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THE EUROPEAN LAND SETTLEMENT SCHEME
AT POPONDETTA

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PREFACE

I wish to make grateful acknowledgement to the New Guinea Research Unit for its assistance in making this research possible. I was a Research Assistant with the Unit for six months in 1962, when the initial survey was conducted, and was given a further grant in 1964 to continue the earlier work.

I should also like to express my appreciation to those who read drafts of the paper and contributed much valuable advice and criticism, in particular to Dr. D.G. Bettison for his editorial assistance.

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Origins of the Scheme

The research for this paper was undertaken as part of a broad programme of land tenure research being conducted by the New Guinea Research Unit. The aim of the research programme is to make detailed studies of selected areas where different forms of land tenure exist, to see which system is

- (a) most conducive to maximum productivity per acre, per man, and per unit of capital;
- (b) best suited to the introduction of new techniques of production;
- (c) best adapted to the emerging patterns of social and work organisation; and
- (d) which factors influence indigenous people in determining the acceptability or otherwise of the various schemes or the decision to modify their existing patterns of land tenure and work organisation on their own land. (1)

The Orokaiva area of the Northern District was selected for the initial studies because of the attempts at cash cropping there under a variety of land tenure systems. These include the government-financed Ex-Servicemen's Credit Scheme (for both Papuans and Europeans), the Higaturu Council Land Registration Scheme, the Yega project, communal plantations, and traditional tenure forms. This paper deals with one of these experiments, the European sector of the Ex-Servicemen's Credit Scheme, which is the first of its kind in Papua. Comparison with other tenure systems in the area must await completion of other studies which are now in progress. Until the trees or the Scheme's plantations come into full production (about 1966-7) it will not be possible to reach final conclusions about the adequacy of the loan to settlers in terms of the local environment, labour availability and other factors. This paper, then, sets out to trace the origin and

(1) Crocombe, 1962:1.

development of the Scheme to date and to make information available on management and development practices.

Before discussing this particular Scheme, the following brief comments are offered on the plantation industry of the Territory which is controlled by non-indigenous owners. (1) It seems that the pattern of development which followed the first world war is being repeated after the second. During the mid-1920s properties expropriated from the Germans in New Guinea were offered for sale (largely freehold). (2) During the economic depression of the 1930s many of the plantations owned by individuals were acquired by companies. The decade of the 1930s thus became characterised by a plantation economy which was largely company-owned and manager-operated, generally at a low level of efficiency and production. (3)

The main plantation crop in New Guinea was copra and in Papua rubber, and the industry was beset by instability due to widely fluctuating prices and high turnover in managerial staff. Profits, such as they were, went largely overseas, mainly to Australia, and perhaps because plantation managers were not usually involved in a personal sense in development, relations with labour tended to be poor and there was little incentive to realise maximum production potential. Agricultural extension services virtually were non-existent and finance for plantation development by individuals was not readily available.

After the second world war new areas of land were

(1) Mainly European (including Australian) and Chinese.

(2) Sale of Expropriated Territories , 1925, p. 19.

This publication also specifies that intending purchasers must be either Australian soldiers who are natural-born British subjects, or companies with at least two-thirds of the shares held by natural-born British subjects (p. 21).

(3) It is not possible to support the statement about low levels of efficiency and production with references, as there is virtually no published material available on the pre-war plantation industry; however, the assumption would appear to be valid in that current expectation of yields, labour productivity, etc. is considerably higher than it was even in the mid-1950s.

again made available for leasing as agricultural holdings, not, this time, as a result of expropriation, but due to the extension of Administrative control into recently discovered areas, particularly the Highlands. New crops such as cocoa and coffee were planted on a much greater scale. And the trend toward individually-owned and operated plantations reappeared because many ex-servicemen who had been in Papua-New Guinea during the war were attracted to return. This trend probably reached its peak by about 1954, by which time a considerable area of land had been leased to individual expatriates.

By about 1956-7 many of the planters who had come to the country in the postwar period were in financial difficulty. Some of the main aggravating factors were insufficient capital, the length of time (usually several years) before a return on investment could be realised from plantation production, fluctuating prices and uncertain markets in the face of competition from other countries with established marketing agreements, and rising costs of labour. For example, a survey of the cocoa industry in the Territory by Bureau of Agricultural Economics in 1957-8 commented

... individual settlers opening up new areas may face a formidable task. This is a feature of plantation crops, where the capital investment is relatively high and worthwhile returns are not immediately forthcoming... Bankers in the Territory indicated that there was little recent demand for bank finance in plantation development. This has been due in part to the general availability of funds for investment in existing plantations and in company enterprises, but also to the inability of individuals to borrow from banks unless they had already established a substantial equity in their new plantations. It is likely that an increasing number of individual planters on new sole cocoa plantations will require bank finance in the next few years to complete the development already under way. (1)

This statement applied equally at that time to coffee plantations in the Highlands.

(1) Department of Territories, 1958:26-7.

Once again, a number of planters had been forced to sell their properties after only a few years, often to companies formed in Australia. This was an unwelcome step for the Territory's economy, both in terms of the outflow of profits from the country, and of production rates, which are invariably lower under company management. It was especially unwelcome as the problem of economic development in the Territory was becoming crucial: government finance was inadequate to meet increased demands for health, education, transport and other services, and the growing realisation that political independence would be sought much sooner than most people had hitherto thought, lent urgency to the goal of economic viability.

The government's obligations to protect the interests and foster the welfare of the European community of Papua-New Guinea have been no less firmly stated than have those towards the indigenous people. Government policy and planning has accepted expatriate enterprise as a necessity for the development and progress of the Territory. Furthermore, most Europeans enjoy a higher economic and social status in Papua-New Guinea than they would in Australia and thus far the Administration has seemed to be anxious to preserve this status, and to prevent the emergence of any white group with incomes below the levels accepted by Australians in the Territory.

By 1958, therefore, it seems to have appeared necessary to the government to take direct action on behalf of the expatriate planters, not only to assist those whose properties were in financial difficulty but also to stimulate further the production of export crops by making land and capital available to attract more settler-producers. It is against this background of economic, social and political⁽¹⁾ issues that the Minister for Territories announced in 1958 the introduction of a scheme to provide land and credit to ex-service-men. Coming as it did thirteen years after the end of the war, the scheme appears to have been primarily a means of

(1) The Returned Servicemen's League both in the Territory and in Australia was influential; one informant stated that R. S. L. pressure was the most important single factor that led to the introduction of the Scheme.

extending aid to expatriates, but, having made such provision in the name of ex-servicemen, the scheme had of necessity to provide some assistance for Papuan ex-servicemen as well as European ex-servicemen. (1)

Early in 1958 Brookfield, discussing the prospects for European development in the Territory, commented that:

Mention should perhaps be made of various proposals to establish European small-farmer settlers, particularly "Soldier Settlers" at various places in New Guinea. . . . Cost alone has discredited such schemes; establishment and initial maintenance of each settler would cost the Australian taxpayer tens of thousands of pounds per head. (2)

Several months later, however, in May 1958, Mr. Hasluck announced in a press release that such a scheme would be introduced:

The scheme will enable credit to be made available to ex-servicemen settlers who are already occupying agricultural land holdings in the Territory, or who obtain agricultural land holdings through the normal method of application for land advertised as available for leasing. . . . Loans may be made to qualified eligible ex-servicemen for the purpose of providing working capital, paying for and effecting improvements, equipping stock, plant and equipment, and discharging any mortgages, charge, bill of sale or other encumbrance on the property.

The legislation was effected in October 1958 when the Ex-Servicemen's Credit Ordinance was gazetted. A Credit Board was set up and applications invited for loans. The maximum amount of credit available to any person (in practice only to Europeans) was £25,000, to be repaid over a maximum period of 25 years at 3 ³/₄% interest. This, together with the cost of providing surveys, roads, schools and the like for the new

(1) See Papua-New Guinea Agricultural Journal, Vol. 15, Nos. 3-4 (articles by R. J. Cheetham) for studies concerning the Papuan ex-servicemen.

(2) Brookfield, H. C. in Wilkes, ed., 1958:23.

settlers would indeed, as Brookfield predicted, involve the Australian taxpayers intens of thousands of pounds, but for the reasons discussed above the financial burden was apparently outweighed by considerations which the government felt to be more important.

The amount of the loan in each individual case was to be determined on the criterion of the capital necessary for development to "home maintenance area". This concept is defined in the Ordinance as follows:

An area developed to a stage of production, based on suitable land use, which, on average yields and prices would, in the opinion of the Board, in each particular case be sufficient to provide a reasonable living for a borrower after meeting such financial commitments as would be incurred by a person possessing no capital.

The fundamental concept determining size of loan was that of "a reasonable living for the borrower", but the Board has never stated publicly what level of income it considers to be reasonable. (1) In the matter of land subdivision and determination of optimum area, consideration was given to the necessity of plantation income to provide a "reasonable living" plus funds for the amortisation of capital invested. (2) For the Northern District settlers this area was determined as 400-500 acres on the following premises: one European should be able to manage efficiently 100 labourers, who are sufficient to develop 300 acres of cocoa; in addition, some 50

(1) Though it obviously considers a "reasonable living" to be many times higher for Europeans than for Papuans.

(2) Optimum area size varies somewhat according to locality, soil fertility, etc. , and is usually expressed in terms of arable land suitable for a specific crop, thus:

Cocoa:	200-250 acres arable land			
Coffee:	100	"	"	"
Coconuts:	600	"	"	"
Rubber:	200	"	"	" (for high-yielding clonal seed).

Often there is not a great difference between minimum and optimum areas. An area of land containing less than two optimum areas generally was made available for leasing in toto, but if land could be conveniently subdivided into two or more optimum areas this was done.

acres or more were included as a "service area" for buildings, gardens, recreation, road development, and whatever un-utilisable land must be included to fulfil these requirements.

To be eligible for a loan, the applicant was required to have served a certain length of time in either the second world war, or the Malayan or Korean operations; to have spent a specified period of residence in the Territory;⁽¹⁾ and to have "a knowledge and experience of agriculture sufficient to enable him to engage successfully in agriculture in the Territory". Although not expressly stated in the Ordinance, it was stressed in press statements that

The experience of an applicant in tropical agriculture and management of native labour will be carefully considered by the Classification Committee . . .⁽²⁾

The basic condition of the loan was that the person in receipt of it

. . . shall reside on and devote his full time to the management of the property the subject of the loan, unless the Board in any particular case otherwise approves.

By April, 1959, several months after the legislation to provide credit had been enacted, loans totalling nearly £180,000 had been approved and a number of further applications were being considered.⁽³⁾ Many of these initial loans were in the form of assistance to plantations already being developed, and were therefore less than the maximum amount of £25,000 per individual, though in the Northern District almost all the early loans to Europeans were for the full amount. In November 1962 it was announced that nearly £3,000,000 had been made available for agricultural development when the scheme closed in the beginning of that month.⁽⁴⁾

(1) The residential qualification required an applicant to have resided in Papua-New Guinea for at least five years prior to, but not necessarily immediately prior to, the commencement of the Scheme.

(2) By the Minister on 25.5.58 and by the Administrator on 11.11.58.

(3) Though not all of these were for settlers in the Northern District.

(4) South Pacific Post, 9.11.62.

By August 1964, a spokesman for the Credit Board stated that 131 loans, totalling £112,550, had been made to Papuans and New Guineans and 141 loans, totalling £3,120,000, had been made to Europeans. (1)

In April 1959 twenty blocks of land suitable for cocoa, coconuts, rubber and lowlands coffee (Robusta) were advertised as being available for lease (in practice to Europeans only) in the Popondetta area. (2) This land in the Popondetta area represents one of the greatest concentrations of new agricultural development in the country. Some applicants for a loan in other parts of the country had been rejected because the size or potential of their existing properties did not warrant the capitalisation they had proposed; and it was suggested that they might consider the opportunity to develop a new block with better economic prospects, such as those advertised in the Popondetta district. (3)

The Physical Setting

The Popondetta plains are among the most fertile regions in the Territory. A gently-graded plain composed of recent alluvial and volcanic materials extends from the piedmonts of Mount Lamington and the Hydrographer Range

(1) By District, the allocation of blocks to mid-1964 was as follows:

<u>District</u>	<u>European</u>	<u>Papuan/New Guinean</u>
Central	19	2
Gulf	-	1
Milne Bay	4	-
Northern	29	78
Bougainville	6	-
Eastern Highlands	20	-
Madang	2	1
Morobe	18	18
New Britain	27	15
New Ireland	6	1
Sepik	-	15
Western Highlands	10	-

(2) Land was also advertised in other parts of the Territory, notably the Warangoi Valley in New Britain.

(3) Several of the European settlers now in the Popondetta area acted on this suggestion and disposed of uneconomic blocks which they had been working elsewhere.

northwards, the soft unconsolidated sediments scored by streams and rivers. The areas which contain the greatest concentration of plantations are described by the CSIRO team which surveyed the area in 1953 as consisting of piedmont terraces, dissected volcanic plains and volcanic outwash plains, ranging in altitude from about 100 to 1400 feet above sea level.⁽¹⁾ A characteristic of the rivers here, which derive largely from Mount Lamington, is their liability to flash flooding after rains; although they rarely rise beyond bankfall stage, unpredictable rises in level in unbridged rivers is a hindrance to local travel.

For the most part the Popondetta piedmonts and plains are covered by dense tropical rain forest vegetation with the usual complexity of species. Much of it is still virgin bush,⁽²⁾ interspersed with small areas under current cultivation or regrowth vegetation. Towards the coast, however, there are large swampy areas and a consequent vegetational change: discontinuous strips of grassland, in which Saccharum spontaneum and Imperata cylindrica are typical, are increasingly found interspersed with the forest and grassland.

