into those cultivated under a 'wet' system and those cultivated on dry land.

Wet Field Taro Cultivation (1)

The terracing in the puna valleys serves two main purposes: each level holds and provides water for lower levels, while during heavy rain and stream freshets, floodwaters are spread evenly over the valley floor and silt is deposited all over the swamp. In this manner fertility is maintained at a satisfactory level and thus chemical fertilisers are never required. (see p.

Upon each terrace level there are two types of wet field for two different varieties of Colocasia. The true wet field, an excavated water-filled enclosure, is used solely for the cultivation of mamio, and a second area, a raised bed surrounded by water, is used for pa'i. The mamio plots are rectangular with bunds approximately three feet high, formed of earth removed from the plot during its construction. The beds are constructed in the opposite manner, with earth from a moat-like ditch surrounding the plot being thrown into the centre to raise the level of the bed above that of the water. Wooden control gates regulate the amount of water flowing through and around the maturing taro plants. (see Figure 16).

Very few plots are constructed by present day planters. Some very old plots are reconstructed and reused, but almost all plots in the swamps are of pre-European construction. From a wooden dam in the mainstream above the swamp, stream waters are diverted down one, or both sides of the valley, in an artificial channel, matavai. Dams at points along the matavai allow water to be diverted on to the various terrace levels. From here it runs down through a number of levels to the next diversion dam. Below the swamp water returns to the stream bed to flow beneath the limestone cliff. (The general pattern of mamio and pa'i cultivation and water reticulation is shown in Figure 17, a map of the larger, eastern part of the Tamarua Swamp.

Planters rarely use all the plots at their disposal. On an average one plot in every four is fallow. Cropping is carried on continuously on one plot for between four and six years, with an indefinite period of fallow. During fallow periods plots are rapidly covered with a mat of vegetation, weeds and swamp grasses. Older fallow areas do support low scrub, but this is unusual in the areas of most intensive

TARO CULTIVATION

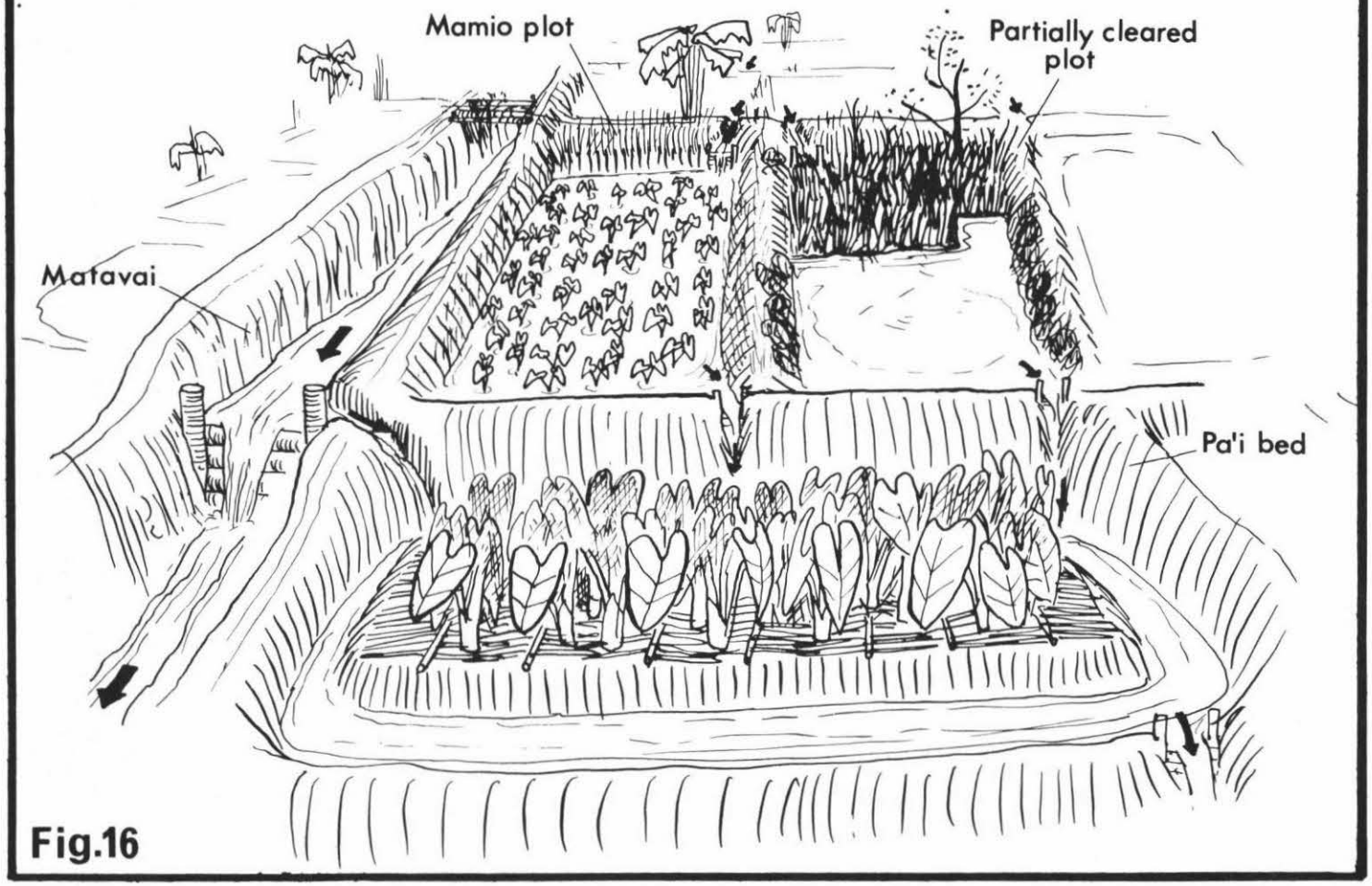


Fig.16

cultivation. (In Tava'enga an area of swamp, abandoned shortly after 1900 because of the distances from settlement areas and a shortage of water, supports only luxuriant ferns, three feet high, beneath which lies a mass of waterlogged grasses a further two feet in depth.) Plot selection is on the basis of the length of fallow and past use and the height and species of the regenerative vegetation.

Once a plot has been selected for recultivation a different technique is employed for mamio plots and pa'i beds.

Mamio Cultivation

Before planting can begin the fallowed plot must be cleared. This is usually accomplished with a bush knife which is used to cut the tangled mass of weeds and grass into blocks small enough to be dragged or thrown up on to the bunds around the plot. In this manner one man can clear about 180 square feet in an hour. It is usual for a group of men to work together to carry out this heavy task. (see p. for a discussion of work patterns). Once the plot is cleared of weeds an adequate supply of water is provided by reopening old water channels and constructing control gates. The plot is then left for two weeks to allow the fine silt and mud stirred up during clearing to settle evenly on the bottom.

Planting material comprises either the tops from mature plants, which are cut just above the tuber, or new shoots which are propogated by allowing tubers to remain in a plot after they are mature. The tops, miko, are pushed gently into the soft floor of the plot, about one foot apart in rows. As soon as the mud stirred up by planting has settled, water is allowed to move through the plot and continues to do so during the growing period. Most larger plots are not completely planted at the one time, but are planted in stages to ensure a continuity of maturing tubers over a longer period.

Weeding, although not difficult, must be done regularly as weed growth is rapid and stultifies the growth of the tuber, spoiling quality and taste. It is usual for women to weed mamio, a task which is often combined with the household washing. The washing is carried out in the nearby matavai and spread around on bushes to dry while a plot is weeded.

Cropping is continual during a period of use of a plot. The planter bases his judgement of when a plot should be allowed back into fallow on the past history of the plot and the quality and quantity of the previous crop. Often during the last harvesting tubers are left to grow beyond maturity to provide new planting material. (Planters in Karanga maintain that in this manner they produced a new variety of mamio from their swamp, a red stemmed mamio which gives a slightly larger tuber.)

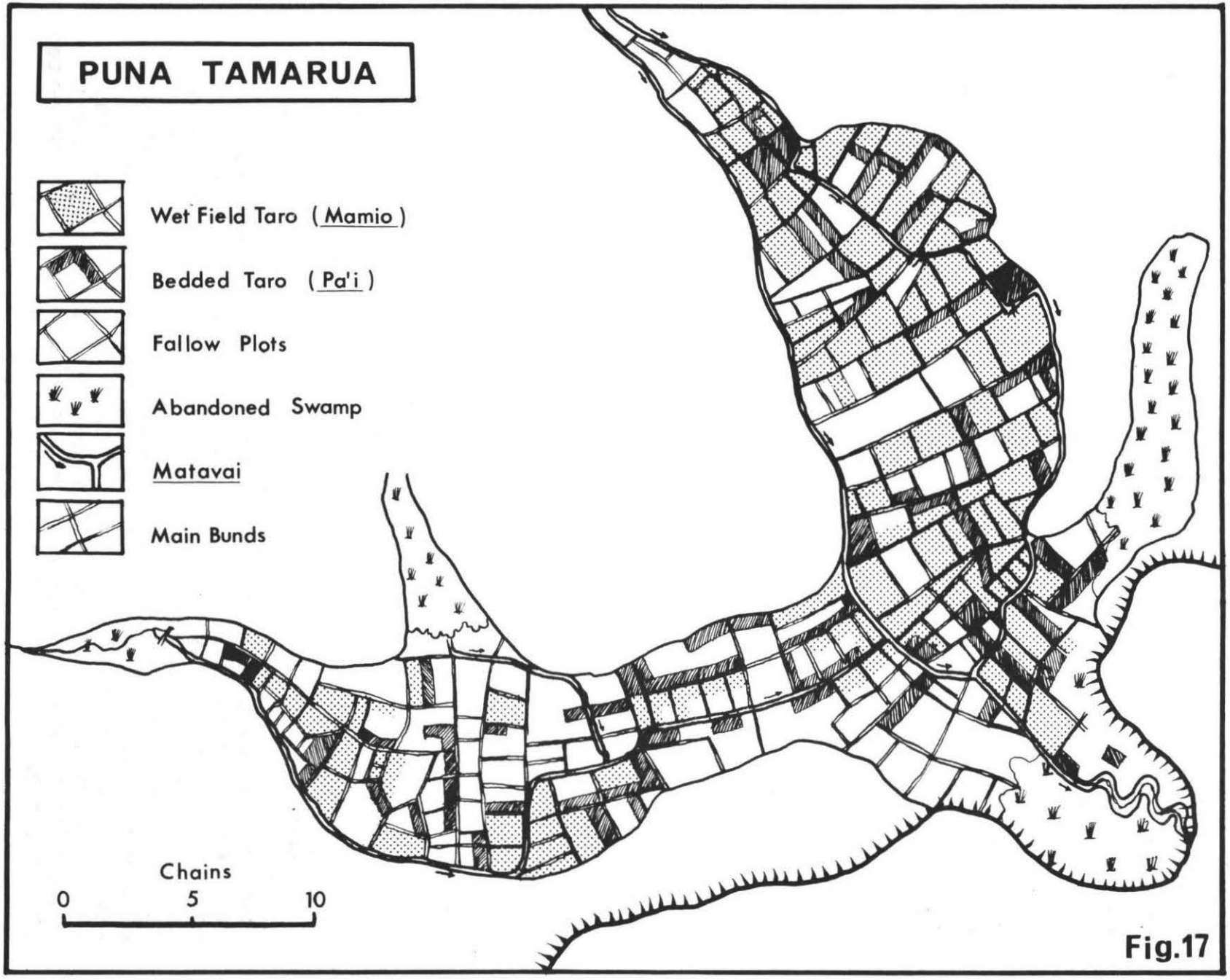

PUNA TAMARUA
Wet Field Taro (Mamio)
Bedded Taro (Pa'i)
Fallow Plots
Abandoned Swamp
Matavai
Main Bunds
Chains
0
5
10

Fig.17

Pa'i Cultivation

On the fallowed bed taller vegetation is cut and removed. The whole area is dug with care being taken to ensure no grass shoots are left exposed to grow again and choke young plants. A ditch is cleared and deepened on all sides of the bed, which is finally covered with coconut fronds, kikau, or long cut grass as a mulch, to stop weed growth and to prevent the soil drying out in the sun. Up to two weeks later planting takes place. Planting material is again miko, the tops of mature tubers cut just above the tuber. Small holes are cleared in the mulch and a torpedo-shaped wooden tool, pau, is used to punch holes up to ten inches deep into the soil beneath. (see Figure 21). The miko are pushed firmly into the boggy soil at the bottom of these holes, and the holes are left unfilled. Weeding is not usually needed more than once, if that, for the mulch stops weed growth until the broad leaves of the young plants shade any competitors.

The pa'i plants are liable at certain times of the year to attack by fungus infections and pests. Caterpillars which strip the leaves are combatted by setting fire to the mulch. Although this destroys the leaves of the plants as well as the pests, the leaves soon reappear.

Recent Changes

Traditional practices have changed little since pre-European time. In overall management and organisation, however, changes are evident. As is mentioned above, all upper valley-side terraces and less accessible areas of main swamps have been abandoned. It is possible that the upper valleys were the first areas to be utilised for mamio plantings and as the terraces spread down to the broader parts of the valley, the upper valley was abandoned. It seems more likely, however, that accessibility has been the major factor in their abandonment.

A more recent development is the steady deterioration in the condition of bunds, dams and matavai and tracks and the surroundings of the swamp. Breaks in bunds, which are often not repaired or repaired carelessly, result in washouts right down the swamp, with losses of soil and plants. Older informants believe the fault lies with the kavana, who appear to have lost the authority and hence the ability to raise communal labour to repair the swamps. Similar occurrences are documented in New Caledonia, where terrace cultivations were quickly abandoned once an encroachment of colonial power into the society destroyed the power of indigenous leaders. Only in isolated parts of New Caledonia and on offshore islands does irrigated taro continue to be the central feature of agricultural systems (2). On Mangaia relative isolation and lack of continuous contact with a colonial administration and commercial values has retarded the process, but has not prevented it occurring.

Dry Land Gardening and Shifting Cultivation

Prior to 1830 the puna was the focus of island life, and dryland gardens were supplementary gardens, supplying a variation to diets and a secondary source of food in times of drought. In the piriaki and in the bush around the swamps tarua and ku'ara were established on a semi-permanent and a shifting basis. Some ku'ara gardens were established in the rautuanu'e on more favourable areas of alluvial soils and in the rautuitui gardens were cultivated by defeated peoples. Today a greater area of the rautuitui is cultivated, but in all three zones, rautuitui, piriaki and puna the major food crops continue to be cultivated with techniques very similar to those used traditionally.

In the rautuitui and piriaki the pattern of cultivation conforms closely to a 'rotational bush fallow system' or 'an established integral system of shifting cultivation' as described by Watters and Conklin. (Watters, 1960, 35; Conklin, 1957, 2). The nature of the rautuitui, namely pockets of soil interspersed with limestone outcrops of varying intensity, causes cultivations to be shifted within areas of established garden sites. There is a concentration of established sites near each of the village locations, very little cultivation occurring outside them and no climax vegetation is removed.

Site Selection (kimi kianga one au)

In selecting a new garden site Mangaian planters consider a number of factors: these include the actual crop to be planted, the time available, the labour that can be called upon, the distance of potential sites from dwellings and the previous uses to which a plot has been subject. Most planters attempt to select a plot as near as possible to the village or to other areas they have under cultivation. Failing these criteria a location near a road or track are next favoured, for in a system in which the staple food is produced from a distant and fixed location, proximity is a prime selection factor for supplementary gardens.

The majority of planters interviewed could not recall the past use of an area beyond about five or six years. In some cases older men and women could remember, and planters often ask the advice of older villagers during site selection. Once a general location has been chosen, selection is based on an examination of soil conditions and vegetation. After abandonment garden areas are first recolonised by grasses, followed by puarenga and scrub, kuava and au. Beneath this cover small ground ferns appear, and most planters stated that the existence of these ferns was an indication that the area was again ready for cultivation. The height and thickness of the scrub trees is also taken into consideration. Soil conditions are considered by fewer planters, who noted humus formation and avoided areas covered by a granular or

powdered clay as this indicated that over cultivation had occurred.

Cutting (vaere anga)

The clearing of a selected site is carried out with a bush knife and sometimes an axe. (see Figure 21). First the brittle stemmed puarenga is pulled out by hand and piled up at a number of convenient points on the site for drying. Smaller shrubs are then cut near the ground, then the larger scrub trees, which are usually cut out in sections. The wood from these trees is cut into manageable lengths and stacked along one side of the plot. Coconuts and any large trees are left standing. Once most of the upper vegetation has been removed, a digging stick with a round steel blade, taiki (see Figure 21) is used to remove stumps and roots. Fern roots and any grass roots are cleared by thrusting the taiki along the ground with one hand, while roots are pulled from the soil with the other. Twigs and rubbish are thrown on to the pile of wood lying along one side of the plot.

The total area of selected site is not always completely cleared before planting is begun. Sometimes half the area will be cleared completely, and the planter will suddenly extend the area. There is little to indicate the formation of a definite plan of shape or area for a plot before clearing is started. Cutting and clearing is normally the work of more than one person and kin or friends may assist, or a gang of workers may reciprocate their labour over six or seven plots.

Burning (ta'u anga teita)

There is no indication that burning is carried out on newly cleared sites for any other reason than to destroy the undergrowth cleared from the area. Piles of smaller twigs and dry rubbish are burnt wherever convenient, often around the base of a coconut to the detriment of the palm, and the ashes are not spread around. In many cases larger piles of rubbish are not burnt immediately, but are left to dry and may not be burnt at all. From this stack of wood all select pieces are removed and carried to the village as fuel for cooking fires. When fires are set the green vegetation surrounding most plots prevents any uncontrolled burning.

Cropping

Planting, tanu ange, is usually the work of an individual planter and his immediate household. Planting begins at one side of the plot where a strip of kiriau is stretched between two sticks. Using the rope as a guide, holes for tarua are dug approximately 18 inches apart across the plot, avoiding the rock outcrops. Once two or three holes are completed, planting may begin. Tarua is planted with green shoots from mature tubers and these are dropped into the holes which are left unfilled. Planting continues until the maximum number

of plants have been put into the area available. If bananas are to be intercultivated they are planted haphazardly between tarua rows and around the edge of the plot. No ku'ara plantings took place during the field research, but informants stated that tubers are pushed into mounds of soil which are laid out in a similar manner to the holes for tarua. Arrowroot is usually planted in a strip down one side of the plot and areas clear of rock are most favoured. Cuttings are merely pushed into loosely dug soil and pressed with the foot.

Although many gardens are multi-crop gardens one crop usually dominates and there is a distinctive area of each individual crop within a garden site. Thus there is not the chaotic appearance characteristic of some shifting systems, where a number of crops are growing at different levels within the same small area. Ku'ara and yam gardens tend to be more often single crop gardens than tarua gardens and although ku'ara and arrowroot are intercultivated, it is uncommon to see ku'ara and tarua gardens intercultivated. Yams are normally grown away from the main garden areas on very small plots protected against animals. A tree is cut and partially pulled down and yam are trained to climb these branches.

Weeding, tama anga, is necessary in tarua gardens only until the leaves are developed, but ku'ara gardens are more open and require greater attention.

Great difficulty was experienced in obtaining details of crop successions. Once the first crop has been planted what follows appears to depend upon the choices and needs of the planter and there does not appear to be an established order. In practice yams are always planted on newly cleared ground which has been in fallow for at least ten years, but tarua, ku'ara and bananas may follow in any order. There is a tendency to plant bananas on an abandoned vegetable garden after the last crop, especially if the planter has spare banana shoots.

Fallowing

Once the plot has been cultivated to the point where crops begin to show signs of diminished quantity and quality the site is allowed to return to fallow. The basic purpose of fallow is to allow the natural recolonisation by grasses and scrub to build up fertility levels in the soil. Sites in fallow are completely abandoned, except those in which bananas are planted, and nothing is done to them until they again become selected for cultivation. Rights to land do not necessarily lapse once land is allowed back to fallow, unless a site has been obviously relinquished by the planter involved. Many informants spoke of fallow land in similar terms to land in use, and fallow is generally recognised as a legitimate 'use', a period through which a plot must pass before it may be again used.

The rotation of plots does not follow a rigid pattern. Length of fallow depends on the crops grown during a period of use, the natural fertility of the plot and the area of wet taro a planter cultivates. Some planters clear two new plots per year, while others clear only one every two or three years.

Recent Developments

The arrival of a bulldozer in June 1967 saw a new development in dry land gardening. Areas of second growth in the puna were cleared with the machine, ploughed with a privately hired tractor and planted in tarua. The bulldozer driver was not selective and removed all trees, large and small, from the site, much to the glee of awed onlookers. Trees were piled along the side of the plots and left unburnt. According to the person planting the land, the tarua was for consumption and not for marketing. He said he regarded the time saved by using the machinery as time which he could spend with his pineapples. As there is a great deal of status to be gained from using a new tractor and he was related to the bulldozer driver, it is difficult to assess the rationality of this argument. But it appears certain more areas of established garden sites will be cleared in this manner and some areas of makatea may be cleared of smaller rock outcrops, thus enlarging present areas and enabling wheel tractors to be used in these plots.

ANIMALS

Almost all Mangaian households care for at least one pig and some fowls. Pigs are an important asset, for they may be exchanged for labour with kin and on important family occasions and life crises used to feed guests. The only persons not owning pigs were those who chose to participate little in village affairs and who held themselves aloof from the community. (see p. for an example of this type of person). Fowls are not kept by all families, but 85 percent of households visited had some fowls. Horses are commonly used as beasts of burden.

Animals are not integrated into a general cycle of cultivation. Most pigs are kept within the makatea in small pens constructed in large holes in limestone outcrops, blocked off with stone walls across the open end. Others are tethered by a hind leg to a coconut or a stake in an abandoned plot. They are fed on coconuts, which are merely split open with a bush knife and thrown on the ground. A tin or a crude wooden trough is often used to catch the water contained within the nuts, which serves as drinking water.

European breeds were introduced and crossed with the island pigs, (the origin of which does not appear to be documented), during a school extension programme (see p but most of the pure breds and single crosses died following

the cessation of the programme. As one informant said: 'The puaka papa'a all died. If you don't feed them every day, mate. The puaka maori, you can leave him in the bush and he's alright.' Traces of the introduced breed are evident, however.

Fowls are used for eating, mainly during important occasions, and eggs are rarely collected regularly, as hens lay haphazardly and in out of the way places. Horses are generally thin and poorly fed and it is common to come upon a horse, tethered in second growth, which has not been shifted for up to a week. The Islanders have little concern for animal care, and appear unable to imagine the occurence of pain and distress in animals.

CONCLUSIONS

It seems safe to assume that early Polynesians arrived at Mangaia carrying some food plants, in particular Colocasia sp. (3). It is likely that taro plants, which were ideally suited to the damp conditions prevailing in the inland valleys and beneath the makatea cliff, were rapidly established in these areas. With a gradual increase in population and the arrival of more outsiders irrigable plots near the streams developed. It is possible that contacts with Western Polynesia recorded by Moss (4) and Hiroa, (Hiroa, 1944, 485) introduced the techniques of large-scale terracing which allowed the extension of irrigated plots across the broad flat valley floors, although this development could be the result of logical progression from a very basic system of irrigated plots beside streams, to the present complex. Concurrent with a more extensive system of terracing was an increasing complexity of political and tribal structures, until the watershed for each swamp became designated by district boundaries and the power of each tribal group was related largely to the area of taro under its jurisdiction. Such was the dominance of the taro species that other foods, possibly later arrivals to the island, such as Ipomoea, achieved little importance.

The cultivation of plants outside of the irrigated terraces developed into a system of bush rotation over established sites, and was not extensive in area. The development of the taro terraces in response to the original challenge of a rather uninviting environment stifled the development of any but this simple shifting system. The taro fields became an extremely important part of Mangaian culture, and land tenure and social organisation became based upon their administration. This dominance of the wet field system and its isolation from dry land systems of cultivation has been of importance since the introduction of alien plants and commercial agriculture. On other islands, such as Aitutaki, the introduction of a cash crop resulted in immediate competition between food and cash crops for cultivation areas, soil fertility and labour (5). On Mangaia the introduction of cash crops resulted only in competition for labour, and the wet system is labour

intensive only at certain times during the cultivation cycle. Once a plot is established, work is light and is carried out by women. The ability of the system to continue production of the great bulk of food consumed on the island in the face of increasing commercialisation and the immense satisfaction most individuals derive from carrying out a traditional activity with important cultural roots has been a stabilising influence within the society. Only within the last ten years has this stability begun to show indications of disruption, the result of changing values within the community as a whole.

Changes are evident in both food producing systems. The complex terrace systems are not receiving the maintenance necessary to prevent their eventual destruction by natural elements, particularly fluvial erosion. This is the result of a breakdown in the power of traditional leaders, especially the kavana, whose responsibility it is to ensure that each district practices conservatory works in their respective swamps. Although there is little present evidence to suggest a sedenterisation of dry land plots, the rapid adaptation of a bulldozer for clearing second growth and rocky outcrops indicates changes are not far away. If the use of machinery in the clearing of food gardens becomes widespread it is possible other changes such as the use of chemical fertilisers (see p.123) will follow.

REFERENCES

1. See Spencer and Hale, 1961, for a discussion of the aims and origins of agricultural terracing. See Barrau, 1965, for a detailed discussion of wet field cultivation in Polynesia and Melanesia.

2. Doumenge, 1966, 327.

3. Barrau, 1963, discusses the migration of foodplants in Polynesia.

4. Moss, in a report to the Governor, relates a story told to him by 'an old man' who said: 'The original migration (to Mangaia) was under an ariki from Samoa whose name was Rauanuku. Years later there came from Tahiti another party under the chief Tane. Tane conquered Rauanuku's tribe and forced the ariki to become a 'drum beater,' a mere mouth piece.' AJHR , A3, 8.

5. See Johnston, 1967, for a description of the Aitutakian agricultural system.

CHAPTER IV

THE DEVELOPMENT OF COMMERCIAL AGRICULTURE

The indigenous system of agriculture on Mangaia was the major productive unit in a subsistence economy and the society was completely independent of resources outside the island for all items of production and consumption. Today, however, there is a greater area of land growing commercial crops than subsistence crops and the island ecomony is one sector of a market economy dominated by a distant and far larger metropolitan state, New Zealand. This change in the orientation of the Mangaian economy is a response to forces originating outside the island which have imposed themselves upon certain parts of the society, and to incentives which have intruded into the economy, in particular goods and services which can only be acquired by exchanging surplus agricultural goods or using money. The missionaries, the British Protectorate and the long period of New Zealand administration have all changed the society in some way. Religious beliefs and social organisation were restructured, new laws introduced and enforced, health and educational facilities provided, new plants introduced and markets arranged.

The cumulative result of these forces is an increase in the components of commercialism within the agricultural system. This process has not been one of a steady increase in commercialisation but one of short periods of rapid change followed by periods of partial regression. Two periods of rapid change occurred between initial outside contacts in 1823 and 1900, but after the second regression which began in 1910, there followed a long period in which there was very little commercial development. It is only since 1945 that commercialisation has again become a dominant feature in Cook Islands agriculture, with the introduction of effective extension services, the provision of financial assistance and the establishment of a fruit processing factory on Rarotonga.

INITIAL MOVES TOWARDS SURPLUS AGRICULTURAL PRODUCTION

Initial mission contacts precipitated a latent movement towards the centralisation of political power in Mangaian society. But despite power being held by one tribal group, there remained strong inter-district rivalries, held in check only by the forceful leadership of Numangatini Ariki. By the arrival of George Gill, the first resident European missionary, Numangatini and almost all his district chiefs had become nominal Christians and because of their traditional status, most had also become leading church members and village councillors. The initial incentives to produce a suplus of agricultural goods were carried into this social environment by European missionaries. The missionaries required the Mangaians to support the mission station by donating arrowroot and the donations were shrewdly organised on a district basis (1). Originally pia, (Tacca sp.), the indigenous form of arrowroot,

was used, but the more productive maniota, (Manihot sp.) proved immediately acceptable as techniques of cultivation were very similar. The chiefs, because of their positions of authority in both mission and traditional spheres, stimulated production by using traditional authority, passed down through the various levels of the society. In this manner individual families were forced to cultivate and produce a certain amount of arrowroot. Substantial amounts of arrowroot were produced immediately following contact and although there was no currency on the island, the donations were given a monetary value and district contributions were made public knowledge and were published in the mission records. Table XIX shows the recorded donations between 1846 and 1898.

Changes in the patterns of cultivation that followed effective contact and the production of arrowroot are poorly documented, but general trends can be deduced from a number of scattered references in mission correspondence. The most important change at this time was the introduction of steel tools. These and the adaptation of indigenous implements increased the productive capacity of the society, allowing a move to the surplus production of arrowroot with relative ease (2). The move to suplus production of arrowroot, even after the introduction of Manihot sp., involved no more than a reorientation of objectives, as techniques of cultivation remained identical to indigenous practices.

In responding to the incentives offered to them by the missionaries, the Mangians were calling upon resources latent within the subsistence system. The system held within it a reserve of labour; time which had previously been used for leisure or recreation in the form of ceremonials or warfare was available for extra production; the indigenous dry land cultivation system included areas of fallow land which were available for increased cultivation and following the establishment of the villages on the makatea, previously unused areas became available for use (3).

The sweeping cultural changes which had taken place immediately prior to the establishment of a permanent mission station also conditioned this response. Traditional religious practices and beliefs, many of which buttressed all facets of daily life within the society, were completely destroyed, or were reintegrated into a form of behaviour acceptable to the middle class English morality of the missionaries. At the same time, the great comparative material wealth of the Europeans became obvious to the Mangaians. In a letter dated 1846, a deacon of the Oneroa church wrote to the Director of the Mission Society saying:

> 'You know the character of the property of our land is very bad, and of no value. It is not like the property of your land where you have silver and gold, and brass and iron and good things. When we saw the character of the property that came to us from your land we greatly wondered and rejoiced.' (4).

TABLE XIX

ARROWROOT DONATIONS TO THE LONDON MISSIONARY SOCIETY, MANGAIA

1846 - 1895

Year	Quantity of Arrowroot (lbs)	Value ($N.Z)
1846	3,000	
1847		146
1848		240
1849	2,520	
1850	2,200	
1851	2,280	
1852	2,340	130
1855		140
1859	18,000	
1863		326
1867		436
1868		400
1870		460
1871		546
1882		598
1884		722
1885		440
1887		234
1895		334

Source: The above figures are drawn from letters written from the mission to the London Missionary Society between the given dates. In some cases only the amount of arrowroot is recorded and in others only the value.

A larger and more affluent world than the Mangaians had ever imagined existed had suddenly been revealed to them and they earnestly desired to become part of it, despite the loss of much that was valued in their traditional culture.

