

TRANSITION FROM SUBSISTENCE

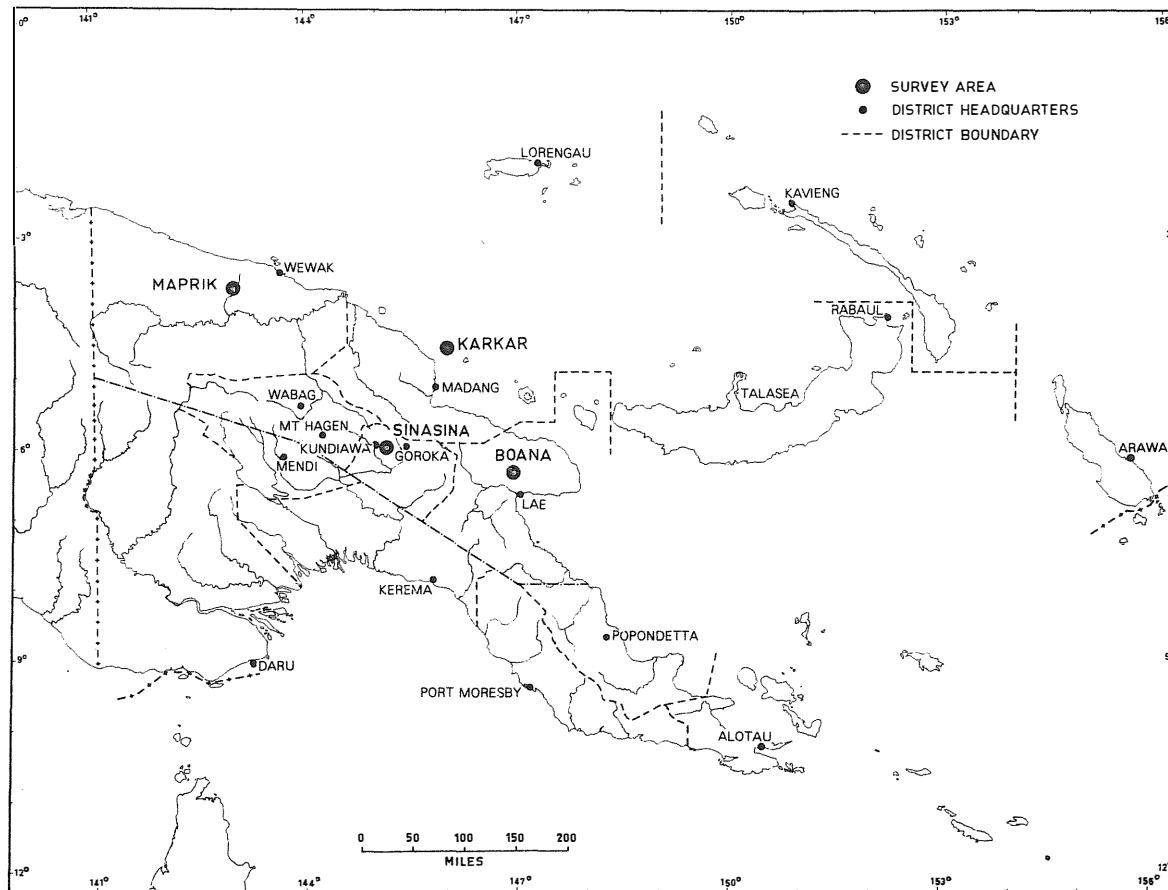


Fig. 1. Cash crop survey areas

TRANSITION FROM SUBSISTENCE:
CASH CROP DEVELOPMENT
IN PAPUA NEW GUINEA

R. T. SHAND and W. STRAATMANS

New Guinea Research Unit
The Australian National University
Port Moresby and Canberra
1974

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Manuscript editor
Susan Tarua

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Chapter 1

Introduction

National interest in agricultural development in Papua New Guinea extends back to 1884 when Papua and New Guinea were separately annexed as colonies by the British and German governments. Successive administrations have encouraged both smallholder and plantation units. Prior to the second world war plantation production expanded slowly but with few exceptions Papua New Guineans still continued as subsistence producers.

Since the war plantation agriculture has continued to expand and indigenous smallholders have made a significant and increasing contribution to total marketed output. Much of this has come from the traditional crop, coconuts, but there has also been diversification into other, primarily export crops - cocoa, coffee, pyrethrum and tea - and into beef cattle production. In 1965-66, for example, smallholders earned about \$13m from export crop sales (Shand 1969:290), and by 1967-68¹ this had risen to over \$19m. Overall, however, the plantation contribution was still dominant in the 1960s (60 per cent in 1965-66) although the relative importance of smallholders' output was increasing in line with the government's emphasis on smallholder development.

The fact that smallholders are now contributing significantly to total marketed output is widely known. Very little, however, is known of the individual producer: how much he earns, the extent of his commitment to market output, and the factors which have influenced his decisions. Yet if, as is desired, the smallholder is to play the dominant future role in Papua New Guinea's agricultural development, then such knowledge is critical for effective planning.

This study is a contribution towards such understanding. In the context of Papua New Guinea, it is an attempt to document

¹ Data supplied by the Department of External Territories, Canberra, 1970.

and analyse the growth of indigenous participation in the cash economy at the village level, and to isolate the factors which have influenced this. In broader perspective, it constitutes an empirical study of individual and community responses to new economic incentives and opportunities provided by government at an early stage of economic development. As such, it is hoped that the study will contribute to an understanding of the process of agricultural development in less developed countries.

The project was originally envisaged as a three-year study to begin in 1962 which would permit two years of fieldwork. In 1970, when data collection finally ceased, it had involved three-and-a-half years of fieldwork, and necessarily a longer period for the analysis. We believe that the far lengthier time perspective thus given to the work has been of considerable value.

At the time the project was started, there was little published information available on indigenous cash cropping. Studies of the rubber, copra and coffee industries almost exclusively concentrated on the estate sector. Official statistics on smallholder involvement and output were fragmentary and provided only a rough indication of which cash crops they produced and where production was concentrated. Studies by anthropologists and geographers provided useful background information but many were carried out before cash cropping began and others paid little attention to economic development. Accordingly, an exploratory field trip to Papua New Guinea was undertaken to observe smallholder activities with different crops and in different locations, and to find out whether further unpublished data might be available locally. It was found that sample counts and even censuses of smallholder plantings of tree crops had been conducted periodically by field officers of the Department of Agriculture, Stock and Fisheries (DASF) which might provide a starting basis for the fieldwork.

Subsequently, it was decided to survey a number of selected areas which would include a diversity of cash crops grown under varying local conditions. This would be done with the aid of official tree counts where these proved sufficiently reliable. Final selection of survey areas was not easy for, among other reasons, it took some time to ascertain how reliable the all-important tree counts were. While these counts were needed by DASF only to indicate roughly what progress had been made in these areas, a much higher order of accuracy was required for this study. Six areas were chosen for which it was thought the statistics would be both reliable and accurate, where fieldwork was feasible, and which were of sufficient interest from a

cash crop viewpoint (see Fig. 1). These were (i) Boana (coffee production), ten miles north of the Markham Valley in the foothills of the Sarawaket Range within the Morobe District; (ii) Sinasina census division (coffee), which included four tribal groups, in the then Eastern Highlands District (now the Chimbu District); (iii) Karkar Island (coconuts and cocoa), close to Madang; (iv) Maprik (coffee, rice and peanuts), a subdistrict of the Sepik (now East Sepik) District; (v) the Nebilyer Valley (coffee) of the Western Highlands District; and (vi) Gazelle Peninsula (coconuts and cocoa) of New Britain. However, existing data in the last two areas were found to be unreliable and/or incomplete, and as prospects of new data becoming available were remote, they were excluded from this study.

Many problems and deficiencies were encountered with the statistics in the four areas finally studied but, with the generous co-operation and assistance of DASF officers, together with our own efforts, they were improved and supplemented to the point where they could be confidently used in the study.

No fixed approach was adopted towards determining the size of a survey area. The most important criteria applied were analytical suitability and interest. For Boana, the area was one within which all coffee growers used the Boana airstrip as a marketing point in 1962-63. Sinasina was a census division for which particularly detailed tree count data were initially available. The whole area and population of Karkar Island were encompassed, while for Maprik, the whole sub-district was first examined broadly with later emphasis on comparison between two census divisions within it.

The official statistics on growers and tree numbers allowed smallholder response to be presented in terms of two indicators. The first was the extent of participation, measured by the number of growers in relation to the population of the survey area community or its subgroupings. The second was the scale of participation, which was measured by the distribution of tree numbers per grower within each survey population. The volume of data varied between survey areas: in some, tree counts were available for several years, though their reliability varied. Some counts even provided details on the age distribution of trees. Overall, however, with all their limitations, these records proved to be a rich source of historical information on smallholder response.

The availability of these data enabled a broad examination of smallholder response in the survey communities, within which the significant patterns could be discerned. An aggregate picture of participation was drawn up for each area using the two above-mentioned indicators, which could then be broken

down by subgroups within each area as considered appropriate, e.g., by villages, tribes, even by clans and subclans to observe the similarities and variations.

Ideally the project might have been conducted in two phases. In the first, basic statistics on participation would have been collected and analysed to reveal the significant patterns. These could have provided the basis for a second fieldwork phase during which data on factors which might have determined these patterns would have been collected. This was not possible in practice, owing to initial uncertainty as to field data available and to the time required to establish reliability of the data once located. Data concerning possible influences on participation had to be gathered simultaneously with those on participation and thus before the patterns were known. Attempts were made to solve this dilemma in two ways. First, during the exploratory phase of fieldwork when area selection was in progress, an assessment was made of factors which might possibly affect cash cropping. This provided the basis for data collection during the fieldwork phase. Second, some additional data needed for analysis were collected during short revisits after the main fieldwork period. The resulting list of factors could be classified into two broad categories:

(i) external influences: those affecting survey area communities which were of external origin included market forces (prices received, etc.), transport, marketing and processing facilities and services, agricultural extension and other government services, availability of consumption goods, missions, plantations, etc.;

(ii) internal influences: those which emanated from within the survey communities themselves. Internal factors of an economic nature included subsistence and cash crop activity patterns and relationships, other economic opportunities, resource availability, patterns of consumption, savings and investment, and attitudes towards cash cropping in relation to crop price variations. Factors of a social nature included household composition, land tenure and inheritance customs, community leadership and initiatives in decision-making, etc.