The climate is characterised by heavy rainfall, uniformly high temperatures and high humidity. Meteorological data is scarce and for the short-term, but rainfall data collected from a number of plantations as well as for Popondetta suggest that over an area extending about fifteen miles inland from the coast the rainfall is about 100 inches annually, with heavier falls between the months of October to March than in the rest of the year, although there is no real dry season. In the drier months, roughly April to October, southeast winds are dominant; in the wetter months the winds are mainly northwest. Further inland across the foothills there is a marked increase in rainfall to almost 200 inches annually, and it is even less distinctly seasonal in nature. A factor of some importance for agriculture is the rainfall

(1) "Lands of the Buna-Kokoda Area", CSIRO Land Research Series 10, Melbourne 1964.

(2) i. e., at least not used within the memory of the local inhabitants.

variability, particularly from month to month, but occasionally for periods of several months together. For example, the rainfall during the 1963-4 "wet" season was well below expectation and most planters claimed to have suffered loss of production as a result.

Temperatures are mainly within the range 70-90 degrees F., with the season of northwest winds being slightly hotter. The high temperatures and high humidity make for an enervating climate, although nights are usually comfortably cool, and minimum temperatures seem to be influenced by comparatively slight increases in altitude.

On the whole, the combination of soils and terrain, rainfall and temperature, make this area eminently suitable for the production of tropical commercial crops. The CSIRO Report states that there are no major (environmental) limitations to plant growth for the greater part of the year in this area, and that some characteristics of the climate, such as cloud cover, are indeed beneficial to tree crops such as coffee and cocoa, which are grown under partial shade. (1)

And, in contrast to some other accessible fertile areas of the Territory, the Northern District is not densely populated, and there was a considerable area of Crown Land available for plantation development. (2)

Although there seems to have been no specific direction to the soldier settlers to plant cocoa rather than one or a combination of the other tropical plantation crops for which the district is suitable, most of the settlers planted cocoa. So far as environmental conditions are concerned, the land around Popondetta appears equally suitable for cocoa, rubber or Robusta coffee, although less favourable for copra

(1) CSIRO Land Research Series No. 10:52.

(2) Up to 1959 the Administration had acquired about 65,000 acres of land in the Popondetta sub-district, although a considerable part of this was grassland for a kenaf scheme which failed. But there were 33,000 acres of timber land at Sangara near Popondetta.

production than areas nearer the coast. But several non-environmental factors were responsible for the choice of cocoa as the first crop in the district. A major problem for producers of tropical crops is the question of markets, and cocoa was at that time (1958-9) considered to be the most promising crop. The marketing of coffee from the Territory at the end of the 1950s was proving difficult, and a quantity of coffee remained unsold at the end of each season, although a marketing agreement has subsequently been negotiated which has relieved the position. (1) The Territory also has an arrangement with Australia to market its rubber production (2) but even so, production of these crops cannot greatly exceed the amount which Australia can comfortably absorb. Apart from the persistent threat of competition from synthetics to the rubber industry, rubber has the further disadvantages, as against cocoa, that it is more expensive to establish, (3) that tapping does not commence until the fifth year and trees do not reach full maturity until the tenth year, that a higher order of skill is required of the labour force and that more extensive processing on the plantation is necessary before it can be marketed.

(1) Since August 1961, as a result of negotiation between coffee producers, coffee-buying agencies in Australia, the Administration of Papua-New Guinea, and the Australian Departments of Trade and Territories, the arrangement has been that agents purchasing 28% of their coffee requirements from Territory production may import the balance of their requirements duty-free. This percentage was adopted because the Territory currently produces about 30% of Australia's coffee requirements. How long this arrangement will continue to be satisfactory to producers is in question; coffee production from Papua-New Guinea is increasing rapidly each year as native plantings come into bearing. No import duty is imposed on Territory coffee on the Australian market; on coffee from all other areas the duty is 3d. per pound.

(2) Australian manufacturers receive all rubber produced in the Territory in return for an import tax reduction thus allowable on rubber imports from other countries. All marketing is handled by the Papuan Rubber Pool. Australian representatives arrange sales of all shipments to the various manufacturers.

(3) One informant suggested that at least £40,000 would be needed to establish a minimum area of 350 acres under rubber.

The Plantation Survey

A survey of selected European plantations in the district was conducted during June-July 1962, and the same plantations were revisited briefly during May 1964. Table 1 lists all the plantations in Popondetta sub-district giving area, type of ownership and management, main crop or crops produced, and year of occupation. Of the plantations operated by individual owners, the table separates those which receive credit under the Ex-Servicemen's Scheme (Nos. 12-38) from those which do not (Nos. 1-11). In order to preserve anonymity the twenty plantations included in the survey are not distinguished from those which were not included.

The nature of the sample deserves some explanation. It was proposed to include in the survey firstly a sample of plantations which were producing cocoa as their sole or major crop, which were managed by the owner, and which were wholly or mainly financed by the Ex-Servicemen's Credit Scheme. The reason for the last criterion was that the amount of capital made available by the scheme (a major determinant of the rate of development), appeared adequate, thus creating an ideal situation in which to study plantation development.

The survey did not include either pre-war plantations or company-owned plantations: in the former case it was felt that few comparisons could be made at this stage with the Ex-Servicemen's blocks, which were still in the early developmental phase when the initial survey was undertaken; in the latter case it was found difficult to obtain access to records, which were usually held either in the company's head offices in Australia or with accountants in other towns in the Territory. It would, however, be useful to include these two categories of plantation in a more extensive survey at a time when the Ex-Servicemen's plantations are in full production.

Secondly, the sample includes two properties which are operating without assistance from the Credit Board, in one instance under individual owner-managership, in the other by partnership. These were included in the survey because in all respects but source of capital they could be compared with the Ex-Servicemen's blocks. Finally, three

Table 1

Area, ownership, management and crop on European plantations in the Popondetta area

No.	Area (acres)	Ownership	Management	Crops (+)	Year Occupied
1	2,870	Company	2-3 managers	R, ca	Prewar
2	1,000	Company	Manager	R	Prewar
3	1,550	Company	Manager	Ca, co	Prewar
4	840	Company	Manager	Ca	?
5	2,850	Company	2 managers	Ca	c. 1955
6	440	Company	Manager	Ca	c. 1955
7	920	Individual	Owner	R, ca, cf	Prewar
8	672	Individual	Owner	Ca	1956
9	430	Partnership	Partners	Ca	1958
10	440	Individual	Manager	Ca	?
11	510	Individual	Owner	Ca	1961
12	530	Individual	Owner	Ca, cf, co	1955
13	510	Individual	Owner	Ca	1955
14	1,280	Individual	Owner	Ca	1956
15	c. 500	Individual	Owner	Ca	?
16	400	Individual	Owner	Ca	1959
17	440	Individual	Owner	Ca, pn	1959
18	400	Individual	Owner	Ca	1959
19	440	Individual	Owner	Ca	1959
20	550	Individual	Owner	Ca	1959
21	440	Individual	Owner	Ca	1959
22	400	Individual	Owner	Ca	1959
23	400	Individual	Owner	Ca	1959
24	470	Individual	Owner	Ca	1959
25	430	Individual	Owner	Ca	1959
26	450	Individual	Owner	Ca, cf, co	1959
27	400	Individual	Owner	Ca	1959
28	420	Individual	Owner	Ca	1959
29	400	Individual	Owner	Ca	1959
30	430	Individual	Owner	Ca, co	1960
31	440	Individual	Owner	Ca	1960
32	570	Individual	Owner	Ca	1960
33	410	Individual	Owner	Ca, co	1960
34	390	Individual	Owner	Ca	1960
35	536	Individual	Owner	Ca	1961
36	488	Individual	Owner	Ca	1961
37	300	Individual	Owner	Ca	1961
38	748	Individual	Owner	Ca	1961

(+) Ca : cocoa Co : coconuts Cf : coffee R : rubber Pn : peanuts

properties are included which are now receiving credit under the scheme, but which were initially operated on private finance. Thus fifteen of the twenty plantations in the survey have been operating on finance from the Credit Board since their inception, i. e. between mid-1959 and 1961. A further stratification was made to select from among the plantations numbered 12-38 in Table 1, as far as possible, those which had been taken up in 1959 and which had therefore had more time to undertake development. Only one plantation is included from those which were begun as late as 1961.

The planters in the sample were interviewed on the basis of a prepared questionnaire, and for comparative purposes that used in 1964 was essentially the same as the original one.⁽¹⁾ The number interviewed was originally greater than twenty, but as some planters were unable to supply all the information sought, the sample was reduced accordingly. Two of the initial twenty were unable to supply all the information needed for the follow-up survey in 1964, but they are included in statistics given later in this paper for the 1962 survey. The plantations in the 1962 sample represent 40% of the total area under European control in the district, and 65% of the total area of plantations which are not under company management. Sixty-three per cent of plantations under individual ownership are represented.

The questionnaire included sections of land use, the pattern of development to the time of survey, and the proposed development over the following three years (i. e. to 1965 in the case of the initial interview; to 1967 in the case of the subsequent interview); census data in a section on household composition; a section on aspects of native labour on the plantations, including occupations, length and type of employment, wages, labour requirements and work organisation; and a final section on investment, income and expenditure. It is proposed to discuss the data assembled during the surveys by reference to and analysis of tables which have been compiled from the questionnaires.

(1) See Appendix.

Land Use

Tables 2 and 3 set out details of the land use on the twenty plantations for the first and second surveys respectively. The year of occupancy is included again as a guide to the variation in rate of development, although in several cases factors such as sickness have retarded progress.

Considering the recency of occupation of most of the blocks, a high proportion of the total area had been planted with cocoa by 1962, although, as will be seen from Table 3, the percentage increase of land under cocoa was comparatively small two years later (5.2%). Furthermore, the statistics in Tables 2 and 3 are those obtained from the planters themselves; Credit Board estimates of "effective acreage" amount to 420 acres less than the total of 4,219 acres of planted cocoa for the eighteen settlers receiving Credit Board assistance. In other words, what the Credit Board considers to be fully planted cocoa in 1964 is only 41.4% of the total area of those eighteen plantations, compared with the 46% represented by statistics obtained from the planters. Some reasons for this slowing-down of development in the last two years will be offered later. Although rapid initial clearing and planting was facilitated for ex-servicemen by considerable loan finance, those plantations which began development on private capital did not differ markedly in the early stages of development.

It is interesting to note the relatively small acreage under other commercial crops in both tables. Few seem to have considered it worthwhile to plant short-term "catch crops" such as peanuts or sweet potato. There are possibly several factors involved here: in the first place, settlers financed by the Credit Board were required to plant a minimum of 150 acres within the first two years; and secondly, for these settlers it was considered that the loan would be adequate to support them until the major crop matured, otherwise the practice of planting quick-maturing crops to provide an immediate income might have been more widely adopted in the first years. It is worth pointing out also that one planter who grew peanuts for this purpose had difficulty in marketing his crop.

Table 2
Land use, 20 plantations, 1962

Plantation No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total Acres	% Total Area
Year Occupation	1961	1956	1960	1960	1959	1959	1960	1959	1959	1958	1960	1959	1959	1956	1959	1955	1960	1959	1955	1959		
LAND USE																						
(ACRES)																						
Forest	275	250	75	36	155	86	125	139	80	121	235	130	255	460	157	52	173	157	316	136	3413	33.7
Grassland	20	20	-	300	-	-	-	-	17	30	-	-	90	372	-	-	-	6	-	40	895	8.8
Cocoa	130	300	260	220	130	216	253	238	196	255	200	240	120	299	180	340	150	164	150	154	4195	41.6
Other Crops*	-	Co.30	-	-	-	Sp.14 Cf. 9	-	-	-	-	-	Sp.5 B. 5 R. 1	B.3	-	-	Cf.5	-	Pn.13 Sp.12	-	-	97	0.9
Native Gardens	7	40	-	-	8	-	-	4	-	10	2	-	-	32	15	90	5	35	16	10	274	2.7
Cleared, not planted	-	-	60	-	-	58	12	-	87	1	-	-	55	-	20	-	29	24	-	40	386	3.8
Shaded, not planted	20	-	-	10	-	43	-	-	-	-	-	-	-	15	15	-	12	-	17	-	132	1.3
Buildings	2	7	10	2	7	16	4	6	1	7	3	10	2	4	3	8	1	6	1	16	116	1.1
Access Roads	2	10	5	2	-	8	6	-	8	-	-	9	5	8	10	3	4	3	4	-	87	0.9
Unusable	80	15	20	-	100	-	10	13	11	6	-	40	20	90	-	32	16	20	6	44	523	5.2
TOTAL	536	672	430	570	400	450	410	400	400	430	440	440	550	1280	400	530	390	440	510	440	10118	100%

*Co. : Coconuts
Sp. : Sweet potato
Cf. : Coffee
B. : Bananas
R. : Rubber
Pn. : Peanuts

Table 3

Land use, 20 plantations, 1964

Plantation No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total Acres	% Total Area
Year Occupation	1961	1956	1960	1960	1959	1959	1960	1959	1959	1958	1960	1959	1959	1956	1959	1955	1960	1959	1955	1959		
<u>LAND USE</u> <u>(ACRES)</u>																						
Forest	151	240	235	26	111	66	84	33	80	105	232	140	255	446	138	52	130	140	316	135	3115	30.3
Grassland	20	50	-	300	-	-	-	-	17	30	20	-	96	372	-	-	-	56**	-	40	1001	9.7
Cocoa	176	310	260	240	172	288	306	340	196	272	180	275	112	329	200	340	235	203	167	200	4801	46.8
Other Crops	-	-	R.30	-	-	R.5	-	-	-	-	-	R. 46 Sp. 10 B. 5	B.5	-	-	Cf.5	-	-	-	-	106	1.0
Native Gardens	5	40	-	-	5	11	-	3	2	10	5	-	-	30	25	90	4	15	15	5	265	2.6
Cleared, not planted	-	-	30	-	5	56	-	-	85**	-	-	-	55**	-	-	-	-	-	-	-	231	2.3
Shaded, not planted	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20**	-	-	-	-	20	0.2
Buildings	2	7	10	2	7	16	4	6	1	7	3	10	2	4	3	8	1	6	2	16	117	1.1
Access Roads	2	10	5	-	-	8	6	12	8	-	-	9	5	9	14	3	4	-	4	-	99	1.0
Unusable	80	15	20	2	100	-	10	6	11	6	-	40	20	90	-	32	16	20	6	44	518	5.0
TOTAL	436*	672	590*	570	400	450	410	400	400	430	440	535*	550	1280	400	530	390	440	510	440	10273	100%

R. : Rubber
 Sp. : Sweet potato
 B. : Beans
 Cf. : Coffee

* These plantations had either extensions to property since 1962, or reductions. Refer Table 2.