One of the first tasks the missionaries set themselves was the translation of the bible into the native language. Printed in England, these books were shipped to the island and sold in exchange for cash or arrowroot equivalent. Small amounts of currency began to enter the island economy from whaling and trading ships, which called in search of fresh food supplies. To meet this demand, tarua and ku'ara cultivations were increased near the new villages and the trading and cultivation of vegetables organised by district chiefs. Produce was collected from growers and carried to Oneroa where a market house had been established under the supervision of Numangatini and his sons. Cash and goods received in payment were later distributed among those contributing produce. The power of money to purchase goods was quickly realised as was its ability to be stored as durable wealth and the ability of a villager to give a donation to the mission in cash rather than produce gave status in the community. Villagers saved money to purchase bibles, but the chiefs of Tamarua were more ambitious and in 1848 approached missionary George Gill, requesting him to 'write again and ask the Society how much property shall we send to England to buy a missionary? We think we can buy him and feed him and pay him.' (5). The incentive to save money or to produce exchangeable goods was felt as keenly by non-church members as church members and many demanded bibles, stating: 'We will buy our Bibles now and when we do repent we shall have them ready for immediate use.' (6). Although clothing received by the mission from the Society in England was not sold to the islanders, outstanding church members were rewarded and chiefs were given substantial bundles for distribution among the worthy in their districts, in particular those whose contributions to the mission were largest.

In this initial move towards suplus production the Mangaian community differed from most contemporary subsistence groups in that currency was all but non-existent. It was replaced by a service. The establishment of a mission was so valued that the Mangaians were prepared to forgo leisure and provide the additional labour necessary to produce a surplus of arrowroot. Money became of importance only as a status symbol during this period as it was unable to be fully utilised. The community was prepared to respond in this manner because of the circumstances preceding the arrival of the mission, in particular resident Europeans, and because of the peculiar social and political situation in existence at the time.

THE INTRODUCTION OF CASH CROPS

Initial moves towards surplus production were made with indigenous plants, apart from one introduced plant with very similar characteristics to those established food plants in use

on the island. Between 1840 and 1850, however, a number of exotic plants were introduced by missionaries with the object of raising the agricultural production of the community above a level of subsistence. Of these plants, which included pineapples, citrus, tea, coffee, cotton and tobacco, only citrus, pineapples, coffee, tea and cotton were successfully cultivated. Cotton was the most important. Its product was non-edible and its cultivation introduced a completely new concept into the agricultural system, that of dry land sedentary cultivation solely for cash exchange. Coffee and tea were also crops most alien to established Mangaian food crops.

The introduction of these plants coincided with a steady increase in the number of ships calling at the island and to accommodate this demand the market house at Oneroa was expanded. The chiefs in control began to trade island produce for consumer goods, in particular European clothing, steel tools, some foodstuffs, preserved meats, cabin bread and flour, tea and sugar, domestic utensils and bric-a-brac. These were in turn sold to the islanders.

Although the acceptance of exotic plants coincided with an increase in the utility of money, this incentive was intensified by other occurrences. By this time the villages on the makatea and foreshore had become well established. Houses constructed out of lime (produced by burning coral) had been made popular by the missionaries, lower middle-class English values had permeated the community and the mission had been largely successful in its aim to establish a theocratic state. Mission laws intruded into all aspects of island life, bringing with them a strong pressure to conform, while the missionaries constantly deprecated the 'old pagan ways' (7). Tracks from the outer villages had been improved with bridges over streams and across swamps, facilitating easier movement to Oneroa. These developments reinforced a desire among Mangaians to own European clothing, to eat European food cooked in improved steel pots and to live in European-style houses (8). Thus the response to an expanding market and the introduction of non-food cash crops was an important modification of the existing system. Cotton flourished around the villages, coffee and tea became established on smaller rautuitui plots and there was an increase in the area of arrowroot and traditional crops.

Following the establishment of the villages in the makatea and the isolation of the bulk of the population from the puna swamps by an average distance of one-and-a-half miles, there was an increase in dry land cultivations. Under missionary guidance, areas of the best makatea soils, those with few rock outcrops, were cleared of stone and partitioned off with stone walls. Within these village plots, villagers were expected to grow arrowroot, cotton, coffee and citrus, as well as their own subsistence requirements. The system of cultivation rapidly became sedentary, but with no way of maintaining fertility - although it is possible some form of fallow was employed,

but it proved inadequate - the plots became exhausted and within ten years there began a gradual abandonment of these areas and indications of food shortages.

Losses in soil fertility were accompanied by a steady loss in population, through emigration, which led to a depletion of the labour surplus that had existed under subsistence conditions. To compensate for this, the community began to neglect the cultivation of swamp taro and by the middle of 1860 food shortages, which were described as 'a near famine... such a shortage not remembered by any of the oldest people'(9), became apparent. Although 1863 produced a record donation of arrowroot to the Mission Society a great scarcity of food was again experienced in 1867. It may be argued that a continuing fall in population would have lowered internal demands for food, but this appears to have been offset by a decline in the labour force and the loss of the use of the land around the villages. Further, shipping was becoming less frequent (in 1869 only one ship called in twelve months), with a subsequent loss of contact with markets. As a result a regression occurred, subtle at first, but obvious by 1886, as reported by missionary Harris upon his return to Mangaia after furlough.

> 'Many changes have taken place in our absence... the island was in a great state of commercial prosperity. Cotton and copra were being constantly sold to schooners and the natives were reaping a real harvest of all kinds of European goods and a good influx of money besides. For their cotton they received 5 cents a pound and 2½ cents for their copra. Since the fall of prices in cotton to half of the old, no trading has been done on Mangaia for a period extending over twelve months. Now all the cotton plantations are thoroughly neglected and the natives refuse to the traders the cotton they have in store except at the old scale of prices...the cloths of the natives are beginning to look exceedingly shabby and a large number of children are kept from attending school in consequence of their having no clothing. The usual contributions, I observe, have fallen off.' (10).

Thus approximately 40 years after the 'surplus' resources of land and labour were utilised to accommodate surplus production, followed by true cash cropping, losses of soil fertility and population as a result of increased outside contacts and changes in patterns of cultivation led to a regression on the island. It is very likely, that without the occurrence of the American Civil War and high cotton prices, this collapse in commercialisation would have occurred earlier than it did.

Although a regression occurred and there was a shift away from the most alien of the introduced crops such as cotton, and a consolidation upon the non-labour demanding citrus trees, surplus production did not cease. A balance was reached between

internal demand, labour supply and land resources. The original incentives, mission pressure, consumer goods and utilisable money remained, although muted, but without an advance in technology, an increase in labour or new incentives, the community could not proceed with the commercialisation of the agricultural system. Most of the village plots were abandoned, and citrus trees, which by now were scattered all over the productive ecological zones of the island, became the major source of money. Although coffee planting was discontinued, many areas continued to be utilised for cash exchange. Indigenous crops were intercultivated with the most acceptable of the introduced semi-permanent plants, pineapples, and copra production continued spasmodically.

For a period, the predominant form of agriculture on the island had been the sedentary cultivation of cash crops, some of which were tree crops, and although there was a move back to a shifting form of dry land gardening, a greater area of the rautuitui continued to be cultivated than prior to the introduction of exotic plants. Many of the village plots were disbanded, the stone walls being used for building houses, and the former enclosures became areas of established garden sites within a system of rotational fallow. Permanent sedentary cultivation in the absence of increased technological knowledge was beyond the potential of the island environment and the community.

INCREASED CONTACTS WITH THE ADVANCED ECONOMY

Following the introduction of cash crops to the island, money came into limited use throughout the community. There remained, however, no direct contact between the producers and the market. All trading transactions were carried out through the chiefs and incentives as well as responses were channelled through these men. (11). The arrival of the first British Resident, F. J. Moss, marked a change in this situation. One of Moss's first duties after his arrival was to arbitrate a quarrel among Mangaian chiefs over the introduction to the island of a European trader. One group of chiefs had become less interested in the mission and more interested in trading, but they were opposed by a strong group, supported by missionary Harris, who were determined not to allow any form of trading other than that carried out by the chiefs in the Oneroa market house. The European had been given some land by the pro-trading group and was attempting to build a store when he was forcibly removed from the island. The pro-trading group were also expelled from the church. Moss wished to encourage the establishment of independent Island Councils which were not directly influenced by the Mission and his decision in this case proved a victory for the pro-trading group. The Mangaians were told they could no longer prevent outsiders from setting up trading stores, providing the traders worked within the new set of laws which were being promulgated on each island. Immediately two traders set up posts on Mangaia and the island producers came into direct contact with the monetised market

economy. (12).

By the 1890s transport facilities were again improving. Trans-Pacific mail steamers began regular calls at the island, allowing trade to develop between the Cook Islands and Tahiti, California, Australia and New Zealand. Concrete efforts were made by Moss to establish trade with New Zealand (13) and these conditions resulted in a renewed interest in commercialisation of agriculture on Mangaia. This second attempt at commercialisation was based on plants which had survived the earlier move and had been selected by the Mangaians as the most suitable for conditions in existence on the island.

Traditional leaders again played an important part in stimulating increased production. Of particular importance was the development of the Oneroa market house into a full trading store, with a tea house and lime juice press attached. John Trego Numangatini Ariki, the son of Numangatini, and his brothers, with the skilful use of traditional power and ra'ui (restricted seasons), were able to successfully complete with resident European traders. Traditional sanctions were employed to achieve a monopoly over certain crops, in particular limes and tea and when a market was ensured, the men could call upon the villagers to bring a stated quantity of a certain crop to the village market house. Casks of lime juice and cases of bananas and citrus were the most common exports, but island vegetables were also supplied to the ships. Imported goods were sold or exchanged for produce with the villagers and records were kept of all transactions. (Appendix III contains a copy of such transactions recorded in the personal diary of Tangingatama, younger brother of John Trego.)

It was during this period, the last decade of the nineteenth century, that New Zealand Government interests in the Cook Islands became most intense. New Zealand politicians entertained dreams of a tropical northern province supplying fruit, coffee and cotton from its 'fertile soils' and 'productive climate', and in 1900 Premier Seddon visited the Southern Cook Islands (14). In 1901 New Zealand was given the right to annex the Southern Cook Islands, and New Zealand administrators replaced British on Rarotonga.

Prior to annexation, Moss had established a Federal Parliament on Rarotonga with separate Island Councils represented on the Federal Council. Although an eventual failure, this form of government allowed traditional elite to continue in leadership of the island communities, to stimulate production and to control the marketing of island produce. This was not the case after the arrival of Colonel W. E. Gudgeon, the New Zealand appointee to the position of Resident Commissioner. Gudgeon did not have Moss's sympathetic ability to view Cook Islands social organisation in its traditional setting. He saw the ariki and sub-chiefs as 'despotic rulers' whose power over land, justice and government was the greatest single

barrier to economic advancement in the Cook Islands. He disbanded the Federal Councils and placed European Residents on each of the main southern islands. The legislation enacted during his term nullified much of the power of traditional elite and removed from the society the most effective of the non-market incentives (15).

Despite the dramatic changes resulting from Gudgeon's administration, the stagnation in commercialisation which began after 1910 cannot be totally attributed to the loss of traditional power by indigenous leaders. 'Stop-go' responses to intrusions by market incentives into subsistence groups undergoing commercialisation are well known in contemporary New Guinea (16). Production will only increase until the community has satisfied its material needs and further available labour input is of no value. At this point the economy will stagnate unless increased labour can be made to result in increased returns. In the Cook Islands, it appears likely this point was being reached before Gudgeon stripped power from the ariki, for there are many reports of the 'laziness and indolence of the natives'. If this is so, it is unlikely that the ariki could have continued to stimulate production for a great deal longer, without other factors being introduced into the economy.

On Mangaia the Aronga Mana were able to withstand the most debilitating effects of the new legislation, although the appointment of a Resident Agent to the island had a detrimental effect on their status. It was developments on Rarotonga, where the collapse of indigenous enterprise was more marked, that had a direct effect on conditions on Mangaia. As trade declined on Rarotonga and shipping began to decrease, communications among the Outer Islands became unsatisfactory. The outbreak of war in 1914 completely disrupted shipping and further economic progress on all islands was seriously retarded. Following this second move towards commercialisation and the subsequent regression, agricultural practices changed little for fifty years. Citrus trees, established in groves on garden lands and within village plots, became the island's sole agricultural export. The trees received no attention apart from picking and interfered little with established patterns of labour. All other exports, established during the first flourish of commercialisation of the Mission era and later during the early years of the British and New Zealand administrations ceased. Agriculture on Mangaia continued little changed from the pattern established prior to European contact.

POST-1945 ADVANCES IN COMMERCIAL AGRICULTURE

After the collapse of commercial agriculture in the early years of this century, successive New Zealand governments concentrated upon programmes of social and educational welfare, supported financially from New Zealand. Citrus continued as the sole commercial agricultural product, exported to New Zealand markets under Administration supervision. The pattern

of production shows no evidence of growth; rather an irregular, fluctuating production characterises the period up to 1945 (see Figure 18), the result of uncertain transport, depressed markets and lack of interest among island growers. After the 1930 depression, citrus production fell to such low levels within the Southern Cook Islands that the Administration was compelled to put into effect a number of schemes aimed at revitalising citrus growing. These had not proved wholly successful up to 1945, when all previous schemes were integrated into a new scheme, the Citrus Replanting Scheme.

The Replanting Scheme was based upon the extension of credit in the form of plants and services to prospective citrus growers. The grower was called upon to establish title to an area of land, the potential citrus plot, after which the Administration supplied the trees and cared for the plot, with the exception of picking the fruit, until production from the trees had paid off the debt incurred by the grower. The plot then became the full responsibility of the grower.

On Mangaia the original citrus trees were rapidly dying of old age and disease, but despite constant warnings from the Administration that trees upon which was based the sole cash earning export of the island were nearing the end of their productive lives, the Mangaian Aronga Mana refused to consider the scheme. Individualisation of titles to land on the island would have destroyed the power of this group and with the use of traditional authority and open threats they carried the bulk of the islanders with them in their refusal to consider the scheme (17).

The refusal of the Mangaians to accept the Citrus Replanting Scheme came at a time of renewed interest in commercial agriculture in the Cook Islands. Mangaians who had been on Aitutaki or Rarotonga during the Second World War had been in contact with American servicemen based on these islands and with the affluent nature of the American economy. Levels of aspiration began to rise and there was a quick acceptance of wage labour on Makatea Island in the Society Islands. Emigration to New Zealand began to increase. The Cook Islands Progressive Association, at first a political movement, but later a cooperative marketing organisation, was having an increasing influence among the Southern Cook Islanders and Mangaians became strong supporters.

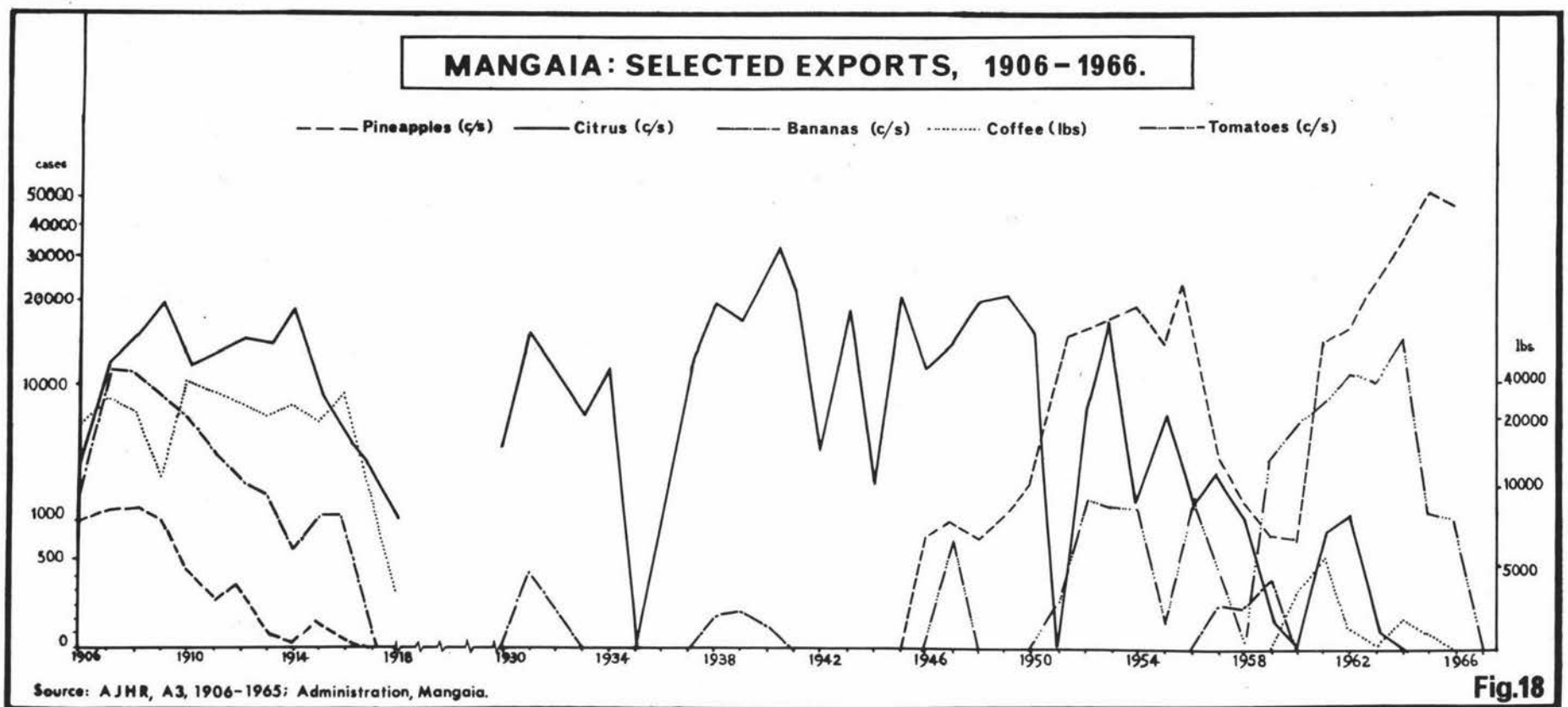
On Mangaia the strength of tradition and the endangering of an institution which had long symbolised defiance of the New Zealand Administration nullified the response to increasing commercial incentives in the community. When, however, a crop which did not involve changes in the land tenure system was offered to the Mangaians there was a quick response, and in 1946 Ripley Queen pineapple plants were imported from Australia and distributed to growers. Pineapples were not unfamiliar to planters as they had been grown in the Mission era. The

plants were introduced into the existing system of dry land cropping with only minor changes and a shifting system developed in the piriaki. Markets were arranged between the Administration and Fruit Distributors in New Zealand, payments being negotiated on the basis of an annual guaranteed price. Between 1946 and 1955 a considerable trade was established in fresh fruit. (see Figure 18).

As pineapple growing became increasingly popular, rights to land within piriaki and puna zones became restricted and new, non-right holding growers were forced to establish plots on the lower fern slopes in the rautuanu'e on the Ivirua Clay Loams. In clearing fern from selected sites, fire was the most efficient and thus the most common method, many fires becoming uncontrollable and ending in large burns across the interior hills, reducing the height and thickness of fern and scrub in all except the valley bottoms and increasing the potential for soil erosion. Plots established on the fern slopes were rarely able to sustain productive plants for longer than three years and trace element deficiencies caused defects in the fruit from these plots. Once established, the pineapple plants were difficult to remove and while land was available, most established plots were abandoned in favour of a new site. When new sites became restricted, old plots were again cleared, a laborious task which involved the removal by hand of all the old plants and their extensive root systems. Many plots had not been fallowed for long enough and the complete clearing of canopy vegetation on bush areas prevented any rise in fertility levels during fallow periods. Pineapples on re-planted plots were very often a failure.

The agricultural system was maladjusted to the demands of sophisticated and distant metropolitan market. Fruit became small and poorly developed, internal rot (Black heart) caused by soil deficiences led to a strong consumer resistance in New Zealand, and poor handling and packing and inadequate transport facilities resulted in rotton and crushed fruit arriving in Auckland. Subsequently Fruit Distributors began lowering the annual guaranteed price, until in 1956 growers refused to accept the offer for the 1956/57 season and requested permission to sell on their own account on the open market in New Zealand. The result was disastrous for the community. A number of shipments made net losses and the average price for the season was 20 cents per case compared with the 99 cents offered by Fruit Distributors. (See Table XX). (18).

Although the full amount of the loss was not passed on to the growers,-Fruit Distributors subsidised the price received with a grant of $8,000 and $1,200 were held in the Administration accounts - this experience had a marked effect on commercial agriculture on the island. The majority of growers abandoned their plots and production fell from 24,000 cases in 1956 to 2,000 in 1958. In the latter year Mangaians were described as having 'lost interest in pineapples'.



Source: AJHR, A3, 1906–1965; Administration, Mangaia.

Fig.18

TABLE XX

PRICE PER CASE RECEIVED FOR PINEAPPLES EXPORTED

1956/57 SEASON

Date of Shipment	Average Price (cents per case)
1956 October 20	91
November 2	32
November 15	13
December 1	-38 Loss
December 10	- 4 Loss
1957 January 19	31

Average Price for Season, 20 cents per case

Source: New Zealand Department of Island Territories File 115/22, 1957.

(Gerlach to Island Territories, File 115/22). With the coincidental failure of the last of the producing citrus trees, the island was without a money earning, exportable crop.

At the end of the Second World War, increased contacts with the advanced sector of the economy and the American economy, and incentives from the advanced sector, channelled through the Administration to the community, had resulted in a marked and rapid response. Pineapples were accepted into the agricultural system and for a time were successfully utilised to supply the New Zealand market. But conditions within the agricultural system were little changed from those existing at the beginning of the century and once demands upon existing fertility and technology had become too great, production and quality of fruit declined. There followed a withdrawal of some of the original incentives, a decline in market prices and a regression again occurred. In 1956, however, it was not possible for Mangaians to return again to a semi-subsistence level as they had done in 1910. First, there was no crop which could supply the very low level of monetary income necessary for this type of economy, and second, the community had been exposed with a greater intensity to the material wealth of a monetary economy. In response many Mangaians left the island to travel to Rarotonga or New Zealand seeking wage employment which would allow them to acquire the income to purchase the goods they now desired. Emigration after 1956 reached a higher level than that experienced at any period in the past. (see Table VIII).

TECHNOLOGICAL AID AND A NEW MARKET

To enable the Mangaian community to respond to incentives from the advanced sector of the economy through agriculture it was necessary for two basic conditions to be fulfilled. Technical changes had to occur within the system and a market had to be discovered which was not subject to the manifold problems of long distance transport of fresh fruit. Between 1958 and 1966 both conditions were partially fulfilled and commercialisation began to proceed more rapidly. In 1958 what was to be the most successful agricultural extension programme ever carried out in the Cook Islands was begun by Mr. A. Nola, a New Zealand school teacher seconded to Mangaia. Two years later in 1960, Island Foods (Rarotonga) Limited, established a canning plant on Rarotonga, only 14 hours travelling time from Mangaia, compared to the seven days to the New Zealand market.

The stated objective of Nola's 1958 extension work was to prove to the Mangaians that pineapples could be grown on the Ivirua soils with the proper use of chemical fertilisers and that this crop could be a successful money-earning enterprise (19). Experimentation was carried out on Ivirua soils which had been previously unsuccessfully cultivated with pineapples and the most promising planting material and fertiliser programmes were utilised by Mangaian school teachers on new plots established

in their home districts. During the period of the trials, the local teachers were given instruction in basic agricultural practices, in particular soil management, the use of fertilisers and plant nutrition. Thus they were able to demonstrate to planters within their home villages that pineapple planting was feasible and that agriculture could be a more certain source of cash than it had been in the past.

Planting material and fertilisers were made available through the Oneroa Primary School where an experimental and instructional farm was established on land loaned by the ariki. Mangaians once again began to plant pineapples and the use of fertilisers, especially pre-planting mixtures, allowed a greater exploitation of the fern areas. At this stage, in preparation for the establishment of the canning factory, the Administration also began to provide assistance with fertiliser grants and extension work. Administration policy during this period appears to have been directed towards decreasing the financial dependency of the Islands on New Zealand subsidies and directives to appointee Agricultural Officers stressed the need to raise pineapple production, in particular to meet the demands of the new canning company which the Administration had guaranteed a specified a supply of fruit. Leading Administrators on Rarotonga assumed that with the assistance Mangaian growers would react favourably to a chance of increasing production and hence income, but Mangaians reacted within their own field of reference, Mangaian culture, and while many began new plots and used fertilisers, there was a limit to the amount of labour and capital they saw fit to use. With little knowledge of extension work among semi-traditional agriculturalists, Agricultural Officers were confronted with a situation which was beyond their comprehension and in order to increase production they tended to by-pass the smaller more traditional growers concentrating their activities on those better educated growers who were prepared to follow their instructions. Many growers gained almost no new knowledge and cultivated their plots under direct instructions from extension officers. Production increased, but the major increases were achieved by a minority of growers. (see p.106). The short-term view taken by the Administration during this period also resulted in the stifling of a very important local development on Mangaia, a local fruit processing company.

Although the Rarotonga factory was now in operation, lack of shipping space on inter-island boats meant that during peak fruit production periods, a quota system had to be employed and much fruit was left to rot either on the plants or the landing at Mangaia. In an attempt to alleviate the wastage and the serious pyschological effect it was having upon growers, the resident priest at the Mangaia Catholic Mission began experiments in sun-drying pineapple slices and in canning pineapple juice. After some successes, a decision was made to form a local company with money invested by interested teachers and growers. Equipment was purchased to build a drier and to electrify the plant and by 1961 dried and candied pineapples,

dried bananas and pineapple juice were being exported in small quantities to New Zealand. The plant was established with no assistance from the Administration, apart from strenuous but futile efforts by the Mangaian Resident Agent to interest officials in Rarotonga and Wellington. Markets were found in Auckland by friends of the Mission and two Auckland companies requested large shipments of the dried and candied fruit. The company extended its activities and bought in consumer goods with profits, selling them to shareholders at cost, a service which attracted more shareholders, but brought resistance from established traders on the island, including the Mangaian Members of the Legislative Council. In 1962 this resistance had spread to the Administration who unofficially voiced fears that the Mangaian factory would begin to compete with the Rarotonga company. Pressure came upon Mangaian growers to stop supplying the local factory, ranging from a refusal to supply fruit cases or to accept fruit for the Rarotonga factory to a refusal of shipping space for the company's exports and imports. Local confidence in the new venture became undermined and it collapsed leaving its members with a financial loss. Their loss, however, did not compare with the loss to the community of a grass-roots industry and a non-Administration supported cooperative venture which could have given long-term social benefits to the island (20).

Concurrent with the development of pineapple growing, the Administration was pursuing a policy which entailed the provision of supplementary export crops for each of the main southern islands. In an attempt to diversify agricultural exports from Mangaia a number of agricultural development schemes were begun. These included a copra production scheme, a groundnuts scheme and a coffee scheme. On the other hand, perishable crops were not encouraged and although tomato growing was already established on Mangaia (where growers gambled on a direct shipment to New Zealand occurring at the same time as their crop matured), no assistance was extended for tomato cultivation. Despite the lack of encouragement and assistance, only tomatoes achieved any export success, while the Administration schemes were failures. The success of tomatoes and the failure of coffee provides an excellent example of the manner in which commercial agriculture developed between 1960 and 1966.

The Coffee Replanting Scheme was conceived by officials of the Administration on Rarotonga. It was one of a number of schemes implemented in the Southern Cook Islands which Stace (1966, 33) has stated were the result of 'hobbyism' among Cook Islands Administrators. Coffee was a marketable crop, suited to the Mangaian environment (as evidenced by the incidence of older coffee plantations in the makatea) and non-perishable, a most important asset for export crops from this isolated island. To these officials it appeared ideally suited as a supplementary cash crop for Mangaia and the scheme was approved by the Legislative Council in 1962 and a Coffee Officer was appointed and instructed to travel to Mangaia to establish a nursery, distribute plants to interested growers and build a

washing plant. Under the scheme no credit other than that for plants and fertiliser was extended, as the Administration was loathe to create another scheme which involved the level of indebtedness created by the Citrus Replanting Scheme. Marketing was to be carried out through the Mangaian Cooperative Marketing Society, an Administration-sponsored cooperative, which was to purchase the beans from growers and pay the Administration for costs involved in washing (21).

Despite Administration enthusiasm, there was a guarded response to the coffee scheme on Mangaia. Individuals who had been selling very small amounts of coffee prior to the arrival of the Coffee Officer showed some interest, but other planters were inhibited by a number of factors. The scheme stipulated that no planter with less than half an acre of land could be given plants and few Mangaians could claim sole rights to an area of land of that size. The crop was a permanent tree crop and right holding families refused individual usage rights for coffee plantations as it meant the virtual loss of the land. By 1962, pineapples had become re-established and this crop entered into direct competition with coffee for the labour and time of the grower. Pineapples gave a cash return on labour invested within one year of planting whereas coffee took three years to give a comparable return. Coffee planting was a longer, more arduous and complicated process than pineapple planting, involving the digging of the plot, the digging of holes for the trees, the provision of shade and constant watering after planting; once trees began to bear the planter was required to pick, sort and wash the beans, and prune the trees. Finally the community was suspicious of the marketing agent, the Cooperative Society - in the past there had been a series of family indulgences and embezzlements by Board Members - and the Cooperative made a net loss on the first season's crop as initial harvests were small and uneconomical to process, and there was no financial assistance from the Administration. The cumulative result was that an estimated 25 acres of coffee were planted after two years of the scheme in operation, compared with the 60 acres per year required by the scheme. Processing equipment was dismantled, the nursery abandoned and the scheme discontinued (22).

By contrast, despite the re-establishment of pineapples, the lack of encouragement from the Administration and the high risk of complete loss, Mangaian planters grew tomatoes continually from 1947 to 1966. The plant was integrated into the system of food gardening in the rautuitui and cultivation took place on the same established sites as food gardens, with garden crops often following tomatoes in succession. The cultivation of tomatoes has resulted in larger areas of fallow existing within the areas of cultivable soil in the rautuitui, but apart from this factor there is little evidence of the existence of tomato cultivations today. The persistence of Mangaians in growing tomatoes was largely associated with

the integration of the crop into the rotational fallow system, but other elements influenced its cultivation. As a supplementary crop, the labour input was negligible and was often compensated for by the use of the plot after the tomato harvest for food crops. Pineapples were able to supply the minimum acceptable income during most of the period, and tomatoes became a cheap investment, which if successful, could bring a return far in excess of the 'costs' in terms of labour, as weeding and staking were not the common practice. The uncertainty of return and shipping and the luck factor appear to have been added attractions to the Mangaians. Perhaps with this crop the 'casual easy-going' character (Beaglehole, 1957, 225) of the Cook Islander found freedom from the persistent pestering of the European Agricultural Officer that is so notable in the cultivation of pineapples. As one Mangaian said wistfully, 'The money for tomatoes was not set - it is if you are lucky you can get away with it; if you are unlucky you lose and too bad.'

The above example characterises Mangaian agricultural development during the last years of New Zealand Administration. Market incentives and enlightened technical assistance led to the establishment of a cash crop on Mangaia, capable of providing the community with an acceptable level of income. Thereafter to become established any other cash crop had to be culturally acceptable and give a return on minimum amount of labour. To grow pineapples Mangaians had given up a greater amount of leisure than at any time since the mission era, and they were not prepared to give up more without a substantial return. On their part, officials in the Administration ignored any but factors of physical environment, economics and marketing in their assessment of whether a new crop was feasible, and this resulted in the failure of a number of schemes, with a financial loss to the New Zealand Government and a loss of confidence by Mangaians in any official government programme, which remains to the present day.