Data on external influences were gathered from a wide variety of sources including Administration records and those of private traders, processing and transport firms, missions, and plantations in contact with smallholders. Much valuable information was obtained by informal interviews with such sources and we take this opportunity to express our gratitude for their co-operation.

The internal factors could be satisfactorily investigated only through intensive survey interviewing of households within

each community. Individual cases were selected for study for a number of reasons. First, since it had been decided that a number of areas were to be studied to give breadth to the project and to permit inter-area comparisons to be made, the available survey time for each area was necessarily limited. Research funds permitted one researcher to conduct such fieldwork for less than two years. Second, as noted above, descriptive participation data had to be collected at the same time as these analytical data which again restricted the time available for interviewing. Third, difficulties of access arising from poor communications in each area meant that had sophisticated sampling techniques been applied in order to obtain a degree of representativeness among informants, a very large proportion of the limited time available would have been absorbed in locating informants and in travelling from one to another. Fourth, because basic data were not available prior to fieldwork, very little was known about the characteristics of the survey area and its population. The number of informants in each area varied from about twenty to forty.

During the exploratory phase of the fieldwork, we experimented with the technique of close interviewing of a large number of informants from a single community group, e.g., a village or clan. However, due to the novelty of our presence, a strong 'feed-back' effect became apparent as informants would pass on our questions to others who were to follow and discussion took place between them prior to interviews as to what answers might be 'wanted'. If this technique had been chosen with such close-knit groups, it would obviously have been necessary to spend considerable time with them, as do anthropologists, to gather data inconspicuously and, therefore, more accurately. Since this was not feasible, informants were selected from widely distributed locations in each survey area. These data clearly required cautious interpretation since little was known of the communities to which they belonged¹ but this did avoid the feed-back problem and more positively, the wider coverage assisted in suggesting possible intergroup and intra-area differences within each survey area.

The informants included a broad cross-section of the survey area population and characteristics. They included growers who ranged widely in scale of participation (trees per grower) together with non-growers. Individuals of varying social prominence and influence were selected, including appointed luluai and tultul or locally recognised men of prestige but

¹ Except where anthropological and/or geographical studies had previously been undertaken, e.g., in Maprik.

also others of no recognised social prominence. Informants were also included from various large kinship groups and also various physiographic zones.

The basis of selection could not be determined in advance for each area as too few data were available, but as the fieldwork provided greater familiarity with the area and its population, the important characteristics and variations emerged and informants were selected.

Interviewing proved to be a delicate part of the work. The fieldworker spent considerable time in each area before attempting any interviews. It was first necessary to explain the reasons for the survey, and to dissociate the work from that of other organisations in the area. It was carefully explained to the people that the work had no association with government, missions, plantations or trading interests but that it was university work being undertaken in order to understand local customs and people's reactions to the new opportunities for cash cropping, and ultimately to assist them in their local endeavours. Once local confidence and acceptance became apparent, the task of establishing rapport with individual informants was much easier.

Interviewing was carried out in Pidgin as most people in each area spoke it fluently. The interviews themselves were conducted within the structure of a formal questionnaire developed during the pilot study carried out in the Boana area. Though the interview was structured, the interviewer varied the order and phrasing of questions as the occasion and the individual demanded. Very few informants refused to answer questions though initially informants became fatigued owing to the length of the questionnaire. This was largely overcome by splitting the interview into two or more sessions. Cross-check questions were included and the data collected suggested that answers were on the whole consistent. Wherever possible, answers to quantitative questions were checked personally by the interviewer (e.g., coffee tree numbers). Many questions of opinion and intention could not be confirmed and were therefore used with caution.

In view of the techniques adopted, data from survey interviews could not be used as a source of conclusive evidence or broad generalisations. They were suggestive, however, of factors operating at a local or personal level. They also threw light at this level upon the influences on participation of other factors studied at a broader level and they usefully supplemented evidence from other sources. They were also of value in understanding the process of decision-making for a large number (150 in all) of individuals living in a wide range of local environments and personal circumstances.

This project to a large extent evolved in the light of practical circumstances. The preliminary planning and pilot testing did assist greatly, particularly in developing techniques of contact with the selected communities. However, the paucity of available data greatly hampered advance planning and many data requirements were only finally recognised and fulfilled towards the later stages of analysis. As indicated above, some of these could be collected in subsequent revisits though unfortunately this was not always possible.

For patience and forbearance during the long gestation period of this project we wish to thank the main sponsor, the Reserve Bank of Australia, which, from its Rural Credits Development Fund, provided most of the funds needed. We are also grateful to the Department of Economics, Research School of Pacific Studies, The Australian National University, for carrying part of the burden.

We would like to express our appreciation of the generous assistance and co-operation of the Department of Agriculture, Stock and Fisheries, and particularly its then director, Mr W.L. Conroy, who supported the project and gave access to official records. Similarly we thank the many field officers of the department who assisted us in collecting new data or checking information. It is tempting but simply not feasible to record them all here.

Our particular thanks go to Mr E.K. Fisk who was instrumental in setting up the study, gave timely and useful advice about its conduct and who, with others in the Department of Economics at ANU, commented on draft chapters.

Finally we wish to thank Mrs Heather Harding, secretary of the Department of Economics, and her staff for their patient support during the drafting stages of the manuscript.

Chapter 2

Boana

Boana was established as a Lutheran mission station in 1933. It is located in the Wain census division of the Morobe District, about thirty miles northwest of Lae (Fig. 1). It is linked to the Markham Valley road, about ten miles to the south, by a foot-track and is about fifteen minutes by light aircraft from Lae. In 1962-63 Boana had an airstrip, tradestore, post office and savings bank branch, and a bakery, in addition to the mission. Since the end of the second world war it developed as a marketing point for cash crops which were subsequently flown out to Lae.

The Boana survey area population included all those who in 1962-63 were marketing their cash crops at Boana. It included sixty-seven villages comprising virtually the whole population of the Wain census division and a large proportion of those in the neighbouring Erap and Naba divisions (Fig. 2.1). In 1965¹ there was a total of 15,147 people in the survey area. Village populations averaged 233 and ranged from 68 to 594. Population density was low: in 1965 there was, in the 550 square miles of the three census divisions involved, a total population of 22,044, giving an average density of 40 per square mile.

Much of the survey area is uninhabitable and useless agriculturally. It is in a mountainous region with altitudes varying from 3,000 to 11,000 feet. The terrain generally comprises steep to very steep slopes and is heavily dissected by three sizeable river systems (Erap, Busu and Sarem).

Probably 25 per cent or more of the three census divisions was unsuitable for cultivation due to steepness of slope and/or shallowness of soil. In the Naba census division the proportion may have been one-third. Most villages were located below 5,000 feet and none was higher than 6,000 feet. A network of

¹ Department of Native Affairs (DNA) village population census, 1965, Lae, 1965-66.

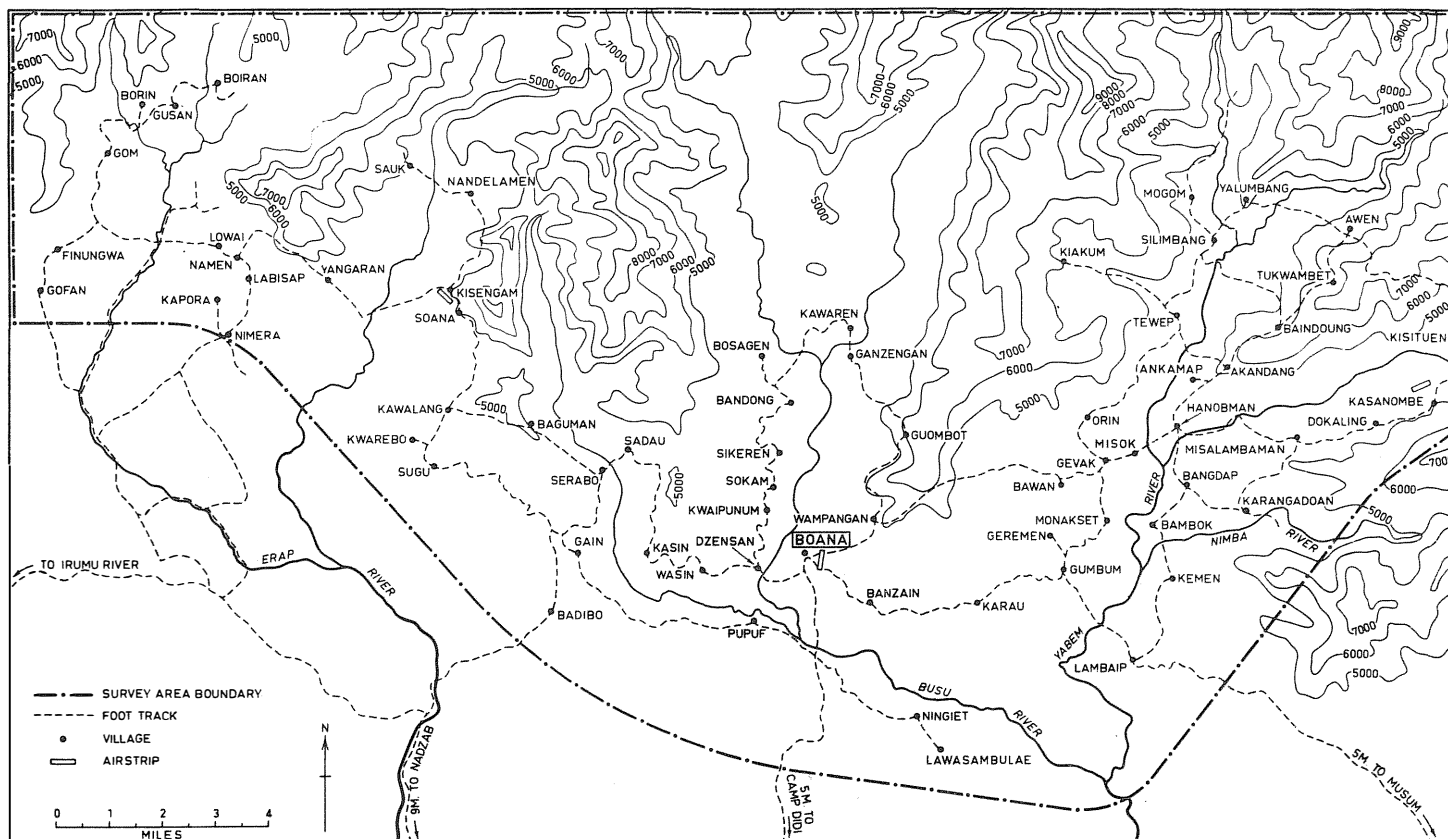


Fig. 2.1. Boana survey area

foot-tracks provided the only intervillage communications, and importantly, enabled travel between villages and Boana (Fig. 2.1).