** Now under second growth.

The plantings to date of the other long-term crops, rubber, coffee, and coconuts, have been largely experimental and so far not notably successful, although it is likely that greater diversification will be undertaken when the present cocoa plantings are in full production. On one plantation thirty acres of coconuts planted several years ago have been retired due to poor soils, and smaller acreages of rubber and coffee have also proved unsuccessful, either because of lack of attention, soil type, or plant variety.

Replies to questions asked in 1962 about proposed land use over the following three years showed that the twenty farmers planned to plant an additional 1,140 acres of cocoa, between 500 and 600 acres of rubber, and a total of another 100 acres or so of various crops such as coconuts, coffee, sweet potato and sorghum (the last two in commercial quantities). Although the three-year period was not up by the time of the second survey, events so far have proved these predictions to be over-optimistic and not likely to be realised for some time. In effect, since 1962 there have been additional plantings of 615 acres of cocoa, and 81 acres of rubber; the 1964 statistics show a reversal of the land planted to sweet potato and peanuts and coconuts. Predictions made in 1964 for the next three years were rather more modest: for the twenty plantations, an additional 700 acres of cocoa, 280 acres of rubber and 30 acres of coconuts.

All but 30 acres of the 4,801 acres planted with cocoa were planted on former forest land. Many of the plantations had no grassland in any case, but on three there are significant acreages. The grassland, mainly Imperata spp., is more difficult to clear than virgin bush⁽¹⁾ and its fertility is uncertain. One planter with a large area of grassland planned to run a small herd of cattle but now considers this beyond his means. The carrying capacity of the grasslands has not been determined but it is unlikely to be high; although some pasture improvement would probably be needed the returns from cattle are likely to be more satisfactory than those which the efforts of establishing cocoa would yield on the

(1) It is not necessary to clear forest completely to plant cocoa, but the grasses must be eradicated thoroughly.

Imperata-dominated land.

The area listed in the tables as devoted to native gardens is an estimate: 70% of the planters interviewed had set aside land on their properties which could be cultivated as food gardens by their labourers in their own time, and in some cases employers bought food thus grown and issued it as part of the food rations; in most cases labourers were expected to supplement their rations from these gardens. The figures given in Tables 2 and 3 represent the area set aside for this purpose, rather than the actual area cultivated, as a margin for fallow is always necessary.

The category Unusable Land is largely gully land, but it is revealing to observe that some planters do not regard such land as unusable, in spite of the danger of aggravating erosion by clearing the gullies and attempting to plant the sides. Certainly there can be no absolute definition of unusable land if it is within certain limits of slope, and providing adequate cover crops are established erosion may be minimised, but a difficulty here is that cover crops under these conditions of rainfall and temperature often become weed pests and nutrient robbers.

The areas shown under Access Roads refer to roads built inside the property - chains or miles have been converted to acreages. The extent of access roading varies considerably. The two tables give only an approximate indication of this, for a planter who has constructed narrow roads may have twice the length of roads as another with wide roads, although the total acreage will be similar. Also, some planters have been able to take advantage of public roads bordering their properties and thus to reduce road development within them. The extension of access roads is regarded as an important aspect of plantation management, and one agricultural officer in the district considers that the maximum area that can be managed effectively by one man is strongly influenced by the extent of the internal road system of the plantation. Limited road development means that more time may be spent in movement and supervising labour gangs with consequent loss of efficiency.

Although not mentioned in the Tables, very little livestock is kept on the plantations investigated. Some ran a few pigs, and most kept poultry, usually for plantation use, although in several cases for the sale of eggs in the township as a minor sideline.

When the first survey was carried out only four plantations had bearing cocoa, although another eight expected a first harvest during the 1962-3 wet season. In fact, only five harvested cocoa when anticipated, and the harvests were minor. Table 4 sets out the actual and potential production from the planted cocoa on the twenty plantations. Estimates of yields were based on the following figures, supplied by the Department of Agriculture: 3-4 year old trees: 0.25 lbs. dry beans/acre; 4-5 year old trees: 0.75 lbs.; 5-6 year old trees: 1 lb.; 6-7 year old trees: 2 lbs.; 7-8 year old trees: 3 lbs.

Table 4

Production, actual and potential - 20 plantations

<u>Year</u>	<u>Actual</u> (tons, dry beans)	<u>Potential</u> (tons, dry beans)
1958	c. 1	less than 3
1959	4.8	12
1960	26	27
1961	27	41
1962	37	58
1963	58.5	106
1964	124 (est.)	192

The figures were derived by calculating the number of trees per plantation from the spacing systems. The spacing system recommended by the Department of Agriculture results in 349 trees per acre; 64% of the total acreage was planted on this system, about 28% was planted on a system giving a density of about 225 trees per acre, and the remaining 8% under a variety of spacing systems.

It is difficult to account for the discrepancies between actual and potential production in this Table for the years 1959 and 1961, although one reason may be suggested. The harvest for the first year or so of production is particularly difficult to predict: some trees, due to poor planting, lack of attention to shade control or some other husbandry practice may not bear up to expectations, although an extra year's growth may rectify this, and much of the 1961 crop was from first harvests. It seems fairly certain that the consistently low yields since then have been caused in large part by pest infestation, and possibly aggravated by dry seasons, especially in the 1961-2 rainy season.

The most serious pest in the district is a caterpillar commonly known as the army worm (Tiracola plagiata). This caterpillar, which mainly attacks the new leaves and shoots of young trees, retarding growth, spread in unanticipated proportions throughout the Popondetta district; its distribution undoubtedly assisted by the close proximity of the plantations. Army worm first appeared in the district early in 1960, at a time when it was not known what or how to spray, and early attempts at control proved both costly and time-consuming. Because previous experience of this pest from other tropical areas suggested that the army worm would eventually be suppressed by parasites and predators, the Department of Agriculture was at first not particularly concerned about eradication measures, but at the end of 1961, when infestation was becoming serious, a government entomologist was sent to the district. However, he was unable to find any parasites or predators, and concluded that they must have been destroyed by previous sprayings. During 1962, a variety of control measures was undertaken, mostly without success. These included the introduction of Tachinid flies from India (but it was later established that they were already present in the area); the use of lead-arsenate as a specific against leaf-eating insects (but because it was slow to take effect, dangerous to handle, and had no special advantage over contact insecticides its use was discontinued); and the introduction of egg parasites from the wasp Trichogramma minutae from the U.S.A. (but although several large introductions were made in 1963, no wasps had been recovered by mid-1964 and it is feared that they may have been eaten

by ants). As well, the Department of Agriculture made a close investigation of the effects of contact insecticides, and concluded that spot-spraying (rather than total spraying) with D. D. T. was the cheapest and most effective means of control. Spot spraying of the "flush", that is, the new leaf growth, was recommended, as this is most vulnerable to attack, and the fear persisted that total spraying was destroying natural predators. In mid-1964, in order to render the control programme more effective, the Department of Agriculture held a three-day residential course at the Papuan Agricultural Training Institute in Popondetta, which was attended by one labourer from each plantation, and it was proposed to follow this up with a field day on other aspects of pest control.

It is hoped that effective biological pest control can be achieved, as sprays are not only expensive⁽¹⁾ but may be quite ineffective if carelessly applied. So far only a few indigenous parasites have been isolated, and it is hoped that these will build up. Toads were introduced early in 1964 at the request of the District Advisory Council - these seemed to be breeding and may be successful. The main problem with egg parasites so far seems to be that the wasp and the army worm cycles are out of phase and the wasp population is unable to increase.

In the meantime, the planters themselves have undertaken a variety of "solutions" to the problem, ranging from no action at all to total spraying, and in some cases, crop dusting,⁽²⁾ and experiments with shade con-

(1) The Department of Agriculture estimated the following costs: DDT: 3/- per acre (application every 4-5 weeks); labour 2/- per acre. Cost is influenced by availability of water, and cartage may increase costs to 8/- per acre. These figures do not include replacement of machinery. Annual cost would be about £400-£500.

(2) The duster is used between 2 a. m. and 6 a. m. to let the dust (5% DDT dust) settle with the cold air during these hours. By this method, not only the cocoa but the shade trees as well can be treated, whereas this is impossible from the ground with hand sprays. The dust is claimed to give a 90% knockdown, and 250 acres can be covered in two nights. Cost is between 12/- and 13/- per ac.

trol. (1) Attacks do not appear to have lessened in severity, although it was reported by several informants that during the dry seasons of 1962 and 1963 the infestations were lighter, and it is also believed that the cycle is lengthening from between four and five weeks to between six and seven weeks. In 1962 most of the planters whose properties had been severely affected estimated that their first harvest would be a year later than normal as a result; by 1964 the majority of planters claimed that their normal production had been set back by up to two years.

Several things seem certain. One is that the pest is serious, although it appears that some settlers have used the army worm as a convenient scapegoat to account for lack of development when other factors, including managerial ability, seem more likely to be responsible. Secondly, it is surprising in this scientific age and after the long experience of monocultural plantation agriculture in the tropics, that some such pest or disease infestation was not anticipated here. After all, the ecological structure of some thousands of acres of land, mostly contiguous, was destroyed in a very short space of time, and in an environment so rich in plant and insect life this upsetting of the ecology could not fail to be manifested by imbalances of some kind. A new environment was substituted in which some competitors and predators would be eliminated and certain species favoured. Although the particular form of imbalance could scarcely have been predicted, it should have been anticipated that such a situation could develop, and any apparent sign of this, such as the army worm build-up, attacked much earlier. (2)

(1) This involved "stumping" all shade trees down to five feet, on the assumption that the shade (Leucaena glauca) harbours the army worm. While this has not been established, there appear to be other advantages in this type of shade control, although the long-range effects remain to be seen. The informant claimed his cocoa grew faster, flowered better, and had a heavy podding, and that caterpillar infestation was absent until the shade trees were of mature height again.

(2) In this connection also, it was observed that since 1962 there has been an increased spread of the vine Mimortica, which is sun-loving and grows in unshaded areas. It is a problem until the cocoa trees canopy, but may also grow completely over trees and kill them eventually. Eight planters said it was present on their properties in serious quantities, ten considered it not serious so far, and two appeared unaware of its existence.

Table 5

Programme of land development under cocoa by year of operation

Plantation Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<u>1st Year</u>																				
Acres cleared	85	190	260	150	80	130	140	146	101	135	50	80	25	n.a.	45	n.a.	105	96	12	120
Acres planted	40	80	-	130	80	130	-	-	-	135	50	-	10	46	-	85	-	-	12	-
<u>2nd Year</u>																				
Acres cleared	65	60	60	80	50	86	118	73	66	63	100	120	50	n.a.	65	n.a.	65	43	21	50
Acres planted	90	110	260	90	30	86	172	189	101	58	100	120	60	72	80	25	120	126	4	109
<u>3rd Year</u>																				
Acres cleared	-	10	-	20	20	101	27	20	29	58	50	40	100	n.a.	60	n.a.	21	42	-	24
Acres planted	-	60	-	20	40	100	-	37	95	41	50	105	40	58	69	20	42	31	17	-
<u>4th Year</u>																				
	-	30	-	-	47	-	53	-	-	-	-	-	-	n.a.	45	n.a.	21	-	80	-
	M	10	-	M	42	-	53	12	-	21	M	35	10	92	31	130	52	18	40	45
<u>5th Year</u>																				
	-	10	-	-	-	-	-	-	-	-	-	-	-	n.a.	40	n.a.	-	-	-	-
	-	30	-	-	-	M	-	72	-	12	-	-	-	10	20	80	-	24	40	56
<u>6th Year</u>																				
	-	10	-	-	-	-	(84)	-	-	-	-	M	-	n.a.	-	M	-	-	17	-
	-	-	-	-	?	-	-	30	-	-	-	-	-	21	M	-	?	-	37	(135)
<u>7th Year</u>																				
	-	-	?	-	-	-	-	-	-	-	-	-	-	n.a.	-	-	-	-	-	-
	-	-	-	-	-	-	-	M	?	?	-	?	42	-	-	-	-	(140)	-	M
<u>8th Year</u>																				
	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
<u>9th Year</u>																				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(300)	-
<u>10th Year</u>																				
	-	-	-	-	-	-	-	-	-	-	-	-	-	(150)	-	-	-	-	-	-

Legend M = maintenance; n.a. = not available; ? = no plans at this stage. Bracketed figures refer to proposed development. Unbracketed figures to actual development.
8th, 9th and 10th years figures refer to acres cleared.

And finally, it seems that for the ex-servicemen's properties at least, some rather more drastic and uniform control measures might have been insisted on by the Credit Board. A lot of public money has been invested here, and conditions are placed by the Credit Board on many aspects of the use of land and finance, so that it scarcely seems an infringement of personal liberty to have insisted on a programme of pest control for these plantations - furthermore, such a programme would undoubtedly have been adopted then as a matter of course by the few privately-owned plantations in the vicinity. In the present circumstances a planter who rigorously attends to spraying each infestation is in effect wasting time and money if his property can be immediately re-infested from adjacent properties where few, irregular, or no control measures are undertaken.