CONCLUSIONS

The major factors in the development of commercialisation in the Mangaian agricultural system were resultant upon the influence of the Mission, the British rule and the long period of New Zealand administration. The main changes which occurred within the system are illustrated schematically in Table XXI.

Since 1823 when the first incentives to produce surplus agricultural goods entered the community, the response of the islanders has been governed largely by their estimate of the 'disutility of additional labour' compared with the desirability of the goods and services that money earned from increased labour could buy. Social change has brought with it a new view of goods and services, which in turn has led to a reassessment of the value of leisure compared to the additional

TABLE XXI

THE DEVELOPMENT OF COMMERCIAL AGRICULTURE ON MANGAIA, 1840 - 1967

	1840 - 1850	1850 - 1900	1900 - 1945	1945 - 1967
Population:	Slight increase followed by steady decrease.	Rapid decrease.	Decrease to 1921, after which total population increases.	Increase accompanied by marked structural changes, particularly in the proportion of children to adults.
Social Structure:	Indigenous structure reintegrated; tribal leaders assume positions of importance in the church. Church membership very important.	Mission rule gives certain ascribed leaders great power. One group of dissenters under one *ariki* split from the church. Island Council becomes more independent of church.	Refusal to allow Land Court investigations reinforces modified indigenous structure. Island Council made up of ascribed status leaders. Development of occupational status; school teachers, traders.	Free Council elections 1946, allow untitled persons to take seats on Island Council. Growth of occupational status. Development of covert withdrawal of respect for ascribed status.
Land Tenure:	Indigenous system modified by missionaries. *Kavana* and *rangatira* assume positions as 'caretakers' of the land. Full influence of LMS not understood.	Gradual increase in land gifted to non-land holding families. Probably further changes under LMS direction, but not documented.	Resistance to Land Court successful.	Continued local responsibility for land disputes. Rejection of Citrus Replanting Scheme for land tenure reasons. Indications that system cannot cope with increasing concept of land having a monetary value.

TABLE XXI (Continued)

	1840 - 1850	1850 - 1900	1900 - 1945	1945 - 1967
Settlement:	Hamlets based upon extended family units scattered around the taro swamps within the puna. Nucleation within puna based on church membership. Houses built from local materials.	Villages established on seaward edge of the makatea formation. Village land given to all villagers. Houses constructed from coral-lime, incorporating new design.	Little change in patterns established during pre-1900 period. Roading slightly improved.	Increase in lime and concrete house construction following wage contracts on Makatea. New Housing Loan Scheme established; new house constructed from imported cement, timber and roofing iron. Two sizes of loans, $400 and $800. Roading extended, access inland improved.
Emigration:	Confined to young males joining whaling vessels.	More general emigration to Rarotonga, Tahiti and California.	Less intense; annual labour contracts on Makatea guano deposits begin 1943.	Gradual increase in emigration; peak reached between 1957 and 1961. Confined to adult males at first, but becoming increasingly more general.
Transport:	Visiting sailing vessels.	Visiting vessels; decrease in shipping towards the end of the period.	Government shipping and mail steamers. War years 1914-18 and 1939-45 seriously disrupt shipping. Irregular and insufficient shipping strong disincentive to produce.	Government and inter-island shipping. Remains inadequate and irregular. Resultant wastage frustrates and embitters Mangaian growers.

TABLE XXI (Continued)

	1840 - 1850	1850 - 1900	1900 - 1945	1945 - 1967
Administration Policy:	Mission Society: establishment of a theocratic society based on English lower middle class Wesleyian values.	Mission rule to 1880. British Resident on Rarotonga. Introduction of island government separate from the church. Attempts to establish overseas trade with Tahiti, California and New Zealand.	New Zealand Administration: Increase of agricultural production by individualising land ownership and destroying the 'despotic' power of the ascribed status groups. Post 1920: social welfare policy replaces economic development as major policy.	Economic development to reduce dependence upon New Zealand subsidies. Introduction of agricultural schemes; financial and technical assistance. Post 1963: policy of internal self-government for Cook Group. Self-government, 1965; continued attempts at economic progress through the commercialisation of agriculture.
Incentives to earn money:	Purchase of bible, payment of church dues. Status only, as production of arrowroot would have resulted in similar ends.	Church donations, some consumer goods particularly clothing and housing materials. Status. Indigenous trading.	Church donations, some European traders, increased demand for consumer goods. Fares to New Zealand. Money in general use but Depression and lack of contact with outside world result in lack of incentives.	European and local trading stores. Increased demand for consumer goods; motorcycles, new houses. Money in use in most transactions. Payment of economic development loans.

TABLE XXI (Continued)

	1840 - 1850	1850 - 1900	1900 - 1945	1945 - 1967
Sources of Income:	Very restricted; visiting trading and whaling ships, in exchange for vegetables and fruit.	Restricted to trading but later from European traders and from exports of fruit to Tahiti, California and New Zealand.	Cash cropping, citrus. Wage labour limited but sought on Rarotonga. Later from Makatea.	Cash cropping, pineapples. Local wage labour for Administration. Remittances from relatives in New Zealand.
Subsistence:	Swamp taro, dryland garden crops near swamps, coconuts. Fishing.	Greater emphasis on dryland gardens near new villages; some imported foods, flour, sugar, tea, cabin bread. Fishing.	Return to dominance of swamp taro. Dryland gardens supplementary. Increase in imported foods. Canned meat, fish, prepared foods. Fishing.	Swamp taro, supplementary dryland gardens. Greater dependence on imported foods. Fishing.
Commercial Agriculture:	Restricted to surplus production of arrowroot and vegetables for payment of church dues.	Surplus production stimulated by chiefs and mission - trading carried out through chiefs. Successful cultivation and marketing of cotton, coffee, citrus, pineapples, copra, bananas.	Regression to single cash crop citrus. Some copra produced.	Increased interest with Administration aid. Pineapple reintroduced but poor transport and marketing frustrates growers. Tomato production irregular for similar reasons. Coffee scheme fails. Increase in pineapple production following establishment of canning factory on Rarotonga.

TABLE XXI (Continued)

	1840 - 1850	1850 - 1900	1900 - 1945	1945 - 1967
Agricultural Practices:	Irrigated taro and rotational bush fallow on dryland areas. Fernland unused. Steel tools introduced.	Irrigated taro declines in area. Sedentary cultivation of introduced and indigenous crops in enclosures near villages. No fertilisers. Fernland unused.	Reversion to rotational fallow system on dryland and irrigated taro in swamps. Citrus trees receive no attention other than picking. Fernland unused.	Administration extension officers introduce machinery and fertiliser. Fernland used for pineapples, which gradually become cultivated in a sedentary pattern. Irrigated taro; indigenous food plants continue in rotational fallow.

labour required to earn the money to buy the goods and services. After each reassessment a period of rapid change has taken place, but the limitations of the island's resources, physical and human, the inability of money earned to provide increased goods and services to justify increased labour and the lack of further incentives has resulted in a cessation of moves towards further commercialisation and a gradual regression to a stable level where income and labour input were satisfactory to the community. Following the Second World War, improved technology and more intensive contacts with the increasingly affluent New Zealand economy led to an increase in commercialisation in agriculture, but also a tendency for Mangaians to emigrate in search of labour to provide the money needed to purchase the increasing number of goods available to them. The migration of individual members of the society led to more intensive contact with the New Zealand economy, its higher living standards and urbanised way of life. Because of this, the Mangaian community will no longer tolerate a further regression in the economy. Indications from the short regression which occurred in 1957 are that Mangaians will leave the island for New Zealand, if the transitional situation their economy and agricultural system is now passing through does not result in a satisfactory reorientation towards the monetised, market economy characteristic of the modern world.

REFERENCES

1. The continuation of inter-district rivalry was only successful in the short term. Later when an Island Council was established, comprising the chiefs of each district, bitter squabbles and boycotts of meetings prevented any real progress in island leadership and twice led the missionaries to believe tribal warfare was again imminent.

2. Salisbury, 1962, 108 gives an example from New Guinea of a subsistence group whose productive capacity was increased by 30 per cent after the introduction of steel tools

3. Fisk, E. K., 1962, 1964 proposes a model of a subsistence economy intruded by a money economy. In the subsistence state, production is limited by internal demand rather than physical restrictions of the environment, thus production is very often below the subsistence group's potential capacity to produce, and there is a suplus of labour which is available to the group in any attempt to produce a surplus of agricultural goods.

4. G. Gill to London Missionary Society, January, 1846.

5. G. Gill to London Missionary Society, 1848

6. G. Gill to London Missionary Society, April, 1852.

7. Lamont, E. H., 1867, describes the oppressive nature of the Mission rule on Mangaia, a feature of which he is sharply critical. Moss, 1891 (AJHR, A3, 3) also provides a description of these conditions.

8. As early as 1841 church members approached missionary Gill with a proposal to establish laws against eating raw fish and eating food half cooked, practices with which the missionaries had no argument, but which the islanders assumed must be wrong as they were traditional and were not practised by the Europeans.

9. W. W. Gill to London Missionary Society, June, 1860.

10. Harris to London Missionary Society, April, 1886.

11. AJHR, 1891, A3, 31, contains a translation of the law pertaining to the market house of Rarotonga, a law which was almost identical to that in force on Mangaia

'XXII Market House

(1) When a captain comes ashore the authorities in charge of the market house are to inquire what he wishes to buy and make it known to the people.

(2) No one (is) to interfere between the captain and the authorities of the market house, but all are to be quiet, 'so that it may be seen that we are an orderly people.'

(3) Chiefs are not to take the best piece of cloth for their own use: 'Let them have a share and the people a share also.' But if money can be paid by the captain it is right that it should go to the chief.

(4) No one is to stand up and call out that he has anything to sell. The person in charge of the market is the proper one to take all the things and deal with them. The authorities must be very vigilant to prevent the interference of one with another in the market house and the police are to take into custody any who do not obey these instructions.'

This law had become obsolete on Rarotonga by 1891 but was reproduced by Moss in a list of Mission Laws. He states it was still in force on Mangaia.

12. AJHR, 1891, A3, 7-12, Charles Wood and W. H. Pearce, the latter representing Donalds and Edenborough.

13. AJHR, 1892, A.3, 37-38; Moss gives a detailed report

on the trade situation in the Cook Group urging New Zealand traders to complete with those in California and Tahiti.

14. Following Seddon's visit in 1900, two biologists were sent from New Zealand to the Cook Islands to study the potential for agricultural development. Their report, published in the Department of Agriculture Report for 1903, 425-426, is typical of the misunderstanding of indigenous agricultural practices by Europeans at that time and includes references to 'large areas of waste' and increasing production on the island 'twentyfold in a few years'. The section of the report dealing with Mangaia is reproduced in Appendix IV.

15. Crocombe, R. G., 1964, provides a detailed discussion on the effects of Gudgeon's policies on agricultural production in the Cook Islands.

16. Fisk, E. K., 1964, 171.

17. Administration Records, Mangaia, File 8/6.

18. Department of Island Territories, file 115/22, 1957.

19. Pers. comm. A. M. Nola, 1968.
'Agricultural Experiments Undertaken at Oneroa School, 1958-1960'. Unpublished.

20. Details of the establishment and subsequent closure of the Mangaian factory were collected from local informants, pers. comms. with A. M. Nola and Administration Records, Mangaia.

21. 'General Instructions and Directive for Mr. Uiterdyk, Coffee Extension Officer from the Director of Agriculture, Rarotonga, September, 1962.' Administration Records, Mangaia.

22. Pers. comm. M. Uiterdyk, 1968.

CHAPTER V

THE EXTENT OF COMMERCIALISATION IN 1967

The preceding chapters of this thesis have provided an analytical description of the Mangaian environment, population and systems of agriculture and a brief discussion of the history of commercial developments on the island. In this final chapter an attempt is made to assess the extent of commercialisation in the agricultural system and modernisation in the community.

The processes of commercialisation and modernisation are dynamic and involve constant change. Changes do not occur with equal intensity in all parts of the society and economy at the same time, and thus nor do they occur throughout a country or an island with equal intensity at the same time. Any attempt to measure the extent of change within an agricultural community is complicated first by the lack ofequality of change in the various parts of the society and second by the existence of many factors which defy mathematic measurement. Measurable factors commonly used include productivity, levels of income and levels of living (Mellor, 1966, 11), although in modernising countries, the basis data needed for these measurements may not be available, and must be collected by the researcher in the field, usually from a sample population. A more meaningful, if slightly less exact measure is obtained if other criteria are added to those listed above. Measures of changes in technology, in patterns of labour, in the use of credit, in the occupational status of agriculture, in the cognitive structures of farmers in the community and in the appearance of entrepreneurial activities may also be used in an attempt to measure the extent of commercialisation and modernisation in an agricultural community. In this chapter eight criteria are applied: the production of cash crops, sources of income, the level of technology, patterns of labour, the use and sources of credit, the occupational status of agriculture in the community, the perception of problems by individuals in the society and the level of entrepreneurial activity in the community.

PINEAPPLE PRODUCTION

Ideally, this section should compare the production of goods from each part of the agricultural system, subsistence and commercial. Although estimates have been made of the amount and value of subsistence production on Mangaia (Kolff, 1965), they are considered to be unsatisfactory for the purpose of this research. Thus the section is restricted to a discussion and analysis of the production of the commercial part of the agricultural system, that is the production of pineapples.

Total Production

Since 1945 there have been two distinct waves of pineapple production. Following the introduction of new plants from Australia in that year, production increased gradually to 1952, when there occurred a sharp increase. By 1956 the island produced 24,002 cases per annum. After the 1956/57 season market debacle described in Chapter IV, production fell away, until by 1959 it barely reached the level which had been achieved in 1949, ten years previously. Production did not cease, however, and by 1961 the results of the Oneroa Primary School extension scheme and administration assistance were reflected in increases. These continued, and in 1966, production was double that of 1956, despite a slight decrease between 1965 and 1966. (see Table XXII).

The great bulk of the pineapple crop is harvested during the Mangaian summer. In 1966, 90.8 percent of the crop for that year was exported during the months of November, December and January. Winter production accounted for a further 3.6 percent of the total, harvested during June, July and August, with the remainder of the crop being produced at the beginning and end of the summer season. (see Table XXIII).

During 1966, of the 60,609 cases exported, 22,144 came from Tava'enga. Excluding the fruit from the government farm, this was 36.5 percent of the total island production. In order of total production the other districts were Keia-Veitatei, Tamarua and Ivirua-Karanga.

Productivity

If presented alone, however, the figures in Table XXIII are misleading. It is true that from all aspects, Tava'enga was the most productive district; more pineapples were produced per acre of pineapples, per adult male and per person in the total population than in any other district. (see Table XXIV). But, in Tamarua, a greater productivity per acre and per person was achieved than in Keia-Veitatei, which registered a lower figure of productivity per acre of pineapples than any other district. Such anomolies deserve further explanation. In Tamarua, there were a minority of planters who produced well above the average production level for the district. Further, this district has experienced a greater degree of emigration than Keia-Veitatei, thus despite there being a greater proportion of non-producers in Tamarua, there were fewer adult males, when compared to Keia-Veitatei. The reasons for the low level of productivity per acre in Keia-Veitatei are not fully understood. One possible explanation is that more existing pineapple plots in Keia-Veitatei have been cleared from fernlands, compared to Tamarua and Ivirua-Karanga, where more plots had been cleared from bush. Natural fertility on fernland soils is less than that of bush soils, and unless measures are taken to ensure a maintenance of fertility on the former soils, productivity may be expected to fall after two to three years of cultivation.

TABLE XXII

PINEAPPLE PRODUCTION, MANGAIA, 1947 - 1966

Year	No. of Cases	Index	Year	No. of Cases	Index
1947	808	0.03	1957	5455	0.23
1948	676	0.03	1958	2060	0.23
1949	1337	0.06	1959	1472	0.06
1950	3533	0.15	1960	1394	0.06
1951	6586	0.27	1961	13761	0.57
1952	14655	0.61	1962	16748	0.70
1953	17410	0.73	1963	21857	0.91
1954	21768	0.91	1964	30778	1.28
1955	14178	0.59	1965	54309	2.26
1956	24002	1.00	1966	48180(a)	2.01

Index Year 1956

(a) This figure differs from that shown in Table XXIII because a different period is used to calculate annual production. In this table production is calculated on a seasonal basis June 1965 - June 1966.

Source: Annual Report Cook Islands and Niue, Department of Island Territories, Wellington. Administration Records, Mangaia Post Office.

TABLE XXIII

PINEAPPLE PRODUCTION, 1 JANUARY - 31 DECEMBER, 1966

(Cases)

Month	Keia-Veitatei	%	Tava'enga	%	Tamarua	%	Ivirua-Karanga	%	Mangaia	%	Government Farm[a]	%
January	4350	28.6	2750	12.4	2499	20.8	981	8.7	10580	17.4	2734	28.4
February	121	0.8	29	0.1	-	-	-	-	150	0.2	354	3.6
March	39	0.3	15	0.1	-	-	-	-	54	0.1	73	0.7
April	-	-	-	-	-	-	-	-	-	-	-	-
May	84	0.5	194	0.9	62	0.5	171	1.5	511	0.8	547	5.6
June	172	1.1	334	1.5	84	0.7	125	1.1	715	1.2	-	-
July	39	0.3	444	2.0	111	0.9	118	1.0	712	1.2	590	6.1
August	100	0.7	-	-	125	1.0	4	-	229	0.4	168	1.7
September	9	-	4	-	7	-	-	-	20	-	210	2.2
October	489	3.2	1415	6.4	384	3.2	905	8.1	3193	5.3	-	-
November	4134	27.2	8939	40.4	4282	35.6	6089	54.2	23444	38.7	539	5.6
December	5655	37.2	8029	36.3	4477	37.2	2849	25.3	21010	34.7	4403	45.7
Total	15192	99.9	22144	100.1	12031	99.9	11242	99.9	60609	100.0	9618	99.6
	25.1		36.5		19.8		18.5		100.0			

(a) The Government Farm, an area of approximately 20 acres is leased and administered by the Department of Agriculture, for the purpose of providing Smooth Cayenne planting material for Mangaian planters. The production figures for the Farm are given here for comparative purposes, and are not considered as part of the total production.

Data extracted from Manure Levy Cards, Administration Records, Mangaia.

TABLE XXIV

PRODUCTIVITY, 1966

	Keia-Veitatei	Tava'enga	Tamarua	Ivirua-Karanga	Mangaia	Govt. Farm
No. of Cases Produced	15192	22144	12031	11242	60609	9818
Total Population	545	527	367	555	1994	-
Total Males Aged 15 - 59 Years	75	91	63	118	347	-
Total Area in Pineapples. (Acres)	88.1	85.2	48.1	60.9	302.3	20.0
Production per Person (cases)	27.8	42.0	32.8	20.3	30.4	-
Production per Adult Male	202.5	243.3	191.0	95.3	174.7	-
Production per Acre of Pineapples	172.4	259.9	250.1	184.5	200.5	490.9

Sources: Agriculture Department, Mangaia; (Manure Levy Cards); Mangaia Census, Administration Records, Mangaia; Land Use Data, 1967.

A more meaningful picture of the distrubution of production throughout the sample population is obtained if planters are arranged in classes of levels of production. (see Table XXV). It is immediately apparent that a minority of large producers are producing the bulk of all fruit exported. Of the total sample planters, 15 percent produced 54 percent of the total pineapples exported during 1966. Although the average production per planter in the sample was 225 cases for the year, the median was 523.5 cases. A similar pattern, a negative skewness of distribution of production was exhibited in every district and was especially marked in Tamarua and Ivirua-Karanga. (see Figure 19). In these two districts, over 30 percent of the sample exported no pineapples during 1966. Over half the total production in each district originated from less than one quarter of the total planters. In Tamarua, 56 percent of the sample produced over 200 cases during 1966 to account for 94.6 percent of the total district population. In Ivirua-Karanga there were more small producers, producing between 50 and 100 cases per year, and the mean production for this district was only 125 cases for the year. In neither district did any planters produce over 1,000 cases during 1966. The most even distribution of production was achieved in Tava'enga, but even in this district 7 percent of the planters produced over 30 percent of the total district production. Only in Tava'enga and Keia-Veitatei, were there planters producing over 1,000 per year.

Thus although total pineapple production has doubled since 1963, the commercialisation of agriculture cannot be stated to have intensified at the same rate. Nor can it be said that increases have been experienced at equal rates all over the island. It is apparent that much of the increase has occurred within a minority group of high producing planters, who tend to be concentrated in those districts nearest to Oneroa, although there are exceptions, particularly in Tamarua district.

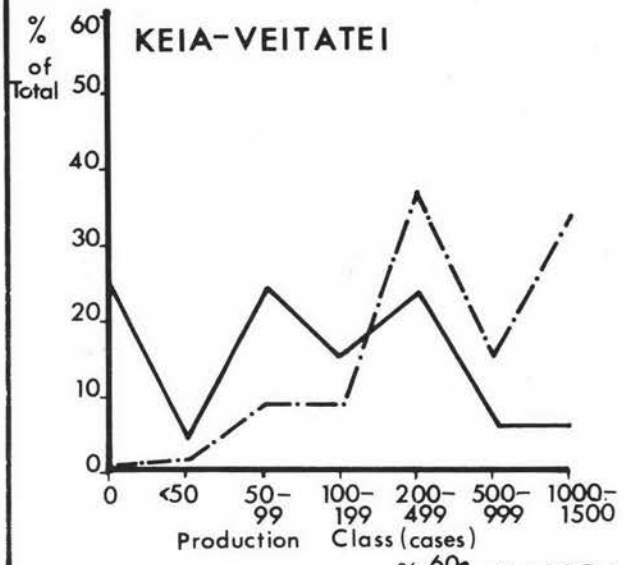
SOURCES OF INCOME

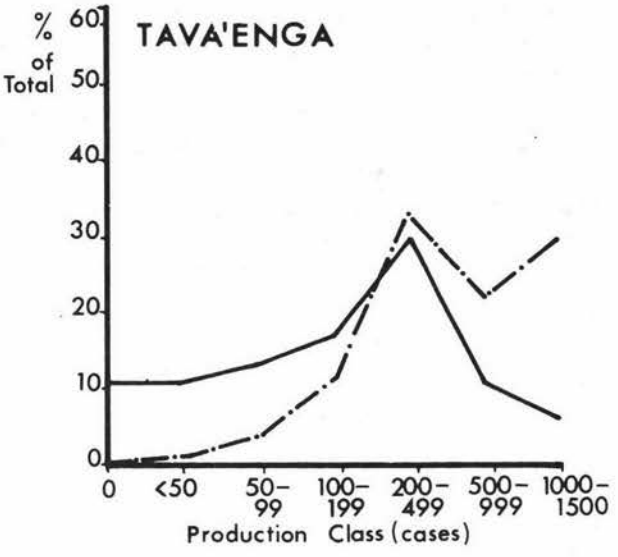
This section compares the sources and levels of monetary income on Mangaia, in an attempt to answer the question, 'How much money does a Mangaian receive from commercial agriculture, by comparison to non-agricultural sources of income?'

Ranges of Incomes

The per annum monetary income of those persons in the sample ranged from $2,452 to no income. Eleven percent received no monetary income during 1966 and a further 30.8 percent received less than $200 during the year. On the other hand, 15 percent received over $1,000 during 1966. A greater range of income occurred in Keia-Veitatei and Tava'enga than in the other districts. In Ivirua-Karanga only three persons out of the twenty interviewed had stated incomes above $399 during 1966, while in Tamarua 23.5 percent

PINEAPPLE PRODUCTION, 1966.

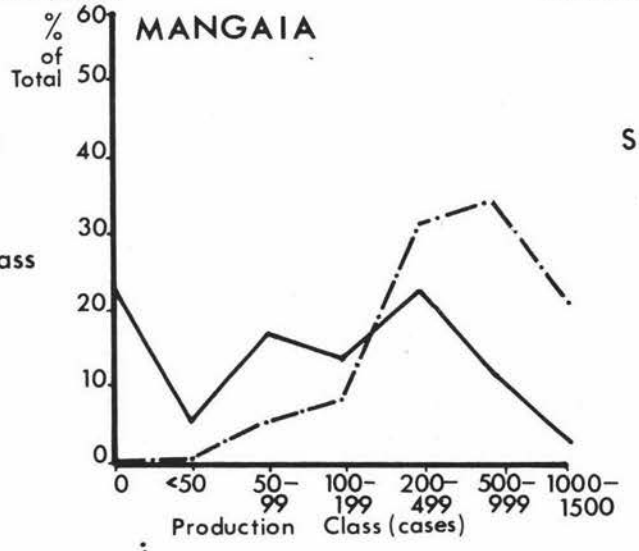




LEGEND

Growers per class

Production per class



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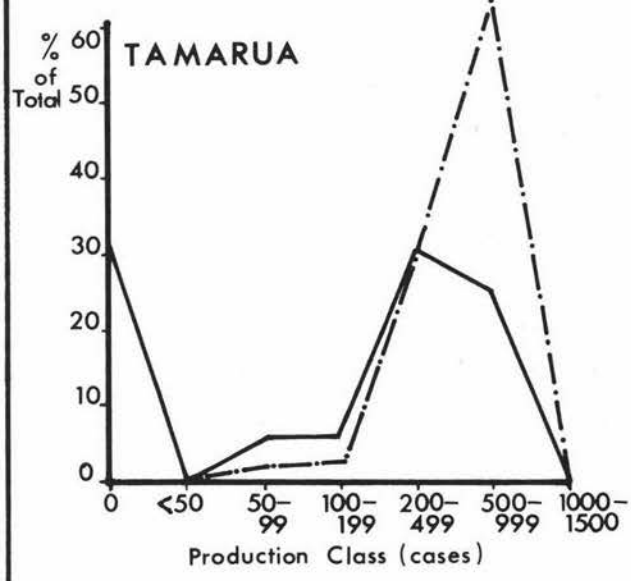
Source : Data based on sample; checked against Administration records, Mangaia.



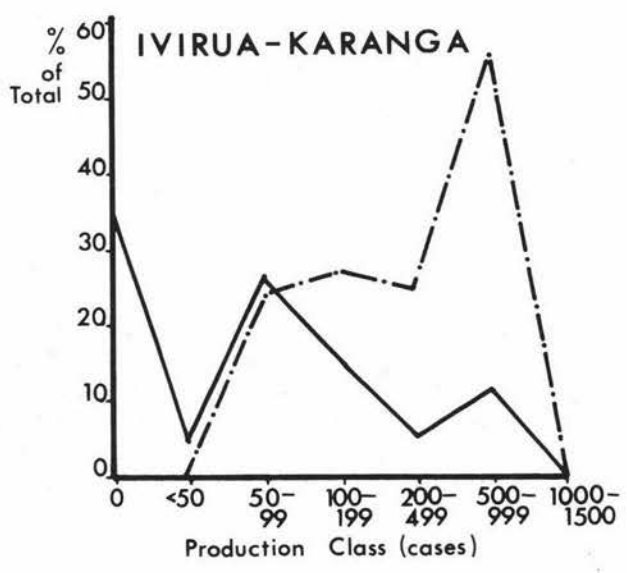


Fig.19

TABLE XXV

PINEAPPLE PRODUCTION PER PLANTER, 1966

Number of Cases Produced, 1966

	None Produced, 1966	Less Than 50	50-99	100-199	200-499	500-999	1000-1500	Total
Mangaia								
A. No. of Planters	20	5	15	12	20	10	3	85
B. % of Total Planters	23.5	5.8	17.6	14.1	23.5	11.7	3.5	100.0
C. Total No. of Cases Produced per Class	-	98	1089	1718	6029	6452	3814	19200
D. % of Total Cases Produced	0	0.5	5.7	8.9	31.4	34.1	19.9	100.0
Keia-Veitatei								
A.	5	1	5	3	5	1	1	21
B.	23.8	4.7	23.8	14.2	23.8	4.7	4.7	100.0
C.	0	40	368	365	1561	534	1413	4281
D.	0	0.9	8.6	8.5	36.5	12.5	33.0	100.0
Tava'enga								
A.	3	3	4	5	9	3	2	29
B.	10.3	10.3	13.7	17.2	31.0	10.3	6.9	100.0
C.	0	55	278	836	2739	1687	2401	7996
D.	0	0.7	3.5	10.5	34.3	20.9	30.0	100.1
Tamarua								
A.	5	0	1	1	5	4	0	16
B.	31.1	0	6.3	6.3	31.3	25.0	0	100.0
C.	0	0	93	154	1389	2911	0	4547
D.	0	0	2.0	3.4	30.5	64.1	0	100.0
Ivirua-Karanga								
A.	7	1	5	3	1	2	0	19
B.	36.8	5.2	26.3	15.7	5.2	10.5	0	100.0
C.	0	3	350	363	340	1320	0	2376
D.	0	0.1	14.7	15.2	14.3	55.5	0	99.8

Data based on sample.

lived on subsistence 'earnings'. (See Table XXVI).

Income Sources

In 1964, net monetary income on Mangaia was derived from three major sources; the export of agricultural produce, wages and salaries and money transfers and remittances from other Cook Islands and New Zealand. In that year money from wages and salaries made up over half of all incoming money and remittances provided $8,360 more than income derived from agricultural sources.

Between 1964 and 1966, income derived from agricultural sources rose by 32.5 percent to form the second largest source of net monetary income. Wages and salaries remained the largest source, 48.3 percent of the total, the great majority paid by the government. In that year, remittances from New Zealand totalled $33,801, twenty-two percent of the total income. (see Table XXVII). (see Appendix V).

Average monetary incomes of the sample followed a similar pattern. (see Table XXVIII). Thirty-one percent of the average total income received per planter during 1966 came from agriculture, 41.5 percent from wages and salaries and 27.1 percent from remittances. Inter-district comparisons, however, show a markedly unequal distribution of average total income, and a dissimilar pattern of composition of income from each source.

Income From Agricultural Sources

The average total income per planter received in Keia-Veitatei was $540 more than that received in Ivirua-Karanga, $264 more than that in Tamarua and $177 more than that received in Tava'enga. Moreover, although only 16.5 percent of the average income per planter in Keia-Veitatei was derived from agricultural sources, compared with 56.8 percent in Ivirua-Karanga, the average income per planter derived from agricultural sources was higher in the former district. Fewer planters in Keia-Veitatei received no income from pineapple exports, and there was a greater range of incomes from this source in this district than in Ivirua-Karanga. Of all districts, a greater proportion of the total income was derived from pineapple exports in Tamarua. In this district there were proportionately fewer small incomes derived from agriculture and a more even distribution of persons who earned over $200 during 1966 from this source. (see Figure 20). Although there were fewer planters in Tava'enga who received no income from agricultural sources, and a more even distribution of the sample around the mean income of $193.37, the larger proportion of people who earned less than $200 in 1966 from agriculture results in the average income from pineapple exports being slightly lower than that in Tamarua.