Most of the land unsuitable for cultivation was left under primary forest and was used for hunting and as a source of timber for house construction, fuel, etc. Forest land was also important as a watershed and contributed to the control of erosion.

Subsistence production

People of this survey area (like those of the following three) were primarily agriculturalists although there was some hunting and gathering by those with access to primary forest. A considerable range of subsistence crops was grown,¹ including yams, taro, sweet potatoes, edible pitpit, sugarcane, tapioca and numerous vegetables, some of which were introduced by Europeans.

A complex cycle of cultivation and fallow was followed in the production of food crops. An individual household usually cultivated several food gardens at the same time, the number depending principally on the year-to-year household requirements and on the success of previous plantings. For example, among eighteen households whose gardens were closely examined, there was an average of five gardens per household with a range of from three to seven gardens. The total garden area varied widely between households. Accurate measurements were taken in only six cases but these ranged from 1.1 to 7.6 acres.²

Individual food gardens were generally used for a number of years, depending on site, soils, climate, erosion, pig damage and the combination of crops grown. Gardens were customarily used for the cultivation of a number of different crops.³ Generally at least one new garden was established each year in order to maintain food production throughout the year.

¹ Furthermore, many varieties of these crops were grown: for example, 150 or more varieties of yams, 50 or more of taro, at least 15 of sweet potato, 25 of edible pitpit and 18 of sugarcane (DASF patrol report for Wain, Erap and Naba census divisions, DASF, Lae, 1961).

² Garden size did not appear necessarily to relate to household size.

³ Exceptions to this were yams and Chinese taro which were each planted in gardens as sole crops. Chinese taro gardens were in production for up to ten years, though usually for four to seven years.

The annual cycle of yam garden activities (which were the most time-consuming of all) was timed so that yam planting took place at the onset of the wet season in October. New gardens were cleared during the dry season (July to October) by felling timber, heaping and burning.¹ Yam gardens were sometimes fenced off, though the necessity for this had diminished in recent years as more pastures for pigs were being enclosed. Fencing was carried out by groups of men and for a big garden, could take two or three months. After planting, which took two to three weeks, gardens were periodically weeded. Yams were harvested about seven months after planting, depending on the varieties used.

Other food crops (sweet potatoes, taro, bananas, pitpit) were either planted in gardens previously used for yams or in new gardens. The timing of and preparations for planting were more flexible than for yams and, providing soil moisture conditions were suitable, could take place throughout the year.

The individual household depended very largely on its own labour resources although for some tasks such as fencing and clearing timber, assistance was obtained from relatives and friends on a reciprocal basis. For a large block of land, labour combined communally to clear, heap and burn, etc., after which individual gardens were marked out for use by participating households. Within the household, the husband and wife provided most of the labour with occasional help from children. Generally men carried out tasks involving heavy labour, e.g., felling and heaping timber and fencing, while women performed lighter tasks such as grass cutting and weeding and in addition did most of the harvesting.

Cash cropping

Prior to 1933 economic activities, as far as is known, were confined to subsistence production. Reports of the German Administration before 1914-18 suggest that even patrol contact was occasional and fleeting. Patrols by the Australian Administration date only from 1929 and were infrequent until the second world war.²

The Lutheran missionary who commenced work at Boana in 1933 viewed economic development as part of his broad programme of

¹ Burning was not carried out in some parts of the Erap census division.

² One patrol in 1932 attempted to collect a cash tax but was unsuccessful, apparently because of the lack of money-earning activity.

parish development. In 1935 he organised the construction of an airstrip near the mission station with the help of local labour. The mission introduced a variety of European vegetables both to improve the quality of diet and as a source of cash income for the local people. The mission encouraged the production of marketable crops, advised on production techniques, transported output on mission aircraft and secured market outlets in Lae and Salamaua. Opportunities for vegetable production were, however, very limited because of the small size of these markets. The mission also introduced Arabica coffee before the second world war but only in small quantities owing to the lack of a marketing organisation for the crop.

Prior to the second world war, the Administration did not actively promote cash crops in the area. Some plantation labour was recruited prior to 1939 but it does not appear to have been extensive.

The limited economic progress which was achieved during the 1930s was interrupted by the war. Following the cessation of hostilities, the mission renewed its interest and efforts and in this was actively joined by the Administration. Initially the mission again began to purchase vegetables locally for sale to private customers in Lae. Then in 1949 the transportation and marketing of vegetables was taken over by a privately owned firm, Crowley Airways, which began to operate between Boana and Lae. Between 1957 and 1960 about \$14,000 worth of vegetables (Lae prices) were produced in the area.¹ The same operator also provided a passenger service between Boana and Lae for the local people, at a price subsidised by the firm, and carried in expanding quantities of trade goods. A tradestore was established near the airstrip as a community venture, initially under the guidance of the mission.

In 1948 coffee began to be promoted as a smallholder crop though not until 1954 did it become a well-organised and extensive programme.

Coffee tree planting. Participation in coffee is described in terms of the number of growers in relation to village populations and the number of trees per grower during the period reviewed. Such data were obtained from periodic coffee tree censuses conducted by DASF.

No detailed data were available on planting activities prior to 1960. The first census was carried out in 1962-63 but was of little use to this study, partly because it excluded many

¹ Personal communication: Mr L. Crowley, Lae, May 1965.

villages in the survey area and partly because tree counts for individual growers were not available. The second census, conducted in 1963-64, was the most fruitful for analytical purposes. It included all survey area villages and provided tree counts of all village gardens. It assessed separately for each garden, the number of mature trees (those planted during or prior to 1960) and of first, second and third year trees, still immature in 1963-64. A third census in 1965-66 collected similar data but unfortunately only 57 of the 67 survey area villages were included, though supplementary data on another 7 villages were obtained subsequently by departmental officers.

The collection of accurate census data was extremely difficult due to such factors as distance between villages, difficult terrain and the wide dispersal of coffee gardens. In the 1963-64 census, for example, the last villages were not visited until late in the year and tree counts for these were sometimes distorted by planting during the census year.

Special problems were encountered in counting trees. Many gardens were planted irregularly and it proved difficult for fieldworkers to avoid some double-counting or to ensure all were included. It was also difficult to ensure that all gardens and their owners were included during a visit, particularly where absenteeism was significant. Another problem concerned frequent changes in census field staff so that, in each census, at least some workers were unfamiliar with the area and with methods used previously. The educational qualifications of some fieldworkers were lower than desired. The 1965-66 census, in particular, appeared to suffer from this problem, and for this reason less reliance has been placed upon it.

Finally, we had hoped that these successive censuses would provide a detailed picture of the industry's progress from 1960 to 1966. Indeed, when survey area tree totals in the 1963-64 and 1965-66 censuses were compared, there was reasonable consistency between them. However, comparisons of individual village totals showed differences which could not reasonably be explained by grower activities between censuses. Fortunately a revisit was made in 1970 and data from a further tree count taken in 1969 were collected which provided a deeper time perspective on the growth of coffee participation.

Some of the inconsistencies encountered may have been due to errors in tree counting, but another problem was that of 'village boundaries' which arose from changes in village populations between censuses. Some of the changes were real

since village composition was not always stable. In some cases groups split off from one village and joined another, and even whole villages shifted and combined with others. Not surprisingly, census data were not sufficiently detailed to identify such movements. Other changes were illusory, and arose from differences in the definition of village populations between censuses. The decision as to where a village began and ended at any one time was often difficult since many villages consisted of a number of hamlets, only loosely connected to one another in a locational sense.

Detailed intercensus comparisons were therefore difficult to make. When differences in recorded tree numbers were encountered, it was not possible to ascertain whether they were due to grower activities, to inaccuracies in recording, or to the boundary problem. The comparisons below are therefore made between aggregates so that at least the boundary problem was eliminated.

By 1963-64¹ approximately 360,000 coffee trees had been planted within the survey area (see Table 2.1).

At recommended tree spacing,² these would occupy about 580 acres. The first trees were probably planted soon after 1948 but most around 1954. Most trees counted in 1963-64 had been established by 1961, which means that about 350,000 trees were planted within an eight-year period. Calculating acreages from tree numbers on the same basis, the area of coffee gardens per village ranged from one to 20 acres among the sixty-seven villages, with an average of 9 acres.

As will be explained below, coffee was at first planted as recommended on a communal basis but individual household ownership was later encouraged. The 1965-66 census data indicated that, for the fifty villages included which are also in this study, approximately 87 per cent of coffee trees were privately owned, 10 per cent were communal, and 3 per cent were mission controlled. All but 7 per cent of the villages had one or more communal and/or mission garden.

¹ The 1963-64 total as measured by the 1965-66 census differs from the 1963-64 census total only by about 3 per cent. This could, however, have been fortuitous.

² Recommended spacing was on the nine-foot triangle, with 621 trees per acre. Sometimes trees were planted too closely so that the acreage calculations may overestimate the actual acreage.