Replies to questions in 1962 regarding proposed land use up to the end of 1965 revealed that five of the plantations expected to be fully developed (that is, the maximum area of cocoa will have been planted) by the end of 1963, a further six by the end of 1964, and all but four by the end of 1965. The re-survey established that five settlers had completed cocoa planting by the end of 1963, and four now expected to complete cocoa planting by the end of 1964. There was less certainty about future planting when the second survey was carried out. Table 5 summarises the programme of land development under cocoa on the twenty plantations, by year of operation. Other crops are not included in the table because planting to date of rubber, coffee, etc. has been minor and plans for future planting may or may not be realised. It will be seen that there is considerable variation between the plantations. In the case of plantations which were begun on private capital in the mid-1950s, the generally slower rate of development was due not so much to a limitation of capital but to rather more modest ideas about plantation operation and management.⁽¹⁾ By contrast, the rate of development by

(1) Whereas the present target is about 100 acres in the first year, and 50 acres in the second and third years, half this would have been considered adequate ten years ago. Also, new techniques have speeded up development, and labour is now used more efficiently.

those planters who began with finance from the Credit Board has been influenced by the fact that the Board requires that a minimum of 150 acres be fully planted within the first two years of occupation. The concept of "home maintenance area standard" referred to earlier ranged from a minimum of 150 to a maximum of 200 acres, and the Board felt that this area was all that could adequately be handled by one person given the extent of the loan. However, planters' own ideas of "full development" (that is, the extent of development the planter was prepared to undertake) vary considerably, as the following table indicates:

Table 6

Anticipated maximum area of cocoa when plantation
fully developed

200-249 acres	9 plantations
250-299 "	2 "
300-349 "	2 "
350-399 "	3 "
400-499 "	2 "
450-600 "	2 "

Thus, less than half the planters interviewed are content to rest on less than 250 acres of cocoa, and five of the plantations whose maximum acreage of cocoa is in this range plan to diversify crop production by planting rubber, rather than extending the acreage under cocoa, as a form of security. Four other planters consider that the maximum of about 200 acres of cocoa is adequate to provide a comfortable income and will not carry out further development after that acreage is reached, although the plantations concerned are large enough for additional production. It must be stressed that "full development" does not refer to the productive potential of the property, but to the planter's estimate of the optimum acreage in terms of his own needed income and managerial capacity. The wide variation in these estimates may be attributed to several factors: in the case of those near the bottom of the range, factors such as size of family, age, sickness, and other business interests seem to contribute; at the other extreme there are men who, by virtue of past experience in handling large numbers of men or large business interests, are undoubtedly capable of the development they

propose; but there are also those who, it would seem, may be over-optimistic or unrealistic about their managerial capacity, or over-ambitious for a large income, and who possibly will not realise the targets they have set themselves.

Labour

In relation to native labour, questions were asked in both surveys about the basis of employment (whether casual or by agreement)⁽¹⁾; the place of origin of the labourers in both these categories; costs of recruiting agreement labour; length of employment of all labourers on the plantation at the time of survey; wages paid to casual labourers and to those with special occupations such as overseers, drivers, domestics, etc.; the variations in demand for labour according to the stage of development and throughout the year; the work organisation on each plantation; and labour requirements for various husbandry practices.

The place of origin of labour was asked in order to establish whether or not the sudden increase in plantation development in the area as a result of the scheme had actually meant increased employment opportunity for local villagers, and to gauge planters' attitudes towards local as opposed to non-local labour. In 1959 the District Commissioner for the Northern District estimated that a labour pool of about 6,000 (presumably additional to those already employed) was available for local industry in the District. Tables 7 and 8 set out details of the places of origin and the occupations of the labour force employed on the sample plantations in 1962 and 1964 respectively.

The first fact to stand out is that there has been a reduction of between 15% and 16% in the total labour force since 1962. One reason for this is that in 1962 some properties were still engaged in initial clearing and planting, and

(1) Workers who are employed outside their home sub-districts are required by law to become agreement workers to gain employment (though compliance is not universal). If employed within the home sub-district, no written agreement is required by law of the terms and conditions of employment, and such workers are referred to as casual workers; they may be employed on a daily, weekly or monthly basis. With certain exceptions, (see Native Labour Employment Ordinance 1958, Par. VIII, No. 67) all other categories of employment must be by written agreement. Regulations applying to the employment of agreement labour are contained in the same Ordinance, Part VII. Special conditions apply to the employment of highlanders (living above 3,500 feet) in lowland areas.

Table 7

Labour employed on 20 plantations
(by place of origin and occupation) 1962

District	General Labourers	Overseers	Drivers	Carpenters	Mechanics	Storemen	Domestic Servants	Other	TOTAL
Popondetta Sub-district	257	12	3	2	1	8	11	2	296
Other Nth. District	18	-	-	-	-	2	4	3	27
Milne Bay	2	3	-	2	-	4	-	-	11
Central	-	-	-	2	-	-	-	-	2
Sepik	8	3	-	-	-	1	3	-	15
Madang	23	2	-	-	-	1	3	-	29
Morobe	89	4	3	-	-	4	4	-	109
E. H'nds	115	1	-	-	-	2	4	-	122
TOTAL	512	25	6	6	1	22	29	5	606

Table 8

Labour employed on 20 plantations
(by place of origin and occupation) 1964

District	General Labourers	Overseers	Drivers	Carpenters	Mechanics	Storemen	Domestic Servants	Other	TOTAL
Popondetta Sub-district	208	8	2	-	1	7	13	5	244
Other Nth. District	2	-	-	-	-	-	2	-	4
Milne Bay	-	-	1	1	-	-	-	-	2
Central	-	-	-	-	-	-	1	-	1
Sepik	12	3	-	-	-	-	6	-	21
Madang	10	1	-	1	-	-	3	-	15
Morobe	62	3	-	-	-	-	2	-	67
E. H'lds	139	5	-	-	-	-	3	4	151
New Ireland	-	-	-	-	-	-	1	-	1
TOTAL	433	20	3	2	1	7	31	9	506

these operations require more labour than maintenance operations. But also, by 1964, some planters stated that they simply could not afford to maintain larger numbers of labourers and would not be able to do so again until they had had a reasonable harvest. In some cases money had been transferred from the labour budget to carry out pest control; in others, mismanagement of funds seems to have led to the necessity to reduce labour costs.

In both tables it will be seen that almost half the labour force on these plantations came from within the Popondetta sub-district. Similarly, the ratio between the total number of labourers from Papua and the total from New Guinea had not changed significantly from 1962 to 1964 (New Guineans formed about 44% of the total in 1962; about 50% in 1964). The Eastern Highlands District stands out as a significant source of labour, although only five planters employed Highland labourers in 1962, and eight in 1964. Digressing for a moment, it is interesting to note that none of the labourers from the Eastern Highlands came from the vicinity of the two main townships, Goroka and Kainantu, but rather from more remote parts of the District such as Lufa and Chuave, where economic change has been less pronounced. Nearer the towns, a variety of interests now tends to reduce the numbers seeking outside employment - these are firstly the fact that many have been away as agreement labourers in the early 1950s and one or two terms satisfy their curiosity and desire for wealth and prestige⁽¹⁾; and also that more recently the local government councils and village cash cropping interests tend to keep villagers locally-based.

It will be further observed that most of the workers drawn from the Eastern Highlands and the Popondetta sub-district are general labourers (about 85% in each table) that is, unskilled. However, the Popondetta sub-district also supplies these plantations with more skilled labourers than

(1) On this subject, see R.F. Salisbury, From Stone to Steel, pp.126-132.

any other. (1)

That part of the labour force which is of local origin is employed on a casual basis, that is, by the week or month rather than on the basis of long-term agreements. An analysis of the employment figures for the plantations shows, however, that there are a few exceptions to the legal situation. Tables 9 and 10 show that a number of non-local natives are employed on a casual rather than agreement basis. This is largely due to the hiring locally of men who found their own way or paid their own passage into the District, or who have found further employment after leaving or being dismissed from a previous job. Of the plantations investigated, twelve employed casual labour only in 1962 and the other eight employed mainly agreement labour with a few casual labourers; in 1964 the figures were the same, except that the individuals employing agreement labour were not the same as in 1962.

Opinions about the efficacy of one form of employment as against the other varied: most planters who employed casual labour maintained that greater efficiency can be achieved with casual labourers because, if unsatisfactory, they can be readily dismissed and others found to take their place. Dismissal of agreement workers before the two-year term is expired is not so simple, and it is also expensive if they have to be repatriated by air to their home districts. However, one informant who employed casual labour said that he would prefer to employ highland (agreement) labour but could not afford to put up permanent labour quarters at the moment. Those who express a preference for agreement labour say that they are able to train and keep a stable work force for about two years and sometimes for longer periods, whereas if one is hiring and firing casual labour one has perforce constantly to train new men into jobs requiring even a very low level of skill.

It is significant that few of the planters who employed casual labour employed men from villages near the

(1) Continuous contact with Europeans since the beginning of the century is probably responsible for this, as well as proximity.

Table 9

Labour employed on 20 plantations
(by place of origin and basis of employment), 1962

Place of Origin	Agreement	Casual	TOTAL
Popondetta sub-district)			
Other N'thn District)	2	321	323
Milne Bay	-	11	11
Central	-	2	2
Sepik	-	15	15
Madang	14	15	29
Morobe	37	67	104
E. Highlands	121	1	122
TOTAL	174	432	606

Table 10

Labour employed on 20 plantations
(by place of origin and basis of employment), 1964

Place of Origin	Agreement	Casual	TOTAL
Popondetta sub-district)			
Other N'thn District)	1	247	248
Milne Bay	-	2	2
Central	-	1	1
Sepik	-	21	21
Madang	3	12	15
Morobe	-	67	67
E. Highlands	135	16	151
New Ireland	-	1	1
TOTAL	139	367	506

plantation; the majority of casual labourers from the Popondetta sub-district came not from within the Higaturu Council area⁽¹⁾ but from the Managalase, south of Mt. Lamington, or the coastal regions around the Opi and Mambare rivers. Although adjacent villagers are cheaper to hire, in that labour quarters do not have to be provided as the men can come daily from the village, it is usually felt that the proximity of families and gardens makes for too much irregularity in the work force.⁽²⁾

By 1964, some interesting additional material had emerged regarding the favoured form of employment. It is more expensive to employ agreement labour, because fares must be paid from the point of recruitment to the plantation, plus repatriation fees, agent's fees, and certain standard issues. Recruitment costs were obtained from several planters, and a breakdown is shown here.

Item	Planter A	Planter B	Planter C
Govt. recruiting fee	£8. 12. 0	£7. 15. 0	£7. 10. 0
Air fare to Lae	7. 5. 0	7. 10. 0	5. 0. 0
Boat fare to Killerton (nr. Pop.)	1. 10. 0	1. 10. 0	1. 10. 0
Issues (clothing blankets, etc.)	3. 19. 0	4. 19. 6	3. 15. 0
Return fare	8. 15. 0	9. 0. 0	5. 0. 0
Agent's fee	5. 0	1. 6. 0	1. 0. 0
Medical	2. 0. 0	2. 0. 0	2. 0. 0
Total	£34. 6. 0	£28. 0. 6	£25. 15. 0

Planter A and planter B received labour from the Kainantu sub-district of the Eastern Highlands; planter C's labour was

(1) See location map.

(2) Some planters who have hired both categories of labourers stated that there was no discernible difference in efficiency between casual and agreement labourers. In any case, this question would be difficult to check. It is possible that until highlanders have gone through an initial adjustment period to the new food and climate, their efficiency is less than that of coastal people.

from the Chimbu sub-district, further west. Some variation in cost is due to air fares: if an air charter can be arranged, fares are considerably cheaper; cost of issues varies according to whether they were bought at wholesale or retail prices. Agent's fees (paid in Lae) will depend on how soon the labourers can complete the journey by sea after arrival at Lae.

Regarding wages for agreement labour, the rates are: first year: 390/- per man, of which 10/- cash is paid over monthly and the rest deferred; second year: 455/- per man, with 15/- cash monthly.

Several planters who had hired agreement labour since 1962 admitted that although it was more expensive in the long run, in the short term it was not, because wages are largely deferred until the end of the contract. This was a vital consideration for some whose budgets were overdrawn. The hope was, in these cases, that by the time the deferred wages were due, a cocoa harvest of reasonable size would make it easier to pay them.

The period for which each labourer had been in employment on the plantation was noted in an attempt to establish the stability or otherwise of labour. If instability exists it will be reflected in the figures for casual labour. Tables 11 and 12 contain the employment periods for casual labour only as agreement workers are bound to serve for two years. The figures suggest that the turnover of casual labour is not great: in 1962 less than one-third, in 1964 about 22%, had been employed for under a year; at the first survey 30% had been employed on the same property for two or more years; by 1964 this percentage had increased to 70%. Thus the second survey seems to indicate that the casual labour force is becoming increasingly stable as plantation routines are established and unsatisfactory workers weeded out. These tables seem to suggest (even though the majority of plantations have been operating for only about five years) that relations between most employers and employees are conducive to long-term employment.

There is remarkably little variation in numbers of

Table 11

Casual labour employed on 20 plantations
(by length of employment), 1962

District of Origin	-3 mths.	3-6	6-12	1-2	2-3	3-4	4-5	5+	n.a.*	Total
	yrs.									
Pop. Sub-dist.	12	27	23	103	25	14	9	28	53	294
Other Nthn. Dist.	-	7	2	6	2	1	-	-	9	27
Milne Bay	3	2	1	3	2	-	-	-	-	11
Central	1	-	1	-	-	-	-	-	-	2
Sepik	-	4	4	1	2	4	-	-	-	15
Madang	-	-	1	6	4	4	-	-	-	15
Morobe	4	3	8	11	37	1	-	-	3	67
E. Highlands	-	1	-	-	-	-	-	-	-	1
TOTAL	20	44	40	130	72	24	9	28	65	432

Table 12

Casual labour employed on 20 plantations
(by length of employment), 1964

District of Origin	-3 mths.	3-6	6-12	1-2	2-3	3-4	4-5	5+	n.a.	Total
	yrs.									
Popondetta	15	3	34	23	67	12	14	67	8	243
Other Nthn. Dist.	-	-	-	-	-	1	1	2	-	4
Milne Bay	1	-	-	-	-	-	-	-	1	2
Central	1	-	-	-	-	-	-	-	-	1
Sepik	2	-	-	3	1	10	2	3	-	21
Madang	-	-	2	-	4	-	2	4	-	12
Morobe	1	9	1	3	11	18	21	3	-	67
E. Highlands	4	7	-	1	1	-	3	-	-	16
N. Ireland	-	-	-	-	-	-	-	-	1	1
TOTAL	24	19	37	30	84	41	43	79	10	367

* Not available

labourers employed on the plantations as a whole: figures were obtained for monthly totals on each plantation for the period January 1961 - June 1962, and June 1963 - June 1964, with, in some cases, complete figures from January 1961 - June 1964. The average monthly totals have decreased somewhat since 1961. The average number of labourers per plantation was 35 in 1961, just over 30 in 1962, 26 in 1963, and 24 in the first six months of 1964. There was, however, some evidence of under-staffing in 1964.