TABLE XXVI

DISTRIBUTION OF INCOME[(a)]: 1966

Income ($)	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No. of Persons	%	No. of Persons	%	No. of Persons	%	No. of Persons	%	No. of Persons	%
2200-2600	2	8.3	2	6.6	-	-	-	-	4	4.4
1800-2199	-	-	-	-	-	-	-	-	-	-
1400-1799	1	4.1	1	3.3	1	5.8	-	-	3	3.3
1200-1399	-	-	1	3.3	1	5.8	-	-	2	2.2
1000-1199	3	12.3	1	3.3	-	-	1	5.0	5	5.5
800-999	1	4.1	5	11.2	-	-	-	-	6	6.6
600-799	3	12.3	3	9.9	2	11.7	1	5.0	9	9.9
400-599	3	12.3	4	13.2	1	5.8	1	5.0	9	9.9
200-399	5	20.5	4	13.2	3	17.6	3	15.0	15	16.5
1-199	3	12.3	8	26.4	5	29.4	12	60.0	28	30.8
Nil	3	12.3	1	3.3	4	23.5	2	10.0	10	11.0
Total	24	100.0	30	100.0	17	100.0	20	100.0	91	100.0

(a) This table refers to cash income only. No attempt has been made to calculate subsistence income.

Data based om sample.

TABLE XXVII

NET MONETARY INCOME, 1964 AND 1966 ($)

Source	1964[a]	%	1966[b]	%	Percentage Change 1964-1966
Net Income From Exports	23,140	20.6	45,456	29.6	+32.53
Wages and Salaries	57,660	51.4	74,098	48.3	+12.48
Remittances and Other Cash Income	31,500	28.0	33,801	22.1	+3.53
	112,300	100.0	153,355	100.0	+15.45

Sources: (a) Kolff, J., 1965, 206.

(b) Administration Records, Mangaia.

TABLE XXVIII

MONETARY INCOME PER PLANTER, 1966 ($)

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Income Derived From Agricultural Exports (Pineapples)	118.18	16.5	193.37	36.0	197.00	43.7	95.11	56.8	152.62	31.4
Income From Wages and Salaries	254.51	29.7	278.30	58.8	214.11	47.5	65.50	39.1	202.09	41.5
Remittances and Money Transfers	383.83[(a)]	53.8	65.30	12.2	39.41	8.7	6.90	4.1	131.64	27.1
Total Income	714.10	100.0	537.03	100.0	450.52	100.0	167.51	100.0	486.36	100.0

(a) Excludes a Post Office Savings Bank transfer of $3600, the savings of a Mangaian who had been employed in New Zealand for over five years, and who transferred his POSB account to Mangaia on his return.

Total Planters: Keia-Veitatei 24; Tava'enga 30; Tamarua 17; Ivirua-Karanga 20; Mangaia 91.

Data based on sample.

Wages and Salaries

Tava'enga planters receive a higher percentage of their incomes from wages and salaries than did planters in other districts. (see Table XVIII). Although a larger proportion of the total average income received in Tamarua was made up from wages and salaries than that in Keia-Veitatei, in the latter district incomes from this source averaged $43 more per annum. In Ivirua-Karanga the level of average incomes derived from wages and salaries was more than four times below that received in Tava'enga and three times below the levels in Tamarua and Keia-Veitatei. Notable differences also existed in the ranges of income from wages and salaries in each district. (see Figure 20).

Only 25 percent of the total sample population in Keia-Veitatei did not receive a proportion of their income from wages and salaries compared with 64 percent in Ivirua-Karanga and 70 percent in Tamarua. A greater proportion of the populations of the Oneroa districts received over $200 in 1966 from wages and salaries, 24.9 percent in Keia-Veitatei and 33.3 percent in Tava'enga. In the latter district almost ten percent of the sample received wages and salaries of between $1400 and $1799 during 1966.

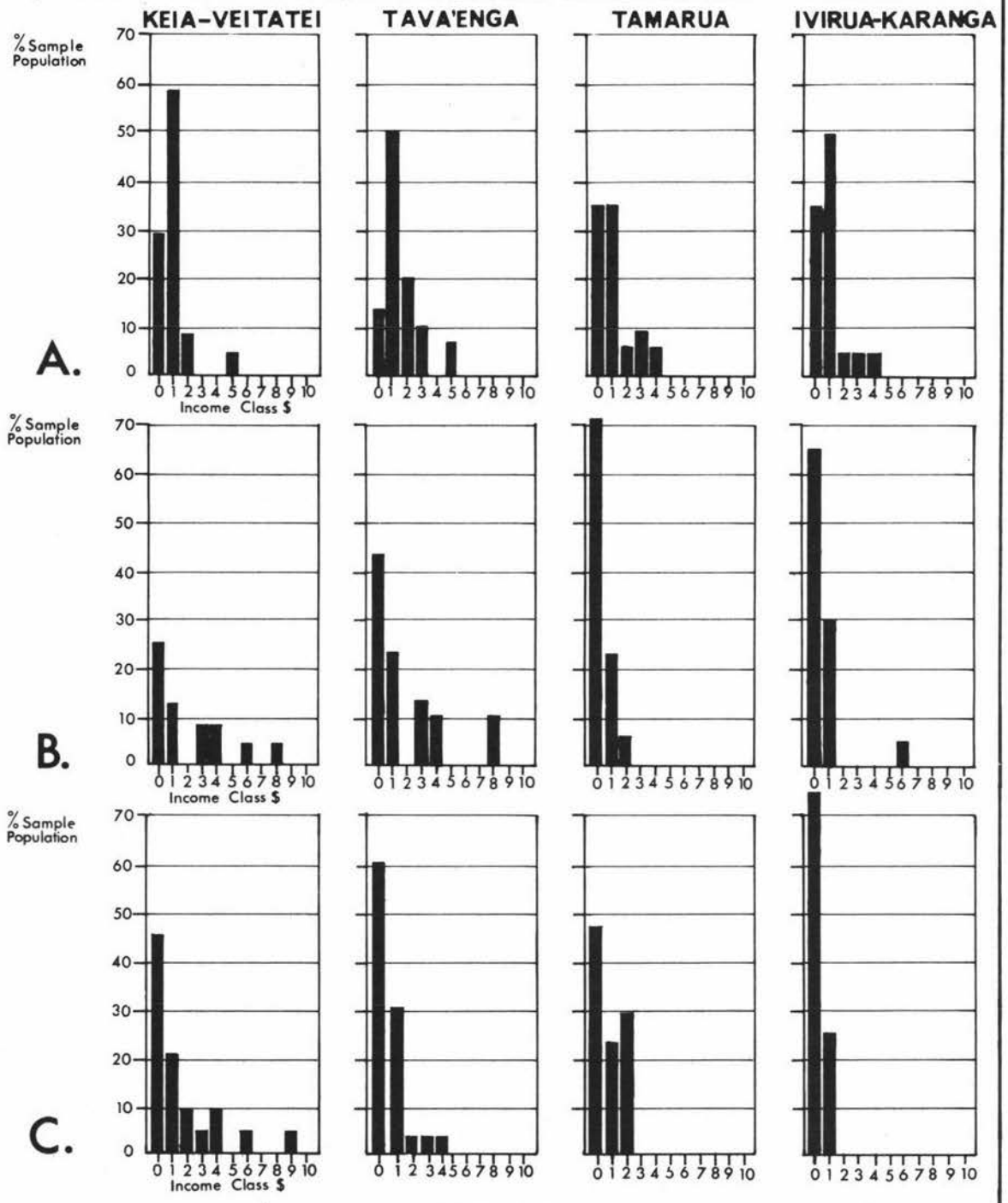
This distribution is related to the residential distribution of public servants on Mangaia, as the majority of wages and salaries are paid to government employees. In 1966 there were 89 government employees on the island, excluding seconded Europeans and the Assistant Medical Officer and wife. Seventy eight percent of these people resided in Oneroa Village and planted in Keia-Veitatei or Tava'enga districts. Of the $74,098 paid to government employees, 44 percent was received by persons in Tava'enga and 31.4 percent in Keia-Veitatei. Thus less than one quarter of all government salaries and wages paid on Mangaia during 1966 were received by people in either Tamarua or Ivirua-Karanga. (see Table XXIX).

Remittances

The distribution of income from remittances is also most uneven. This source of income comprised over half of the total average income received, per planter, in Keia-Veitatei, and was three times as great as the average income per planter derived from agricultural sources in this district. Tava'enga planters in the sample derived an average of $65.30 from remittances, 12.2 percent of their total income. The two eastern districts received much less than this. (see Table XXVIII).

The proportion of district income derived from remittances appears to be closely related to the emigration patterns in operation in each district. In Keia-Veitatei, emigration reflects the choice of a non-agricultural alternative by planters in the district, in their attempts to raise their standards of

DISTRIBUTION OF MONETARY INCOME 1966



LEGEND

INCOME CLASS $

0	....	No Income	5	....	800 – 899
1	....	1 – 199	6	....	1000 – 1199
2	....	200 – 399	7	....	1200 – 1399
3	....	400 – 599	8	....	1400 – 1799
4	....	600 – 699	9	....	1800 – 2199

10 2200–2600

INCOME SOURCE

A. Pineapple Exports. **B.** Wages and Salaries. **C.** Remittances and Transfers.

Fig.20

TABLE XXIX

DISTRIBUTION OF PUBLIC SERVANTS,[a] 1966

Occupation	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No.	Income $	No.	Income $	No.	Income $	No.	Income $	No.	Income $
Police	2	1960	1	850	1	850	2	1700	6	5360
School Teachers	9	8310	14	16460	5	5910	6	6190	34	36870
PWD Employees	12	6878	6	5792	1	580	-	-	19	13250
Wireless Op.	1	920	-	-	-	-	-	-	1	920
Admin. Staff	2	2700	4	3220	-	-	-	-	6	5920
Agric. Dept. Emp.	3	1600	7	3926	-	-	-	-	10	5586
Health Dept. Emp.	1	750	-	-	-	-	2	2750	3	3500
Mosquito Control	-	-	3	2328	-	-	-	-	3	2328
Island Council	2	104	2	104	1	52	2	104	7	364
Total	32	23282	37	32680	8	7392	12	10744	89	74098
		31.4		44.1		10.0		14.5		100.0

(a) Excluding seconded Europeans, Medical Officer and wife.

Source: Administration, Mangaia.

living. Although largely a subjective judgement, it appears to the writer that the links between the emigrant and those of his family remaining on Mangaia in Keia-Veitatei, are much stronger than those existing between emigrants and their families in other districts on the island. Emigrants from Keia-Veitatei are more usually temporary emigrants, and most can be expected to return to the island at some time in the near future, bringing with them their accumulated savings, or cement, roofing iron and timber from New Zealand to build a new house. These men have chosen to travel to an area where wage labour is more readily available, and where their labour is more effective in earning the money they so strongly desire. By contrast, emigrants from Tamarua and Ivirua-Karanga appear to make a complete break with the island, and although some send back money to their families, stories and examples of abandoned wives and old people, are common in these villages.

The Greatest Source of Income

Despite a greater percentage of the total incomes received in three out of the four districts being derived from non-agricultural sources, commercial agriculture provided the largest source of income for the majority of the sample population in all districts except Keia-Veitatei. Agriculture became increasingly important as a source of income the further from Oneroa the village was located; 40 percent of Tava'enga planters received more income from cash cropping that from any other source, compared with 60 percent in Ivirua-Karanga. (see Table XXX).

Conclusions

A comparison of the sources of monetary income on Mangaia indicates that despite an increase in the importance of commercial agriculture in providing income, this sector of the economy still provided less than one third of the total net monetary income for 1966. Wages and salaries and remittances, both originating from sources outside the island remained as the most substantial part of the island's net income.

Internally there were marked differences in the relative importance of each source of income, and in the distribution of levels of income from each source. Average incomes are notably higher in the Oneroa districts, decreasing through Tamarua to Ivirua-Karanga, the furthest from Oneroa. The importance of agriculture in providing the greatest source of income increases relative to the distance from Oneroa, but levels of income from this source remain lower in Ivirua-Karanga than in the other districts, Tamarua and Tava'enga in particular. Income from wages and salaries, which in 1966 comprised 48 percent of the total net income of the island, is received overwhelmingly in the Oneroa villages. Although income from remittances follows a similar pattern, Keia-

TABLE XXX

GREATEST SOURCE OF MONETARY INCOME, 1967

Source	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%
Pineapples	3	12.5	12	40.0	10	58.7	12	60.0	37	40.7
Wages and Salaries	7	29.2	11	36.5	4	23.6	5	25.0	27	29.6
Remittances	14	58.3	7	23.1	3	17.7	3	15.0	27	29.6
Total	24	100.0	30	99.6	17	100.0	20	100.0	91	99.9

Data based on sample.

Veitatei receives far more money from this source than any other district.

In general it may be stated that from all sources, a higher level of income and a better distribution of income is achieved in Tava'enga and Keia-Veitatei than in any other districts, with the exception of income from agriculture in Tamarua, which tends towards the pattern evidenced in Tava'enga. From the viewpoint of total net income and levels of income per planter, commercial agriculture is of secondary importance; but more planters receive an income from commercial agriculture than from any other source, and commercial agriculture provides the greatest source of income to more individuals who receive income from more than one source, than do wages and salaries or remittances.

TECHNOLOGY

The commercialisation of a traditional agriculture system involves a complex process, which includes the changing of much of the culture of the society utilising the system. An integral part of a culture is its technology, the sum total of the knowledge and techniques employed by the society to produce the goods (in this case agricultural goods) the society requires. For this reason, the acceptance by a society of more productive innovations and the demonstration by members of the society of an increase in the technical knowledge and expertise associated with such innovations will be indicative of changes which favour increased modernisation and commercialisation within the agricultural system.

Productive Innovations

The criteria upon which this section is based are the acceptability of new tools and machinery, the use and knowledge of artificial chemical fertilisers and the acceptance of new techniques in the cultivation of pineapples.

Traditional Mangaian agricultural implements were few in number. Fashioned from wood they reflected an adaptation to the type of cultivation and the ecological zone in which they were to be most often used. Taro was planted with the *pau*, dryland crops with the *taiki* or *ko*, the digging stick, and coconuts were husked and scraped on a sharpened stick and a three legged stool upon which was mounted a shell scraper. Stone tools bound on to wooden handles with sennit, plaited coconut husk strips, served as cutting and digging tools, *toki*. Until about eight years ago, hand tools on the island continued to be very similar to the traditional style, with only minor modifications being made, in particular the fitting of steel blades in the place of stone or wood. In the case of the *pau*, no modifications were necessary as the tool was ideally suited for the planting of *pa'i*, and no changes took place in traditional cultivation in the *puna*. (see Figure 21). Subsequent upon the introduction of the pineapple, however,

AGRICULTURAL TOOLS

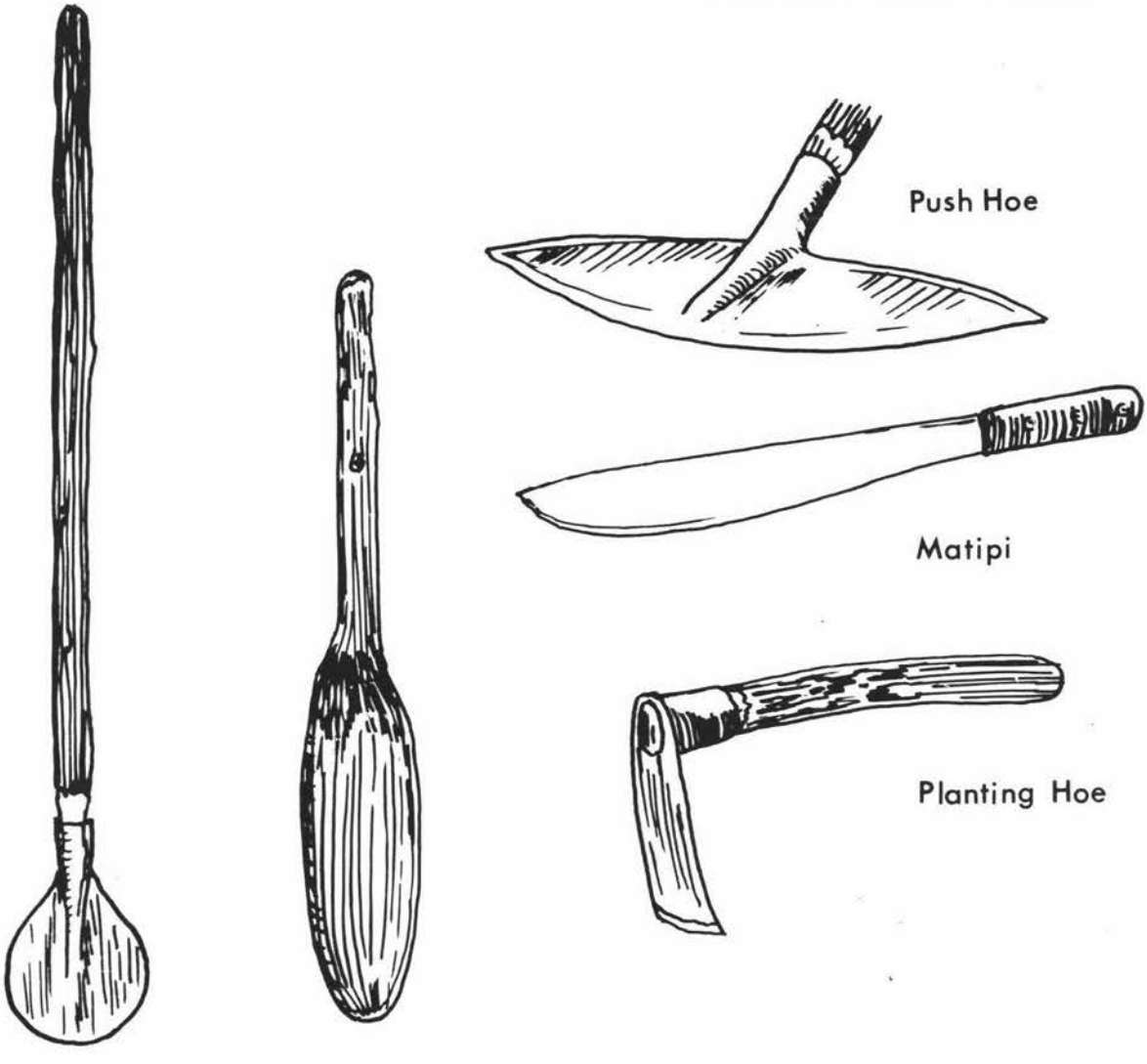


Fig.21

there followed the introduction of two new tools, the push hoe and the planting hoe.

To discuss the latter first, as pineapple planting spread from the original very small plots to larger areas in the puna and on the fern slopes of the rautuanu'e, difficulty was experienced in the planting of pineapples, in that there was no local tool suitable for making a hole into which the plant could be placed, quickly and efficiently. The planting hoe was introduced, and was immediately acceptable. As is shown in Figure 21 it resembles a small mattock. The planter holds the hoe in one hand and a plant in the other, and bending at the waist, knees slightly bent, digs a hole with the hoe. On the final blow the hoe remains in the ground. The plant is placed behind it and soil is packed around the plant with the back of the hoe blade. This action is very similar to that which was employed by Mangaians in the use of the hafted adze and there is thus some cultural precedence in the use of this tool.

The push hoe is less familiar to Mangaians. Traditional body positions when indigenous long handled tools were employed involved standing with the legs slightly apart and thrusting the tool vertically into the soil with the arms. This action is similar both in the use of the pau and the taiki, although the taiki is also used low to the ground, from a crouching position, similar to a bayonet thrust, when makatea garden plots are cleared of roots. The push hoe involved a standing thrust or a chipping action, but because weeding was so important to the optimum development of the pineapple fruit, this tool was quickly in demand.

Productive innovations are not confined to hand tools, however. Both the administration and a local entrepreneur have introduced wheel tractors to the island, and the former has also provided a range of tractor drawn equipment for use specifically in the cultivation of pineapples. In 1967 machinery available was three wheel-tractors, a three furrow disc plough and a single furrow mouldboard plough, three sets of discs, two rotary slashers and a four cylinder Caterpillar bulldozer. The slashers and the bulldozer came into use during 1967. An experimental spraying plant mounted on a trailer was also almost ready for use.

The initiative in engaging machinery to work on a plot lies with the individual planter, who is required to travel into Oneroa to the Post Office to make the arrangements. Payments were usually arranged under an Economic Development Loan (page 139), and were on a specified hourly basis. Usually a planter will clear a plot of undergrowth or fern by hand, or by burning, although the bulldozer was quickly put to use for this task shortly after its arrival on the island. Following the clearing, a plot is ploughed and then disced, the frequency of discing depending upon the resources of the planter involved. If the plot concerned has previously been

used for pineapple growing, the rotary slashers are used to smash down the old plants. A subsequent discing chops up and buries the old root systems and any rubbish left on the surface of the soil. The use of the slashers is an important step in the reutilisation of the old pineapple plots, as the efficient removal of old plants by hand is almost impossible.

Chemical fertilisers became generally available to Mangaian planters about 1958, when amounts were obtainable through the Oneroa Primary School. In 1960 an important step was the establishment of the present Manure Levy Scheme, a scheme under which all fruit exported is levied a nominal sum, five cents per case of pineapples in 1967, which is credited to the exporter's account in the Post Office. When a planter wishes to make use of this credit he is issued with a credit slip from the Post Office which he presents to the Agricultural Department Extension Officer, or his assistant, and the specified number of bags of fertilisers are made available to the planter. The planter has to arrange transport back to his home village or to his plot. It is also possible to purchase fertiliser with cash, or to arrange for an Economic Development Loan to cover fertiliser as well as tractor hire.

The Use of Machinery

Of the 91 planters interviewed 57 or 62.6 percent had made use of some of the machinery available during 1966. Of the remainder, 12 had used a tractor prior to 1966 and 22 had never used machinery. (see Table XXXI). The most notable feature of the use of machinery was the high frequency of usage in Tava'enga, where 97 percent of informants had made use of machinery at some time prior to 1967, compared with only 65 percent in other districts. The duration of use of machinery showed a similar inter-district variation. (see Table XXXII). Of the total planters interviewed in each district Tava'enga planters tended to use machinery for longer periods than planters in other districts. Tamarua planters, however, tended not to use machinery for short periods, less than two hours, whereas the most frequent use of one hour periods occurred in Keia-Veitatei.

There are a number of factors which influence this pattern of machinery use. The first is the distance of outer villages from Oneroa. Because a planter must travel to Oneroa to arrange a tractor hire, it is less likely he willfrequently arrange to use machinery. If his arrival in Oneroa did not coincide with the presence there of one of two staff in the Agriculture Department Office, a planter from an outer village would often wander off to visit friends, or go down to the boat landing and forget the real reason of his visit. If he was to arrange for a tractor after this, it entailed another trip to Oneroa. The second factor, is the 'demonstration' factor (Mead, 1955, 186). Because planters closer to Oneroa are

TABLE XXXI

NUMBER OF PLANTERS USING MACHINERY

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No.	%	No.	%	No.	%	No.	%	No.	%
Prior to 1966	2	8.4	6	20.0	2	11.8	2	10.0	12	13.3
During 1966	14	58.3	23	76.6	9	53.0	11	55.0	57	62.6
Never used machinery	8	33.3	1	3.3	6	35.2	7	35.0	22	24.1
Total Planters	24	100.0	30	100.0	17	100.0	20	100.0	91	100.0

Data based on sample.

TABLE XXXII

DURATION OF USE OF MACHINERY (a)

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
Duration of Use	No.	%	No.	%	No.	%	No.	%	No.	%
One hour	6	25.0	2	6.6	-	-	2	10.0	10	11.0
1½ hours	1	4.2	1	3.3	-	-	-	-	2	2.2
2 hours	4	16.6	2	6.6	1	5.9	6	30.0	13	14.3
3 hours	1	4.2	5	16.5	1	5.9	1	5.0	8	8.8
4 hours	2	8.4	4	13.2	2	11.8	1	5.0	9	9.9
5 hours & over	2	8.4	14	46.2	5	29.5	1	5.0	22	24.1
Total Using Machinery	16		28		9		11		79	
Uncertain	1	4.2	1	3.3	2	11.8	2	10.0	6	6.6
Never Used Machinery	8	33.3	1	3.3	6	35.4	7	35.0	22	24.1
Total Planters	24	100.0	30	100.0	17	100.0	20	100.0	91	100.0

(a) This table does not take year of use into account, only the duration of use of the most recent tractor hire.

Data based on sample.

more likely to engage machinery, there is a greater chance planters in Tava'enga and Keia-Veitatei will see what may be achieved with the use of machinery. Thus a cumulative effect is put into action, as the more planters that use machinery enable a greater number to see the benefits of its use, and so on. The lack of 'demonstration' was evidenced by a planter interviewed in Karanga. Although this man made frequent trips to Oneroa on his motorcycle, he had spent all of a week removing old pineapple plants from a used plot by hand. When the writer described the rotary slashers, his reply was that, 'this is an excellent idea; why don't the Agriculture (Department) get some here so I can use them.' At this time many Tava'enga planters had slashed old plots of pineapples in preparation for spring planting. A third factor which works to the disadvantage of outer village planters is lack of understanding of how to set about arranging for a tractor to disc a plot. As it is unknown for a European Extension Officer to speak Maori, a number of outer villagers were extremely nervous when approaching the Agricultural Office in case the interpreter should happen to be away from the office. One man was seen to wait all morning before arranging for a tractor hire because he was afraid of embarrassment over his lack of English.

Taking these factors into account, there remained a definite pattern of machine usage which favoured the western side of the island. In the districts of Tava'enga and Keia-Veitatei machinery has been more acceptable to pineapple planters, than it has to those in Tamarua or Ivirua-Karanga, where only the larger producers make prolonged use of tractor hire.

The Use of Chemical Fertilisers

One quarter of the sample had never used fertilisers, although all had exported fruit at some time between 1962 and the period of the survey. The distribution of these planters over the island was not even; only three planters out of thirty had never used fertiliser in Tava'enga, whereas 45 percent of the total planters of Ivirua-Karanga and 41 percent of Tamarua planters had never made use of fertiliser. Of those planters using fertilisers, the majority made use of a Manure Levy credit, although a slightly higher proportion of Tava'enga planters used cash purchases to obtain fertilisers. (see Table XXXIII).

Among those planters using fertilisers, over one third could state neither why fertilisers were used, nor the common names of the fertilisers supplied to them by the Agriculture Department. Ten percent had some understanding of the use of fertilisers, and 53 percent knew the names of fertilisers used, but did not know why they were used. The knowledge of fertilisers was at a similar level in all districts although slightly fewer Tava'enga planters demonstrated a complete lack of knowledge compared to planters in other districts.

TABLE XXXIII

USE AND KNOWLEDGE OF FERTILISERS, 1967

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No.	%	No.	%	No.	%	No.	%	No.	%
I. Means of Obtaining Fertiliser										
Manure Levy Account	12	60.0	18	66.6	8	80.0	7	63.6	45	66.2
Cash Purchase	3	15.0	3	11.1	1	10.0	1	9.1	8	11.7
Levy & Purchase	3	15.0	4	14.8	1	10.0	1	9.1	9	13.2
Economic Dev. Loan	2	10.0	2	7.4	-	-	2	18.2	6	8.8
Total Using Fertiliser	20	100.0	27	99.9	10	100.0	11	100.0	68	99.9
II. Knowledge of Fertilisers(a)										
Principle of Use	3	15.0	3	11.1	1	10.0	-	-	7	10.3
Names of Those Used	9	45.0	16	59.2	5	50.0	6	54.5	36	52.9
No Knowledge	8	40.0	8	29.6	4	40.0	5	45.5	25	36.7
	20	100.0	27	100.0	10	100.0	11	100.0	68	99.9
		83.4		90.0		58.8		55.0		74.7
III. Never Used Fertilisers	4	16.6	3	10.0	7	41.2	9	45.0	23	25.3
Total Planters	24	100.0	30	100.0	17	100.0	20	100.0	91	100.0

(a) Responses to the questions, 'What are the names of the fertilisers you use?' and 'Why do you use manure and what does it do to the plants?'

Data based on sample

Results from the sample indicate that ten years after the effective introduction of chemical fertilisers, three-quarters of planters were making use of them. Despite this level of usage there remained a high level of ignorance as to the reasons for the use of fertilisers, and even their common names. There were two factors which bore a relationship to this anomaly.

In 1967, most planters used fertilisers under direct instructions from the Pineapple Extension Officer, a retired Australian pineapple farmer. In the field situation, the Officer would point out the advantages of fertilisers, which type of fertiliser should be used at different periods during the growth of the fruit and when the optimum times for use occurred. Planters nodded vigorously in agreement, but if questioned shortly after had very little understanding of what had been told them by the Officer. It appeared the Officer did not comprehend that most Mangaian planters had a complete lack of any background knowledge whatsoever, and thus pitched his extension discussions on a plane above the level of comprehension of the average planter.

The second factor was related to the non-use of chemical fertilisers in the cultivation of food crops. In the area of food crop cultivation, Mangaian planters were the recipients of technical knowledge and expertise built up through centuries of experimentation, and had greater understanding of natural fertility, soil types, indicator plants and food plants best suited for certain conditions, than in any other area. Pineapple cultivation on the lower fern slopes was a recent innovation, and there was general lack of knowledge about conditions prevailing there. If fertilisers were used in the area of food crops, Mangaian planters would have had more chances of experimenting with the unknown in the area of the known, and techniques learnt there could have been applied to cash cropping. There was little experimentation in the use of fertiliser in pineapple growing, although there were isolated exceptions. (1).

Techniques of Pineapple Cultivation

When pineapples were reintroduced to Mangaia in 1946, they were unaccompanied by any form of extension programme. Planters had some prior knowledge of the plant from the first introduction in the late nineteenth century, and they proceeded to cultivate it as had been done in the past. To overcome the difficulties of loss of natural fertility and aging of plants, a new plot was cleared and replanted with suckers broken from old plants. The only variety of pineapple on the island at this stage was the Ripley Queen, the most suitable variety for the fresh fruit market. Plots were small, often untidy, with older plants becoming bushy and overgrowing the rows, which often ran down slope, increasing the potential for soil erosion. The plants in an established plot were utilised until they no longer produced fruit acceptable for export, after which a new plot was cleared; this resulted in

a planter producing no fruit for the period of the changeover and very poor fruit for the last two or three years production from the original plot. After a new plot had been established, the old plot was abandoned, and was quickly overgrown with secondary bush, or invaded by fern.

On their arrival on Mangaia, Agricultural Extension Officers appointed during the last ten years have had two basic objectives. Prior to 1963 it was to improve the quality of fruit being exported to New Zealand. Post 1963 it was to persuade the Mangaian planters to change the variety of pineapples grown from Ripley Queen to Smooth Cayenne variety, and to ensure the newly established canning factory on Rarotonga received adequate supplies of good quality fruit.

Prior to 1963 these objectives were reflected in attempts to get planters to plant larger plots on a semi-permanent basis, with rows across the slope, replanting every three to four years, using fertilisers. With the introduction of the Smooth Cayenne, the objectives have been to stress the use of fertilisers to maintain fertility, while replanting the same area of pineapples every two years. In this way large, high quality fruit would be produced constantly. The availability of machinery has obviously influenced the success of these programmes, and discussion has already taken place on this subject, and on the use of fertilisers. This section will examine techniques of cultivation in 1967 so that the extent of acceptance of new techniques of cultivation may be assessed.

Of the 91 planters interviewed suitable details of the present and past use of pineapple plots were obtained from 80 and this information is presented in Table XXXIV. A total of 164 plots is represented, 50 of which were abandoned or in fallow, 46 in Ripley Queens and 63 in Smooth Cayennes. Five were in some other use, coconuts, bananas or gardens. On a district basis, half of the total plots in Tamarua were unused at the time of the survey compared to 25 percent in Tava'enga, 26 percent in Keia-Veitatei and 32 percent in Ivirua-Karanga. All districts except Ivirua-Karanga had more plots of Smooth Cayenne pineapples than Ripley Queens, and in this district there were ten of each, represented in the sample.