Table 2.1
Coffee tree planting, Boana, to 1963-64

	Before 1960	Coffee trees planted			Total 1963-64	Area equivalent (1963-64) (nearest acre)
	1960	1960-61	1961-62	1962-63		
Wain census division						
Baguman	5,723	12	-	-	5,735	9
Bandong	6,101	2,132	105	-	8,338	13
Banzain	3,482	194	-	-	3,676	6
Bawan	8,399	2,824	-	-	11,223	18
Bosagen	6,903	378	-	-	7,281	12
Dzenzen	3,976	586	49	-	4,611	7
Gain	5,617	687	264	-	6,568	11
Ganzengan	5,592	1,789	40	-	7,421	12
Gayaran	5,930	796	-	-	6,726	11
Geremen	2,437	371	-	-	2,808	5
Gevak	9,172	739	-	-	9,911	16
Gumbum	3,593	239	-	-	3,832	6
Guombot	9,581	168	-	-	9,749	16
Karau	4,567	1,193	140	31	5,931	10
Kasin	8,517	112	-	-	8,629	14
Kawaren	6,028	1,193	-	-	7,221	12
Kwaipunum	7,923	2,133	-	-	10,056	16
Lawasambulae	1,361	1,115	-	-	2,476	4
Misok	4,932	120	-	-	5,052	8
Monakset	4,923	685	-	-	5,608	9
Ningiet	3,146	62	-	-	3,208	5
Orin	5,385	638	62	-	6,085	10
Pupuf	3,221	709	-	55	3,985	6
Sadaw	6,677	631	-	-	7,308	12
Serabo	3,482	374	-	-	3,856	6
Sikeren	8,597	612	-	-	9,209	15
Sokam	10,995	550	-	-	11,545	19
Wampangan	10,307	2,243	-	-	12,550	20
Wasin	4,146	602	-	-	4,748	8
Erap census division						
Boiran	602	98	-	-	700	1
Borin	2,914	344	-	-	3,258	5
Finungwa	6,746	1,511	-	-	8,257	13
Gofan	657	294	-	-	951	2
Gom	2,738	2,200	43	-	4,981	8
Gusan	3,280	1,783	-	-	5,063	8
Kapora	4,367	807	-	-	5,174	8
Kawalang	3,904	411	-	-	4,315	7
Kisengam	6,523	106	661	-	7,290	12
Kwarebo	5,369	426	49	-	5,844	9
Labisap	9,154	-	-	-	9,154	15
Lowai	8,758	259	252	-	9,269	15
Namen	2,057	-	-	-	2,057	3
Nandelamen	3,393	-	38	396	3,827	6
Nimera	8,122	-	-	-	8,122	13
Sauk	10,267	522	862	150	11,801	19
Soana	1,978	2,222	289	-	4,489	7
Sugu	3,215	-	-	-	3,215	5
Yangaran	4,950	-	-	-	4,950	8
Naba census division						
Akandang	1,777	179	-	-	1,956	3
Awen	2,383	-	110	-	2,493	4
Baindoug	5,134	-	-	-	5,134	8
Bambok	4,565	1,642	16	-	6,223	10
Bangdaip	2,181	-	-	-	2,181	4
Dokaling	2,206	257	-	-	2,463	4
Hanobman	2,336	189	236	-	2,761	4
Karangadoan	2,242	286	86	-	2,614	4
Kasanombe	4,752	392	-	-	5,144	8
Kemen	4,720	404	-	-	5,124	8
Kiakum	293	1,366	1,157	-	2,816	5
Kisituen	3,576	-	-	-	3,576	6
Lambaip	8,337	434	-	-	8,771	14
Misalambaman	1,252	-	-	-	1,252	2
Mogom	125	43	864	60	1,092	2
Silimbang	1,466	77	-	-	1,543	2
Tewep	1,594	624	1,543	-	3,761	6
Tukwambet	2,127	-	-	-	2,127	3
Yalumlang	503	1,652	1,121	-	3,276	5
Total survey area	311,276	42,415	7,987	692	362,370	582
Cumulative total	311,276	353,691	361,678	362,370	362,370	582
Cumulative percentage	86	98	100	100		

Source: DASF coffee tree census in 1963-64 of the Erap, Wain and Naba census divisions, Lae, 1964.

Participation by individuals (i.e., by adult males as recorded in the censuses) to 1963-64¹ was generally small (Table 2.2). On an area basis,² about two-thirds of growers had planted one-sixth of an acre of coffee trees or less, and 96 per cent had less than one-half acre of trees. The average area per grower was less than one-sixth of an acre. The proportion which had established one acre or more was negligible.

Table 2.2

Distribution of coffee trees among growers, Boana, 1963-64

Number of coffee trees	1- 25	26- 50	51- 100	101- 200	201- 300	301- 400	401- 500	501- 600	601- 700	701- 800	801- 900	901- 1,000	1,001- 2,000	2,001- 3,000	Over 3,000	Total
Number of growers	566	797	1,040	913	202	71	30	13	8	6	5	4	-	-	-	3,655
Per cent of growers	15	22	28	25	6	2	1	-	-	-	-	-	-	-	-	100
Cumulative per cent	15	37	65	90	96	98	99	99	99	99	99	100	-	-	-	100

Source: DASF coffee tree census in 1963-64, Lae, 1964.

Nearly 86 per cent of trees counted in 1963-64 were mature and were therefore planted during or prior to 1960 (Table 2.1). About 85 per cent of the 3,655 growers recorded in 1963-64 were growers by the end of 1960. This suggests that most trees were planted before 1960. Planting from 1961-63 was mainly establishing gardens for the first time (Table 2.3).

Table 2.3

Coffee tree planting, Boana, 1961-63

Year	1960	1961	1962	1963
Total growers (end of year)	3,090	3,502	3,651	3,655
New growers	-	412	149	4
New growers as percentage of 1963-64 total	-	11	4	-
Villages with new growers	-	54	17	3
Growers who expanded tree numbers	-	37	6	-
Growers with expanded tree numbers as a percentage of 1963-64 total growers	-	1	-	-
Villages where growers expanded tree numbers	-	22	4	-
Villages with no grower activity	-	11	47	64

Source: DASF coffee tree census in 1963-64, Lae, 1964.

¹ This probably still remained true in 1965-66 when the recorded distribution of trees among growers was broadly the same as shown for 1963-64 (in Table 2.2) according to the 1963-64 census.

² Using recommended spacing of 621 trees per acre.

Few growers enlarged their gardens (or added new ones) in this period. Those who did were widely scattered among the survey villages. The 1963-64 census data also strongly suggest that before 1961 most growers established only one coffee garden, and subsequently neither extended it nor planted another.

The coffee censuses did not record those not owning private coffee gardens. To gain a clearer picture of the extent of village participation, details of the total adult male population (which approximates the potential grower population) were extracted from population census data and compared with grower numbers (see Table 2.4).

Table 2.4

Some indicators of participation in coffee growing, Boana, 1963-64

Census division*	Total growers**	Total adult males***	Growers/adult males (per cent)	Average number of trees/grower	Average number of trees/adult male
Erap	1,000	1,023	98	103	100
Wain	1,634	1,685	97	120	116
Naba	989	1,937	51	65	33
Boana total	3,623	4,645	78	97	78

* Including the whole population of the Wain census division but only parts of the Erap and Naba census divisions.

** DASF coffee tree census in 1963-64, Lae, 1964.

*** DNA population census of Erap and Naba census divisions, 1965, Lae, 1965-66.

Two problems emerged in calculating these indicators of participation. While the coffee tree census was for 1963-64, the nearest population census was taken in 1965, so assuming population growth took place, the figures in Table 2.4 on the proportion of growers to adult males might be a little lower than if a 1964 population census had been available. Second, the village boundary problem intruded because the coffee and population censuses were taken independently of each other and by different personnel so village populations in the two censuses may not have been identical. It is unlikely that the first difficulty is significant since the difference was only one year. As for the second, the analysis which follows considers participation largely on a census division basis, and the village aggregation involved therefore virtually eliminates this problem.

As Table 2.4 shows, over three-quarters of the adult male population in the survey area were coffee growers by 1963-64. Participation was almost universal in Wain and Erap villages; however, in the Naba the proportion was only one-half. The scale of participation revealed a similar pattern. The average

number of trees per grower in the Wain and Erap villages was roughly similar at an area equivalent to one-fifth to one-sixth of an acre, while in the Naba it was only one-tenth of an acre. The figures for average tree numbers per adult male bring out the contrast between Wain/Erap and Naba villages even more strongly.

Coffee production and income. It was not until 1957 that a substantial number of coffee trees came into bearing and output became significant. The fact that marketed output was only four tons in 1957 (Table 2.5) provides strong evidence that tree planting was not substantial before 1953, given that coffee trees come into bearing in the fourth year after planting. If a yield of 0.5 lb per tree is assumed for 1957, a backward projection would suggest that the total number of trees planted by 1953 may not have exceeded 18,000 (twenty-nine acres).

Table 2.5

Marketed coffee output and income, Boana, 1957-65*

Year	Total marketed output (tons parchment)	Estimated coffee income (\$)**
1957	4	1,192
1958	15	4,470
1959	37	11,026
1960	42	12,516
1961	50	14,900
1962	78	23,244
1963	n.a.	n.a.
1964	n.a.	n.a.
1965	132	38,438

* These data could not be updated to 1970 as Boana depot ceased to be the only marketing point beyond the mid-1960s and other points in the area purchased from villages outside the survey area.

** Price assumed was 13¢ per lb (\$298 per ton), the 1963-64 price paid to growers for y-grade parchment at the depot.

Source: annual records of purchases from growers, Boana coffee buying depot.

Production expanded quickly to reach 132 tons in 1965 when output would have come from trees planted during or before 1961. Details of coffee tree ages obtained in the 1963-64 census suggest that the number of bearing trees in 1965 was about 350,000. With an output of 132 tons in that year, the average realised yield¹ was approximately 0.8 lb per bearing tree.

¹ The average realised yield here refers to that portion of production which is marketed. It is distinguished below from actual yield (output of the coffee garden) and potential yield (that which could be obtained using recommended cultural practices).

DASF assumed average yields of 0.4 lb per tree in the first bearing year, rising to 1.5 lb per tree in the four crop years.¹ Estimates of average realised yields per tree were made by the authors for ten survey villages based on coffee sales records for growers at the Boana depot in 1963 and on 1963-64 tree counts for these villages. These showed village averages varying from 0.4 to 1.0 lb per tree, with an overall average of 0.7 lb per tree. Six of these villages were located close to the Boana airstrip and four were situated near the perimeter of the survey area, in the Naba census division. Among the former six, average yields varied between 0.6 and 1.0 lb, while three of the latter showed averages of 0.4 lb and one showed 0.8 lb. This suggests that realised yields for growers on the perimeter of the survey area may have been lower than those from gardens near the airstrip.