An important part of the survey concerned the management of labour. Enquiries were also made in the original survey into labour requirements for various husbandry practices on the plantations, as it was thought that the figures might give some measure of managerial efficiency; for example, if planter A needed 30 labourers to carry out a task which could be expected to be achieved by 20 labourers, then it might be assumed that planter A's men were not working as well as they were capable. The results are contained in Table 13.

Table 13

Husbandry practices and labour requirements 1962

Operation	Average of labourers/acre/day	Range
Felling bush	18	13-23
Stacking and burning	20	10-30
Lining	4	1-7
Planting shade	3	1-10
Planting cocoa:		
(i) nursery	3	1-6
(ii) stake	2	1-3
Thinning shade and weeding	4	2-5
Pest control	1	$\frac{1}{2}$ -4
Harvesting:		
(i) light	$\frac{1}{4}$	$\frac{1}{6}$ - $\frac{1}{2}$
(ii) heavy	2	(not yet available)

Planters' estimates of the number of men required to carry out a particular operation on an acre in a day were used in an effort to reduce to a common denominator answers which were usually given by example, thus: planter A found that 20 men took two days to weed ten acres under cocoa; planter B found that seven men took 26 days to prune 140 acres, etc. Not all the operations are carried out in the same way on each plantation; this is particularly true of pest control, weeding, and planting methods. Also, few planters were able to supply figures for labour requirements for harvesting when the first survey was conducted, and not many more by the time of second survey, so the figures for harvesting are based on only a quarter of the plantations.

Because the answers ranged so widely, the range as well as the average is shown. It is felt that the average figure given in the table does not necessarily represent the optimum labour requirement for efficiency in each operation - to achieve this, a time-and-motion study would appear to be necessary. It should also be pointed out that for some operations, such as the felling, stacking and burning of bush, local contract groups were hired, and planters who used this method felt that contract labour was more efficient for these tasks. In passing, it may be mentioned that the introduction of the settlement scheme does not appear to have led to the emergence of labour contracting entrepreneurs in the district, although during 1959 and 1960 especially there was quite a demand for contract labour. Mention should also be made of a new clearing technique which has been adopted since the first survey: this is the so-called "thinned-bush" technique, which involves the removal of only under-bush and small trees (one planter left standing all trees with a girth greater than 36 inches), the larger trees thus providing the necessary shade. The merits of this system remain to be finally established, but it is less demanding of labour, and cheaper (from between £2.10.0 to £6.0.0 per acre, compared with about £15.0.0 per acre for conventional clearing).

As an alternative measure of labour requirements, the number of labourers employed at the time of first survey was calculated against hundreds of acres of planted cocoa for each plantation. At that stage of the scheme's operation, the

measure was not considered reliable for precise prediction as some plantations were still clearing and planting while others were already harvesting. These figures, which are contained in Table 14, are however considered more realistic than figures for 1964 when a number of plantations were understaffed to the detriment of the property. Table 14 lists those properties in the "maintenance" stage (that is, where the crop was bearing and only maintenance and harvesting were undertaken) by the symbol M, for a comparison with the rest of the properties. Those employees whose occupations have only marginal or no bearing on cocoa production, such as domestics and storemen, are excluded. Some plantations had crops other than cocoa, as pointed out earlier, but these crops were of limited acreage and the planters concerned generally divert labour to them only spasmodically, when the cocoa requires no particular attention. This factor has been ignored.

Table 14

Labourers per 100 acres of planted cocoa, 1962
(Twenty plantations)

Acres Cocoa	No. labourers (minus domestics and storemen)	Labourers per 100 acres
130	36(-1) 35	27
300	44(-3) 41	14
260(M)	19(-2) 17	6.5
220	29(-2) 27	12
130	22(-1) 21	16
216	32(-1) 31	14
253	34(-3) 31	12
238	25(-3) 22	9
196	19(-2) 17	9
255	33(-3) 30	12
200(M)	28(-2) 26	13
240(M)	37(-7) 30	13
120	22(-2) 20	17
299	40(-3) 37	12
180	27(-3) 24	13
340(M)	47(-6) 41	12
150	27(-3) 24	16
164	33(-2) 31	19
150	31(-4) 27	18
154	30(-2) 28	18

Once again, the range is wide, and these figures are based on numbers actually employed, not on estimated needs. The two extremes can be explained due to special circumstances: in the case of the planter employing 6.5 men per hundred acres, he had, until several months before the 1962 survey, employed 30 agreement workers and 10 casual workers. When the agreement workers were repatriated he took on another ten casual workers but did not plan to build his labour force back to full strength again until the wet season several months later; while in the case of the highest extreme, the planter was still in an early stage of development and had a comparatively large labour force engaged in clearing operations. Table 15 sets out the rank order of labourers employed (per 100 acres of planted cocoa).

Table 15

Rank order of labourers employed - per 100
acres cocoa

Labourers per 100 acres cocoa	No. of plantations
6.5	1
9	2
12	5
13	3
14	2
16	2
17	1
18	2
19	1
27	1
Average per 100 acres cocoa : 13.3 labourers	

The labour requirements of plantations in full development are difficult to estimate, as ideas on the productivity and efficiency of labour seem to be changing fast. It is probably safe to say that under present conditions a figure in the vicinity of fifteen men per 100 acres of cocoa is an average requirement. About 1957, however (before the

present scheme was initiated) a minimum requirement was considered to be one labourer per three acres of cocoa, or 33 per 100 acres. Rising costs of labour in particular have led to insistence on greater efficiency and managers have had to devise means to improve labour output. Other ways in which productivity has been stepped up (and the labour force reduced) are possibly through more rational estate planning and layout, thus lessening the time lost in movement over the plantation; and through more efficient work organisation.

The method of work organisation was investigated in the expectation that additional light might be thrown on the issue of management efficiency. In 1962, eight of the planters interviewed set their labourers to work on a target basis, that is, the plantation labour force was divided into gangs of appropriate size, and directed to finish a certain task or "mark" which was usually capable of completion within a working day. The supposition here was that the gang would have the incentive of a possible early finish to the day's work. The mark set varied according to the task - one planter was in the habit of setting a mark which, in his estimation, his men could achieve by noon if they worked continuously; most set a mark which had to be completed over a certain number of trees, one hundred per worker as a rule (or equivalent to between one-third and one-quarter acres, depending on the spacing system), but up to 200 trees per worker in some cases. A further eight planters worked their labourers according to set hours (8 hours per day, five days weekly as a rule) in 1962, and the remaining four set marks occasionally but basically worked to set hours. In 1964 nine planters were working labour to set hours, seven to marks, and four used a combination. Two had changed to marks since the first survey and one to set hours; of the four now using a combination, two previously worked to marks and one to set hours.

As with virtually every aspect of plantation management, there was a variety of opinions. Some felt that the best results were not necessarily achieved by setting marks, because in the interest of reaching the mark quickly, the task was often carelessly carried out. One informant said that he was forced to employ local labour for economy's sake, and that on the whole they refused to work to set hours, but pre-

ferred the target system so they could leave early to tend their gardens, and so forth. Although another insisted that the target system was inefficient in that the pace tends to be geared to the slowest worker in the group, it would seem that the target system was the more productive of the two if the figures in Table 14 are meaningful, i. e. of those who based their work organisation thus, only two exceeded the average number of labourers per 100 acres of cocoa and the three planters with the lowest ratio of men per 100 acres all set marks. On the other hand it could be argued that an energetic employer would achieve better results from an 8-hour day by intensive supervision; that labourers who complete a mark in less than eight hours are not being used efficiently, and that greater leisure time is more likely to lead to unrest on the plantation, especially if, as in the case of many plantations here, the labour force comes from several districts of the Territory and inter-tribal conflicts could result. Obviously, it is a circular argument.

Two additional factors may be mentioned as important in respect of efficient use of labour - the development of the internal road system, already discussed, which enables the planter to make spot checks on the work being carried out in various parts of the property; and the experience and managerial capacity of the native overseers employed. Although the value of native overseers has been questioned as being unproductive, it seems that they are indispensable if the total labour force is split into small groups, and also if both casual and agreement workers are employed on the one property. It is usually found that they work better under a man they know and whose language they can understand. In conclusion, then, it appears that under existing conditions the combination of work organisation by marks, a good internal road system, and efficient and reliable overseers to check on quality will make for the best results in plantation management.

A final aspect of the question of labour management involved the collection of personal data from the planters in respect of age, length of residence in Papua-New Guinea, and previous occupations. It was thought that with cross-reference to other material, these factors might have some bearing on

management efficiency. It is felt, however, that while this is undoubtedly true, the data collected are not adequate to be usefully employed in this way, as too many imponderables are involved; much more detailed investigation of personality traits, attitudes and so forth would have to be undertaken to reach conclusions of this nature. The results of this section of the interviews are, however, presented for their value as facts, in Table 16.

Processing and Marketing

Preparation of cocoa for the market involves two processes, firstly fermenting and then drying of the beans. After these the beans are bagged for export. Although both are relatively simple processes involving little capital expenditure for plant, they are nevertheless of basic importance: as Henderson points out "cacao beans develop the characteristics of the commercial cocoa only during the fermenting and drying processes. Correct fermenting and drying are essential if a high grade product is to be produced".⁽¹⁾

At the time of the initial survey, when little of the planted cocoa was of bearing age, most of the planters had not decided what course they would follow with regard to processing. Plans were much more definite in 1964. There are a variety of alternatives open to the settlers. A cocoa fermentary, operated as a limited liability company, was established near Popondetta in 1960. The majority of the shareholders are Australian (and in Australia) but at least two residents of the district are shareholders. Equipment installed in the fermentary was, in July 1962, capable of producing about 100 tons of dry cocoa per year (i. e. about 270 tons of wet beans) and was then handling about 60 tons of dry beans. In mid-1964 it was processing about 3,000 lbs a week (equivalent to about 70 tons a year) although space exists to install machinery capable of producing 600 tons of dry beans annually. It will be seen from Table 4 (p. 21) that existing plant was barely sufficient to handle 1963's crop, and quite inadequate when it is considered that the fermentary also

(1) Henderson, 1954:18.

Table 16

Europeans : 20 sample plantations, 1962

1. By Age Groups

	30-34	35-39	40-44	45-49	50-54	55-59	60 plus	Total
Males	-	9	4	1	3	2	1	20
Females	2	6	3	2	3	2	-	18
Total	2	15	7	3	6	4	1	38

2. By Length of Residence in Papua-New Guinea

	Less than 5 years	5-9	10-14	15-19	20-24	25 plus
Males	-	5	4	7	2	2
Females	-	9	4	3	1	1
Total	-	14	8	10	3	3

3. By Years Employed in Various Occupations since 1946 (males only)

Planter Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Administration			3	11			9	5		5	6							6		3
All Departments																				
Australian																				
Government																				
Departments							4	7									11	7		5
Own Plantation						8					9						3			
Plantation																				
Manager	9	8	15		14	9									14				4	4
Transport								5	14											
Commerce													7				7			
Trade																				
(artisan)	5	2		2																
Profession		9			5									9	2				6	3

processes cocoa which is purchased from villagers.

The Credit Board insisted from the outset that each ex-serviceman allow a minimum amount of £600 in his budget of expenditure to provide basic fermenting and drying equipment to handle the initial small crop, and it was expected that finance for extending the capacity of the installation would be derived later from cocoa income. Although central fermentaries would seem more economic of both time and money, and also more likely to command a market reputation eventually, it appears that central fermentaries elsewhere in the Territory have not always been successful and the Board was prepared to sanction individual fermentaries. Later, the Credit Ordinance was amended to permit the Board to advance money for the purchase of shares in an "approved producers' processing organisation", and twelve of the European settlers, together with a majority of the Papuan settlers, have taken advantage of this amendment to form a company (not a co-operative) which will, its directors hope, begin processing at the end of 1964. Another four settlers are processing their own cocoa in a partnership, and a Tolai manager operates their factory. There is a second partnership of two, which, unlike the former, is processing village-grown cocoa as well; and others are running individual fermentaries.

An informant connected with one of the companies expressed doubt about the wisdom of small processing units, mainly because it is more difficult to maintain a consistent output in terms of both production and quality of processing. It was claimed that it takes about five years to establish a position on the market where the cocoa is of a standard to assure forward selling, (obviously an important factor in marketing) and that forward selling is generally more difficult to achieve from small processing units.

Cocoa is one of the few commercial products of the Territory for which there is no large Australian market, but good overseas market prospects. New Guinea cocoa is generally regarded as a "flavour cocoa" for which there is a greater demand in the United Kingdom and Europe. The dark eating chocolate is more popular there. The Australian demand is largely for mild cocoas for milk chocolate, and any

large disposals of Territory cocoa on the Australian market will depend on an increased demand for flavour cocoa. New Guinea cocoa is not well known overseas and must compete with other producers for a market. The fermentary established in Popondetta in 1960 sells all its cocoa outside the Australian market, generally at better prices (it is able to command a premium of up to £20 a ton over Ghana prices, whereas New Guinea cocoa generally sells at about the same as Ghana). The Territory's proximity to Australia does not lead to a preference for its cocoa on other scores: for example, freight charges from Europe to Port Moresby can be lower (on non-conference line ships) than from Australia to Port Moresby. In a few years' time, therefore, when there will be considerably increased production of cocoa from Papua-New Guinea, growers may well have to organise selling campaigns overseas or marketing agreements with Australia, much as the coffee producers were recently obliged to, to dispose of their crop.