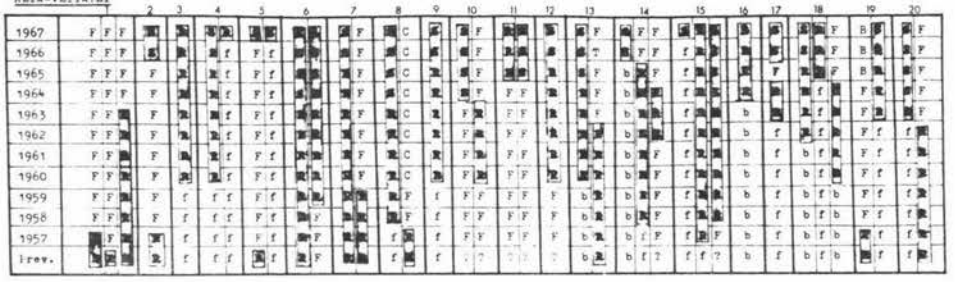
Eighteen of the 109 plots in pineapples represented in the sample, were being reused after a fallow period. The average length of fallow was unable to be calculated because of lack of definite information, but replanting of old pineapple plots was most frequent in Keia-Veitatei where 24 percent of existing pineapple plots were located on plots previously used for pineapple growing. In Ivirua-Karanga 16 percent of the plots were located on old pineapple plots, 10 percent in Tava'enga and 6.5 percent in Tamarua. All other plots had been cleared in either previously unused fernland in the rautuanu'e or from bush in the puna and piriaki. Forty five plots of the 109 in use had been cleared from fernland and 43

TABLE XXXIV

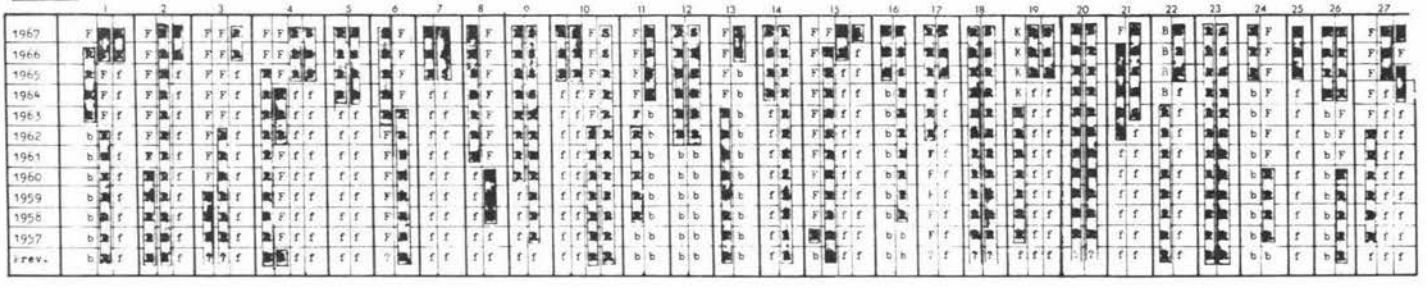
LAST USE OF PINEAPPLE PLOTS BY DISTRICT AND PLANTER

MANGAIA, 1967

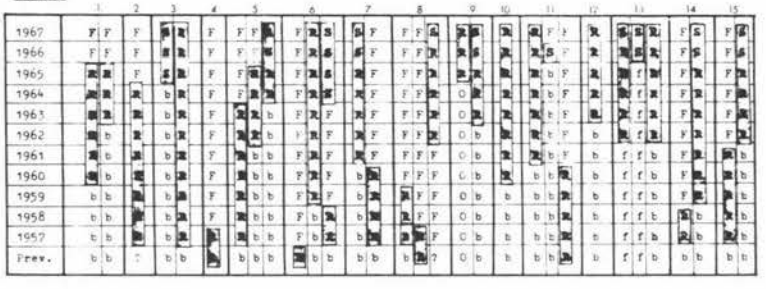
KEIA-VEITATEI



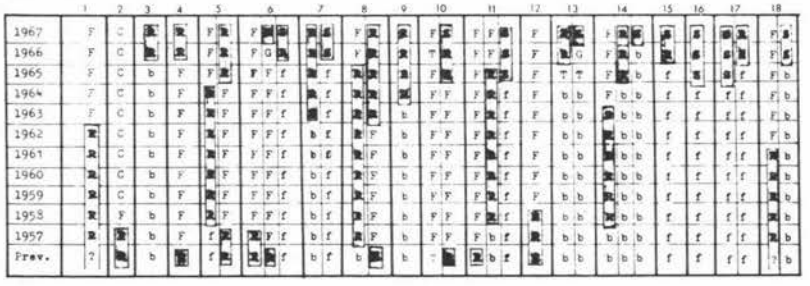
TAVA'ENGA



TAMARUA



IVIRUA-KARANGA



LEGEND: S = Smooth Cayenne Pineapples; R = Ripley Queen Pineapple; F = Fallow; G = Garden Vegetables (Taruo, ku'ara, maniota.); T = Tomatoes; O = Oranges; K = Coffee; f = Fernland; b = Bush; C = Coconuts

NOTES: Each vertical column of letters represents the past use of one plot. The plots are grouped within the heavier lines, representing the total pineapple cultivations of one planter during the period, 1957 to 1967. One planter's plots are not necessarily at the one location but are more commonly isolated from one another. The planters represented in the table are drawn from the sample.

from bush, with more plots being cleared from fern areas in Tava'enga and Keia-Veitatei and more from bush in Tamarua and Ivirua-Karanga.

It was not possible in the time available to measure the area of pineapple plots cultivated by those planters in the sample. Few plots were over one acre in area, however, most lying between one-quarter and three-quarters of an acre in area. The cultivation of a single plot was more common than the cultivation of more than one plot. Thirty eight planters tended one plot, 30 two plots, and only three cultivated three plots. In Tava'enga, however, 17 of the 24 planters sampled cultivated two plots of pineapples.

The average length of cultivation of the plots was five years, three years longer than that recommended by the Agriculture Department. There remained an attitude common among all planters, that replanting Cayenne plants every two years was wasteful of time and labour. Thus many continued production with plants four and five years old. The situation was typified by an argument between the Pineapple Officer and his assistant, a Mangaian who had received his agricultural training at Avele College, Samoa. This man refused to accept the point of view that replanting every two years could be related to the benefits of a higher income. He saw the task of replanting plants which were obviously still producing fruit as 'stupid', and equated replanting with a loss of time which would have been available for food gardening, house building, fishing or cricket playing. After the argument, he admitted to the writer that it was probably correct that replanting every two years was the best thing for pineapple production in Australia, but on Mangaia other things complicated the problem.

The benefits of replanting with Cayenne were accepted by most planters, and 33 plots showed a change in variety of pineapple during a consecutive period of cultivation. Most of the planting material for Cayenne pineapples came from the government farm in Veitatei. Suckers, slips and tops are collected and distributed to growers on a rationing system and although attempts were made by the Pineapple Officer to extract promises from planters receiving Cayenne material, that the new plants would be suitably cultivated, including the use of fertilisers, often such promises became an embarrassment to the planter and a source of irritation to the Pineapple Extension Officer.

Conclusions

Productive innovations are generally readily accepted on Mangaia. A majority of planters used machinery and fertilisers, and pineapples were beginning to be cultivated in a sedentary pattern as opposed to a shifting pattern. There are two reasons for the ease of introduction of these innovations. First, all innovations were introduced for the

purpose of cultivating a cash crop which had no cultural importance. Few innovations have carried over into the area of traditional food gardening. Only one case of tractor drawn machinery being used in the preparation of a tarua plot was noted during the fieldwork, and this was a very recent development according to the informants. Chemical fertilisers were not used on any traditional crops. Furthermore, there was a strong resistance to their use; a number of informants explained seriously that, 'fertiliser would ruin the flavour of the mamio.' Second, most innovations have been introduced when the need for improvement was greatest. Tractor drawn ploughs and discs arrived when pineapple cultivation was being extended rapidly on the fern areas, slashers when planters were becoming frustrated with attempting to remove old plants by hand. Those planters who had heard of the new spraying plants were extremely anxious to have their plots sprayed with pre-emergent weed sprays, an answer to the constant problem of weed control. Mangaian planters have been able to recognise the need for the 'new thing', be it machinery or fertiliser, with comparative ease.

Where such recognition was not seen, however, innovations were not as acceptable. Because many planters had little understanding of the way in whichfertiliser maintained fertility, they did not have a long term motivation to use it. After applying a first dressing to their plot, many forgot about subsequent dressings. Although it was not possible to collect substansive information on how much fertilisers was used correctly, out of the total distributed, in many of the small kikau roofed huts which dot the pineapple areas, rotting, half used sacks of fertiliser are a common sight. Similarly, the rationale of replanting producing pineapples is not seen, with the result that most planters continue cultivating plants longer than is optimum.

PATTERNS OF LABOUR

One of the basic distinctions between an industrialised, modern commercial society and a traditional society lies in the division of labour. With increasing commercialisation, the role of an individual within the society becomes increasingly specific functionally. In the traditional setting, the individual's role is diffuse, for he performs all types of work, as well as providing for his own and his family's subsistence. In this section an attempt is made to measure the diffuseness or specificity of Mangaian labour patterns in 1967.

It is important to remember cultural factors play a part in influencing work patterns, and care must be taken to provide a measurement which is not influenced by what we, as Europeans may look upon as normal. Work patterns within the traditional Polynesian community were governed 'more by an adjustment to natural phenomena than to the dictates of a time schedule.' (Lovegrove, 1964, 438). As Beaglehole concluded after his work on Aitutaki, the Aitutakian people 'work hard when necessary

but because their culture does not build into their personalities any set of obsessive compulsive perfectionist drive, they do not often feel any necessity to work hard, as hard work is understood by the European.' (Beaglehole, 1957, 156). For these reasons, this section is confined to a comparison of the way three Mangaians spent a period of their active time between June and July, 1967, and does not attempt any comparisons with labour input in other pineapple growing areas of the world.

The data in this section was collected from three informants who agreed to keep work diaries over the period of one month. A fourth informant began a diary, but fell ill one week after the survey period began. Although these three men were considered by the writer to be typical of their type, one a full time planter who was employed infrequently in wage labour, married with two children, the second a school teacher, also married with children and the third a mapu or unmarried youth, this judgement is obviously a subjective one. Similarly, the period of the survey is very select, and was chosen for no other reason than convenience. The activities over one fortnight are summarised in Appendix VI and Table XXXV. Because of the repetitive nature of the activities, details of a full month are considered unnecessary.

Cash Cropping

All three of the informants spent a greater proportion of their active time during the survey fishing or cultivating food crops, than they did cultivating pineapples. This factor is a feature of the Mangaian situation in which school teachers, wage labourers, administration workers and traders succeed in combining commercial cropping with other daily activities. Rua, a full time school teacher spent only 3.6 percent of his active time working on his pineapple plot. His wife, a nurse at the Oneroa hospital was not able to assist during the week, and his children were below school age. Ta'i's wife commonly assisted him in his pineapples, and during the period he was employed labouring, she carried out all work in this area. Toru is the youngest and last of his father's sons living on Mangaia. As his father was fully employed as a school teacher, Toru has full responsibility for the family pineapple plots. However, the slightly greater proportion of his time spent in this area was largely the result of being continually sent to weed the pineapples by his father. When working in the plot, his labours were considerably less efficient than the older informant.

Food Gardening

Ta'i spent more than twice the amount of his active time during the survey working in the area of food gardening. This time included visits to check on the progress of new shoots, the construction of a new pa'i bed and the weeding of taro plots. Rua was not involved in any activities in this area other than weeding a new plot, planted prior to the survey. Toru was

TABLE XXXV

SUMMARISED WORK PATTERNS OF THREE MANGAIAN PINEAPPLE PLANTERS (a)

	Ta'i		Rua		Toru	
	Hrs.	%	Hrs.	%	Hrs.	%
Productive Activities:						
Wage Labour or salaried work	30	17.1	70	54.2	0	-
Food Gardens	24	13.6	1	0.7	9	8.5
Pineapple Plots	11	6.3	5	3.8	11	10.4
Housebuilding	34(b)	19.5	0	-	2	1.9
Fishing	25	14.3	6	4.6	8	7.6
General subsistence activities(c)	4	2.2	6	4.6	30	28.5
Communal Activities:						
Council Work	8	4.6	0	-	0	-
Boat Work	7	4.0	0	-	2	1.8
Non-Productive Activities:						
Church, sport recreation and rest	32	18.4	41	31.7	43	40.9
Total Hours	175	100.0	129	100.0	105	100.0

Notes: (a) Full details are presented in Appendix VI.

(b) This figure is unusual, in that the informant's house was burnt down and had to be replaced immediately.

(c) Includes general domestic activities such as preparing food, collecting firewood, cleaning house, etc.

involved in planting and weeding taro, and was assisted during one weeding by a friend, reciprocating labour from an earlier period. Of the three informants, Ta'i spent a greater proportion of his time cultivating his gardens. This was a reflection of his position as a full time planter, who must depend to a great extent upon his subsistence production to provide sustenance for his family. Into the households of the other informants were coming steady salaries which provided bought food to supplement local vegetables.

Fishing

The lack of a steady income is again reflected in the number of hours Ta'i spent fishing. Planters in a similar position to him spent a high proportion of their time fishing. By contrast wage and salary earners are more able to purchase canned meat and supplementary foods. Both Rua and Toru spent much less time fishing. Furthermore, Ta'i looked upon fishing as a vital part of his activities, whereas the other informants viewed fishing as a means of varying one's diet and as a pleasant pastime in which the lack of a catch was not particularly serious.

General Subsistence Activities

Toru, as a mapu spent much more time than the other two informants collecting firewood, gathering coconuts and grating them, preparing food or cleaning around the dwellings. In the other two households, the wives or a younger relative were responsible for such tasks.

Wage Labour and Salaried Work

Rua left home in the morning for school, returning shortly after two in the afternoon. Upon his return he normally took his motorcycle out to where his pig was tethered and fed the animal, returning to the village to play cricket until dusk. Despite a full time occupation teaching, he was able to produce fruit successfully from a quarter acre plot of Smooth Cayenne pineapples, weeding on Saturdays, usually in the morning, and picking and packing the day prior to the arrival of a ship. Ta'i took on labouring jobs at irregular intervals. During the survey, he and two other men travelled on foot across the island from Karanga to Veitatei swamp where they were employed by a Kaumata storekeeper, clearing and planting pa'i plots. Wage labour in the traditional sector of agriculture was not common; reciprocal labour was the usual form of group labour in the area of food gardening. Wage employment was much more common in pineapple plots, particularly for weeding, and sometimes for planting. Toru did not earn wages during the survey period.

Housebuilding

Most Mangaian men are involved in a housebuilding operation at

some period through the year. Of the informants, Ta'i was forced to rebuild his inland dwelling following its destruction by fire. This he succeeded in doing within a week, although he did not work on it every day during the week. Toru assisted a friend who was building a new concrete block house. Assistance with housebuilding on a casual basis is normal, although more formal assistance which is repaid with food and drink, and receiprocal labour is also very common.

Communal Activities

Communal activities include council work, church maintenance, boatbuilding and maintenance and wharf or boating work. Other communal activities such as the reroofing of a meeting house occur at irregular intervals. Roadwork is compulsory for every able bodied male over 15 years of age, and entails completing approximately thirty days work on road construction and maintenance per year. The payment of two dollars per year by an individual waives his obligation. Rua, as a public servant paid a road tax, but Ta'i and Toru were obliged to do road work. Toru, however, arranged to be absent from the village during the organisation of the gang and thus did no road work during the survey period.

Boat work is the other area of regular communal labour. Each district owns a long boat which is stored in a shed at Avarua Landing. On a boat day, the district is required by Island By-law to provide a boat crew and a wharf gang, the former to take the boat out through the reef passage to the ship, to load the boat and return to the wharf, where the wharf gang are required to unload the boat and carry the cargo beyond the reach of waves which lap over the concrete landing apron. The captain of each boat calculates his day's trips, and is paid accordingly by the administration and local trading stores. The crew each receive a share. Ta'i was a regular member of his district's boat crew. Rua worked the boat during weekends, and Toru worked irregularly on the wharf.

Non-Productive Activities

Church attendance, sport, resting and sleeping during the day are included in this category. Sunday is a day of non-activity whether or not a person attends a church service. Public opinion is strongly against any type of work on Sundays, and when an exception was made during the writer's stay, to unload a bulldozer from a ship which could not stay overnight, dissension ran high and the unloading operation was forecast to end in doom. Ta'i attended church all day Sunday from early morning until the evening service. Rua attended irregularly and usually spent Sunday sleeping, or playing cards with neighbours. Toru spent much of his time during the week, as well as on Sundays, visiting and talking with friends. Although older people sometimes complained about such 'idleness', it appeared to be a prerogative of youth

and was certainly accepted as such by the mapu themselves.

The Relation of the Case Studies to Island Patterns

A number of important points arise from the three case studies which can be related to trends which appeared in individual districts around the island.

The first relates to the payment of road tax. Although Rua, as a public servant, paid road tax, it was not uncommon for full time planters to fulfill their road work obligations in a similar manner. It was expected that an examination of all persons in each district paying road tax would show a distinct pattern, relative to the economic orientation of each district. This was not so, however, and the pattern was confused. (see Table XXXVI). The avoidance of road work was a more complex action than a mere choice between two alternatives, giving labour or money. Despite a proportionately higher level of incomes, Keia-Veitatei planters made few attempts to avoid road work by paying a road tax, whereas planters in Ivirua-Karanga, where incomes are the lowest on the island, tended to avoid roadwork to a much greater extent, by paying a road tax. This pattern suggested there was a certain amount of status derived from paying road tax, and that once a number of villagers had paid, others followed, to maintain face. Village leadership was another factor which influenced the efficiency of road work, and such leadership was noticeably lacking in the eastern village. Whatever the factors involved, it is certain that very few planters saw council roadwork denying them time to work on their pineapple plots.

The occurrence with increasing frequency, of wage labour in the area of cash cropping is another important factor. Planters in the sample were questioned on this point and their responses are summarised in TablesXXXVII and XXXVIII. Thirty seven percent of the planters interviewed had made use of wage labour in 1966, although only 16 percent had employed labour to the exclusion of using their kin group. The kin group as labour was most important in Ivirua-Karanga and least important in Tamarua. In the former district a greater degree of traditionalism was experienced than in any other district; thus the tendency to employ family before wage labour is to be expected. The pattern in Tamarua is complicated by a high level of emigration from the district, reducing the size of the kin group available for labouring, and by a number of relatively large pineapple producers who earn incomes in teaching and choose to employ labour and continue in their other occupations. The first factor appeared to be the most important. The greatest degree of integration of kin group labour and wage labour occurred in Tava'enga and Keia-Veitatei, where up to one third of planters interviewed used both types of labour during 1966.

Payment for agricultural labour took one to two forms, either a straight cash payment, or a cash payment plus food.

TABLE XXXVI

NUMBER OF MALES PAYING ROAD TAX, 1967

Occupation	Keia-Veitatei	Tava'enga	Tamarua	Ivirua-Karanga	Mangaia
Public Servants	11	16	9	4	40
PW Labourers	7	6	1	-	14
Ag. Dept. Labourers	5	8	-	-	13
Trader	4	2	-	1	7
Baker	1	-	-	-	1
Shop Assistant	1	-	-	-	1
Planters	8	39	6	40	93
Total	36	71	16	45	168

Source: Mangaia Administration Records.

TABLE XXXVII

SOURCES OF LABOUR EMPLOYED BY MANGAIAN PINEAPPLE PLANTERS, 1966

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%
Kin Group	15	62.5	17	56.5	8	47.2	17	85.0	57	61.6
Paid Employees	4	16.6	2	6.6	7	41.3	2	10.0	15	16.5
Both	5	20.8	11	36.6	2	11.8	1	5.0	19	20.9
Total	24	99.9	30	99.7	17	100.3	20	100.0	91	100.0

Data based on sample.

TABLE XXXVIII

PAYMENTS FOR AGRICULTURAL LABOUR, 1966

	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%
Cash and Food	2	8.3	7	23.3	5	29.4	1	5.0	15	16.5
Cash only	7	29.2	7	23.3	4	23.5	2	10.0	20	22.0
Total Employing Labour	9	37.8	14	46.6	9	52.9	3	15.0	35	38.5
No Paid Labour Employed	15	62.2	16	53.4	8	47.1	17	85.0	56	61.5
Total	24	100.0	30	100.0	17	100.0	20	100.0	91	100.0

Data based on sample.

If cash alone was paid, average payments were two dollars per day, compared with approximately one dollar eighty cents, plus a tin of meat and boiled taro, per day when food was included. No instances were noted where only bush beer and food were offered for labouring in the area of commercial cropping. Such a payment was common in house-building, or the construction of a lime pit, and sometimes in food gardening labour, but in cash cropping, payments were restricted to reciprocal labour, cash and food or cash. With the exception of Keia-Veitatei, the distribution of cash payments and food and cash payments were approximately equal. In that district, cash payments without food predominated. (see Table XXXVIII).

It is noteworthy that neither Johnston nor Bassett (2) found money payments for wage labour a normal occurrence on Aitutaki. (Johnston, 1967, 39). It is suggested that this development on Mangaia is related to the predominant cash crop grown on the island. On Aitutaki citrus and tomatoes are the major commercial crops. Citrus is produced from plantations planted under the Citrus Replanting Scheme and all cultivation except picking is the responsibility of the administration. Tomato cultivation has been grafted on to the existing system of 'rotational bush fallow' which closely resembles the indigenous system of food gardening. An Aitutakian does not need labour for his citrus plot, except during picking, and the time available for picking, up to three or four days, allows reciprocal labour to provide an adequate force when combined with kin group assistance. Furthermore, a lesser proportion of planters in the total population cultivate citrus plots, relative to the rate of pineapple plots per head on Mangaia. Tomato cultivation is sufficiently similar to semi-traditional food gardening to allow traditional methods of raising labour, by supplying food and drink, to operate. (Johnston, 1967). On Mangaia pineapple cultivations are disassociated from food gardening by location, and the bulk of locally grown food is produced from the swamps. Mechanical cultivation is not yet possible in pineapple plots, after the plants have been established. Thus the factors of individual responsibility for pineapple plots, non-traditional and to a large extent non-mechanised cultivation, tend to support a trend towards monetary payments in commercial cropping on Mangaia, whereas the converse of similar factors on Aitutaki influences against paid labour.(3)

A minority of planters engaged themselves regularly as wage labourers in agriculture. An attempt was made to discover the number in each village who worked as labourers in agriculture but results were indefinite. A common form of employed labour is a group of mapu, usually under the leadership of an older youth, who labour together and share their earnings between them.

Care must be taken not to lay too great a stress upon cash payments for agricultural labouring, despite the importance of its development. In 1967 the greatest source of labour

remained the kin group, in particular the nuclear family. A common sight on Mangaia is that of a man and his family chipping weeds on their pineapple plot. On Saturdays it is common for whole families to leave their villages at dawn, carrying food and tools, to work all day on their pineapple plots. If the planter is fishing, the wife and children will work inland, a considerable effort being expected from children over the age of about ten years. This process, in which the extended family can no longer function in its traditional economic role, and breaks down into a number of nucleated groups is termed 'individualisation' by Watters (1968) and has been observed in Fiji and in the Society Islands. (Finney, 1965). As is noted in Chapter Two, this process is in many cases moving beyond the nuclear family, and the household is becoming the most common and important resource utilising unit.

Conclusions

The patterns of labour observed on Mangaia in 1967 portray a community in transition. Despite the growth of more specific occupations, the normal daily activities of a typical Mangaian were diffuse. Of those informants who gave their occupations as being other than planters, only one was not actively cultivating a plot of pineapples, and all provided a substantial amount of the staple foods consumed by their families from their own gardens, in particular, swamp taro. Most Mangaians could be expected to engage during the year in the building of a house or a meeting house, or a canoe, in boat work at the landing, in clearing and planting food crops and pineapple, and in regular fishing expeditions. The variety which such a life holds was valued by a majority of the islanders. None of the informants would agree to the suggestion that if wages were high enough they would give up planting altogether. Many stated they enjoyed planting, but desired other work because more money could be earned in other, regular employment; none wished for full time employment to the exclusion of agriculture. Typical was a Tava'enga housebuilder who viewed the New Housing Scheme as a two-edged sword; although it gave him a higher income, it also denied him the time for other activities. 'I'm tired of building houses,' he stated, 'I want to go and plant now.'

Other factors point to change, however. The increasing incidence of paid labour in agriculture, the breakdown of extended family responsibilities in this area and its replacement by the nuclear family and the household as the primary resource utilising units indicate fundamental changes within the Mangaian community, which reflect a tendency towards greater commercialisation and modernisation.

THE USE OF CREDIT

In a community typified by low incomes and low agricultural productivity, the provision and use of suitable credit

may enable planters with small financial resources to attain increased production efficiency. If credit is coupled with a suitable extension programme and the introduction of more productive innovations, its effects may be greatly enhanced. Credit is often divided into two forms, consumer credit and productive credit. The first may be defined as a loan to enable the purchase of consumer items, and the second a loan for the purpose of purchasing instruments of production. Consumer credit may only maintain long-term patterns of consumption, although in certain circumstances, in particular in the subsistence economy, it may raise production by raising internal demands. Productive credit, by contrast, is usually most effective in a transitional situation, where marginal productivity of new and traditional input is raised, as is the demand for the means to purchase these inputs. (Mellor, 1966, 315).

Credit Agencies in the Cook Islands

The overwhelmingly predominant credit agency in the Cook Islands is the government. From this source both forms of credit are available, although modified by local conditions. Consumer credit is available in the form of loans for the construction of new houses and production credit is obtainable for extending or establishing agricultural plantations. Private money lending and extended credit does not constitute a large proportion of credit available. Cooperative Societies extend credit to members, but no trading banks have been established.

The New Housing Loan Scheme was established on a limited basis in 1957 and amended to its present form in 1960. The scheme is based on a total grant from New Zealand of $300,000, which is made available to the Cook Islands Government at a rate of $40,000 per year. The terms of a loan enable a borrower to acquire through the Social Welfare Department adequate building material to construct a standard design house to the value of $400 or $800. The loan is interest free over the repayment periods of four and ten years respectively, and repayments are arranged by debiting payments due to a borrower for fruit exported, or from wages or salaries.

The Economic Development Loan Scheme was established in 1963 with the aim of providing interest free loans up to $40 or $200 to small-scale growers of export crops. In 1966 the scheme was amended to include all types of crops. Loans up to $40 are available for the payment of expenses incurred in the production of an annual crop, in particular tomatoes. The term must not exceed 12 months and interest at five percent is payable on the balance owing after the repayment period. Loans of up to $200 are allowed only where there is an extension or establishment of a crop which will not mature within two years, with the exception of citrus, which is included in the Citrus Replanting Scheme, a scheme which does not operate on Mangaia. As with the New Housing Loans, Economic Development

Loans give the borrower the right to acquire material, such as fertilisers, seeds or plants, and the use of tractor drawn machinery for clearing and preparing the plantation. Repayment is arranged under a standard agreement which involves debiting the borrower's fruit account, or his wages or salary. Repayment is arranged on an annual basis over three years, the level of annual repayment depending upon the borrower's means.

The Use of Credit on Mangaia

Up to 8 August 1966, 67 New Housing Loans had been actioned on Mangaia, compared with 415 on Rarotonga, 112 on Atiu, 63 on Aitutaki, 32 on Mauke, 3 on Mitiaro and 41 in the Northern Group islands. (Stace, 1966, 23). New Housing Loans were tied to the construction of a standard house, which in most cases was of better standard than the one in which the borrower was living. Although bad debts were avoided by the use of non-cash loans and repayments, this system left many users with little understanding of the process of investment and repayment which they had undertaken. It did, however, provide the means of building a new dwelling without an individual being forced to leave the island to raise the necessary money, and it enabled payment for the new house to come from within the productive sector of the island's economy.

The most serious drawback to the New Housing Scheme in 1967 was the lack of any village-level programme aimed at raising concurrently living standards with the development of new housing. A number of families in recently completed houses were living on concrete floors covered only by mats, with no raised beds, tables or chairs. Cooking and washing continued to be carried out in often unhealthy, semi-traditional detached buildings. Two cases were encountered where a person had constructed a new house with loan money, but had moved back into the old house for reasons of comfort or from a sense of limited good. As one informant stated: 'My old house is not worn out yet, so I will stay there until it is, and my new house will be ready for me to move into.' Many informants living in new houses could give no real reasons for the move. When questioned they answered that their old houses were not cold, were not dirty, were not hard to keep clean and were very comfortable, but all remained adamant that their old houses were 'no good' by comparison to the new house. The occupation of a new house aften gave rise to a demand for furnishings of a higher standard but most Mangaians considered the means to furnish their houses were not available on the island, and some were planning to go to New Zealand to earn the money necessary, defeating one of the scheme's objectives.

The Economic Development Loan Scheme demonstrated fewer disadvantages. Tied to the use of innovations it was succeeding in allowing and inducing a majority of planters to use machinery, fertilisers and new plants, and was thus leading towards a greater efficiency and a higher level of production.

The main problem associated with the scheme was lack of initiative on the part of planters. Many were prompted by Extension Officers to apply for a loan, but when the amount of money approved and the amount actually advanced were compared, it appeared a number of planters were not initiating the second stage of the agreement, the hiring of machinery, the ordering of fertilisers and the collection of planting material. There existed a group of very small producers or subsistence planters who, although they knew vaguely of the existence of the scheme, were not interested in change or innovation and were therefore not interested in credit which enabled them to innovate or improve production.

Credit and Levels of Income

The New Housing Loan Scheme was aimed at the community in general, although it was envisaged it would be of greater assistance to those on lower incomes than those on a higher level. The Economic Development Loan Scheme was established with a stated objective of assisting small producers to increase production. When the number of loans issued were related to the borrowers' incomes it became apparent, that although there existed a fairly equable distribution of loans throughout each income range, proportionate to the total persons in the sample, credit from the Economic Development Loan Scheme tended to favour the higher income groups, that is those persons earning over $1,000 per annum. Only 14.8 percent of the sample earned over $1,000 in 1966, yet 22.2 percent of all loans issued were to this group. Excluding persons earning no monetary income, there were 66.7 percent of the sample who earned less than $600, and 59.2 percent of the loans were held by persons in this income range. Despite the distortion resulting from the small numbers in the higher income ranges, it may be stated that this scheme tends to favour the higher income ranges. (see Table XXXIX).

This pattern is to be expected. As is noted in the preceding section, many low income and non-income planters were unwilling to innovate and so had no reason to seek credit. Persons earning higher incomes are more likely to be interested in ways of increasing their productivity and thus their income. Furthermore, many are likely to be earning wages or a salary, which brings them into contact with money more often than persons receiving income from agriculture alone. These people have a better understanding of the methods of obtaining credit and are more likely to see the advantages of the proper use of credit.