The foregoing estimates of realised yields, while indicating variation, all show that low yield levels were achieved overall. Admittedly in 1954, many trees were in their early bearing years and it is possible that average yields in recent years could have risen as the trees matured. Nevertheless, it became clear during fieldwork that other factors were affecting the realisation of full yield potential. Also a substantial proportion of poor-quality coffee beans was offered for sale. These problems will be considered below.

Although price records were not complete, it appears that between 1957 and 1965 there was little variation from 13¢ per lb paid to the grower. On this assumption, total income paid to growers at Boana depot was estimated to be more than \$38,000 in 1965 (see Table 2.5).

Data on the distribution of coffee income among growers were not surprisingly unavailable but on the basis of foregoing data some approximations can be attempted. The average number of coffee trees per grower was 97 in 1963-64. If it is assumed that all trees were in bearing and the average yield of 1963-64 (0.8 lb per tree) was obtained, the average income per grower at a price of 13¢ per lb would be approximately \$10 per annum. If the same assumptions are applied to the distribution of trees among growers (see Table 2.2), about 65 per cent of growers would have received \$10 or less, and only 1 per cent would have earned more than \$50 per annum.

Finally, the pattern of total coffee income accruing to villages can be shown using 1963-64 census data for coffee tree numbers by villages (see Table 2.1) and the above assumptions as to prices received by growers and tree yields. These

¹ DASF Arabica coffee budget, Konedobu, 1963.

indicate that almost half of the 67 villages would have earned \$500 or less per annum; 29 would have received between \$500 and \$1,000; and 5 villages would have earned over \$1,000. The highest-earning village would have received less than \$1,400 per annum.

Naba villages would have been concentrated mainly at the lower end of the income range. In terms of average total adult males per village, they differed little from the other two census divisions but participation was low both in terms of proportion of growers and trees per grower. If average marketed output per tree was also relatively low in the more remote Naba villages, as was suggested by the limited yield data, the income disparity would have been even greater.

The foregoing outline shows a number of significant general characteristics. There was a high level of participation in terms of growers among adult males by 1964 but the scale of individual participation was small; no growers had gardens which could be considered large. There was also a clear deviation in the pattern of participation in the Naba area compared with the survey area as a whole, evident in both indicators of participation. We now turn to a consideration of factors which influenced this performance.

Extension services. Before the second world war the attitude of the Administration was favourable to economic development, but it had neither the finance nor the personnel to undertake an extensive programme. It did, however, improve conditions of personal security as one of the preconditions of economic development. During the 1930s the Lutheran mission introduced the first cash crops (fruit, vegetables and later coffee), and even organised their transportation and sale outside the area. After the war the mission again encouraged vegetable production. The Administration's promotion of Arabica coffee, begun in 1948, was running well by 1954. As the Administration assumed greater responsibility so the mission's role in encouraging economic development in the area diminished.

Initially coffee trees were planted communally within the villages. Typically an administrative officer and village headmen together picked out a site for a communal garden. Villagers then cleared and prepared the site, planted the trees, and performed all subsequent operations. Income from harvests was generally held in communal village funds. In many villages coffee gardens were also planted communally for the mission, as a source of funds for the building and maintenance of schools and other mission activities. Parishioners and school students periodically provided labour for these gardens.

To accelerate coffee planting villagers were later advised to split up the communal gardens among individual contributing households. By 1963-64 most trees were owned by individual households but despite this, many villages chose to retain their communal gardens intact. Moreover, household interviews showed that partnerships were common in garden ownership,¹ sometimes between brothers, sometimes between friends, though it was not clear that such partnerships would be maintained in the long term. Sometimes a household received outside assistance during garden establishment and a 'partnership' was formed with the helper, which often lasted only until harvesting commenced, when the helpers were paid off with part of the proceeds.

In 1954 agricultural extension patrols were made through the area to persuade villagers to participate in coffee planting and to provide planting material and technical assistance. In 1956 these patrols were made regularly and five agricultural fieldworkers were stationed in the survey area. By 1962 there were twenty-five fieldworkers, each providing advice and supervision in five or six villages. Their work was supervised by an officer stationed in Lae who spent about one-third of his time in the Boana area.

Administration efforts were strongly supported by the mission and also by local leaders, some of whom DASF appointed as local fieldworkers to continue promotional work between patrols. The influence of two leaders in particular was reflected in the high proportion of growers in their area. One was also a church leader and since church influence was strong and in the same direction, it probably reinforced the particular value of this individual in extension work. Evidence suggested that the whole area received similar encouragement and attention and that the performance of Naba villages could not be explained by the neglect of extension workers.

Garden yields were considerably influenced by the quality and frequency of extension work. Problems arose particularly in the early years.² On the production side they included the use of unsuitable sites (soils, slope, etc.), inadequate protection by shade trees, trees planted too closely, competition from food crops planted beneath the trees, damage by pigs, unsatisfactory pruning methods, and poor garden hygiene, as

¹ Although DASF typically recorded them under the name of only one of the partners.

² See DASF agricultural patrol report for the Erap, Wain and Naba census divisions, Lae, 1961.

well as a high incidence of pests and diseases in neglected gardens. Some of these early shortcomings were remedied when field staff was increased and garden work was more closely supervised, but in many instances long-term productivity had been affected. Continued low productivity in gardens even when extension work was more concentrated often reflected growers' unwillingness to make anything more than a token response to advice. The 1961 report, for example, commenting on the wastage of coffee beans, stated that 'harvesting tended to be spasmodic'. This is supported by our own observations in many instances.

Processing, transportation and marketing. Until 1960 growers processed the crop in the villages. Cherries were pulped and fermented, usually in hand-carved wooden containers (garimuts). The beans were then extracted, washed and sun-dried to the parchment stage. Growers hulled the coffee with small hand-operated machines and carried it on foot to the Boana airstrip where it was purchased by the Lutheran mission which sold it to DASF.

The mission helped to organise a local co-operative organisation, the Boana coffee buying depot, which took over its purchasing operations. As mentioned, the depot began selling coffee to Crowley Airways in 1960 and until 1966 it acted as the sole buyer at Boana. It purchased the coffee as parchment, and air-freighted it to Lae for final processing, grading, and sale to overseas buyers.

Since growers generally did not have large numbers of trees and the harvesting period for coffee is lengthy, the quantities of cherries harvested by a grower at any one time were small, particularly when trees were coming into bearing. Often bean quality suffered owing to delays in transportation to the airstrip and to damage in transit. Also, insufficient care in the various phases of fermentation resulted in inferior quality beans. In the mid-1960s a number of pulping machines were introduced at strategic locations and this, combined with low prices paid for poor-quality beans at the airstrip, virtually eliminated the quality problem. Most beans marketed at the depot were classed as Y-grade.¹

As mentioned, contact between Boana and Lae was established with the construction of an airstrip at Boana in 1935. Services expanded in response to the growth of marketed output and income, particularly after 1957 when coffee production became significant. As incomes grew, the Airways also built up passenger services to Lae.

¹ One grade below top quality.

In 1964 a new airstrip was opened at Kisengam in the Erap census division (see Fig. 2.1), constructed with the aid of volunteer labour from surrounding villages. Crowley Airways extended its services to this airstrip and immediately attracted business from villages which found it closer than Boana. To this extent it reduced the quantity of coffee passing through Boana and encouraged the development of local trade-store activities at Kisengam. It also drew business from other villages (outside the survey area boundaries) which had previously carried their coffee to a marketing point in the Markham Valley.¹

In 1965 work commenced on a third airstrip within the survey area, at Kasanombe in the Naba census division (Fig. 2.1). This was expected to be in operation by 1966-67. Crowley Airways said they intended to operate services between Lae and this new airstrip, but did not expect it to be particularly profitable in the short run.²

During the 1960s there was a strong demand locally for the construction of a road link between the survey area and the Markham Valley, and therefore with Lae. The route was surveyed but due to high costs estimated, the project had not been undertaken up to 1964.³

The only other recent changes in transport facilities have been improvements of foot-tracks between villages and some minor development of roads near the airstrips. Travel between

¹ Information on the effects of the new airstrip is based on interviews with villagers in the vicinity of Kisengam with Administration officers and with Crowley Airways.

² Personal communication: Mr L. Crowley, 21 December 1966. There seemed to be good reasons why Kasanombe would be less profitable for coffee than Kisengam. First, the volume of coffee output and income around Kisengam was greater than around Kasanombe. Furthermore, there appeared to be greater scope for attracting new business in the former case from individuals previously outside the survey area with respect to coffee and tradestore goods. By contrast, it appeared that most of Kasanombe's business would simply be a transfer of existing business from Boana. In the event, Crowley Airways did not purchase from Kasanombe and the area's potential proved greater than anticipated. Purchasing was carried out by another company (Namasu) and included a considerable volume of vegetables in addition to coffee.

³ DNA patrol report for the Wain census division, November 1964.

villages has continued on the network of foot-tracks shown in Fig. 2.1.

Data on transportation of coffee to Boana were collected for nine villages located at varying distances from Boana for 1963, i.e., before the other airstrips were operating (see Table 2.6).

Table 2.6
Coffee transportation from nine survey villages to Boana, 1963*

Village	Carrying time per trip (hours)	Number of carrier trips	Total carrying time (man-days)**	Total coffee carried (tons)	Total income received by growers (\$)***	Average weight carried per trip (lb)
Wampangan	$\frac{1}{2}$	311	20	3.5	1,007	25
Banzain	$\frac{1}{2}$	148	9	1.0	294	15
Dzenzen	1	194	24	1.7	495	20
Lawasambulae	1	51	6	0.4	124	19
Pufuf	3	126	47	1.2	357	22
Kawaren	5	231	144	2.5	731	24
Angamap	$6\frac{1}{2}$	80	73	0.6	175	17
Awen	$10\frac{1}{2}$	63	83	0.4	114	14
Kisituen	$10\frac{1}{2}$	104	137	0.6	174	13

* Boana depot buying records, 1963.