Capital

The final section of the questionnaire related to capital investment, income and expenditure. It was hoped to demonstrate here whether or not the amount of the loan, £25,000 maximum to the individual, was in fact adequate or perhaps excessive. It will be recalled that one of the reasons for extending credit to ex-servicemen so long after the war is taken to be the fact that so many of the plantations established post-war were in financial difficulty, and that economic development in the Territory was in danger of decelerating. An important consideration for the Credit Board would therefore be to avoid a recurrence of this situation, without undue expenditure of public moneys.

Two surveys of the cocoa industry in Papua-New Guinea were available to the Credit Board, Henderson's paper (1954) which contains an estimate of capitalisation necessary to develop 150 acres of cocoa; and the survey conducted by the Australian Bureau of Agricultural Economics in 1957-8 (Department of Territories, 1958), with special emphasis on costs and long-term prospects. Both, however, were based on estimates rather than actual costs.

The Henderson report estimated that capital to the extent of £23,217 would be necessary over a four-year period to develop a plantation with 150 acres of cocoa. The B. A. E. report, basing costs on a 200 acre block of sole cocoa⁽¹⁾, estimated total developmental costs at £32,000. Henderson's report seems to be based on absolute minimum requirements, and the B. A. E. report on optimum requirements. It appears also, from a comparison of the two, that certain items included in the latter report have been omitted from Henderson's budget. Thus he does not appear to have made provision for internal road development, or allowances for freight charges; cost of housing in Henderson's report is estimated at £2,200, and in the B. A. E. report at £3,000 (although the latter sum includes water supply and electric wiring, which is not mentioned in Henderson's budget). Furthermore, labour costs have risen since Henderson's report was published, although for reasons discussed on pages 40-41, he may have been assuming a larger labour force than is considered necessary now. The two budgets are tabulated in Table 17 for comparison.

Table 17

Summary of developmental costs for sole cocoa (from the Henderson and B. A. E. reports)

Item	Henderson report	B. A. E. report
Labour (four years)	£11,550	
Living expenses (annual)		
for four years	1,000	£1,500
House	1,800 (plus 400 (furniture))	3,500
Labour quarters	750	1,500
Stores	450	250
Drier/fermentary	400	4,150
Tools	550	250
Transport	1,500	1,200
Tractor and trailer	-	1,500
Blade terracer	-	150
Access roads, bridges	-	300
Rent (four years)	200	-
Insurance (four years)	400	-
Transport costs (four years)	800	-
Totals	£22,800	£13,000

(1) A common practice is to interplant cocoa and coconuts, and the majority of cocoa plantations surveyed by the B. A. E. were interplanted, rather than sole cocoa, plantations.

Some comparisons are possible between these two reports and the survey of costs undertaken at Popondetta. The latter did not investigate the ultimate extent of capitalisation proposed for the plantations but only the capitalisation to date. Much of the machinery and most of the structures necessary for full plantation operation had, however, already been installed at the time of first survey. Table 18 sets out the average expenditure on various basic items on the survey plantations, and also the range between highest and lowest expenditure in each case.

Table 18

Capitalisation on 20 plantations

Plantation	House	Labour quarters	Other buildings	Vehicle	Tools	Machinery	Fermentary	Roads
1	£2500	£250	£120	£1660	£250	£66	£1370	£350
2	6000	1260	30	1250	40	1925	900	700
3	1500	900	400	1500	300	1060	-	-
4	1500	100	-	1360	150	?	-	-
5	2600	405	120	1700	120	415	-	-
6	3100	800	270	1315	250	350	500	1000
7	1960	650	300	1480	230	130	-	-
8	4250	675	350	1700	120	570	-	690
9	2500	1200	10	1500	90	160	-	90
10	2340	500	-	850	350	1820 x	?	100
11	5000	1350	1300	1700	100	1175	-	-
12	5100	1000	400	1700	100	1600 x	-	500
13	3200	660	120	850	100	365	-	250
14	5000	870	1000	1100	110	3130 x	100	-
15	1650	500	90	1700	200	140	-	200
16	2500	1840	350	1700	120	245	920	800
17	3200	240	120	1550	120	65	-	150
18	10150	800	450	1175	430	2600 x	500	140
19	1800	1420	400	1530	220	160	-	90
20	2580	500	150	1650	200	50	200	1000

Note: Those who are not shown with fermentaries have invested in one of the processing companies. Trade stores are not included in Other Buildings.

x : includes tractor.

Cost of structures and machinery on these plantations varied from as low as £3,500 to over £16,000 (although this includes a house valued by the owner at £10,000) compared with the B.A.E. estimate of £13,000 and Henderson's estimate of about £4,000. It should be pointed out that although even in 1962 more than half the survey plantations had acreages of cocoa in excess of those on which the two reports were based, in fact developmental costs do not increase in direct proportion to planted area, and that much the same structures and machinery are needed for 100 acres of cocoa as for 500 acres. Of the planters interviewed at Popondetta, the majority had expended about £5,000 in machinery and structures in 1962, and between £5,500 and £6,000 by 1964 (in 1962 the cost of fermentary and driers had not generally been met, but was included by 1964; Henderson allowed £400 for processing and the B.A.E. report contemplated much more elaborate equipment, costing just over £4,000).

The two planters in the survey operating on private finance had expended £6,000 and £4,500 respectively on structures and machinery, which is roughly the amount spent by those receiving the loan; two of the three planters who received credit from the Board after several years of operation on private finance had, however, considerably exceeded this amount: nearly £12,000 in one instance had been devoted to structures and machinery, and just over £10,000 in the other case. In each case about £3,000 of these amounts had been expended since converting to the Credit Scheme. It would appear, therefore, that the amount of credit extended to those receiving the loan for fixed improvements, plant and equipment has been both reasonable and adequate.

One may well ask, then, why it was necessary for the Board in 1964 to advance additional loans of £2,500 to several settlers, with the expectation that almost every settler in the area who commenced development without private cash resources would also apply for such an additional sum? During the 1964 survey, planters were asked whether they were applying for an additional loan, whether they considered the original loan adequate, and if not, why not. Of those eligible for an extra loan, only two felt that they would not apply for

further money. The Credit Board feels that the inadequacy of the original loan was possibly due to a combination of pest attacks and dry seasons, and in one or two instances to below-average managerial efficiency. The planters interviewed largely agreed with these reasons, but suggested additional factors: one was that the £25,000 was probably adequate for a single man (although one of those who says he will not need another loan is married with two children) but that living and educational expenses for men with families would form a considerable additional expense; several suggested that the £25,000 would have been enough if the allocations had been more closely supervised; some planters who started in 1959 said that their expenditure had been heavy in terms of lack of road development (which they had to undertake themselves), high vehicle maintenance costs as a consequence of the poor roads, and the high cost of building materials, especially timber, which had to be brought in from other parts of the Territory (although valuable timbers were standing on all this land, they were destroyed in initial clearing operations, whereas with some forethought a sawmill might have been erected in 1959 which could not only have provided settlers with timber from their own blocks, but also some income from sale of timber rights; subsequently a privately-owned sawmill has been erected, and in 1964 the Forestry Department was making arrangements for the disposal of remaining timber rights on settlers' blocks). In 1962 most planters appeared confident that they would manage on the original loan, but by 1964 factors which had been only embryonic earlier had become actual - the cumulative effect of pest infestation for one, and the cumulative effect of mismanagement for another.

An original condition of the loan was that the recipient should "..... reside on and devote his full time to the management of the property . . . unless the Board in any particular case otherwise approves". Living expenses were imputed by Henderson at £1,000 per year, and in the B. A. E. report at £1,500. The Board allocates £950 annually for a married man with an allowance of £50 for each child, and £800 for a single man. Actual living expenses for most planters were in this range, but most settlers who had children at school in Australia claimed that the education allowances

were inadequate. (1) In 1962 a few of the planters interviewed had sources of income other than the loan, although they did not necessarily involve time spent away from the plantation (e.g. investment in other plantation interests or other business ventures). But by 1964 almost every planter had subsidiary sources of income. In some cases these were from trade stores either on the plantation or in the locality (but registered in the wife's name), or from wives taking jobs in stores and government departments. In other cases they involve considerable absences from the property by the planter, although if the Board is satisfied that there is no apparent neglect involved, it is now prepared to sanction these activities. In a few cases, however, negligence has been found and the planters concerned ordered to terminate external activities and to reside full time on the property. The temptation to supplement a dwindling budget by additional sources of income must have been considerable in the last two years, and the opportunity to do so has increased as the size and functions of Popondetta township become greater; furthermore, the necessity to do so appears to have been admitted by the Credit Board in relaxing the conditions quoted on p. 50.

An attempt was made to forecast likely income to the planters surveyed once their properties were in full production. This proved somewhat difficult. Henderson (1954:1) said that "There has been no carryover (of the cocoa crop) from season to season for some time, hence, with no backlog, prices respond rapidly to each crop forecast from the main producing centres". A representative of a cocoa-buying firm in Sydney informed me in 1963 that over the previous five years the price per ton of dry beans had varied from £Stg 150 to £Stg 350, and that in the period September 1962 to April 1963 (by way of example) the price went from £Stg 160 to £Stg 240. Such price fluctuations make predictions somewhat unreal, but he suggested that planters in

(1) Provision exists, subject to certain conditions, for European children at school in Australia to receive a bursary amounting to about £300, for each child, and return fares are paid once a year (about £40), by the Administration. The adequacy of these allowances depends on the type of school selected by the parents for the child, and in respect of a certain amount of "keeping up with the Joneses" operates in a small community such as this.

Papua-New Guinea might expect a yield of 0.5 tons per acre as a fair average, and that a likely price on which to base projected incomes would be £A170 per ton. Early in 1965, however, the Department of Agriculture in the Territory considered that 0.4 tons per acre, and £A190 per ton, were more realistic estimates of production and price, and the following projections are based on the latter figures.

On this reckoning, planters with 150 acres of sole cocoa may expect an income when the cocoa is fully bearing of £11,400. Those with 200 acres may expect an annual income eventually of £15,000 plus. Actual incomes to date, from the few plantations which theoretically should be in full bearing by now, so far do not support the above assumptions in the matter of yields, which seem to be in the vicinity of 0.25 tons per acre, although the price received is equivalent. Those receiving a loan were committed to begin repayments after the fifth year, by which time it was anticipated that income from cocoa would be sufficient, and to complete repayment over a period of 25 years from the commencement of the loan. Under these circumstances the annual repayment of principal with interest would amount to almost £1,800. However, the Board now considers it unrealistic to expect repayments to commence before the seventh year: taking into account the additional loan of £2,500 and accrued interest, the amortisation figure is likely to average about £2,300 annually.

Annual operating expenditure includes maintenance costs on buildings, vehicles, machinery and roads; the cost of labour; cost of stores such as seed, insecticide and bags, occasionally fertilisers; land rental; transport and insurance costs; and living expenses. Data were obtained from all plantations regarding annual expenditure, but as none considered their properties in full production this data cannot be compared at present with predicted incomes.

Labour costs over a twelve-month period amount to an average of £3,000, although the range is about £1,500 on either side of this. Although the figures contained in Tables 8, 10 and 12 are felt to be reliable, labour costs obtained in 1964 are not. They were frequently supplied from statements to the Board, and in some cases were falsified so

that money allocated for labour could be used for other purposes. The labour costs quoted above are from 1962, when this situation did not apply. At this stage few had heavy maintenance costs on buildings, although annual maintenance on machinery amounts to perhaps £150-£200 average, and vehicle maintenance is high - higher than it was in 1962 - due to rapid depreciation. Running and maintenance costs were about £300 annually per individual planter in 1964; about £200 in 1962.

Land rental is not high initially: between 2/- and 3/- per acre per year, or £40 to £50 per plantation per year. However, provision exists to revalue properties after ten years, and at five-yearly intervals thereafter. Because assistance is received for education expenses beyond the primary school level, this item was not considered in computing expenditure, even though in many cases expense here was above the allowances.

It was hoped that when the re-survey was made some concrete observations would be possible on the questions of income and expenditure, but events between the two periods of survey have not permitted this. It is considered that until all the survey plantations are at an equivalent stage of development, namely, in full production rather than at varying developmental stages, complete estimates of developmental costs and comparisons between plantations will be unsatisfactory and of necessity incomplete.

Race Relations

The subject of race relations was not a deliberate part of the survey, but a few comments may be made on this question. Mention may be made here of one interesting departure in this area from previous land policy, and indeed in most areas where plantations have been developed in the post-war period. Mr. Hasluck, then the Minister for Territories, said in January 1958 (in Wilkes, ed., 1958:108) that:

(The lands policy) has also been designed deliberately to prevent the building up of enclaves of Europeans and seeks to disperse the Europeans among native

settlement so that the European may become in fact a neighbour and not a stranger and will be able by his example to help in the growth of the agricultural activities of the people.

This has not been strictly adhered to in Popondetta so far as the ex-servicemen's blocks are concerned: although there are now over 220 Papuan settlers in five main concentrations interspersed among the European planters, the areas under European and Papuan settlement are adjacent rather than truly interspersed, and the entire area of new plantation development is separate from that of village settlement. It was stated by one informant that although strong pressures were exerted from some quarters early in the scheme's operation to adopt interspersal, many Australian planters preferred the present design of the blocks, and, ironically as it turns out, veiled their reluctance for inter-mixing of blocks with talk of more effective pest control and so on.