A similar pattern of use occurred in the New Housing Loan Scheme, but in this scheme a higher proportion of low income persons received loans than in the Economic Development Loan Scheme. Because low income planters are less likely to see the long-term benefits of investing in agriculture as opposed to the short-term benefits of a new house, this pattern is also predictable.

TABLE XXXIX

LEVEL OF INCOME AND THE USE OF CREDIT, 1966

	No. of Persons in Sample		%	No. of Persons Using EDL		%	No. of Persons Using NHL		%
2000+	3	3.7	3.7	2	7.4	7.4	1	5.5	5.5
1400-1999	4	4.9		0	-		0	-	
1200-1399	2	2.5	17.1	2	7.4	14.8	0	-	11.1
1000-1199	3	3.7		2	7.4		2	11.1	
800-999	7	8.6	18.5	1	3.7	18.5	3	16.6	22.1
600-799	8	9.9		4	14.8		1	5.5	
200-599	28	34.6	66.7	9	33.3	59.2	9	50.0	61.1
1-199	26	32.1		7	25.9		2	11.1	
Total	81	100.0		27	99.9		18	99.8	
No Income	10								

(a) Econonic Development Loan.

(b) New Housing Loan.

Data based on sample.

The use of credit on a district basis was related to the scheme involved. Keia-Veitatei and Tamarua were dominant in the New Housing Loans. Of a total of 72 new standard type houses counted in the four districts, 32 were in Keia-Veitatei and 18 in Tamarua. Only 15 were located in Tava'enga and seven in Ivirua-Karanga. The relatively high figure for Keia-Veitatei further reflects the non-agricultural orientation of this village, where a greater amount of money is invested into non-agricultural areas than in other districts. The use of credit from the Economic Development Loan Scheme follows closely the pattern established for the use of machinery. This tied credit was utilised to a greater extent in Tava'enga and Tamarua, than in the other two districts.

Conclusions

Since 1963 credit has been available for the construction of new dwellings and the extension or establishment of plantations. Both schemes are tied to specific programmes, the first aimed at raising the standards of village housing and the second at raising productivity through the use of more productive innovations in agriculture. Despite some inherent disadvantages which arose mainly from the associated programme, or lack of it, these credit schemes have been a success. A majority of planters have made use of the Economic Development Loans, and over 70 new houses have been constructed under the New Housing Loan Scheme since its inception.

THE OCCUPATIONAL STATUS OF AGRICULTURE

For a programme aimed at increasing the productivity of a system of agriculture to succeed, it is important the community involved has confidence in the ability of agriculture to provide the means of obtaining what in their view is the 'good life'. In an attempt to gauge the attitudes of Mangaians towards agriculture, informants were asked to name what ambitions they held for their children. All informants were engaged in some form of agricultural pursuit, and the question was designed to enable them to choose between an occupation similar to their present way of life and non-agricultural occupations.

It was notable that no informants suggested any of their children should leave Mangaia permanently in search of a better life. All chose from within the limited range of occupations possible on the island, agriculture, public service, including school teaching, medicine, clerical work and the church, wage labour and higher education. Only 17.6 percent of the sample chose agriculture as the most desirable occupation, and some of these informants had personal reasons for doing so, such as the continued occupation of the family land. Of the 91 informants, 47 chose the public service and a further ten chose higher education, with the long-term objective of entering the public service. Altogether, 63 percent of informants chose these two occupations. A minority chose wage labouring.

Notably, nobody chose trading. When questioned planters said they thought this was an unattainable occupation, for one had to be very clever to be a trader, while others thought traders too 'mean'. Sixteen informants offered no choice.

In Tava'enga, the most commercially oriented district, only 6.7 percent of informants chose agricultural occupations, compared to 25 percent in Ivirua-Karanga, the most traditionally oriented district. In both districts the choice of public service was about equal, but in Tava'enga there was a far greater recognition of the advantages of a good education. (see Table XXXX). Choices in other districts follow the pattern demonstrated in Ivirua-Karanga, although some informants chose higher education which was not the case in Ivirua.

Over half of all informants chose the public service because they related this occupation with a higher and more regular monetary income. All but one who selected higher education, did so because they associated education with increased incomes. Only three out of 16 persons chose agriculture for similar reasons. Most related agriculture with a source of subsistence and a source of monetary income. Most of these people stated they thought it wasteful to buy food when it could be grown on the island, but one needed some money in life to buy certain goods, and agriculture could supply both needs adequately. Nine informants hoped their children would enter an occupation which would enable them to 'help people have a better life on Mangaia.' Whether this was a rationalisation of a latent desire for a child to have a greater earning ability is uncertain, but all related this reason to either public service or higher education.

Sixteen persons were unable, or refused, to answer this question. Many thought about a response for a minute or two before slowly shaking their heads and saying they did not know. These responses indicated an inability to imagine their children as adults in a place or time disassociated with the present. Two informants could see no reason for a response and replied fatalistically, 'What difference will what I say make, he will be whatever he will be.' One woman refused to answer on the grounds that this was no question for a woman to answer, as it was a man's affair to decide what he wanted his children to be.

Conclusions

A number of important points arise from the responses to this question. First it quickly became obvious that most Mangaians considered agricultural occupations as 'second best'. Agriculture has always been there and would always be there, and children who were not lucky in life could always return to it in the knowledge that at the worst it would provide subsistence. This loss of status of agriculture as an occupation was related to two factors, first, to the past

TABLE XXXX

OCCUPATIONAL STATUS, 1967

Note: Response to the question, 'What do you think would be the best work for your son (or, if the interviewee had no children at pre-school or school age, 'that child there') when he grows up to be a man?' and 'Why do you say this work is the best work for him?'

MANGAIA

Reasons for Choice

Choice of Occupation	Higher Incomes	Service to the Community	Would Enable Persons to Live a Better Life	Person Can Grow Food & Earn Money	Family Land Must Be Occupied	Don't Know	Total	Percentage of Total
Public Service	25	8	7	3	-	4	47	51.64
Agriculture	3	-	1	8	2	2	16	17.58
Higher Education	9	1	-	-	-	-	10	10.98
Wage Labour	2	-	-	-	-	-	2	2.19
No Response	-	-	-	-	-	16	16	17.58
Total	39	9	8	11	2	22	91	100.00
Percentage of Total	42.8	9.9	8.8	12.1	2.2	24.2	100.0	

Data based on sample.

TABLE XXXX (Continued)

TAVA'ENGA

Reasons for Choice

Choice of Occupation	Higher Incomes	Service to the Community	Would Enable Person to Live a Better Life	Person Can Grow Food & Earn Money	Family Land Must Be Occupied	Don't Know	Total	Percentage of Total
Public Service	10	4	1	3	-	2	20	66.6
Agriculture	1	-	-	1	-	-	2	6.7
Higher Education	5	-	-	-	-	-	5	16.7
Wage Labour	-	-	-	-	-	-	-	-
No Response	-	-	-	-	-	3	3	10.0
Total	16	4	1	4	-	5	30	100.0
Percentage of Total	53.4	13.4	3.3	13.4	-	16.6	100.0	

IVIRUA-KARANGA

Reasons for Choice

Choice of Occupation	Higher Income	Service to the Community	Would Enable Person to Live a Better Life	Person Can Grow Food & Earn Money	Family Land Must Be Occupied	Don't Know	Total	Percentage of Total
Public Service	7	2	3	-	1	-	13	65.0
Agriculture	-	-	-	4	-	1	5	25.0
Higher Education	-	-	-	-	-	-	-	-
Wage Labour	1	-	-	-	-	-	1	5.0
No Response	-	-	-	-	-	1	1	5.0
Total	8	2	3	4	1	2	20	100.0
Percentage of Total	40.0	10.0	15.0	20.0	5.0	10.0	100.0	

Data based on sample.

inability of agriculture to satisfy the growing desire for an improved standard of living, and the second, to the establishment of a 'white collar' administration of seconded Europeans. Mangaians had become increasingly frustrated by the inability of agriculture to meet their needs, while concurrently there was growing an occupational group which could give an individual both a higher and more regular income and status. Further, because of the close association between the public service and the European 'way of life', and the higher educational levels required by an individual who wished to enter the service, a new elite began to emerge, and it was this group that many parents desired their children join.

A second point of interest was the qualification the majority of parents put on their responses. Almost all who chose public service occupations or higher education added 'if he is lucky' to their answer. Although there was general agreement that hard work may assist a child in achieving this ambition, most informants repeated that 'luck' was the most important factor involved. Parallel to these responses were those which suggested trading was an unattainable occupation because a person had to be 'very clever' to be a trader. This suggests there is in operation within the community a phenomenon named by Foster (1965) 'limited good', which he claims explains much of the conservative nature of traditional and peasant societies. Individuals cannot improve their positions in life despite hard work, because there exists within their world a limited amount of success all of which is the occupation of successful people. It is of note that a greater proportion of Tava'enga informants thought it desirable that their children should have a chance of higher education and the accompanying chance of success, compared to informants in Ivirua-Karanga. There appeared to be less reliance on fate in the Oneroa villages and more reliance upon skill, a reflection of a less traditional nature.

Despite the low status of agricultural occupations, there was developing within the community an awareness that a person could earn a good monetary income from commercial agriculture. This awareness was due mainly to the successes of a few individual planters who by managerial skill, a readiness to innovate and an investment in agriculture as a long-term venture, had raised their productivity to a level where it provided an income equal to that received by most public servants. A contributing factor was the willingness of public servants and other wage earners to continue investments in agriculture as a source of supplementary income, and the expression of an opinion by some that they were considering agriculture as a full time occupation. The great love Mangaians expressed for planting and growing food and cash crops indicated they did not consider agriculture a menial type of labour, but that they considered it could not, in 1967, provide them with the means to raise living standards.

COMMERCIALISATION AND THE PERCEPTION OF PROBLEMS

In the traditionally oriented community, there exists a characteristic conservativeness, 'in the sense that there is rarely a wish to reject radically any of its major institutional elements and substitute others.' (Firth, 1963). If changes are accepted by or are forced upon the community, repercussions may occur. The monetisation of a traditionally non-monetised economy may result in the sweeping away of many old values and the partial or total destruction of traditional institutions. Members of the community must be prepared 'to subject themselves to a new discipline, or at least to choose between the benefits which may accrue from change and some types of satisfaction enjoyed hitherto.' (Firth, 1963).

The decision to accept change involves a 'cognitive reorientation' by the members of the community, a reorganisation of the way in which they perceive the structure of their physical, social and cultural surroundings. In the traditional society an individual has little control over natural and social phenomena but accepts adversities as unavoidable and expected facets of life. For change to occur, the individual must gain a new perception of his natural and social environment. He must begin to question his lack of control over some areas of the physical environment and his past acceptance of traditional values and mores.

As is noted in the preceding section, personal ambition in the traditional community is rare, and acceptance of 'one's lot in life' is normal. But in the transitional situation, more and more individuals begin to perceive of a future as distinct from a day to day existence, and in this new dimension, ambitions and goals may be formed. Goals may be limited at first, such as the goal of owing one's own bible, but however small, the creation of a goal is important. In attempting to attain the goal, further changes in cognitive structure may be required, especially where a barrier blocks direct attainment. For example, low soil fertility or heavy village reciprocal labour obligations may block the attainment of a goal until the individual concerned discovers a new technique or rejects a traditional value. If no new technique is forthcoming, or the individual finds traditional values too strong to reject, he may forget the goal, or he may react with frustration and tension which could impair his ability to change or find a satisfactory solution to the problem. An incorrect perception of the original impediment may result in a similar circumstance, as the related cognitive reorganisation is unsuitable for the achievement of the goal. (Kretch & Crutchfield, 1948, 111- 145).

Two questions included in the questionnaire were designed to test informants' perception of problems existing on Mangaia in 1967. A high frequency of accurate responses it was assumed would indicate a tendency towards rapid reorganisation of knowledge, thoughts and perceptions of the changing situation on the island, and a subsequently greater potential for success

and further change, whereas a large number of non-accurate responses would indicate that for some reason the population lacked the ability to efficiently reorganise cognition in the face of change. Non-perception of problems indicates a clinging to traditional values and a refusal to acknowledge changes which had occurred but which are viewed as undesirable. The first question was related to problems faced in the growing of cash crops and the second to problems which were affecting the island as a whole.

Problems Related to Cash Cropping

The major impediments to increased production of pineapples were, as stated by Bell (1966) and Bambrick (4), poor weed control causing loss of fertility, mealy bug infestation, trace element deficiencies resulting from poor fertilising and a lack of large scale mechanisation, limited by the small and scattered nature of plots and shortage of suitable machinery. Both observers were experienced Australian pineapple growers, who were commenting on the practical problems of increasing production. To the Mangaian planter, many other problems including social and cultural difficulties were more dominant than practical difficulties of increasing production. (See Table XXXXI).

Of the problems listed above, only weed control featured as a response to the first of the two questions presented to informants. Twenty eight percent of informants named weed control as the problem which caused them the greatest amount of anxiety. Other problems were largely immediate nuisances, wandering stock, vermin and one case of erosion. Four persons discussed inadequate returns for labour input and a lack of land suitable for the expansion of pineapple plots. These responses appeared to be offered as excuses for an inability to improve production rather than real problems, although this may have been an incorrect impression. Twenty three percent of the sample either stated there were no problems associated with their pineapple plots, or could not make a response to the question.

The important feature of all responses was that they showed a poor perception of actual problems involved in growing pineapples. Two main factors influenced most planters who stated weed control was their main problem. First there was a psychological stress resulting from the choice they were constantly being called upon to make; to leave weeding in favour of more satisfying semi-traditional activities and accept the loss of income which would inevitably result, or give up these other activities in order to receive the benefits of a higher monetary income. The second factor resulted from the activities of the Extension Officer. As is related elsewhere, new Cayenne plants were distributed from the government farm to growers on the verbal conditions that adequate weeding would be undertaken. If the weeding was not carried out, the Officer, when he saw an offending planter in the village, would lightly reprimand him, often before his peers. This

situation brought great embarrassment to offending Mangaians, who, because of other obligations or of choice, rational to the individual concerned, could not or would not weed their pineapple plots. Many who knew they were expected to weed plots, but had not, went to what appeared to an outsider as childlike and slightly ridiculous efforts to avoid meeting the Officer in public. Where there was more likelihood of a person meeting the Officer, there was a higher frequency of responses. Planters in Keia-Veitatei, whose plots line the track from the village to the government farm registered the highest frequency of responses, while planters in Ivirua-Karanga who tended not to be visited by an Extension Officer, recorded a low frequency of responses. (see Table XXXXII).

The problem of wandering animals was controlled by an Island Council By Law, but few offending owners were fined and few pigs shot. Almost every villager owned a pig and it was feared by many that if they shot their neighbour's pig when it rooted up pineapples or ate the fruit, the situation would snowball, until few animals would be left alive. Many stated they felt it to be the responsibility of the Resident Agent to destroy wandering animals. In the past when Resident Agents have shot pigs, the situation has improved immensely. However, both this response and that relating to vermin appeared to be responses stimulated by the question, and about which there had been little previous thought, or anxiety.

Informants who stated they had 'no problems' had undergone very little cognitive reorientation. Their perception of their surroundings had been changed little by the intensification of cash cropping on the island and they remained resistant to all but superficial change.

On a district basis, the most extensive changes in perception had taken place in Tava'enga, and decreased relative to the distance from Oneroa village. Over one half of all informants in Ivirua-Karanga could see no problems associated with cash cropping, compared with only 20 percent in Tava'enga.

Problems Related to the Island as a Whole

Problems which gave greatest concern to Mangaians may be divided into three categories, economic problems, social problems and physical problems. (see Table XXXXIII). Economic problems were related to the general lack on the island of the means to earn what was considered a satisfactory living. Social problems covered a wide range, in which moral issues were predominant, but in which a minority of informants named some important impediments to future progress, lack of education and emigration. An interesting response from younger informants, all of whom had been away from Mangaia for long periods, was that of conservatism in the community. Physical problems included the continual difficulties associated with isolation and poor transport facilities. A slightly higher proportion of informants gave no response or stated the island

TABLE XXXXI

PERCEPTION OF AGRICULTURAL PROBLEMS, 1967

Problems	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%	No. of Planters	%
Weeds[a]	9	37.5	9	30.0	3	17.7	5	25.0	26	28.6
Erosion[b]	2	8.4	1	3.3	-	-	-	-	3	3.3
Vermin[c]	1	4.2	4	13.5	2	11.8	-	-	7	7.7
Wandering Stock[d]	2	8.4	4	13.5	2	11.8	3	15.0	9	9.9
Inadequate Returns For Labour Invested	-	-	2	-	-	-	-	-	2	2.2
Lack of Suitable Pineapple Land	-	-	2	-	-	-	-	-	2	2.2
Miscellaneous	6	25.2	1	3.3	2	11.8	3	15.0	12	13.2
No problems Recognised	8	33.3	6	19.8	7	41.3	11	55.0	21	23.1
Total	24	100.0	30	100.0	17	100.0	20	100.0	91	100.0

(a) Refers to the rapid growth of weeds and the inability, lack of time or drudgery of dealing with the problem.

(b) Informants complained of loss of top soil between pineapple rows, and rilling.

(c) Rats and mice eating small holes in fruit result in complete loss through rotting or rejection by fruit inspectors.

(d) Untethered or escaped pigs and horses damage plants and fruit by rooting out young plants and eating the fruit from mature plants.

Data based on sample.

TABLE XXXXII

NUMBER OF PLANTERS VISITED BY AGRICULTURAL EXTENSION OFFICER, 1966

	Keia-Veitatei	Tava'enga	Tamarua	Ivirua-Karanga	Mangaia
Visited	13	23	5	6	47
Never Visited	11	7	12	14	44
	24	30	17	20	91

Data based on sample.

TABLE XXXXIII

PERCEPTION OF ISLAND PROBLEMS (a)

Responses	Districts									
	Keia-Veitatei		Tava'enga		Tamarua		Ivirua-Karanga		Mangaia	
Economic Problems;	No.	%	No.	%	No.	%	No.	%	No.	%
Insufficient returns from cash cropping	-		6		-		2		8	
Lack of earning opp-ortunities	2		1		2		1		6	
General lack of money to live with	7	37.5	2	30.0	6	47.0	3	30.0	18	35.2
	9		9		8		6		32	
Social Problems:										
Drinking, working on Sundays, sexual immor-ality, laziness	4		3		2		3		12	
Lack of education	1		-		-		-		1	
Conservatism in the Community	1		1		-		1		3	
Emigration	-		-		1		-		1	
Land Administration	-		1		-		-		1	19.8
	6	25.0	5	20.0	3	17.6	4	25.0	18	
Physical Problems:										
Lack of transport, harbour facilities, water supply, roading, isolation and lack of fertile land	4	16.6	7	23.3	2	11.7	1	5.0	14	15.4
No Problems	2		8		4		5		19	
No answer or 'Don't know'	3	20.8	1	29.9	-	23.5	4	45.0	8	29.6
	5		9		4		9		27	
Total	24	99.7	30	99.8	17	99.5	20	100.0	91	100.0

(a) Responses to the question, 'What are the worst things about the life here on Mangaia, the things which worry you the most?

Data based on sample.

had no problems, compared with responses to the first question.

Responses falling into the first category, economic problems, reflected a general dissatisfaction with existing conditions, rather than a clear perception of the causes of such conditions. The canning company on Rarotonga, or the Cook Islands Government were usually named as the agencies most responsible for the conditions. Bitter accusations were made of corruption, profiteering and deliberate refusals to accept all the island's fruit on the part of the factory, and a plot between the two to defraud Mangaians was mentioned by a number of informants. At two meetings of the newly formed Mangaian Pineapple Growers Association, many planters who spoke against the company or the government, showed a complete lack of appreciation of the actual difficulties facing the company and the island. Such responses did, however, indicate a change in the perception of what was considered an acceptable level of living by many informants, and the formation of ambitions by the same individuals, relating to better housing, more consumer goods and more imported foods. A number of informants made statements similar to that made by an older man who said, '...with money you can do what you want. You can build your own house. Without money you don't know what to do....Yes, you can live without money, but there are little things, bread, sugar, flour and soap for washing. Without these things you cannot be a human.' As with many informants, this man's perception of the minimum level at which he was prepared to subsist, now included money as a necessity of life rather than merely a supplement.

Two-thirds of the informants who named social problems responded to the question in a characteristic traditionalist manner. Informants were worried by deviations from what they considered to be the norms of Mangaian society, norms established as the result of missionary influences on contact on Mangaian Society. The remaining one third touched upon significant problems facing the island, conservatism, lack of education, emigration and land administration. Three younger informants, all below 35 years of age saw conservatism as the island's greatest problem and personally, the problem which gave them the greatest anxiety. As one said, 'Mangaians refuse help to do things they cannot do well themselves, because they are too proud. If I try to do something different, the older men tell me it will not work, and wait for me to look silly in front of them.' A school teacher and local political leader thought low standards of education were providing the most significant barriers to progress, and that even if transport facilities were improved, Mangaians would be generally unable to take advantage of them because of their inadequate education. A Tamaruan informant pointed to the deserted house sites near his own dwelling and said, 'There is the worst thing about this island. All of our children are leaving. Some are returning but many are not and now there are not enough in this village to do the work.' Only one informant, a Rarotongan married to a Mangaian, thought land administration

was the most serious problem. After two land disputes, one over planting land and another over his house site, he was very nervous of disputes over other land, although both Aronga Mana decisions had been in his favour. It was the arbitrary manner in which judgements were made which disturbed him, and he thought there would 'soon be much trouble.'

Only 15 percent of informants named physical problems. It is probable that a number of these responses were influenced by discussions heard during political meetings held during the time of the fieldwork, which were related to improving the Mangaian landing facilities. Many of these informants answered glibly and with little thought.

Negative responses were divided between those who said emphatically, 'There are no problems here, everything is good' and those who gave no response. Where it appeared the question may have been misunderstood it was asked again, in a different way, but although informants were helpful and interested in other questions, none changed their response after requestioning. As with the first question, the most frequent demonstrations of inaccurate or non-existent perception of problems existed in Ivirua-Karanga, while in other districts distribution was even, although for reasons not understood, Tava'enga district was considerably above the other two districts, Tamarua and Keia-Veitatei.

Conclusions

Responses to both questions demonstrated that a majority of Mangaians, although faced with problems which gave rise in them to anxieties and tension, were unable to name actual problems which were impeding the processes of modernisation. Notably there was a more accurate perception of actual problems related to the island as a whole than there was of those related to agriculture. This was probably because there was greater public discussion of the former problems, but it was also a reflection of the lack of comprehension of the new technology required to produce commercial crops for fresh markets or for factory processing. It was apparent that most Mangaians were dissatisfied with present living conditions, although few could suggest practical ways of improving them. Such a growing body of dissatisfaction is indicative of potential change, providing suitable social and economic assistance is forthcoming. If not, dissatisfaction may result, as in the past, in emigration providing the outlet for a frustrated population.

Approximately one quarter of the sample showed little or no indication of cognitive reorientation. For these people, the 'traditional mission' social values and attitudes remained meaningful, despite a steady encroachment by commercial values and modern influences. These attitudes typified the traditional elite and older church members.

ENTREPRENEURIAL ACTIVITY

The processes of cognitive reorientation discussed in the preceding section are further demonstrated by the existence of entrepreneurial activity in the community. Schumpeter sees as the defining characteristics of entrepreneurship 'simply the doing of new things, or the doing of things in a new way.' Thus entrepreneurship involves a creative response to one's environment. When such a response is stimulated by changes introduced from outside of the community, as is the case in all Polynesian communities, those persons who can efficiently and rapidly reorganise their cognitive structures are more likely to begin 'doing new things' than those who cannot reorient. The doing of things in a new way involves a deviance from the normally accepted social and cultural behavior of the society and for this reason deviance is most often a characteristic of 'marginal men' (Park, R. E., in Hoeselitz and Moore, 1963), who because of their 'ambiguous situation from a cultural, ethnic, linguistic or social structure standpoint, are strongly motivated to make creative readjustments in situations of change', that is to make rapid cognitive reorganisations. The success of a community as a whole in making adjustments to change depends to a large extent upon the existence in the community of individuals who are potential deviants, of institutions which may sanction certain types of deviance and allow it to undergo 'institutionalisation and routinisation', and the strength of sanctions against deviant behaviour.

The Potential for Deviance on Mangaia

Since original European contacts with the island, missionary, colonial and commercial activities have led to the creation of conditions within the Mangaian society, which tend to favour the appearance of entrepreneurial activity. Traditional social stability, it is suggested by Sahlins, was upset by original contacts with Cook and other early Europeans. (Sahlins, 1958, 174). Later missionary activities led to the destruction of most indigenous religious institutions, institutions which influenced all other sectors of the society. Commercial activities were stimulated by whaling and trading contacts, and ascribed elite entered into such activities with ease. But because this group was traditionally responsible for the administration of resources their commercial activities would be better termed 'structural differentiation' than entrepreneurship. The establishment of the New Zealand administration, resulted in the creation of an occupational elite, (school teachers, medical officers and administrators) and a subsequent loss of status by ascribed elite. The creation of a governing institution and the related public service gave rise to an institution which sanctioned certain types of deviance, as well as causing social disaffection among youngermembers of ascribed rank groups. Finally, repeated failures of traditional occupations to provide a means of livelihood in the face of increasing contacts with a commercialised, modern economy created conditions in which deviance

was more likely to be accepted if it occurred. Undoubtedly, the relatively free access to New Zealand by Mangaians, particularly after 1945, meant that many potential deviants were lost to the community, but many individuals who found themselves in an 'ambiguous' social situation, remained resident on the island.

Four Mangaian Entrepreneurs

Not all persons who find themselves in an ambiguous social situation have the ability to readjust or reorient, and despite the existence of conditions which would favour the emergence of deviant behaviour, the existence of entrepreneurial activity within a community depends upon the existence of individuals who have the ability to change. Presented below are four case studies of Mangaians who were demonstrating entrepreneurial ability in 1967. No attempt is made in these studies to state definitely why these individuals demonstrated this ability, as the period of study was too short and the writer's competence in this field is in question. The studies are presented primarily as examples of the manner in which individuals have made a reassessment of the social and natural resources of their environment, and have used them in a new way, within the framework of the island community.

Case Study A

A resides in Tava'enga village and is the most dominant personality on Mangaia. Aged between 50 and 60 years, he was born an only child and the grandson of a rangatira of Maro tapere in Tava'enga district. The rangatira title was transferred to his grandfather's brother shortly after A's birth, for reasons which neither family would disclose and although A was never heard to mention the matter, it was held as common gossip in the village that he believed the title should be in his family.

Following his primary education, A was allowed to remain at school as a pupil teacher and later he received further education on Rarotonga. During his teaching career, he began a bakery, employing a baker to produce bread which he sold from his home in the village. Gradually small items of consumer interest were added to the shelves in his home, and A began part time trading in local agricultural produce, citrus, tomatoes and taro. When the trade at the store became too large for his wife alone to handle, A left school teaching and became a full time trader. Throughout this period A was cultivating taro, tomatoes and citrus, on family land in Tava'enga.

Because he was an only son, A inherited all the land held by his father. Despite the loss of the rangatiraship, he began judiciously accumulating relatively large amounts of land from other less active relatives until he and his side of the family held the bulk of planting land in Maro tapere. Many

villagers spoke of his influence in land matters, in particular his influence with the Aronga Mana. When pineapples were reintroduced into Mangaia in 1946, A immediately began planting them in Maro and following the introduction of Smooth Cayenne variety A purchased through the Agriculture Department, over 2000 plants, the nucleus of his present plantings.

A purchased one of the first privately owned trucks on the island and later bought the only privately owned tractor, both of which are hired out to other planters. A's store, the largest on the island, sells a wide range of products. Behind the store is a large hall, in which A runs dances and cinema shows. The shop and hall are served with electricity produced by a diesel powered generator, also the only privately owned generator running on Mangaia. A spends a great majority of his day sitting behind the counter of his store, writing letters, paying accounts and ordering goods. His store holds numerous agencies for overseas firms, including motor vehicles and motor cycle agencies.

After the establishment of the Legislative Council on Rarotonga, A stood for and won the Mangaia seat. He remained one of the two Mangaian members of the Legislative Assembly and thus spent much of the year resident in Rarotonga, attending the Assembly. In 1964 he travelled to United States and other Pacific countries on a United Nations sponsored trip to study government in these countries. He was an ex-officio member of the Mangaia Island Council and with the other Legislative Member, tended to dominate discussion and lead the Council.

A has only one child, a son who is about 35 years old. A's son, in contrast to A, has almost nothing to do with island or village affairs. Also an ex school teacher, this man manages the store and the pineapple plantations while A is away in Rarotonga. A's son is married with nine children and has recently moved into a new concrete house nearby his father's dwelling. An extremely intelligent person, A's son refuses to mix with most villagers, and chooses to make most of his interpersonal contacts with the resident doctor, a Cook Islander from Pukapuka. Although as a child he cultivated vegetables and raised pigs, A's son has no pigs nor poultry, and pays labourers to cultivate his taro. His own family plus labourers work on the family pineapple plots, but he rarely visits the plots, except when planting or harvesting is to be carried out. A's son has never travelled outside of the Cook Islands, but despite his limited experience, he has a wide knowledge of conditions in New Zealand, especially market conditions and standards of living.

A is generally respected on the island, though disliked. Over the last few years a number of incidents, in particular a land dispute and the closure of the pineapple drying factory, have caused him to experience some disfavour with islanders. As the dominant trader on Mangaia he appears unwilling to allow any further competition, and is accused by general village rumour of

threatening other islanders who become a potential source of competition. It is recognised, however, that in the past his leadership and public spirit have been invaluable.

Case Study B

B is a half blooded Tahitian and was born on Borabora in the Society Islands. B's father was a Mangaian who had left the island as a young man, travelled to Tahiti, married and later, with his wife and family, returned to Rarotonga where B spent his early childhood. When B was about six years old, his grandfather, a rangatira on Mangaia, went to Rarotonga and returned with B to Mangaia, where B lived in his grandfather's household. At his grandfather's death, the rangatira title was transferred by the Aronga Mana to B and he held the title in 1967.

As a young man just out of school, B took a casual labouring job with the Public Works Department, and began planting in his spare time. He gradually increased his annual tomato plantings until it was not worth his while to take labouring jobs, and he became a full time planter. When pineapples were reintroduced, he began a plot well up on the lower fern slopes in Keia, using fertilisers. With permission from his neighbouring rangatira he extended his plot over the tapere boundary. Since then he has extended the plot a number of times without permission and over half of the plot is out of his tapere, on land to which he has no right to plant. B is not worried by this, as his long use of area has established his right, in his interpretation, to remain in occupation. B is one of the four largest producing pineapple growers on Mangaia.

B has 12 children, seven of whom are living at home. His eldest son is in New Zealand working in an Auckland freezing works. Previously, this son had been joined by another brother, and together they earned enough money to purchase a modern three ton truck, which the younger son brought back to Mangaia, and drove. B showed no interest in learning to drive the truck, and he refused to allow his son aged 19 to return to New Zealand as there would be no one to look after the vehicle or drive it. B himself has only been to Makatea outside of the Cook Islands. He used the money from a year's labouring there in 1949 to provide the basic materials for his house but now states this was the wrong way to do things.