** Assumes 8 hours per man-day.

*** Price received was 13¢ per lb of Y-grade parchment.

It was not easy to decide what labour time involved in a coffee-carrying trip from a village to Boana and back should be attributed as an input to the coffee enterprise. Often a grower spent part or all of the proceeds of the sale of his coffee on tradestore goods, which were then either consumed at Boana or carried back to the village. It could be argued that part of the trip, logically the return half, should be regarded as effort devoted to consumption activities. On the other hand, some growers returned with all their monetary proceeds intact and purchased goods from village tradestores. Then again, one purpose of many trips to Boana was to mix socially there and/or to engage in mission activities. There is no simple answer to this problem since production, consumption and social activities are deeply interwoven in these societies. On balance, it was considered most reasonable to allocate the labour time necessary to bring the coffee to Boana - the forward journey - to the coffee enterprise as an input.

A comparison of transport labour required for these nine villages shows the wide range for the survey area. At one extreme, Wampangan, which produced 3.5 tons of coffee, required only 20 man-days to shift it to Boana, while Kisituen, which produced only 0.6 ton had to contribute 137 man-days for transportation. While this difference was principally due to

distance, data also suggested that the average load per carrier was lower from more remote villages. Two factors probably contributed to this. First, the longer trip induced carriers to transport lighter loads in view of the difficulty of negotiating some of the foot-tracks. Second, since trees per grower were relatively fewer in the more distant villages (e.g., in the Naba census division), the quantities which individuals harvested and processed, ready for transportation at any one time would have been smaller. Since deterioration in quality occurs if marketing is delayed and a lower price is earned, there would have been no incentive to store and accumulate the small lots for any length of time. Whatever the reasons, the lower average weights per carrier did significantly add to labour inputs for growers from the more remote villages.

It was possible to estimate transport labour requirements per acre for the nine villages, using transport labour requirements per ton of coffee calculated from Table 2.6, and an estimate of average output per acre of bearing coffee for the survey area in 1963-64 (see Table 2.7). Transport labour clearly made only minor demands on villages close to Boana, such as Wampangan and Banzain, but was important in remote villages. In relation to estimated total labour requirements per acre of bearing coffee, transport labour may have almost equalled the sum of all other labour inputs in such distant villages as Awen and Kisituen.

The standardised estimates of labour requirements in Table 2.7 cannot be taken as an accurate indicator of actual labour inputs within the survey area. In the first place, few growers had planted as much as one acre of coffee: the survey area average was less than one-sixth of an acre.

Table 2.7

Transport labour in relation to total labour requirements, Boana, 1963

Village	Transport labour per ton coffee (man-days)	Transport labour per acre bearing coffee (man-days)*	Total annual labour per acre bearing coffee (man-days)**	Transport labour in total labour inputs (per cent)
Wampangan	6	1	61	2
Banzain	9	2	62	3
Dzenzen	14	3	63	5
Lawasambulae	15	3	63	5
Pupuf	39	9	69	13
Kawaren	58	13	73	18
Angamap	122	27	87	31
Awen	208	46	106	43
Kisituen	228	50	110	45

* The average yield of 0.8 lb per tree for the survey area in 1963-64 was assumed, together with the standard recommendation of 621 trees per acre, thus giving an assumed average yield of 0.22 tons per acre.

** This assumes an annual requirement of 60 man-days per acre of bearing coffee (as assumed by DASF) covering all activities up to but not including transportation.

Indeed, growers in villages of the Naba division averaged only about one-tenth of an acre so for this reason alone, an average Naba grower might have only spent about ten or eleven man-days, excluding transport, on coffee in 1963-64. Furthermore, the figure of sixty man-days per acre was based on the assumption that all departmental recommendations regarding garden maintenance, harvesting and processing were followed. In practice, the majority of growers did not do this, so that in the Naba, for example, inputs may have been less than the man-days calculated.

Returns to growers. Estimates of the average monetary returns to labour from coffee growing (see Table 2.8) were based on estimates of total labour inputs per acre and an estimated average gross return of \$65 per acre.¹ These figures are approximations only but they do suggest how the level of average returns to labour varied between villages.²

Table 2.8
Estimated average returns to labour from coffee growing, Boana, 1963

Village	Total annual labour inputs per bearing acre (man-hours)*	Average returns per man-hour (¢)
Wampangan	488	13
Banzain	496	13
Dzenzen	504	13
Lawasambulae	504	13
Pupuf	552	12
Kawaren	584	11
Angamap	696	9
Awen	848	8
Kisituen	880	7

* Assumes labour inputs estimated by DASF as required to carry out recommended practices that one man-day equals 8 man-hours, that only recurrent labour inputs are relevant and that so far as transport labour is concerned, only the forward journey, from village to Boana, was an input for coffee.

¹ Assumptions here were an average annual yield of 0.8 lb per tree, recommended tree spacing (621 trees per acre), uniform Y-grade quality parchment produced, and a price of 13¢ per lb.

² Strictly speaking, these calculations show returns to labour and all other inputs combined. In practice, however, labour was the key input. There was little money capital involved in coffee development in the area. During the tree establishment phase, labour was virtually the sole input as equipment was restricted to a few simple tools, often already in growers' possession for other purposes. It would be difficult to put a cost on land used for coffee gardening since if values for other inputs were imputed and subtracted, differences in returns between villages would not be materially affected.

Returns to labour from coffee growing in such remote villages as Awen and Kisituen were only about half those obtained by growers located near Boana, owing to differences in labour inputs for transportation. The economic incentive for coffee production was markedly weaker towards the periphery of the survey area.

It is therefore possible to appreciate the enthusiasm shown by villagers in the more remote parts of the survey area towards the construction of the Kisengam and Kasanombe airstrips. Kisengam, for example, was about 'eight hours' walk from Boana. Assuming an average load of 13 lb per carrier, transport requirements to Boana per acre of coffee (producing about 500 lb) would have been about 38 man-days before the airstrip was opened. This would have been 38 per cent of total labour requirements per acre per annum, and returns to labour would have been 8¢ per man-hour. With the opening of the airstrip, transportation labour was virtually eliminated for Kisengam growers, who received about 14¢ per man-hour, i.e., a 57 per cent rise. For Kasanombe growers the increase in labour returns was probably greater.

The above calculations represent rough averages for a whole year. In the survey area, coffee is harvested over almost the whole year, in varying degrees of intensity. There are, for example, two harvesting peaks, one major and one minor, during the year. This means that there were considerable variations during the year in the quantity of beans which were ready for growers to process and transport to Boana. Since the same processing and transportation operations were necessary whether loads were large or small, there was a tendency for returns to labour to vary directly with the quantity of beans harvested. This variation would clearly be greatest in remote villages where transportation labour was particularly important. It is therefore possible to argue that, in remote villages where average returns were low, the incentive for harvesting, processing and transporting coffee during the lean months would have been even lower.

Recent statistics on coffee trees bear out the importance of the level of monetary returns (and of transportation upon this level) in decision-making within the survey area.

There was a 21 per cent increase in tree numbers between 1963-64 and 1968-69 (see Table 2.9), with a 4 per cent increase annually. Naba villages accounted for over half of the total increase, and showed a 64 per cent increase over the 1963-64 numbers. This reflected a substantial increase in the number of men planting coffee. The increase in villages of the other two census divisions was, by comparison, minor (2 per cent or

Table 2.9

Coffee tree planting by census division, Boana, 1963-64 and 1968-69

Census division	Total trees planted		Increase (per cent)
	1963-64	1968-69	
Wain	195,246	219,633	12.5
Erap	102,717	113,073	10.1
Naba	64,307	105,460	64.0
Total			21.0

Source: DASF coffee tree censuses, 1963-64 and 1968-69, Lae.

less annually). Erap growers had been influenced when planting trees prior to 1964 by the imminent prospect of the new airstrip at Kisengam. It is not surprising therefore that there was no marked increase in tree numbers subsequently.¹

The same prospect, however, was not in sight for Naba villagers in 1964 although in 1965 work did commence on a site near Kasanombe and in 1970 this was in use. It seems fair to conclude that the greatly increased planting in these villages was due to higher returns available owing to lower transport costs in labour. It is supported, too, by the fact that in this period coffee prices followed a downward trend. Furthermore, DASF promotion of planting had been discontinued, in keeping with the provisions of the International Coffee Agreement. It should be added, of course, that the development of these airstrips not only raised the level of returns to labour for coffee, but also reduced the costs of incoming consumer goods and thus greatly improved the terms of trade for the communities affected.

Other economic activities

Other economic activities included vegetable production for Lae market, cattle raising, some labouring work and tradestore business. Poultry production was in the experimental phase.

In the post-war period up to 1960 vegetable production was an important source of income, particularly for villagers in or near Boana. After 1960, however, marketed output fell sharply owing to the more attractive returns which coffee offered to labour inputs. Data beyond 1960 were scanty for vegetable production. Jackson (1965:7) claimed that enthusiasm

¹ The opening of the airstrips at Kisengam and at Kasanombe influenced villagers other than those included in the survey area. The 1968-69 data for the Erap census division as a whole showed that an 87 per cent increase had taken place over the five years of which relatively little had occurred in villages of our survey area. In the Naba division as a whole, the increase was over 200 per cent.

'increased again when coffee prices fell', but vegetable production has not seriously challenged coffee as the principal cash crop.

Cattle were introduced by the Lutheran mission in 1933 and by 1939 there was a mission herd and another controlled by mission workers. Almost all the cattle were slaughtered during the war, after which the mission once again began building up numbers. After 1952 local interest in acquiring cattle spread and with the help of the mission and (later) the Administration, numbers under private ownership expanded to about 400 in 1964 within the Erap, Wain and Naba census divisions. Most of the slaughtering (if not all) has been for local consumption and, according to Jackson (1965:66) cattle have largely replaced pigs in major feasts within the area. While no estimates of income were available, cattle production was of minor importance compared with coffee during the period.

In 1963 some interest was being shown in poultry production for the Lae market, and pigs were also being raised, but neither was a significant source of cash income.

Villagers contributed labour to various communal tasks, some of which could be classed as economic activities, e.g., the construction and maintenance of foot-tracks. Such labour was primarily responsible for the construction and maintenance of the airstrips at Boana, Kisengam and Kasanombe. One day per week was formally allotted to 'Administration' work, though the number of men who worked on these tasks, and the proportion of the day thus spent, varied greatly over the year.