Another researcher is studying the social consequences of the juxtaposition of the two groups of ex-servicemen, Papuan and European, but so far as relations between the villagers and the European sector of the planters is concerned, Mr. Hasluck's statement of policy seems to have been ignored. One may, of course, question the value to villagers and Papuan settlers of the example from large plantations where, although the crop produced may be the same, virtually all phases of management are very different. In the Eastern Highlands during the early 1950s the "neighbour" relationship is reported to have existed, but there was not much evidence of it at the end of the 1950s⁽¹⁾. Certainly, to judge from the facts relating to employment of labour, relationships between employers and employees are fairly stable in the Popondetta district. But attention is drawn to Tables 2 and 3 to the areas shown as standing under forest. This amounted to 33.7% of the total area of the survey plantations in 1962, and had been

(1) However, the situation had changed again by 1964, and I saw evidence of a number of examples of cooperation, mainly economic. While not doubting the good intentions of the majority of Europeans involved thus, it is also possible that recent political achievements have been contributory.

reduced to only 30.2% by mid-1964. It seems that it is in the planters' interests to develop as much of this land as possible, not only for the obvious reason of their financial well-being, but also for the less tangible reason that relations between the indigenes and expatriates may be adversely affected if fertile and potentially productive land is left idle.

There are two aspects of this problem. In most areas of plantation development to date, land has been taken up amidst a relatively unsophisticated village-dwelling population. The aspirations of these people are, however, changing fast, as more and more villagers become interested in growing cash crops, and are simultaneously hampered by the conditions of land tenure which their traditional social organisation has imposed upon them. This is certainly a problem in the Popondetta area, and the recent and proposed legislation relating to individualisation of tenure may well make the problem more acute. The attitude of local natives to a group of Europeans in their midst, occupying (even though with full legal right) land which they formerly owned but which is not being used might well be an unfavourable compound of envy and resentment⁽¹⁾.

The question is further complicated in the Popondetta area by the fact that a large group of Papuans, in many cases highly acculturated, have also been settled on cocoa blocks. University staff here found that Papuans in the area, both ex-servicemen and villagers (to whom Papuan ex-servicemen represent an elite group) consider that the conditions under which the two groups of settlers were able to acquire blocks of land and credit to operate them were discriminatory against the Papuans. Quite different concepts were applied in the allocation of land and finance to the two

(1) In 1962 I had occasion to introduce the president of the Local Government Council in Popondetta to a planter's wife. She said "I don't suppose you know me", and he replied "Oh yes I do: you are sitting on my land". The implication was that the land was still tribal property, in spite of legal alienation.

racial groups⁽¹⁾ and if it becomes apparent to the Papuan settlers that these concepts were unjust, it would be as well if the European planters were able to demonstrate that they had used their land and financial grants to the fullest extent for the country's economic welfare.

Some Conclusions

It will have become evident, because the first survey was conducted when most of the plantations involved had only recently begun operation, and the second survey at a time when anticipated developmental goals had not been realised, that this paper can give no more than tentative and preliminary conclusions.

It seemed, in 1962, that for the settlement scheme the amount of the loan was fully justified for its fulfilment, taking into consideration costs and conditions at the time. By 1964 this no longer appeared to be the case. For one thing, it appears that the Board set too fast a pace of development, presumably in the belief that the credit provided was ample to sustain such a pace, although experience in cocoa-producing areas elsewhere in the Territory suggests that six to seven years to reach production would have been more realistic than the five years initially set by the Credit Board. It would seem also that closer control of finance, and inspection of the plantations, would have been advisable from the start. Supervision of soldier settler schemes in Australia has been fairly careful, no doubt for good reason, and it seems surprising that it was felt unnecessary to adopt the same practices in Papua-New Guinea. For example, there is only one officer (seconded from Lands Department) resident in the Popondetta district (and no resident officers in other plantation areas),

(1) The size of the cocoa blocks allocated to Papuan ex-servicemen was determined by the area of land which the Board considered a biological family could effectively utilise. It was considered that this would amount to about 15 acres of cocoa, although in most instances the blocks are 25-30 acres in size, because areas of grassland, gullies, and other unproductive land were included in the blocks.

No allowance was made in the Papuan settlement areas for additional labour as it seems to have been assumed that Papuans did not have the necessary skills to employ labour (though many have done so in fact). Most Papuans were granted a maximum loan of £750.

and this officer's directions involved supervision of the Papuan blocks in particular; the European blocks being considered to require less attention. Closer supervision of the European blocks might have prevented a number of what might be called malpractices: not only the employment of inadequate numbers of labourers and neglect of pest control, but also excesses of zeal for which the loan was not designed, such as the planting of twice the suggested acreage, so that the available money had to be spread too thinly.

It is conceded that those provisions in the Scheme for a certain standard of living for the European settlers are probably indispensable at this stage of the Territory's development. The B. A. E. report commented that its members were strongly impressed at the small number of young men undertaking as individuals the development of plantations. It is a fact that, in the face of rising political aspirations on the part of the indigenous people, many Europeans are apprehensive of their future in the Territory, and that since the late 1950s overseas investors have shown little confidence in the economy⁽¹⁾. At this period, fewer Europeans are prepared to settle in the Territory than probably at any other time, and there seems to be an increasing disinclination to "rough it" to the extent that existed pre-war. There are relatively few advantages to life in Papua-New Guinea for those who might contemplate settlement, to outweigh the fact that one will become part of a minority expatriate group. Furthermore, in view of the Territory's urgent need to achieve economic viability, coupled with a present inadequacy of indigenous managerial skill (and an apparent reluctance on the part of the Administration to foster and train indigenous people in these techniques), a solution must still rest heavily upon European enterprise and activity.

In this connection, a comment may be made about

(1) However, alienation of some thousands of acres of land in the Western Highlands early in 1964 has produced quite a keen response from prospective developers, and indications of willingness to invest capital for development. But the Highlands have always been a favoured area and in recent years little alienation of land there has occurred. Possibly also the period of indecision about the Territory's political future is drawing to an end, now that the House of Assembly elections have been held.

the granting of credit on the condition of war service. As a generalisation, and without necessarily reflecting on any of the planters in the survey, it seems that it might have been more advantageous in the long run to make credit available to younger men for agricultural development (see Table 16). Greater selectivity might also have been exercised: the author was informed that all eligible applicants for a loan were accepted, with the exception of a few whose personal financial resources were deemed adequate to do without the loan. None was rejected on other grounds, although some have subsequently proved to be unsuitable farmers in Territory conditions. In this context, one of the most critical requisites is an ability to manage native labour, and while it is admitted that this would be difficult to test by a selection committee, nevertheless it could have been supervised subsequently.

Although one cannot yet regard the plantation experiment here as successful, it must be observed that the indirect effects of the venture have in some ways been fruitful. To those who have been resident in the district since before the war, the progress of the area must seem dramatic. Certainly it seemed so, on the second visit, to one who first visited the area in 1962. In that short space of time the township of Popondetta had almost doubled in size, and its amenities had greatly increased: in 1964 there was a hotel, many more stores, new businesses, new sports facilities, all of which help to make life more attractive and to remove the frontier somewhat: factors which are particularly important for wives and families, if not for the planters themselves. The town's status has also been increased by the recent establishment of the Papuan Agricultural Training Institute, and development in the district is indicated by the improved system of roads and bridges. This kind of development will continue with the completion of the road link to Kokoda, and the development of a port at Oro Bay, some forty miles by road from Popondetta.

Finally the need for a further survey of these plantations in several years time is stressed. An appropriate time would be, as suggested above, when the current growing problems have been overcome and the plantations concerned have made the transition from the developmental to the pro-

duction stage of operation. The hope is expressed that if a re-survey is possible, some of the company-owned plantations might be included for wider comparisons, to test the variations in capital, labour input and management against production with those plantations which are individually owned and operated.

APPENDIX

A.N.U. NEW GUINEA RESEARCH UNIT --- POPONDETTA RESEARCH

EUROPEAN SURVEY 1962

Questionnaires for 1962 and 1964

I.

1. OWNERSHIP

Ex-servicemen's Scheme

Private Ownership (1) by individual

(2) by company

2. MANAGEMENT

By Owner

By Manager

By Owner + Manager

3. TOTAL AREA PLANTATION

Area under:

- | | |
|------------------------------------|-------|
| (1) Forest | Acres |
| (2) Grassland | |
| (3) Cocoa | |
| (4) Other crops | |
| (5) Cleared not planted | |
| (6) Shaded not planted | |
| (7) House, other structures | |
| (8) Unusable (gullies, etc.) | |
| (9) Roads (in chains) | |

4. SOIL TYPES (acres)

5. RAINFALL STATISTICS

<u>Year</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jne</u>	<u>Jly</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Total</u>
-------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	------------	--------------

II. LAND USE

1. COCOA

<u>Year</u>	<u>Ac. cleared</u>	<u>Ac. shaded</u>	<u>Ac. planted</u>	<u>S. M.</u>	<u>Ac. bearing</u>	<u>Yield (tons)</u>
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S. M. - spacing method

Area cocoa planted on former forest land:

Area cocoa planted on former grassland:

Est. area cocoa when plantation fully developed: (state year)

2. OTHER TREE CROPS

<u>Year</u>	<u>Ac. cleared</u>	<u>Trees planted/ Acres planted</u>	<u>Trees bearing/ Acres bearing</u>	<u>S. M.</u>	<u>Yield (tons)</u>
-------------	--------------------	---	---	--------------	---------------------

3. ANNUAL CROPS (for plantation consumption or sale)

<u>Year</u>	<u>Crop/Crops</u>	<u>Acreage</u>	<u>Purpose</u>	<u>Production</u>
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4. PROPOSED LAND USE 1963-1965

Year	Crop or crops	Est. acreage/No. trees	Other development
1963			
1964			
1965			

5. LIVESTOCK

Type	Number	Purpose
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III. HOUSEHOLD COMPOSITION

1. ADULTS

Age	Sex	Date Arr. (PNG/Pop)	Languages (E. P. M)	Country birth	Prev. Occ.	Place	Duration
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2. CHILDREN (under 21)

Age	Sex	Country birth	Languages	Where school	Freq. N.G. vacations	Where employed	Occupation
-----	-----	------------------	-----------	-----------------	-------------------------	-------------------	------------

IV. NATIVE LABOUR

1. TOTAL ON PLANTATION:

- (1) indentured
- (2) casual

2. INDENTURED LABOUR

<u>Place of Origin</u> <u>(Sub-District)</u>	<u>Number</u>	<u>Date of Arrival</u> <u>(month, year)</u>	<u>Recruiting cost per</u> <u>capita</u>
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3. CASUAL LABOUR

<u>Place of Origin</u> <u>(village)</u>	<u>Number</u>	<u>Where resident</u> <u>(village; pltn.)</u>	<u>Occ.</u>	<u>Period</u> <u>Employment</u>	<u>Freq.</u> <u>Emp.</u>	<u>Wages</u>
--	---------------	--	-------------	------------------------------------	-----------------------------	--------------

4. SPECIAL OCCUPATIONS

<u>Occupation</u>	<u>Place of Origin</u>	<u>Salary</u>	<u>Period employed</u>
-------------------	------------------------	---------------	------------------------

Overseer
Mechanic
Driver
Carpenter
Domestic

5. LABOUR EMPLOYED, 1961

<u>Month</u>	<u>Indentured</u>	<u>Casual</u>	<u>Plantation operations</u>
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

6. ESTIMATED MAXIMUM LABOUR REQUIREMENTS

Month:
Reason:

7. ESTIMATED MINIMUM LABOUR REQUIREMENTS

Month:
Reason:

8. WORK ORGANISATION

- (a) Does labour work to "marks"?
 - (b) What marks are set (size of gang; size of mark)?
 - (c) How are overseers selected?
 - (d) Who supervises casual labour?
 - (e) How is labour rationed?
-

V. LABOUR REQUIREMENTS

Labour Units/
Acre/Day

Clearing Lining Shading Planting Shade Pruning Weeding Harvest

Pests and Diseases

<u>Type</u>	<u>Frequ. of outbreak</u>	<u>Control</u>	<u>Cost/Acre</u>	<u>Labour units/acre/day</u>
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Other operations and maintenance

VI. PROPERTY

<u>Item</u>	<u>Type</u>	<u>When Purchased/ constructed</u>	<u>Original Cost</u>	<u>Est. Life</u>
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House (+ furniture)
Labour quarters
Other structures
(specify)
Vehicles
Tools
Machinery
Roads
Other

VII. SOURCES OF INCOME

<u>Source</u>	<u>Owner/Manager</u>	<u>Wife</u>	<u>Amount</u>
S. S. loan			
Employment			
outside			
plantation			
Trade stores			
Cocoa			
Other crops			
Other			

VIII. EXPENDITURE

<u>Item</u>	<u>Ann. Expenditure</u>	<u>Item</u>	<u>Ann. Expenditure</u>
Maintenance on:		Labour	
(1) House		Stores (seed,	
(2) Labour quarters		insecticides)	
(3) Other buildings		Land rental	
(4) Vehicles and		Insurance	
machinery		Transport	
(5) Roads		Living expenses	
		Other	

A.N.U. NEW GUINEA RESEARCH UNIT --- POPONDETTA RESEARCH 1964

TOTAL AREA PLANTATION

Area Under:	Acres
(1) Forest	
(2) Grassland	
(3) Cocoa	
(4) Other crops	
(5) Cleared not planted	
(6) Shaded not planted	
(7) House, other structures	
(8) Unusable (gullies, etc.)	
(9) Roads (in chains)	

RAINFALL STATISTICS

Year	Jan.	Feb.	Mar.	Apr.	May	Jn.	Jly.	Aug.	Sep.	Oct.	Nov.	Dec.	Total

PROPOSED LAND USE, 1965 - 1967

Year	Crop or Crops	Est. acreage/No. trees	Other Development
1965			
1966			
1967			

LIVESTOCK

Type	Number	Purpose

II. LAND USE

COCOA

Year	Ac. cleared	Ac. shaded	Ac. planted	S.M.	Ac. bearing	Yield (tons)

S. M. - spacing

Area cocoa planted on former forest land:

Area cocoa planted on former grassland:

Est. area cocoa when plantation fully developed:

(State year)

OTHER TREE CROPS

Year	Ac. cleared	Trees planted/ Acres planted	Trees bearing/ Acres bearing	S.M.	Yield (tons)

ANNUAL CROPS (for plantation consumption or sale)

Year	Crop/Crops	Acreage	Purpose	Production

NATIVE LABOUR

Total on Plantation:

- (1) Indentured
- (2) Casual

INDENTURED LABOUR

Place of Origin (Sub-District)	Number	Date of Arrival (month, year)	Recruiting cost per capita

CASUAL LABOUR

Place of Origin (village)	Number	Where resident (village pltn.)	Occ.	Period Employment	Freq. Employment	Wages

SPECIAL OCCUPATIONS

Occupation	Place of Origin	Salary	Period Employed
Overseer			
Mechanic			
Driver			
Carpenter			
Domestic			

LABOUR EMPLOYED, 1963-4

Month	Indentured	Casual	Plantation Operations
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

WORK ORGANISATION:

- (a) Does labour work to "marks?"
- (b) What marks are set (size of gang; size of mark)?
- (c) How are overseers selected?
- (d) Who supervises casual labour?
- (e) How is labour rationed?