B thought most Mangaians were 'stupid people' because they worked for years in New Zealand to get money and then put it into a house where it was 'a dead thing'. If they put their money into pineapples, B was certain they would make a profit and then they could build a house. Although he stated he did not like 'all this loaning business', B had borrowed from the Economic Development Loan in the past. Now he was owed money which he had lent to fellow villagers. B thought of himself as a 'successful planter', and although he sees agriculture as

the best future occupation for his younger children, he is considering sending them away to school in New Zealand, where he thinks they will have a better chance to 'live a good life'. Despite this view, he is in no doubt that for himself, there is a better future on Mangaia than anywhere else.

Apart from his duties as a rangatira, B takes very little part in communal activities. He is seen by most villagers as easy going, and is respected for his success as a planter.

Case Study C

C is also not a full blooded Mangaian. His mother was a European, the daughter of a trader who had been once resident on the island. C was brought up away from the village in a house isolated from other families and as a child spent a relatively large amount of time on his own. The oldest child, he left Mangaia for New Zealand when in his early twenties, returning to the island a number of times. While in New Zealand he worked on construction sites as a builder's labourer, where he learnt the rudiments of building. On his final return to Mangaia, C married a Mangaian woman and now has three small children. He lives on the outskirts of Tava'enga village in a traditional style dwelling, although he has ordered building material from New Zealand, with which he is planning to build a new house.

C has made use of his previous building experience in constructing new houses built under the New Housing Loan Scheme. He contracts to build the houses for $400 each and no labour is required from the owner of the house. C employs two other men, one his brother, and he pays both two dollars each day in wages. Usually the men travel home on foot for meals and thus no food is involved in the payment. Construction involves first making the concrete blocks, then the laying of foundations and the erection of the walls, followed by the roof frame and iron. Each house takes approximately two months. In weekends and other days during the week, C travels inland on foot to his taro plots and a new pineapple plot which he is preparing. He has made use of the Extension Officer who has surveyed his land and laid out the position of two blocks of pineapples. Following this C hired a tractor and disced the ground in preparation for planting. With his mother he cares for a few citrus trees, mainly limes, which he uses for domestic consumption.

C keeps in close contact with the outside world. He listens regularly to his radio and receives copies of a New Zealand left-wing periodical sent to him by a former seconded New Zealand school teacher. Despite this, he plays almost no part in village activities. On special occasions such as village sports days he usually goes inland to his plantations. He laughs at his wife's need to gossip and mix socially with the village women, and grumbles good naturely at his brother's relationship with a village girl. C takes no part in boating activities although he lives not far from the landing, and does

not do road work, but pays a road tax. Like B, he too thinks borrowing money to build a house is not the best way to build. C has sent money earned from the construction of other people's houses, to New Zealand with an order for building materials from a company with which he is familiar.

Case Study D

D manages a store for a large trading company. Aged 44 he is married with eight children, all under the age of 15 years. D has no traditional rank. He had taken a job as a labourer for the European manager of the store after leaving school and had worked for him for almost ten years. After the manager fell ill, D ran the store under his instructions and later was appointed as full time manager on a salary a little over $1,000 per annum. When the company built a new store, D moved his family out of their old house into the store, and after borrowing $800 from his employers and $400 from the New Housing Loan, built a new house on the edge of Kaumata village. However, D and his family remain in the store, for why, he says, should he wear out his house when he can live in a good building like the store and be near to his work as well. D's wife is a school teacher at the local primary school, and her sister stays in the shop and cares for the children while D and his wife work. D employs men to clean around the shop, as well as to labour in his plantations, for he thinks the two salaries coming into the household are more use than if his wife cared for the shop and he worked.

D employs men to cultivate all his plantings. Two and sometimes three men from Karanga were employed in his taro plots during the period of the survey, planting taro pa'i. D has more plots than usual for he sends some cases of taro to Rarotonga to be sold on his behalf in the market there. He also had half an acre of kumara growing on the edge of Temakatea village, which is solely for marketing. He is increasing his one acre of pineapple by discing another plot further up the fernland slopes in Veitatei. D has no wish to buy a tractor or a truck to assist in these cultivations. He believes a truck could not be run for enough profit without plenty of hire work, and with 'everybody buying a truck' he thought truck hire prices would very soon fall. Then it would be much cheaper to hire than to own. When tomatoes were grown on the island D organised shipments on behalf of his employers. In 1967 his activities were limited to taro exports, and most villagers were forced to purchase new cases from him if they wished to send taro, bananas or pineapples to relatives or to the market in New Zealand, as he had the only supply open to casual exporters.

People in his village do not like D very much. He is too 'mean' according to most, while his affinial relatives dislike him because he refuses them discount on their groceries. D takes part in no village activities, but spends much of the day sitting in his shop or on the step talking to older villagers,

in particular the kavana of Veitatei, to whom he shows a great deal of favour. He shows no anxiety at being generally disliked, and identifies with the island community to a very small extent.

Conclusions

All of the case studies show a reassessment of the social and natural resources of their environment. All show some degree of anomie in their relationships with their families and the island society in general. All except A show disregard for village communal activities (A, in his relationship with the villages gains a great deal of status from his position as Legislative Assembly member). All show disregard for most family obligations. All pay labour rather than entering into reciprocal labour agreements, but when familial obligations can be used to their advantage all attempt to use them. Traditional land tenure agreements are used by A and C to gain more land to the disadvantage of their relatives, or to other islanders. D is prepared to use his sister-in-law to care for his children, but he refuses to allow her family reduced prices for their purchases. None of the cases identify closely with the village, although all think their greatest future lies in staying on Mangaia. B in particular made a number of ambivilent statements, deprecating normally accepted village behaviour after admitting he had taken advantage of the opportunities it offers.

All view their natural surroundings as a source of profit if careful investments are made. Agriculture is seen as an investment rather than a traditional occupation, but all but one are involved in non-agricultural activities as well. A shows the greatest appreciation of the opportunities offered by the changing situation on the island. His purchase of machinery and the construction of an electrically serviced dance hall and cinema demonstrate this. The others have taken advantage of smaller areas of the changing island environment, house building, cash cropping and trading, whereas A is involved in a broader sector of the economy. Neither A nor D involve themselves in traditional agricultural activities solely for the sake of providing food. Both sell taro and D is preparing to sell ku'ara in Rarotonga and New Zealand. Both employ labour in the cultivation of these crops.

It is most probably not a coincidence that all of the case studies have unusual backgrounds. A is an only son and a schoolteacher, B a part Tahitian, C a part European, son of a trader and D has lived under the tuition of a European trader for much of his youth. Of the cases, only B has specified traditional responsibilities, and he is the least deviant. The others are to a large extent in an 'ambiguous' social situation, which allows and motivates them to innovate and deviate from the accepted norms of the Mangaian village. All feel 'different' from ordinary Mangaians, and are seen as such

by most islanders. Although many villagers expressed a dislike for these men, in particular those involved in trading, their status in the community is high. They earn high and regular incomes, they are successful planters and they hold positions of power. Their agricultural successes are an important demonstration to other planters, who recognise that cash cropping can result in increased incomes. In this regard, these cases are more successful in their re-assessment of their natural environment than case studies presented by Johnston from Aitutaki. Only one of Johnston's cases showed an inclination to invest in agriculture, whereas all the Mangaian cases are involved in cash cropping, one to the exclusion of other activities, except truck hire. (Johnston, 1967, 100).

All of the Mangaian case studies are drawn from the Oneroa villages, and are chosen to demonstrate what is subjectively interpreted as examples of typical stages of development of entrepreneurship on the island. Only one other person of A's ability lives on the island, in Kaumata village. One or two other persons approaching B's level of development exist, one in Ivirua and one in Tamarua. (The individual who resides in Ivirua presents a complex case of personality difficulties, and frustrations which are expressed by a high degree of drunkeness). One other person builds houses on the island, but he is not as individualistic as C and works more erratically, combining traditional incentives with cash payments for his fellow labourers. Apart from these persons, few individuals show any entrepreneurial skills.

CONCLUSION

An assessment of the criteria presented in this chapter indicates that the Mangaian agricultural system is becoming committed to commercial agriculture. Despite serious setbacks during the last ten years, Mangaian planters have persisted in cultivating pineapples and in 1967 the great majority of planters had at least one plot under cultivation. Productivity has increased, the proportion of the island's monetary income derived from agricultural exports has increased, productive innovations have been generally readily accepted, patterns of labour are changing, with increasing individualisation of responsibility in the area of cash cropping and the growth of wage labour in this area. Mangaians have made use of credit facilities tied to technical changes. Although the majority of the population hold agricultural occupations as 'second rate', there are indications of a change of attitude, related to a restructuring of the cognitive organisation of Mangaians. This has allowed them to create goals, in particular to raise their standards of living and become part of the modern world, and to see more clearly the problems which are blocking their progress. A few individuals have emerged from this change demonstrating entrepreneurial skills. That all of them are involved in cash cropping is a most important

TABLE XXXXIV

DEGREE OF COMMERCIALISATION IN AGRICULTURE

	PRODUCTION				TECHNOLOGY				INCOME	
	Pineapple Production Per Acre of Pineapples 1966 (cases)		Pineapple Production Per Planter 1966 (cases)		Percentage of Planters Using Machinery		Percentage of Planters Using Chemical Fertiliser		Net Median Income From Pineapple Exports ($)	
Tava'enga	259.9	4	42.0	4	96.6	4	90.0	4	134.00	4
Tamarua	250.1	4	32.8	3	64.8	1	58.8	1	115.50	4
Keia-Veitatei	172.4	1	27.8	2	66.7	1	83.4	4	53.25	1
Ivirua-Karanga	184.5	1	20.3	1	65.0	1	55.0	1	40.60	1

Ranking is calculated on quartile rank, 4 representing the upper quartile and 1 the lower quartile. For sources of data, refer to individual tables presented within the chapter.

Data arranged for sample population.

development. These men are a constant demonstration to the Mangaian community that agriculture could provide the means to a better life.

Changes have not occurred to a similar extent in every part of the island. In the Oneroa districts, where administrative, educational, medical and consumer services, higher levels of income from all sources and a higher density of population exist, modernisation is at its greatest extent. In the most isolated district, Ivirua-Karanga, there exists a greater frequency of conservatism, a greater resistance to changes and the least modernisation. Despite the existence of two poles of modernisation, the Mangaian situation is transitional. As Table XXXXIV shows, anomalies occur in developments. Within a district where, by other criteria, modernisation is relatively advanced, one factor shows little change. Not all districts demonstrate modernisation in agriculture. Keia-Veitatei, on solely agricultural criteria, falls below Tamarua on an index of commercialisation, but demonstrates a greater degree of modernisation on non-agricultural criteria.

There is little doubt that the majority of Mangaians do not want to return to their semi-traditional past. They are committed to commercial agriculture and to the manifold social and cultural changes which accompany it. Although potential for change within the island is high, progress in socio-economic change is tied to progress in the Cook Islands as a group, and will be achieved only with continuing and improved financial and technological assistance.

REFERENCES

1. Hendry, 1964, 67 describes a Vietnamese situation in which twenty years following the introduction of fertilisers unaccompanied by any form of extension, almost all villagers used fertilisers and the greater part of their knowledge of the use of fertilisers had been gained from experimentation and past knowledge of village lands. In this example the village crops were for both consumption and marketing.

2. Pers. comm. I. G. Bassett, Massey University.

3. On Rarotonga where it is common for tomato growers to employ wage labour, other factors must be taken into account. Tomato cultivation is more stable, there is a large pool of 'landless' immigrants available for labour and a greater degree of commercialisation, including the commercial and administrative 'core' at Avarua township.

4. The late R. W. Bambrick was employed up to 1966 as Pineapple Extension Officer on Mangaia. This information is from his notes on the Mangaian pineapple industry, in the possession of Mr. D Kerr, headmaster, Mangaia Junior High School.

CONCLUSION

Although each chapter contains a conclusion and summary of the points made within it, it is felt necessary to include a brief summation of the major themes of the study. This study has traced the development of commercialisation within a small and isolated Polynesian community in the Cook Islands. All of the forces which have been responsible for stimulating this development have had sources outside of the island, in materially advanced, commercialised nations. The intrusion of these forces into the Mangaian society has wrought marked changes to the society, the culture and the landscape. Nor have the changes finished. As this study has repeatedly shown, Mangaian society is passing through a transitional period which may be the beginning of the final dissolution of those remaining vestiges of traditional life and the precursor to the development of a new 'modern-Polynesian' culture.

The most important point to emerge from the study is that despite marked changes in socio-economic conditions, changes have not occurred at random and none have been determined totally by forces from without. Changes have come about following the intrusion or introduction of a factor from outside, which has forced the Mangaian society to make a choice, to choose between accepting change or rejecting it. Each decision has been made within a complex cultural framework comprising the values system of the society at the moment of choice. A number of factors impinge upon the development of a society's values; the social organisation, the culture, methods of exchange and ways of perceiving of the environment. Further, each decision, influences following decisions, as the values of the society are slightly altered or reinforced by each decision made. Throughout the study there are numerous examples of choice; the decision to accept Christianity despite the loss of much considered valuable in traditional beliefs, to purchase bibles, to wear different clothes, to resist land investigations, to reject the Citrus Replanting Scheme, to leave the island in search of wage labour. The choices have been continual and unnumerable.

There are several important theoretical and practical implications which arise from this point. The first is a growing theme in socio-economic studies, that there should no longer be a distinction between strictly 'economic' actions or decisions and strictly 'social' decisions. The values held by a society or an individual impinge upon every decision which may be made, and all actions are carried out within a cultural context. This means that any programme which is designed to bring about economic change will fail if it does not take into account cultural and social factors. In this study it is demonstrated that since 1945, success in development programmes has been the result of the work of one or two outstanding individuals and luck, and as a result failures have far outnumbered successes. Failures have resulted in

marked emigration, losses in labour, as well as serious disruptions in family structure and age-sex ratios within the community. Programmes have ignored traditional agriculture, food production and individual village needs. Social welfare programmes have been generally unrelated to agricultural programmes. This has resulted in a necessary increase in imported canned foods and may lead, in the near future to food shortages as were experienced on Mangaia during the first flourish of commercialism. Villagers invest money into new houses, which without associated amenities lead, in the short term, to a lower standard of living and an increased potential for sickness and ill health. Concrete floors and walls require furniture, and traditional mats will no longer suffice for sleeping and sitting. It is most important that future programmes, as well as providing integrated financial, technical and social aid, take account of the cultural values of the Mangaian society.

Achieving this objective is not simple, for as this study shows, values may differ from village to village across the island, and villages may be at different stages of development. In a village such as Tava'enga, where there is greater contact with the outside world, where incomes are higher and money is in more general every day use, values are markedly different to those which exist in an isolated village such as Ivirua. For this reason, programmes must be structured to the village level, and must allow for each village's individual needs. This is most important. If conditions within the island do not change following a decision by members of the island community to make changes, they will begin to leave the island, as they have in the past. Continued emigration will compound the problem and the community may eventually disintegrate.

Those persons responsible for future development on Mangaia, be they New Zealanders or Cook Islanders, must be prepared to see develop a society which is based upon Mangaian values. They must not expect, nor attempt to create, a modern 'Western' society, but a 'modern' Polynesian society.

APPENDIX I

THE SAMPLE AND QUESTIONNAIRE SURVEY

The sample survey was carried out in order to gain otherwise unobtainable data on a quantified basis, in particular details of living standards and personal details not covered in censuses up to 1961 and unobtainable in 1967. A second object of the survey was to gain responses to a section of questions designed to gauge attitudes towards agricultural and social change and to assess the amount of change which had taken place within the Mangaian community.

The questionnaire was administered in the latter stages of the fieldwork in July and August, 1967. Prior to the survey the writer had become familiar with all parts of the island during land use mapping and had met and talked with many of the villagers who were later selected to be interviewed. Despite this and a public explanation of the reasons for the survey many villagers had little idea of why they were chosen from among others to be interviewed and some professed complete ignorance of the writer's presence on the island. No one refused an interview although some interviews later proved to be partially unusable.

Due to the lack of facilities available on Mangaia the questionnaire was constructed and cyclostyled prior to travelling. This meant it was unable to be tested thoroughly and a number of amendments became necessary following the first half dozen interviews. The order of questions and the wording of some questions was changed. For example the question which was phrased, 'What is the greatest problem facing Mangaia today' was reworded to read, 'What do you think are the bad things about the life here on Mangaia?' This was necessary as there appeared to be no Mangaian word with exactly the same connotations as the English word 'problem' and informants became confused when the word 'great' was translated, and began suggesting problems in physical dimensions rather than magnitude of difficulty of the problem. The questionnaire was divided into four parts, the first dealing with house construction, the second with details of the household, the third with personal details of the head of the household and the fourth with questions, answered by the head of the household on agricultural practices and open ended questions on attitudes and opinions. (For detail, a copy of the questionnaire administered is included at the end of this appendix.)

The size of the sample population was chosen as much with the time available for interviewing in mind, as any other factor. On the files of the Administration there were, excluding those who had died, 319 persons who, since 1962, had exported a cash crop from Mangaia. A list of names was compiled, and each village was checked to ensure all the households in

existence in 1967 were covered. Of the 319 persons on the original list, 30 had left for New Zealand, nine for other Cook Islands, one was serving a prison sentence and 52 had ceased growing cash crops. Including this latter 52, the total survey population was 279. A sample of approximately one-third was selected with random number tables and reserves were added to bring the sample population to 100. At the completion of the survey only 91 questionnaires were assessed as being suitable for use, this being 32.9 percent of the households on the island or 35.7 percent of the number of males aged between 20 and 59 years in 1966. The sample was stratified on a district basis, with one-third of each district population being selected by random.

As very few of the sample population spoke English, it was necessary to use an interpreter for the bulk of the interviews. Two men were used, one was the island's radio operator, Paio Kapi, and the other an assistant Agricultural Officer, Atingakau Tangatakino. Both men were most suitable as interpreters. All messages and telegrams to and from the island population passed through the hands of the radio operator, and thus people were prepared to discuss personal matters with him, whereas with another person this may not have been so. Paio was not born on Mangaia, but was a Rarotongan; however, his father was a Mangaian and the Kapi family is well represented on the island. The Agricultural Officer, Atingakau, knew most of the planters and once they were shown photographs of Massey University and convinced that the survey was not government sponsored, they were prepared to talk freely through him. The use of an interpreter obviously has certain disadvantages and some meaning is lost in translation, both from English to Maori and vice versa. As Jan Myrdal notes, however, the use of an interpreter during an interview allows a concentration on the main questions, gives both persons time to think and strips the interview of most emotionalism allowing the interviewer to remain impersonal and objective. (Myrdal, 1965, 32-35). Both interpreters were most interested, in fact intrigued, with the work, giving up a great deal of their own time to assist, and the writer is indebted to them both, as the success of the survey was largely due to their assistance.

Within each village, the persons to be interviewed were visited, the purpose of the interview explained and a time most convenient to them was arranged for the interview. Most interviews took place in the dwelling of the subject, but interviews were carried out outside the village. The most ideal conditions for an interview were those carried out at night within the planter's home. The writer and interpreter along with the planter usually lay on the matted floor of the small houses, often with only a flickering, smoking candle or kerosene lantern lighting the three faces. In the background the planter's wife listened intently, nodding or shaking her head as applicable to each question, while children giggled or slept. Within this atmosphere, a planter could

give the most concentration to the questions, and although many consulted their wives on some points, this was not seen as jeopardising the interview in any way. In a minority of cases, other persons or villagers who came from surrounding houses upset the person being interviewed and some interviews were later rejected as being unsuitable. No person refused an interview, but three were unhelpful and flippant.

Interviews normally lasted between 30 minutes to 45 minutes, although some were longer. If a person wished to talk at length on any subject he was encouraged and given a sympathetic hearing and at no time was any disagreement voiced towards opinions expressed by the person being interviewed. Care was taken to avoid giving any indication of expected responses to open ended questions, as some informants had a tendency to give what they thought was the 'right' answer. It was explained that there was no right answer, but what was wanted was their opinions. Nor were the reasons for these questions explained to the interpreters until the survey was completed, to avoid them unconsciously giving a biased answer.

LAND USE MAPPING

Complementary to the sample survey was the construction of a land use map of Mangaia at a scale of one inch to ten chains. This was considered an equally important part of the fieldwork as without this map and the data obtained from it, much of the material collected during the interviews could not have been related to any broader pattern of land use. Furthermore it was the first major attempt to map land use and the first attempt within a programme which included a social survey. One other land use map was constructed by Nola during his period school teaching at Oneroa but its present whereabouts is unknown and it has not been sighted by the writer. The 1967 map will be the third in a series of Land Use Maps of the Cook Islands at present being published by Massey University Geography Department in conjunction with the New Zealand Department of Lands and Survey, NZMS 146/3, Land Use Map of Mangaia, Sheets 1 and 2.

The preparation of base maps took place in New Zealand prior to travelling. A major problem to be overcome was the complete lack of reliable base maps, a result of Mangaian resistance to surveys of any nature. The only recent series of aerial photographs were of a poor quality with only four prints out of ten being of practical use in the construction of a base map. This series, CAA 272 consisted of photographs taken during two runs of the aircraft, one from north to south and one from west to east, with the prints at the extremities of each run being blurred and tilted so as to be of no use whatsoever. With the use of three prints, A2, A3 and B2 a base map was constructed by using common points. The scale of this map was calculated solely from data related to the aerial photographs, supplied by the Department of Civil Aviation.

All mapping was carried out with the use of aerial photographs. Land use was sketched on to the photograph in pencil during the day and transferred to the base map at night. In this manner two copies were retained and the large base map was not ruined by a sudden downpour of rain or dropped into the mud of a taro swamp, the fate of one photograph, fortunately washable. No other method is seen as practicable in an environment such as that on Mangaia. Visibility in secondary growth or in makatea bush is limited to about ten feet, and a coconut canopy often obscures vision above the height of the scrub and weeds. Isolated and small yam gardens deep into the makatea were impossible to locate and once off a main track navigation is most difficult even with a compass. The writer became temporarily lost and was forced to resort to climbing trees to find the direction of the sea and the edge of the makatea cliff. Large outcrops of rock and sinkholes make travel in a straight line impossible. For these reasons small isolated plots are not represented on a map. Within established garden sites, an area of up to one acre was chosen and two prominent trees or isolated coconuts were sited on the photograph. Traverses were then carried out over the area between the landmarks and small gardens were plotted on this basis. In this manner the smaller areas were built up to form larger blocks. Any errors became quickly apparent and errors were not compounded over a larger area. Mapping in the pineapple areas and above on the fernland was very much easier and the open nature of the country lent itself to rapid mapping. The centre of the island was mapped by a series of transects down each of the main ridges radiating from Rangimotia. The mapping of land use was completed in six weeks.

Name.....

House No.....

Village.....

MASSEY UNIVERSITY

Geography Department

Mangaia..../..../1967

A. DWELLING SCHEDULE

1. House Type:
   A. Kikau walls and roof.....
   B. Wooden walls, kikau roof.....
   C. Lime walls, kikau roof.....
   D. Lime walls, iron roof.....
   E. Wooden walls, iron roof.....
   F. Housing Loan scheme or new houses of concrete-iron construction.....

2. Number of rooms excluding kitchen, bathroom, washouse.....

3. Is cooking done on:

   oil stove .....
   wood or coal range .....
   traditional oven .....

4. Water supply:

   own water, piped or tank .....
   village tanks .....
   other source (specify) .....

5. Ownership: Is house

   leased or rented .....
   loaned without payment .....
   being paid off .....
   free with job .....
   freehold .....

   Is land on which house stands:

   leased or rented .....
   loaned without payment .....
   freehold or family land .....
   held under family rights from council .....
   other (specify) .....

B. HOUSEHOLD SCHEDULE

1. What is the total number in the household.

males 15 - 59	.....
females 15 - 59	.....
males over 59	.....
females over 59	.....
children under 15	.....

2. What is the relationship of members to the head of the household:

grandfather	.....	son	.....	brother	.....
grandmother	.....	daughter	.....	sister	.....
father	.....	son-in-law	.....	nephew	.....
mother	.....	daughter-in-law	.....	niece	.....
wife	.....	adopted children	.....	other relation	.....
				non-relative	.....

3. Children: (of the head of the household)
Where are they living at present: What are their occupations.

Location	Number	Occupations
at home	.....	.....
elsewhere in Mangaia	.....	.....
within Cook Island	.....	.....
Nuie	.....	.....
Samoa	.....	.....
Tahiti	.....	.....
New Zealand	.....	.....
Makatea	.....	.....
elsewhere (specify)	.....	.....

4. What are the occupations of those persons between the ages of 15 and 59, living in the household.

agriculture	.....	domestic	.....
trading	.....	married	.....
labouring	.....	other	.....
industry	.....	not working	.....
public service	.....		

C. PERSONAL SCHEDULE

1. Age..... Sex..... Race.....

2. Birthplace.....Religion.....

3. Number of dependents.....

4. Main occupations:
planter, cash..... wage labourer.....
planter, subsistance..... retired.....
public servant (specify)..... other.....
other occupations.....

5. Income: How much money did you get in last year altogether?

nil	£400 - 499	£1100 - 1299.....
£1 - 99	£500 - 599	£1300 - 1499.....
£100 - 199.....	£600 - 699	£1500 - 1749.....
£200 - 299.....	£700 - 899	£1750 - 1999.....
£300 - 399.....	£900 - 1099	£2000 and over....

6. Education: How many years of
primary education.....
secondary education.....
higher education.....
educational qualifications.....
.....

7. Position held: in family.....
in village.....in island.....

8. Have you lived here all your life?.....
If not where else have you lived or visited:

Place	Period	Place	Period
Mangaia.....		Samoa.....	
Rarotonga.....		Makatea.....	
New Zealand.....		elsewhere.....	
Tahiti.....			

9. Would you leave Mangaia if you were able to?.....
Why.....
Why not.....
Where would you go and why.....
Rarotonga.....
New Zealand.....
Elsewhere.....
Would you return to Mangaia again?.....
Why.....
Why not.....

10. What do you hope your children will do when they become older?
farming..... higher education.....
trading..... other.....
public service (specify).....
domestic.....
Why do you wish this?.....

11. Do you regularly:

listen to radio	.....
read the news sheet	.....
read books	.....
read the Bible	.....
cannot read	.....

12. What do you think are the bad things about the living here on Mangaia?

Name.....

House No.....Village.....

D. AGRICULTURAL SCHEDULE

1. Particulars of land in use, 1967

No.	Use	Distance	Tenure	Remarks

2. Past use of plots

No.	1966	1965	1964	1963	1962	1961

No.	1960	1959	1958	1957	Previous

3. Livestock: Pigs.....Horses.....
fowls.....

4. What handtools do you use

.....
.....
.....

Have you recently changed the type or make of hand tools?
if yes, from.....to.....
Do you use any machinery.....
If so what types

Make	Type
.....	.....
.....	.....
.....	.....
.....	.....

Who owns them.....
How much does it cost to use them.....
How often do you use them.....
How often would you like to use them.....

5. Fertilizer: What type of fertilizer do you use.....
.....Amount.....
How much did you get from levy.....
Own purchase.....
Where did you use it.....
.....

6. Income and expenditure: How many cases of fruit did you export last year, 1966?

Type	No. of cases	Return
Pineapple Citrus Tomato Vegetables other		

Other income: Money from New Zealand.....
Rarotonga.....
elsewhere.....
wages.....

How much money did you spend on:
seeds or plants.....
Fertilizer.....
labour.....
machinery.....
other (specify).....

Did you borrow money last year.....
Amount borrowed.....When borrowed.....
From whom.....
How much money do you owe.....
Credit.....From whom.....

If you couldget a job, how much money would you have to be paid each day before you stopped planting pineapples?
.....

7. Who provides the labour on your plots:
family.....
employees..... wages.....
reciprocal.....

8. Agricultural extension:
How often does the agricultural officer visit.....
Do you wish he came more often.....
Do you think his words are useful or not.....

9. What are the bad things about your plantations, the things which make you worry?.....
.....

APPENDIX II

DIETARY SURVEY

During the fieldwork a partial dietary survey was conducted with seven children at the Mangaia Junior High School at Oneroa. Forms were made out and children filled in the previous day's meals each morning under the supervision of a teacher. Brief personal details were taken from each child and are as follows:

A. A 13 year old male, from a household of eight living in a traditional style house. Three older brothers in New Zealand and one in Rarotonga. Father planting pineapples full time. Food prepared in a traditional oven, umu. Ivirua village.

B. 14 year old female, father a freezing worker in Auckland, sending regular remittances to his family. Household of nine in a new house. Family does not grow any cash crops. All food prepared in the umu. Ivirua village.

C. A 13 year old girl, living with a brother, a school teacher, under the care of her grandmother. The household income is drawn from her brother's salary, from his pineapple plot and from her grandmother's old age pension. The house is traditional in style but includes a kerosene stove as well as an umu. Tava'enga village.

D. A 14 year old female from a household of six. Nine siblings in New Zealand with consequent income from remittances. House constructed of wood and iron. Father planting pineapples. Cooking on primus and umu. Tava'enga village.

E. A 14 year old female, household totals seven persons, house traditional style. One older sister at home, one brother assists father with pineapple planting. Father also irregularly drives a truck for wages. All cooking on umu. Tamarua village.

F. A 13 year old male living in a new house with nine other perons. Three sisters at home, one brother planting pineapples. Father full time planter. All cooking on umu. Tamarua village.

G. A 14 year old female. Father a full time fisherman with no land on Mangaia. Total of 10 persons in household. All food on exchange basis with fish as father has no gardens or pineapple plots. Traditional house, poor quality. Traditional umu. Kaumata village.

FOOD TYPE

Locally Produced Food	A	B	C	D	E	F	G	Total Meals	% of Total Meals
Swamp Taro	45	29	40	41	51	22	20	248	46.3
Tarua	2	6	1	2	1	-	4	16	2.9
Rukau (Taro leaves)	12	2	4	23	17	1	1	60	11.2
Kumara	3	4	-	-	5	-	2	14	2.6
Yam	2	15	-	-	8	3	1	29	5.4
Coconut	11	5	4	-	9	3	2	34	6.3
Banana	10	7	9	2	3	1	4	36	6.7
Pineapple	12	3	6	1	1	1	-	24	4.4
Oranges	7	-	2	-		1	1	11	2.1
Pork	1	1	4	8	7	-	3	24	4.4
Fish	12	9	11	7	14	8	6	67	12.5
Chicken	-	-	-	1	1	1	2	5	0.9
Eggs	2	-	-	-	1	-	-	3	0.5
Imported Food									
Bread	10	24	29	19	13	15	21	131	24.4
Cabin Bread	8	4	5	4	-	4	-	25	4.6
Biscuits	-	14	11	23	15	1	8	72	13.4
Cake	1	-	-	-	-	-	-	1	0.1
Tinned Meat	11	5	14	12	27	7	4	77	14.3
Tinned Fish	1	1	1	2	-	1	-	6	1.1
Tea	18	42	42	51	42	23	25	243	45.3
Coffee	1	1	7	-	-	1	-	10	1.8
Cocoa	-	3	-	-	-	-	1	4	0.7
Soup	2	1	-	-	-	2	-	5	0.9
Total Meals	90	90	90	90	90	48	38	536	100.0
Total Days	30	30	30	30	30	16	13	179	

COMMENT

The table is self-explanatory and shows at a glance those foods which occurred most frequently per meal. Swamp taro is the most common food grown on the island and 46.3 percent of all the meals eaten by the seven children in the survey included taro. A further 11 percent included rukau, boiled taro leaves. Bread, biscuits, tinned meat and tea are also common ingredients of a meal and in young children these foods with taro lack sufficient protein and malnutrition does occur.