Tradestore activity developed as income from cash cropping expanded. It centred on the community store near Boana airstrip. This store traded directly with people and also provided goods for individuals who traded within their own villages. Many villagers travelled to Lae and more distant towns and made purchases during these visits, but Boana and the village stores combined were the principal source of consumer purchases.¹

Data on the pattern of sales at the Boana store are presented in Chapter 6, with information on expenditures by individual households. It is clear from these sources that the availability of consumer and producer goods at Boana and

¹ This statement is based on household interviews, data on frequency of travel and cargo loadings from Lae to Boana and on the relation between expenditure at the Boana tradestore and estimated incomes within the survey area.

in the village tradestores was a key factor in the decision to earn cash and particularly to grow coffee.

Many men were engaged in wage employment outside the survey area, either in the Morobe District or in other Districts. In 1964-65,¹ 31 per cent of adult males in the Erap census division were absent, as were 26 per cent for the Wain and, significantly, 43 per cent for the Naba,² and 36 per cent for the three divisions as a whole (40 per cent of whom were employed outside the District).

Many absentees worked on plantations or in urban areas. It was difficult to judge, however, the extent to which the number of absent workers indicated that economic opportunities outside the survey area were considered to be more attractive than those available within it. First, the statistics probably included individuals who were merely visiting relatives or friends. Second, some young men may have taken employment elsewhere in order to broaden their experience and would return. Third, some absentees had left established coffee gardens in the care of relatives or friends in order to take an outside job. Nevertheless, even if the absentee rates of the Erap and Wain divisions were the result of a mixture of economic and non-economic motives, the significantly higher rate of absenteeism in the Naba division reflected the less attractive economic opportunities there.

The 1969 population data showed a higher level of absenteeism in two of the three census divisions. For the Wain, Erap and Naba they were respectively 37, 30 and 56 per cent of adult males. The lure of better employment elsewhere could well have been a significant and increasingly important factor, particularly for the remote Naba villages, despite improved opportunities with coffee.

The response over time to the opportunity of earning cash income from coffee growing was impressively fast in terms of the growth in grower numbers in places where attractive returns were perceived, i.e., villages located within reasonable proximity to the Boana airstrip up to 1963-64 and to the other airstrips more recently. By 1964 virtually all men in the Wain and Erap villages had coffee gardens. This progress was achieved through the effective market linkage provided by

¹ DNA population census data, Lae.

² This figure suggests that interest among the Naba people in earning money was probably little different to that shown in the other two census divisions.

the airstrips and the provision of marketing, processing and transport services. It was also made possible by the integration of the Administration's extension programme with local sources of influence (local leaders and the mission), and by a receptive local community which wished to raise its material living standards through the purchase, use and consumption of new, locally available goods.

The importance of individual factors can readily be appreciated by the variation in performance geographically, where higher transport costs in more remote areas reduced returns on labour and the terms of trade, and discouraged participation. It could be seen again in the response to the improvement of transport facilities, and transport and marketing services to these areas with new airstrips which effectively raised returns to labour and the incentive to participate in coffee growing.

Participation in terms of the scale of involvement (trees per grower) of individuals in coffee growing was much less impressive as there was no noticeable increase between 1961 and 1964 and very probably none to 1970. Admittedly the Administration did not actively encourage planting from the mid-1960s but this did not prevent an increase in grower and tree numbers in the Naba census division once there was a greater economic incentive.

By 1963-64 the annual average income per coffee grower (and thus per household) was about \$10. This may constitute a substantial rise in money income over pre-war levels, but taken in relation to the value of indigenous subsistence output per household (over the whole of Papua New Guinea valued monetarily) the change was minor. In 1962-63 the average value of indigenous subsistence output per capita (i.e., production for consumption) was about \$73 (Department of External Territories 1964:61). Assuming an average size of four per household, this would give \$292 per household for the year. Since cash crops were produced in addition to subsistence production, the average total value of output was probably about \$302, so that the addition of coffee represented a 3.3 per cent rise in the value of output.¹

The high rate of absenteeism was partly due to the proximity of Lae and the ease with which the local community could reach it via the air services. People may possibly

¹ Additional income, from the sale of vegetables or labour remittances, probably did not alter significantly the average level for the whole survey area.

have thought, rightly or wrongly, that there were opportunities for earning higher money incomes through employment there. However, whatever the cause(s), it is worth noting that absenteeism and cash crop participation were not necessarily in conflict. Almost all the adult males of the Wain and Erap were coffee growers in their own right in 1963-64, yet 30 per cent or more were absent at that time. Both tree numbers and absenteeism had increased considerably in the Naba by 1969. Absenteeism is thus a doubtful indicator of the degree of confidence placed in local, as against outside, opportunities for economic advancement.

The role of the mission in the process of development deserves special mention. It initiated cash cropping in the area and the construction of the airstrip. It assisted in developing the Boana-based tradestore activities as income in the area began to expand and later helped to diversify business around the airstrip. In so doing, the mission undoubtedly reinforced local interest in earning money. Its activities greatly facilitated the later, official programme of economic development.

The volume of output from the survey area was eventually sufficient to attract private enterprise into transportation and marketing of, first the vegetable, then the coffee and tradestore businesses, and of course into passenger traffic to Lae.

The expansion of transport services in the survey area holds some interesting lessons. From the viewpoint of villagers in closer proximity to Kisengam and Kasanombe than to Boana, there was clearly an advantage in attracting air services to these points, provided that increased costs did not negate the saving in labour.¹ From the viewpoint of Crowley Airways, the question was principally the effect on total volume of business (both immediately available and new business from increased output) which might be generated by the provision of these new services.

Before work on the two newer airstrips was commenced by the local population, assurances were sought as to whether air services would be forthcoming if they were built. Crowley Airways agreed to provide services to both locations, though without any great confidence that services to Kasanombe would be particularly profitable.² As far as Kisengam was concerned,

¹ In fact, costs in servicing these two other airstrips were not noticeably higher than for Boana.

² Personal communication: Mr L. Crowley, 1966.

enough business was thought to be immediately available to warrant the service. Admittedly a considerable volume of coffee and trade goods freight was merely switched from Boana and provision of services would only maintain an existing volume of business. However, new business (coffee, trade goods and passengers) could now be attracted to Kisengam from villages originally outside Boana's sphere of influence. This again was redirected business but it was new for Crowley Airways. There was also the possibility of more business through expanded economic opportunities around Kisengam (e.g., from higher productivity from existing coffee trees and from vegetable production). Villagers in the area expressed keen interest in the possibilities which the air service would open up.

In contrast, the possibilities at Kasanombe were not so immediately attractive. Coffee output was lower in the Naba division, so the potential at Kasanombe would depend more on the volume of new output and income stimulated by the air services themselves. As well, there was a relatively high level of absenteeism in surrounding villages. However, these doubts were ill-founded as the availability of the services greatly stimulated further coffee planting and other business.

Clearly it was the total volume of output and income which attracted improved transportation and marketing services to the area and which in turn raised the level of returns to the individual growers concerned and stimulated further activity on their part. Such development was obtained cheaply from the viewpoint of the Administration, due primarily to the self-help programmes of the local population (especially in developing internal economic infrastructure) and to the assistance of the mission and local leaders.

Further coffee plantings have been officially discouraged, though the people themselves obviously have only a limited interest in expanding their money-earning activities. Other commodities must be promoted. Cattle production could be expanded although limited grazing land will probably prevent this becoming a major money-earner. Vegetable production could increase as the township of Lae expands.

There has been strong local support for the construction of a road referred to earlier to link the survey area with the Markham Valley. Even if it were constructed, it is questionable whether it would bring much direct economic benefit. Since it would not penetrate the area it would have little effect on the all-important intra-area transport costs. Thus it is unlikely that it would stimulate higher levels of activity and output. Indeed, it is difficult to see how

transportation could be improved within the area (unless a 'flying-fox' cable system were found to be economic) since the nature of the terrain precludes a vehicular road system and seriously limits the number of feasible sites for airstrips. Such a road would, however, provide a cheaper access route for the local population to and from Lae. Given the continued if small-scale interest of the local people in coffee growing, cheaper access to the area might reduce the level of absenteeism, even if local economic development was not greatly stimulated in the process.

Chapter 3

Sinasina

An exploratory visit was made to the heavily populated Sinasina census division of the Chimbu District (see Fig. 3.1) in 1962-63 and was followed by a four-month visit in 1963, a revisit in 1966 and a final brief visit in 1970. Considerable use is made of a study conducted by Hughes (1966) in 1965-66 partly as a follow-up to test some initial hypotheses arising from our 1962-63 visits.

In 1964-65 the total population of 16,830 lived within an area of seventy-five square miles (Department of External Territories nd), giving an average population density of about 224 per square mile,¹ comparable with that of the neighbouring Chimbu area which is one of the most densely populated areas of the country. Between 1957-58 and 1962-63 population growth was estimated to be 1.5 per cent (Department of External Territories nd).

The population of Sinasina comprised four tribal groups (see Fig. 3.1), all of which spoke Sinasina languages. The Tabare tribe, with more than half the total, was by far the largest unit, while the Nimai and Kere were relatively small (see Table 3.1).

Table 3.1

Tribes and tribal lands of the Sinasina census division

Tribes	Population* (1961)	Total tribal area (acres)	Total area per capita (acres)
Tabare	8,258	23,300	2.83
Nimai	1,828	4,800	2.62
Dinga	3,601	8,700	2.41
Kere	2,040	4,200	2.06
	15,727	41,000	2.67

* Number of clans and subelans.

Sources: for population, DNA village population census, Sinasina census division, Goroka, 1961. No more recent breakdown on a tribal basis was available. For tribal areas, map by Alder of the Chimbu subdistrict, Port Moresby, 1962.

¹ More recent data suggest density is now about 300 per square mile.