LABOUR REQUIREMENTS

Labour Units/ Acre/Day	Clearing	Lining	Shading	Planting	Shade	Pruning	Weeding	Harvest

PESTS AND DISEASES

Type	Freq. of Outbreak	Control	Cost/Acre	Labour Units/Acre/Day

PROPERTY

Item	Type	When Purchased/ Constructed	Original Cost	Est. Life
House (+ furniture)				
Labour quarters				
Other structures (specify)				
Vehicles				
Tools				
Machinery				
Roads				
Other				

SOURCES OF INCOME

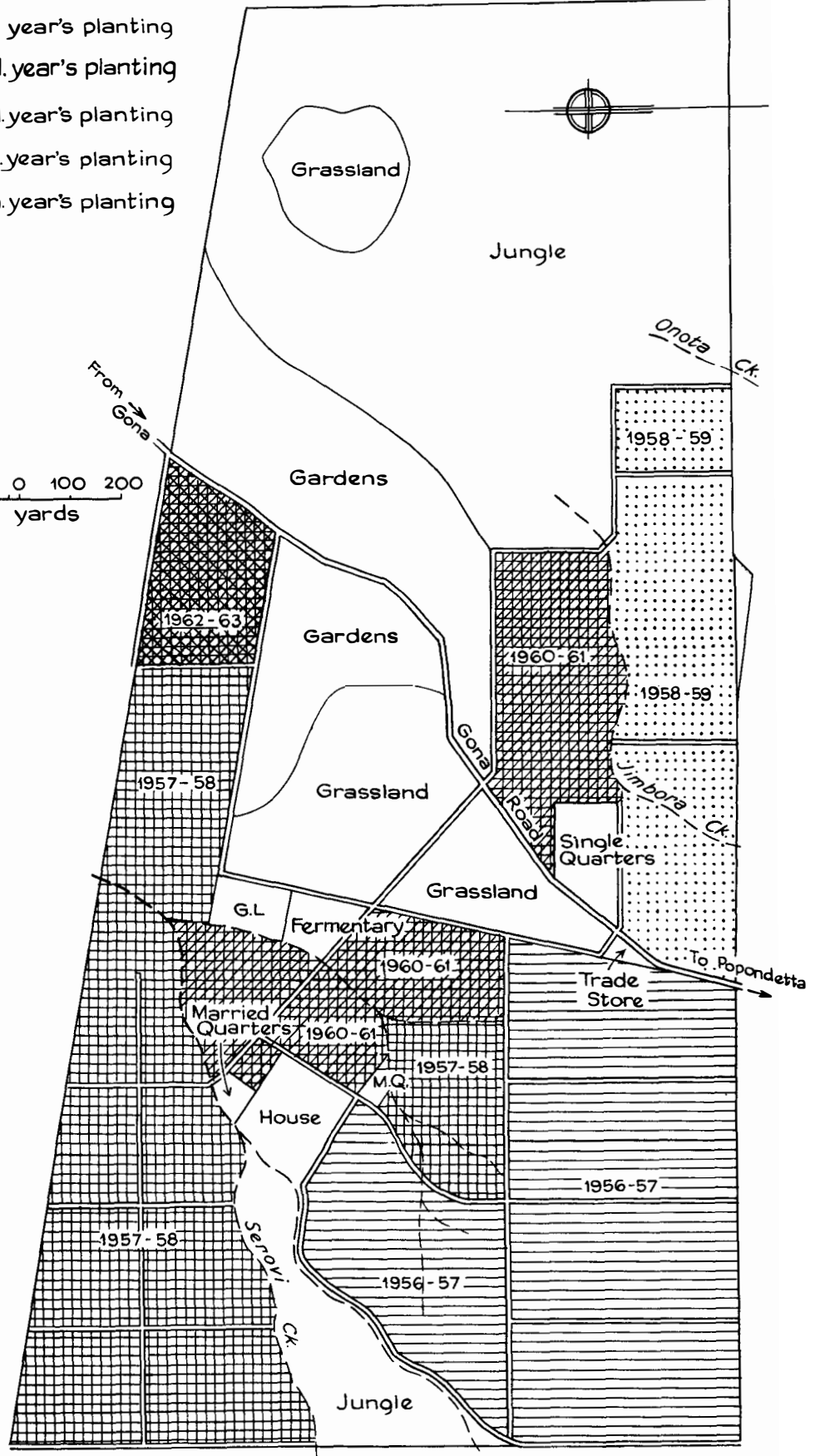
Source	Owner/Manager	Wife	Amount
S. S. Loan			
Employment outside plantation			
Trade stores			
Cocoa			
Other crops			
Other			

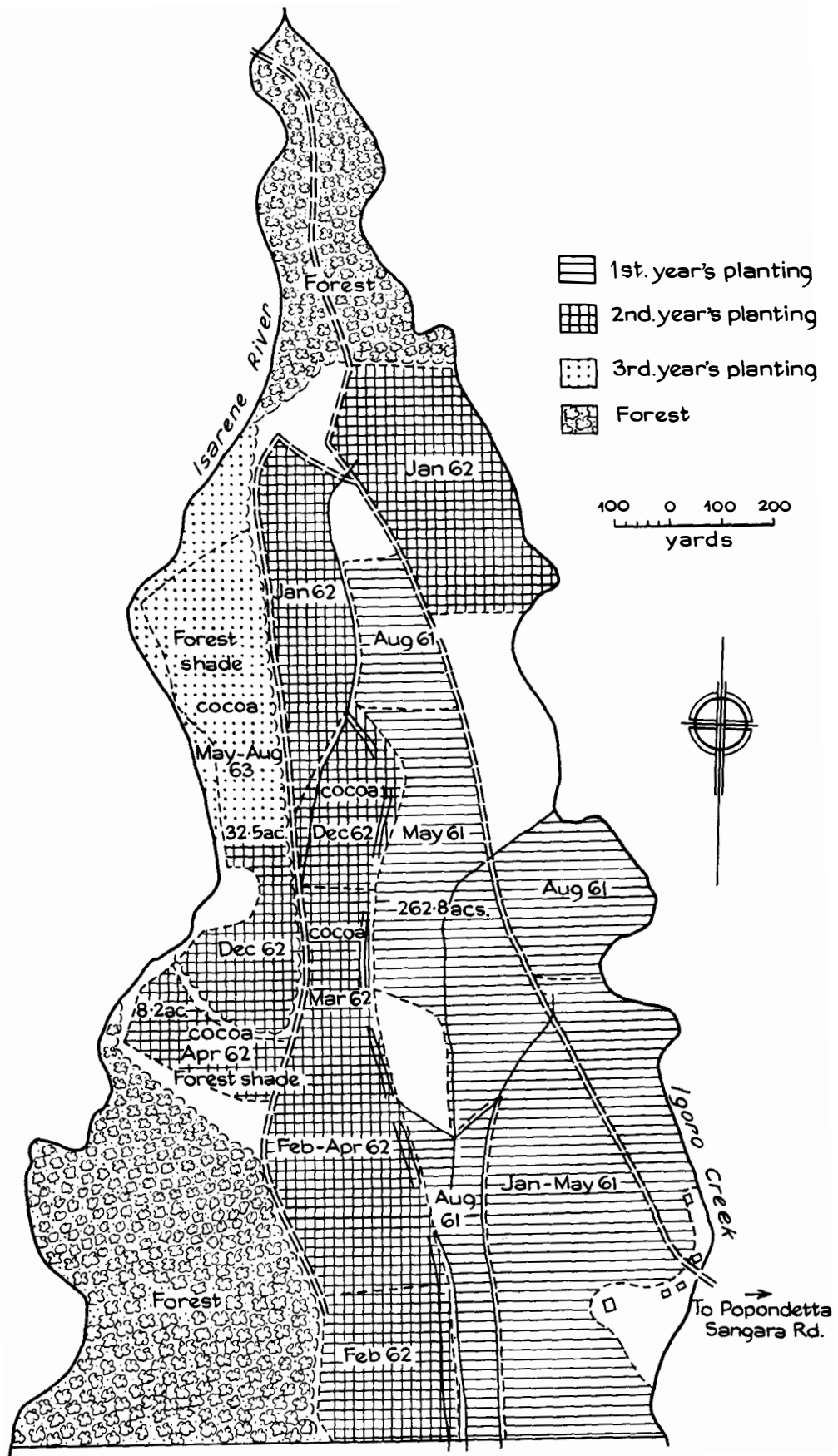
EXPENDITURE

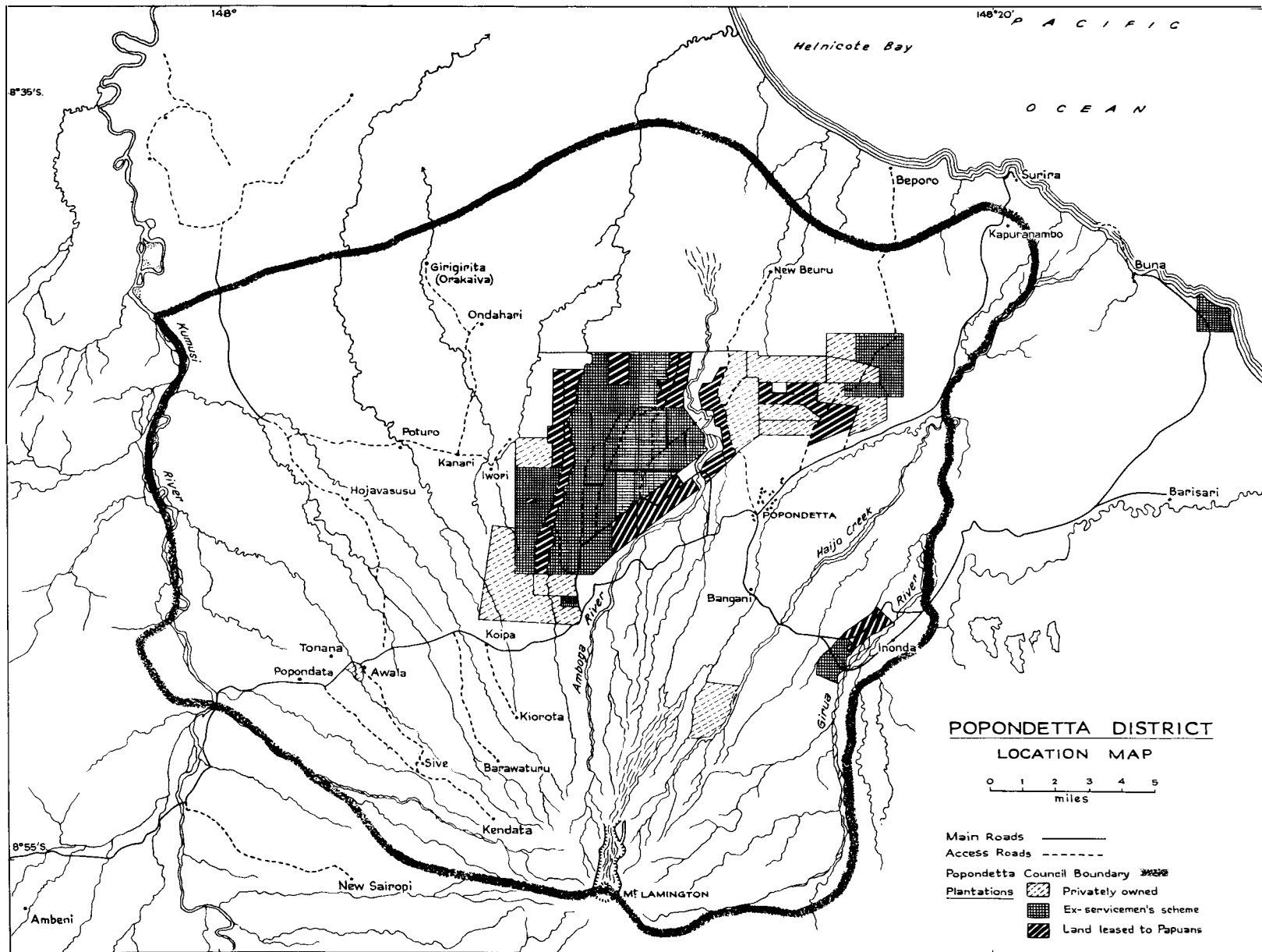
Item	Ann. Expenditure	Item	Ann. Expenditure
Maintenance on: (1) House (2) Labour quarters (3) Other bldgs.		Labour Stores (seed, insecticides) Land rental Insurance	

-  1st. year's planting
-  2nd. year's planting
-  3rd. year's planting
-  4th. year's planting
-  5th. year's planting

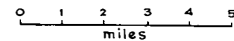
100 0 100 200
yards







**POPONDETTA DISTRICT
LOCATION MAP**



- Main Roads ———
- Access Roads - - - - -
- Popondetta Council Boundary **thick black line**
- Plantations
 - Privately owned
 - Ex-servicemen's scheme
 - Land leased to Papuans