Although three meals were taken each day by the children in the survey, many adults eat at daybreak and have only a light meals such as a piece of taro, a pineapple or a coconut during the day and eat a hot meal at night. Typical meals for a day are:

Morning: A piece of tarua and coffee (no milk).

Early afternoon: A pineapple.

Evening: Rukau and taro (hot).

Meat may feature in a meal only once or twice a week, depending upon the resources of the house. Generally, those persons who earn the money or produce the food receive the better food.

APPENDIX III

EXTRACT FROM THE DIARY OF TANGINGATAMA NUMANGATINI

Ngatama was the younger brother of John Trego, known as 'King John', the ariki in 1890 and was associated with him on the Island Council and in the market house at Oneroa. Ngatama, John Trego and Vaipo, a chief from Ivirua, were the leaders of a group which came into conflict with the mission over the question of traders setting up posts on Mangaia. The diary from which the extract is taken is not written on a day to day basis, but contains market house accounts and lists of purchases, notes on council meetings and one or two personal letters, all written in Maori. Access to the diary was given by Mrs. Tuaongo Koroa, the youngest daughter of Ngatama, now a part time resident in Kaumata Village and in Ponsonby, Auckland. Translations were carried out by Paio Kapi.

The extract is in two parts. The first from page 33, is a record of purchases from A. V. Hoff, a New Zealand trading company, during 1899. The second is from page 67 of the diary, and is a record of transactions between the trading store and a local planter, Aitau. The difference in 1899 and 1904 figures is the result of the change from Chilean decimal currency to sterling.

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1899	No. 1.	A. V. Hoff	R.
Ap. 7	6 rolls material	38	57.00
	1 case matches		16.00
	10 bags flour	5.00	50.00
May 29	2 cases matches	16.00	32.00
Jul.21	4 rolls	43	34.40
	10 lb fishing line	1.00	10.00
	1 roll red material	70	26.60
	1 shawl		30
	4 rolls material	25	33.00
	2 doz. matches		32.00
	2 rolls ribbon	22	9.00
	1 door lock		1.50
	2 lbs. white paint	3.30	6.60
	6 lbs. nails	40	2.40
	1 saw		4.50
	6 pr. trouser	2.00	12.00
	2 blue silk shawls	2.50	5.00
	2 rolls cotton No.118		4.00
	2 " " No.501		4.00
	2 " " No.499		
	2 " " No.504		
		347.90	347.90

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1904	Aitau		
Dec. 23	6 cases, 4 banana, 2 pineapple 2/8	16. 0	
Apr. 5	7 cases, 4 orange, 3 banana ¾	1. 3. 4.	
		£1.19. 4.	
	13 starch		
	13 empty cases	1.	
	Money left	£1.19. 4.	
July 28	3 mens shoe 5/6		
	3 ladies shoe 4/0		
	1 shawl 16/0		
	11 starch 9/8¼		
	10 doz matches		
	3 mens sock 1/0		
	3 ladies sock 1/6		
	4 dozen matches		
Aug. 24	3 white coats 35/0		
	Account owing	5. 7. 4. 3.	8.
		8.14. 8.	8.

APPENDIX IV

Extract from the Report of the New Zealand Department of Agriculture, 1903, 423-433

From p.425

'Mangaia

This island comprises about 30 square miles. Here the cocoanut, banana, orange, lime, pineapple and coffee flourish. Indeed the coffee was the healthiest of any we saw, though like everything else, it had never received any attention whatever and had therefore attained a great height even as much as 15 ft to 25 ft. This of course reduced the crop and rendered eventual picking impossible. Yet the best coffee in the Group is produced here.

The soil is largely volcanic and eminently suited to the orange and other citrus fruits and there are large areas lying to waste. These are covered with a very light scrub which could be cleared at small cost, and the output of the island increased by twentyfold in a few years.

At the present time large groves of limes exist which have become so interwoven as to render it impossible to gather more than one-tenth of the crop. We suggested to the leading men of the island that wide tracks should at once be cut through this jungle to allow fruit to be gathered. Thus the 4,000 gallons of limejuice exported last season might at once, if desired, be raised to 20,000 gallons.'

APPENDIX V

MONEY-ORDER REMITTANCES FROM NEW ZEALAND TO MANGAIA, COOK ISLANDS

April, 1966 to March, 1967

	Tokoroa (a)	Bluff	Rest of N.Z.	Total
1966	$ c.	$. c.	$. c.	$. c.
April	1064.00	328.00	1043.65	2435.65
May	1222.00	380.00	2284.74	3886.74
June	995.80	140.00.	1030.00	2165.80
July	1042.00	100.00	1222.85	2364.85
August	1167.00	60.00	954.00	2181.00
September	912.00	100.00	1704.50	2716.50
October	744.00	20.00	739.84	1503.84
November	1518.00	60.00	1004.71	2582.71
December	684.00	420.00	7008.35	8112.35
1967				
January	380.00	40.00	1107.00	1527.00
February	962.00	70.00	752.00	1784.00
March	1278.00	230.00	1033.35	2541.35
TOTAL	11968.80	1948.00	19884.64	33801.44
Average Monthly Total	997.40	161.30	1657.01	2816.78

(a) Includes Kinleith

Source: Mangaia Post Office, Mangaia, Cook Islands.

APPENDIX VI

DAILY ACTIVITIES OF THREE MANGAIAN PINEAPPLE PLANTERS

	Ta'i	Rua	Toru
Personal Details	Male, aged 28 years, married, 3 children. Two houses, one on Ivirua Village of concrete and iron, one inland of traditional materials. Engages in agricultural wage labouring, but otherwise full time pineapple planter. Income between $200 and $400 p.a. Cultivates 1½ acres of pineapples in two plots, one Smooth Cayenne and one Ripley Queen, and 6 taro plots, and 2 makatea gardens, tarua, ku'ara, arrowroot and bananas.	Male, aged 24 years, married, 3 children. House in Kaumata Village, lime walls, iron roof. Sister and mother occupy same house. Full time primary school teacher. Income between $800 and $1,000 p.a. Cultivates ½ acre of Smooth Cayennes, and 5 taro plots, 1 banana plot.	Male, aged 18 years, single. Lives with parents at Tamarua. Father a school teacher, sister a school teacher. Main ambition, to become a motor mechanic. Income $100. Cultivates 1 acre of Smooth Cayennes and looks after family taro plots.
Time		**SATURDAY**	
6-8	Collected food and firewood for the day.	Fed animals, collected taro.	Domestic chores.
8-10	Fishing	Cricket match	Cricket match
10-1			
1-4			
4-6	Visited all plantations to check progress		
		SUNDAY	
6-8	Visited and fed relatives' goats	Slept most of the day.	Visited pineapple plot to check progress
8-10	Travelled to Ivirua for church.		
10-1	Church		Church
1-4			Sleeping and talking to friends.
4-6	Church		

APPENDIX VI (Continued)

Time	Ta'i	Rua	Toru
		MONDAY	
6-8	Cleaned around village house.		Travelled to Oneroa on motorcycle to wait for the arrival of the ship.
8-10	Travelled to Oneroa landing on a truck to wait for a ship.	School teaching	Waiting at Post office for ship.
10-1	Waiting at Post Office for ship.		
1-4	Worked ship in village boat crew.		Helped unload ship. Travelled home.
4-6	Travelled home. Fishing until 10 pm.	Fed animals, collected taro. Cricket practice.	Cricket practice.
		TUESDAY	
6-8	Domestic chores.		Collecting firewood.
8-10	Council roadwork.	School teaching	Travelled to Oneroa to visit relative in hospital.
10-1			Assisted friend with some housebuilding.
1-4	Cleared a new taro bed.		Weeded pineapples.
4-6		Fed animals. Cricket practice.	Cricket practice.
		WEDNESDAY	
6-8	Domestic chores.		
8-10	Wage labour - cleaning taro plots at Veitatei. Travel over Rangimotia, by foot.	School teaching	Visited friends and talked.
10-1			Collected taro for home use. Made up some kits to send to Rarotonga for relatives.
1-4			
4-6		Fed animals, collected taro. Cricket practice.	Cricket practice

APPENDIX VI (Continued)

Time	Ta'i	Rua	Toru
		THURSDAY	
6-8			Domestic chores.
8-10			Visited friend at Oneroa.
10-1	Wage labour	School teaching	Returned to Tamarua. Fed pigs.
1-4			Collected taro from swamp.
4-6		Fed animals, cricket practice.	Cricket practice.
		FRIDAY	
6-8			Travelled to Oneroa with parcel for ship.
8-10	Wage labour		Watched boat unloading.
10-1		School teaching	
1-4			Travelled home.
4-6	Returned home to find inland house accidentally burned down by young daughter. Travelled to Ivirua Village.	Fed animals, cricket practice.	Cricket practice.
		SATURDAY	
6-8	Travelled inland to old house.	Fishing from the reef.	Weeded pineapples.
8-10			
10-1	Building new house.	Collected taro from swamp.	Fed animals, collected taro.
1-4		Cricket match	Cricket match.
4-6	Travelled back to village.		

APPENDIX VI (Continued)

Time	Ta'i	Rua	Toru
		SUNDAY	
6-8	Domestic chores.	Fed animals and visited pineapples.	Domestic chores.
8-10	))Church)	))Slept and read newspapers.)	Church))Explored caves with friends.)
10-1			
1-4	Visited relatives.		
4-6	Church	Played cards.	
		MONDAY	
6-8	)Weeded pineapples; applied fertiliser.		Collected firewood and coconuts.
8-10	)	)	)
10-1	)	)School teaching.	)Planted tarua shoots in garden near house.
1-4	)Weeded taro pa'i bed and set up a rat	)	)
4-6	)trap.	Fed animals, cricket practice.	Cricket practice.
		TUESDAY	
6-8	Picked 10 cases of pineapples for ship.	Picked and packed pineapples. Arranged for transport to pick up cases.	Picked one case of pineapples. Helped friend pick his plot.
8-10	Accompanied pines to Oneroa landing on truck.	)	Travelled to Oneroa on motorcycle.
10-1	Worked with boat crew.	) School teaching.	Assisted unloading ship.
1-4		)	
4-6	Visited taro beds to check for storm damage.	Cricket practice.	Cricket practice.
		WEDNESDAY	
6-8	Travelled inland.		Domestic chores.
8-10	)	)	Visited relative at Oneroa hospital.
10-1	)	) School teaching	Stayed with friends to talk.
1-4	)	)	Travelled home.
4-6	)Completed house frame. Fishing all night.	Fed animals, collected taro and bananas; cricket practice.	Fed pig; cricket practice.

APPENDIX VI (Continued)

Time	Ta'i	Rua	Toru
		THURSDAY	
6-8	Collected kikau for wife to weave for new house roof.		Collected firewood and coconuts.
8-10	Built new pa'i bed		Moved pig to new site. Collected nuts to feed him. Inspected taro plots.
10-1		School teaching.	
1-4			Fishing from reef.
4-6	Fishing until 11 pm.	Fed animals, cricket practice.	Cricket practice.
		FRIDAY	
6-8	Housebuilding - put rau battens on roof and tie down.		Domestic chores.
8-10			Collected taro and tarua and arrowroot from inland.
10-1		School teaching	
1-4			Fishing from reef.
4-6	Travelled to coast to sleep there in preparation for fishing in the morning.	Fed animals, cricket practice.	Cricket practice.

PLATE 1

VIEW DOWN TE PUA VALLEY SOUTH TOWARDS VEITATEI SWAMP

Represented in this view are all the ecological zones described in this chapter, with the exception of the pa tai. Beneath the horizon, the makatea formation with the rautuitui on its surface, runs horizontally across the scene. Beneath the vertical limestone cliffs is the narrow bush covered piriaki and the puna, visible as the flat area in the right middle distance. In the foreground, surrounded by the fern clad hills of the maunga is a plot of pineapples. Although more common in the rautuanu'e on the lower slopes and ridges beneath the maunga, pineapples are grown on the more gentle slopes up many main valleys. Immediately above the puna is a plantation of Albizzia, remnant of a now defunct re-afforestation scheme, while on the ridges stunted Casuarina trees form a scrubby cover.

PLATE 2

WOMAN WEEDING MAMIO, PUNA KARANGA

This woman, weeding a plot of young mamio shoots, is standing in the plot, knee deep in mud. In the foreground an area has just been planted. The raised pa'i beds are visible behind the woman and to the right of her daughter who stands in the background. A solitary banana plant stands on a bund to the right, while surrounding the swamp is typical second growth with coconuts throughout. In the foreground on the extreme left two bunches of taro shoots, miko, lie immersed in water, in preparation for planting.

PLATE 3

THE MARKET ECONOMY IN A MANGAIAN COOKHOUSE

A Mangaian woman bathes her grandchild on the coral gravel floor of her cookhouse. In the background on the table is evidence of the changing patterns of consumption in the Mangaian community, and the subsequent development of a new 'system of needs'. The common brand of soap powder, the dried milk powder, the talcum powder tin and on the floor, plastic sandals, rubber jandals and an instant coffee tin; as each of these items becomes a 'necessity', so does the ability to earn money, and in this manner the market economy intrudes into the society.

PLATE 4

PINEAPPLES INTEGRATED INTO ROTATIONAL BUSH FALLOW

This pineapple plot in Keia-Veitatei district illustrates the pattern of pineapple cultivation in which plots are integrated into a shifting system of rotational fallow. Plots are small, irregular, single rows of plants predominate and fertiliser is not used. In this plot, some fertiliser has been used, but two or three rotten sacks lie beneath sheets of tin on the right hand edge of the plot. Coconuts and other trees shade the plot, while a small heap of old pineapple roots lie across a row to the left. In such a plot fertility is low, and fungicidal and nematodal infestation high. This plot has been replanted after ten years fallow.

PLATE 5

ABANDONED PINEAPPLE PLOT

This plot of pineapples has been abandoned for about four years, and is now used for tethering a pig. Located in the piriaki, the plot is about 50 yards from the makatea cliff, which is hidden by vegetation in the background. In the right foreground a single coffee tree remains, the last of twenty-five which were planted between the rows of pineapples. The boy's father has shifted his plot to an area 200 yards away. The boy is feeding the pig green coconuts, and is merely splitting open the nut with a bush knife. The pig is tethered by a hind leg, but escapes fequently.

PLATE 6

PINEAPPLES IN THE FERNLAND

This Karanga planter stands on a recently ploughed plot of land just across the district boundary in Tava'enga, land he has acquired through his wife, a former Tava'enga woman. His case is typical of the 'individualisation' occurring in the Mangaian community, for he has carried out all the work on this plot alone or with the help of his wife. He has used an Economic Development Loan for tractor hire to plough the plot and has made use of the Agricultural Extension Officer in laying out drainage and rows. The use of fertilisers will enable him to utilise successfully this Ivirua clay loam, previously uncultivable. In the background the makatea formation encircles Tava'enga district, and the low hills of the Tava'enga pineapple area lie in the centre middle distance. Bush, second growth and coconuts surround and obscure the Tava'enga taro swamps.

PLATE 7

SEDENTARY CULTIVATION

This plot near Lake Kaveravao in Tava'enga is a good example of the latest development in pineapple cultivation. Double rows of Smooth Cayenne plants are planted along the contour in blocks convenient for weeding and picking. Blocks are still too small for the proper use of machinery and coconut trees remain too valuable to be destroyed. A further block behind the established pineapples is due for planting next season. This plot is a family plot and is cultivated by four brothers, although one takes most of the responsibility. They have built a small tin shelter for their fertiliser and as a place to sleep during the peak picking season. In the background are the fern clad hills of the maunga.

PLATE 8

NEW HOUSES

In Temakatea Village a man, assisted by two neighbours, constructs a small house beside a mission period house built by his grandfather. On the verandah of the old house is stacked the cement for the new house, while in the foreground lie an upturned canoe and a kumete on the table, a large wooden bowl used in food preparation. This man spent six weeks building this house, much of the time without assistance. During this period he did no other work, except pick pineapples, and as a consequence probably lost a number of new pineapple plants which were smothered by weeds. From his point of view, a new house was much more important as a status symbol than a good plot of pineapples, an attitude emphasised by the fact that he did not intend to live in the new house until the old one was completely 'worn out'. This example illustrates the complex pattern of priorities of labour within which many Mangaians work, and where labour often remains a non-monetary factor.

BIBLIOGRAPHY

Unpublished Works

Bassett, I. G. 1965 Population and Land Use on Aitutaki, Cook Islands. (Ms. and maps) Massey University.

Belshaw, H. and Stace V. D. 1955 A Programme for Economic Development in the Cook Islands. (Cyclostyled) Dept. Is. Territories, Wellington.

Bambrick, R. 1966 Notes on Pineapple Growing, Mangaia.

Bell, H. D. 1966 Report on the Mangaian Pineapple Industry. (Multilithed) Cook Islands Government, Rarotonga.

Crocombe, R. G. 1967 Improving Land Tenure: A Survey of Problems of Adapting Customary Tenure Systems to Modern Economic Conditions. (Cyclostyled). S. Pacif. Comm. Noumea.

Douglas, E. M. K. 1965 Migration of Cook Islanders to New Zealand. MA Thesis, Victoria University, Wellington.

Gerlach, J. C. 1954 An Agricultural Report on the Lower Cook Group. Dept. Island Territories, Wellington.

Gilson, R. P. 1952 Administration of the Cook Islands. MSc Thesis, University of London. Copy in Alexander Turnbull Library.

Holmes, S. 1954 Report on a Nutritional Survey in Three Villages in the Cook Islands. S. Pacif. Health Service, Numea.

Jollife, W. H. 1953 Forestry in the Cook Islands. Dept. Island Territories, Wellington.

_____ 1957 Supplement to Forestry in the Cook Islands. Dept. Island Territories, Wellington.

Kolff, J. 1965 The National Income of the Cook Islands. MA thesis, Victoria University, Wellington.

London Missionary Society 1797-1906 Letters, Journals and Reports to the Society from the South Seas Mission. Microfilm copy, Alexander Turnbull Library, Wellington.

McArthur, N. 1955 The Population of the Pacific Islands: Part II. The Cook Islands and Niue. Aust. Nat. University.

Nola, A. M. n.d. Agricultural Experiments Undertaken at Oneroa School, 1958-60. Mangaia.

Sadaraka, S. M. 1961 Factors Affecting the Development of Commercial Agriculture in the Cook Islands. MA Thesis, Victoria University, Wellington.

Stone, D. 1967 Political Resurgence in the Cook Islands: The Path to Self-Government. (2 vols) MA Thesis, Auckland University.

Strickland, M. 1968 Colonisation and Self-Government. A paper presented to the 40th ANZAAS Conference, Christchurch.

Tiller, L. W. 1958 Agricultural Problems and the Scope for Agricultural Research in the South Pacific Islands. Dept. Island Territories, Wellington.

Williams, J. & Bourne, R. 1823 Journal of a Voyage Made... for the Propogation of the Gospel etc. Copy held by Judge J. Morgan, Rarotonga.

Published Works

Allen, B. J. 1968 Cook Islands Agricultural Development. Comment 37: 31-34.

Barrau, J. 1960 Plant Introduction in the Tropical Pacific: Its Role in Economic Development. Pacif. View. 1:1-10.

_____ 1961 Subsistence Agriculture in Polynesia and Micronesia. Bernice P. Bishop Mus. Bulletin 223.

_____	1963	Plants and Migration of Pacific Peoples.
_____	1965	Le Humide et le Sec. J. Polynes. Soc. 74.
Bassett, I. G.	1965	Transport and Development in the Cook Islands. New Zealand Geographical Soc. Record 40: 10-13.
Bassett, I. G. and Thomson K. W.	1968	Land Use and Agrarian Change on Aitutaki. S. Pacific Bulletin 18:25-30.
Beaglehole, E.	1955	Evaluation Technique for Induced Technological Change. International Soc. Sci. Bulletin 7:376-386.
_____	1958	Social Change in the South Pacific: Rarotonga and Aitutaki.
Becket, J.	1964	Social Change in Pukapuka. J. Polynes. Soc. 411-431.
Belshaw, C. S.	1954	Changing Melanesia: The Social Economics of Culture Contact.
_____	1964	Under the Ivi Tree: Society and Economic Growth in Rural Fiji.
_____	1966	Traditional Exchange and Modern Markets.
Belshaw, H.	1960	Some Pacific Island Problems. Pacif. View. 1:125-142.
Bohannan, P.	1963	Land, Tenure and Land Tenure. In Beiryuk, R. (ed), 1963 African Agrarian Systems.
Boserup, E.	1965	The Conditions of Agricultural Growth: the Economics of Agrarian Growth under Population Pressure.
Brookfield, H. C. and Brown, P.	1963	Struggle for Land: Agriculture and Group Territories among the Chimbu of New Guinea.
Buck, P. H.	See Hiroa, Te Rangi.	
Buzacott, A.	1866	Mission Life on the Islands of the Pacific.
Canter-Visscher, J. W.	1963	Growing Pineapple on Mangaia. S. Pacif. Bulletin 13.

Challis, R. L. 1953 The Social Problems of Non-Maori Polynesians in New Zealand. S. Pacif. Comm. Tech. Paper 41.

Christian, F. W. 1924 A Vocabulary of the Mangaian Language. Bernice P. Bishop Mus. Bulletin 11.

Chubb, L. J. 1927 Mangaia and Rurutu. Geology Mag. 44:518-522.

Cochran, T. C. 1954 Social Attitudes, Entrepreneurship and Economic Development: Some Comments. Explorations in Entrepreneurial History 6:181-183.

Collins, R. 1960 The Pineapple.

Conklin, H. C. 1957 Hanuoo Agriculture in the Phillipines. Food and Agriculture Organisation.

Cook Islands News 1951-1968 Daily News Sheet.

Cook Islands Review 1952-1968 Monthly News Review.

Crocombe, R. G. 1961 Land Tenure in the Cook Islands: A Symposium on Land Tenure Problems. 10th Pacif. Sci. Congress, Honolulu.

_____ 1962 Development and Regression in New Zealand's Island Territories. Pacif. View. 3:17-32.

_____ 1964 Land Tenure in the Cook Islands.

Cumberland, K. B. 1948 New Zealand's Pacific Island Neighbourhood: The Post War Agricultural Prospect. N.Z. Geogr. 5:1-18.

_____ 1951 Geography and Land Use Survey in the Southwest Pacific: A Review and Suggestion. N.Z. Geogr. 7:139-153.

_____ 1962 The Future of Polynesia. J. Polynes. Soc. 386-396.

Curson, P.H. 1968 Some Demographic Aspects of Cook Islanders in Auckland. Proc. 5th New Zealand Geogr. Soc. Conference 67-74.

Davis, T. R. A.	1947	Rarotonga Today.
De Schlippe, P.	1956	Shifting Cultivation in Africa.
Douglas, E. M. K. & Johnston, K. M.	1965	Cook Islands: Implications for Independence. Comment 25:11-13.
Doumenge, F.	1966	L'homme dans le Pacifique Sud: Etude Geographique.
Faine, S. and Hercus C.	1951	The Nutritional Status of Cook Islanders. British J. Nutrition. 5:327-343.
Fallers, L. A.	1961	Should African Cultivators Be Called Peasants? Current Anthrop. 2:108-110.
Finney, B.	1965	Polynesians Peasants and Proletarians. J. Polynes. Soc. 74.
Firth, R.	1951	Elements of Social Organisation.
_____	1939	Primitive Polynesian Economy. (1965 ed).
_____	1963	Money, Work and Social Change in Indo-Pacific Economic Systems. UNESCO.
Firth, R. and Yainey, B. S.	1964	Capital, Saving and Credit in Peasant Societies.
Fisk, E. K.	1962	Planning in a Primitive Economy: Special Problems of New Guinea. Econ. Record 39:462-478
_____	1964	Planning in a Primitive Economy: From Pure Subsistence to The Production of a Market Surplus. Econ. Record 41:156-174.
Foster, G. M.	1961	Interpersonal Relations in Peasant Society. Human Organisation 19, 4:174-184.
_____	1962	Traditional Cultures and the Impact of Technological Change.
_____	1965	Peasant Society and the Image of Limited Good. Am. Anthrop. 67:293-315.
Frazer, R. M.	1968	A Fijian Indian Community. Pacif. View. Monograph 3.

Geertz, C.	1966	Agricultural Involution: the Process of Ecological Change in Indonesia.
Gill, W.	1857	Gems From the Tropical Isles.
_____	1886	The Autobiography of the Rev. William Gill.
Gill, W. Wyatt	1876	Life in the Southern Isles.
_____	1880	Historical Sketches of Savage Life in Polynesia.
_____	1885	Jottings From the Pacific.
_____	1890	Mangaia (Hervey Islands). Report of Aust. Assoc. for the Advancement of Sci.
Gilson, R. P.	1955	The Background to New Zealand's Early Land Policy in Rarotonga. J. Polynes. Soc. 64:267-280.
Goldman, I.	1959	Variations in Polynesian Social Organisation. J. Polynes. Soc. 66:374.
Grange, L.I. and Fox, J. P.	1953	Soils of the Lower Cook Group. DSIR Soil Bureau Bulletin 8.
Hagen, E. E.	1962	On the Theory of Social Change.
Henderson, J. Mc.	1958	Ratana: the Origins and the Story of the Movement.
Hendry, J. B.	1964	The Small World of Khan Hau.
Hickling, H.	1945	Notes on the Adoption and Naming of Children in Mangaia. J. Polynes. Soc. 54:83-86.
Hiroa, Te Rangi	1927	Material Culture of the Cook Islands.
_____	1934	Mangaian Society. Bernice P. Bishop Mus. Bulletin 122.
_____	1944	Arts and Crafts of the Cook Islands.
Hooper, A. B.	1961	The Migration of Cook Islanders to New Zealand. J. Polynes. Soc. 70:11-18.

Hoselitz, B. F. 1963 Main Concepts of the Analysis of the Social Implications of Technical Change, in B. F. Hoselitz and W. E. Moore (ed), Industrialisation and Society.

Johnston, K. M. 1962 Research Notes: Social and Economic Change in the Cook Islands. Pacif. View 2:101-103.

_____ 1967 Village Agriculture in Aitutaki. Pacif. View. Monograph 1.

Johnston, W. B. 1953 Land, People and Progress in the Cook Islands. Econ. Geogr. 2:107-124.

_____ 1959 The Cook Islands: J. Trop Geogr. 13:38-57.

Kay, P. 1963 Aspects of Social Structure in a Tahitian Urban Neighbourhood. J. Polynes. Soc. 72:325-371.

Kelly, J. L. 1885 The South Sea Islands: Possibilities of Trade with New Zealand. Report to the Auckland Chamber of Commerce.

Kolff, J. 1965 The Economic Implications of Self-Government for the Cook Islands. J. Polynes. Soc. 74:119.

Lamont, E. H. 1867 Wild Life Among the Pacific Islanders.

Leach, E. 1962 A Note on the Mangaian Kopu, With Special Reference to the Concepts of Unilineal Descent. Am. Anthrop. 64:601.

Legislative Assembly of the Cook Islands. 1958-1967 Proceedings of the Assembly.

Lovegrove, M. 1964 Speed of Performance: A Cross Cultural Study. J. Polynes. Soc. 73:438-439.

Lovett, R. 1899 The History of the London Missionary Society, 1795-1895.

Marshall, P. 1927 The Geology of Mangaia. Bernice P. Bishop Mus. Bulletin 36.

_____ 1929 Mangaia and Rurutu: A Comparison of Two Pacific Islands. Geology Mag. 46:385.

Massal, E. and Barrau, J.	1956	Food Plants of the South Pacific. S. Pacif. Comm. Tech. Paper 94.
McArthur, N.	1961	Population and Social Change: The Prospect for Polynesia. J. Polynes. Soc. 70:393-400.
_____	1964	Contemporary Polynesian Migration from Samoa and the Cook Islands. J. Polynes. Soc. 73:336-337.
_____	1966	Essays in Multiplication: European Seafarers in Polynesia. Pacif. History 1:91.
McKee, H. S.	1956	Cash Crops and Imported Foods in the South Pacific. S. Pacif. Bulletin 6:23-26.
Mead, M.	1955	Cultural Patterns and Technological Change. UNESCO.
Mellor, J. W.	1966	Economics of Agricultural Development.
Moerman, M. H.	1968	Agricultural Change and Peasant Choice in a Thai Village.
Moore, W. E.	1955	Economy and Society.
Myrdal, J.	1965	Report From a Chinese Village.
New Zealand Meteorological Service	1963	Meteorological Notes 3B, Cook Islands.
Nola, A. M.	1961	Education in Mangaia. Pacif. Is. Education 27:26-34.
Ross, A.	1964	New Zealand's Aspirations in the Pacific in the Nineteenth Century.
Sahlins, M. D.	1957	Land Use and the Extended Family on Moala. Am. Anthrop. 59:449-462.
_____	1958	Social Stratification in Polynesia.
Sailsbury, R.	1962	From Stone to Steel.
Schwimmer, E.	1965	The Cognative Aspects of Culture Change. J. Polynes. Soc. 74:149.
Sellitz, C. et al.	1965	Research Methods in Social Relations.
Shand, R. T.	1965	The Development of Trade and Specialisation in a Primitive Economy. Econ. Record. 41:193-206.

Smelser, N. J.	1963	Mechanisms of Change and Adjustments to Change. In B. F. Hoselitz and W. E. Moore (ed), Industrialisation and Society.
Spencer, J. E. and Hale, G. A.	1961	The Origins and Distribution of Agricultural Terracing. Pacif. View. 2:1.
Stoddart, D. (ed).	1967	Ecology of Aldabra Atoll, Indian Ocean, Atoll Research Bulletin 118.
Stone, D.	1965	The Rise of the Cook Islands Party. J. Polynes. Soc. 74:80.
Summerhayes, C. P.	1967	Bathymetry and Topographical Lineation in the Cook Islands. N.Z. J. Geol. and Geophys.6:1382-1399.
Ward, R. G.	1965	Land Use and Population in Fiji.
Watters, R. F.	1958	Cultivation in Old Samoa. Econ. Geogr. 4:338-351.
———	1960	The Nature of Shifting Cultivation: A Review of Recent Research. J. Trop. Geogr. 14:35-50.
———	1965	The Development of Agricultural Enterprise in Fiji. J. Polynes. Soc. 74:490.
———	1968	Tribesman or Peasant? The Evolution of Rural Society in Fiji. In I. G. Bassett (ed) Studies of Pacific Peasantry. (In prep).
Wilder, G. P.	1931	Flora of Rarotonga. Bernice P. Bishop Mus. Bulletin 86.
Wood, B. L.	1967	The Geology of the Cook Islands. N.Z. J. Geol. and Geophys. 6:1429-1445.
n.a.	1900	The Rt. Hon. R. J. Seddon's Visit to the South Sea Islands, Tonga, Fiji, Savage and the Cook Islands.

Government Records

Cook Islands Department of Agriculture Records.

Cook Islands Department of Justice Records.

Cook Islands Fruit Control Records.

Mangaia Administration Records.

New Zealand Department of Island Territories. Records and Files.