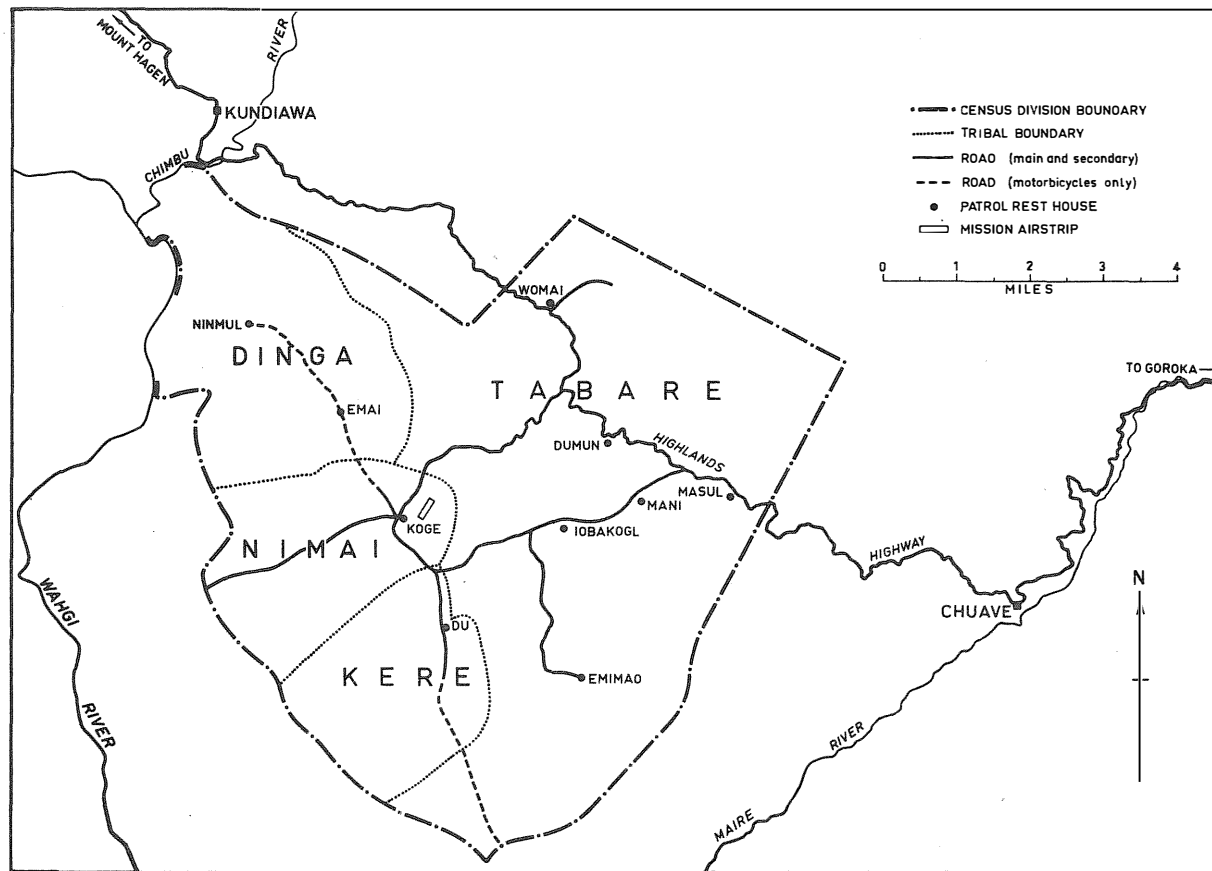


Fig. 3.1. Sinasina census division

Sinasina census division is located at an altitude of between 4,500 and 9,000 feet and comprises four physiographic zones¹ which run approximately east-west. The most northerly of these, which is dominated by a massive limestone ridge, has deep fertile soils with frequent rock outcrops and limestone fragments of all sizes. In 1963 most of the original vegetation had been removed to open up land for subsistence gardening. Part was in fallow and planted to groves of casuarina species and some sections were planted to pandanus palms which yield edible seeds.

The second zone, adjacent to the first, lies mainly on the northern side of and parallel to the Highlands Highway. It comprises sloping and very broken foothill country with deep, fairly well drained and fertile soils. It was mostly under food gardens, in temporary fallow or was planted with casuarina trees and pitpit (Saccharum sp.).

Farther south is a third zone of irregular hilly country about four miles wide, which extends from Dumun rest-house to beyond Koge rest-house. It contains deep fertile soils but has drainage problems in lower sections. Again, this zone was under food gardens or casuarina fallow, except for localised areas of swampland. It merged into a fourth zone of rugged, hilly to mountainous country, comprising the foothills of the Kubor and Bismarck ranges, with altitudes ranging from 5,000 to 8,000 feet. Soils were variable, tending to be shallow on the steep slopes. This zone was mostly used for food gardens with small sections of montane rain forest remaining on the upper slopes.

A soil survey in 1963-64 (Department of External Territories) determined that almost the whole of Sinasina could be used for food gardening although 25 per cent was steeply sloping (25 to 40 degrees).

The Tabare tribe had land in all four zones, particularly in the second and third, the Dinga had land in the second and third, while the Nimai and Kere tribes were located mainly within the fourth zone.

The survey area was strongly dissected by numerous river tributaries, which flowed into either the Maire system to the southeast or the Chimbu system to the northwest. These two river systems were themselves tributaries of the Wahgi River, south of Sinasina.

The Sinasina people depended upon the sweet potato as their principal staple; Bailey (1966:5) estimated that highlanders

¹ For a fuller description see CSIRO (1958).

obtained 90 per cent of their calories and 50 per cent of their protein intake from sweet potatoes. Other sources of carbohydrates were potatoes (Solanum tuberosum), taro, cassava, yams, sweet corn, plantains and bananas. A wide variety of other minor foods was also grown, including pitpit, sugarcane, pumpkin, marrow, beans, cucumber, capsicum, cabbage, silver beet, tomatoes and a number of green vegetables. Forest trees provided nuts and oils, especially the nut pandanus and oil pandanus, while various shrubs were the source of fibres and materials for ropes, carrying bags, belts, tools, clothing, fencing and ornaments. Food crop production was carried on within a cultivation fallow system which is considered later.

The development of European contact

In 1933 the first European explorers penetrated the area on their way to the western and southern highlands. They were followed in the same year by Catholic missionaries and in 1934 by Lutheran missionaries. The Catholics established mission stations at Koge and the Lutherans at Dumun and Du. Government administration commenced in 1935 with the establishment of a post at Kundiawa.

The Lutherans attempted to encourage local economic development prior to the second world war. The mission itself planted coffee trees as early as 1934 and subsequently persuaded local people to follow suit, both on church ground and on their own garden land. The first crops belonging to the Sinasina people came into bearing around 1940; however, the effort was on a small scale and expanded little before the second world war. Coffee was sold to the mission intermittently but only a few pounds at a time. The only other pre-war cash crop activity was the sale of small quantities of vegetables to the missions and the Administration. The Administration concentrated on pacification and the maintenance of law and order (Brookfield and Brown 1963:4). In addition, it recruited labourers for road construction within Sinasina, an activity which was continued during the military administration of the second world war.

After the war transport and communication facilities were established to link the highlands with the coast. Air transportation between Goroka and the coastal ports provided an outlet for highland products. The Kundiawa airstrip, completed around 1954, provided such a link with Goroka and coastal areas. As early as 1948 a vehicle passed through Sinasina from Goroka and by 1954 heavy-duty (four-wheel-drive) vehicles ran regular services between Kundiawa and Goroka. Road construction within Sinasina gradually improved access to villages from the Highlands Highway.

After the war the Administration actively encouraged the production of coffee as a cash crop. In Sinasina extension work by DASF and DNA commenced in 1952, and later DASF took over almost exclusively.

The growth of Kundiawa as a subdistrict, and then a District, headquarters has provided a stimulus for local development of trade and commerce, some limited opportunities for employment, and a small but expanding market for fresh food. An expansion of post-war mission establishments in Sinasina provided a further small outlet for these foodstuffs. Post-war contact with areas outside the Chimbu District opened up new opportunities for wage employment. In particular, large numbers were recruited for plantation work both in other highland areas and on the coast.

Development of the coffee industry

Tree planting. The Sinasina census division was one of the earliest to commence coffee planting (see Table 3.2),¹ but there was little planting activity until after the mid-1950s. By 1957-58 it had nearly one-third of all coffee trees in the subdistrict. However, there was only the area equivalent of about 752 acres planted in the whole subdistrict.²

Table 3.2

Early coffee tree planting, Chimbu subdistrict, to 1957-58

Census division	Number of trees planted			Total to 1957-58	Area equivalent 1957-58 (acres)*
	To 1955-56	In 1956-57	In 1957-58		
Central	68,215	18,955	17,551	104,721	169.6
Yonga	18,417	41,805	719	60,941	98.1
Upper Chimbu	5,210	2,505	2,775	10,490	14.9
East Koronigl	21,246	17,919	19,700	58,865	94.8
West Koronigl	10,757	20,074	2,438	33,269	53.5
Kup	2,905	1,304	-	4,209	6.8
Dom	3,927	8,033	3,685	15,645	25.2
Sinasina	48,455	55,292	47,365	151,112	243.3
Chuave	2,508	1,201	5,903	9,612	15.6
Elimbari	2,452	3,708	401	6,561	10.6
Nambaiyufa	1,831	3,919	3,908	9,658	15.3
Maire River	-	1,769	-	1,769	2.9
Salt	-	967	-	967	1.6
Subdistrict total	185,923	177,451	104,445	467,819	752.2
Sinasina as per cent of total	26.1	31.3	45.3	32.3	

* Assumes planting at recommended spacing with 621 trees per acre.

Source: DASF annual report for 1957-58, Kundiawa, 1958.

¹ Accuracy of early counts is suspect and little reliance can be placed on details of plantings. It is thought, however, that the trends are probably indicative.

² The area was estimated by dividing tree numbers by the number of trees at recommended spacing per acre. Since trees were often planted too closely the figure quoted probably exaggerates actual area.

The first official coffee census in 1962-63 showed that about half the total number of adult males had planted coffee (see Table 3.3). Aside from the Dinga, there was a fairly even level of participation among the tribes.

Table 3.3

Participation of Sinasina tribal groups in coffee growing, 1962-63

Tribes	Number of coffee growers	Number of adult males*	Percentage of coffee growers among adult males
Dinga	744	1,248	60
Nimai	320	626	51
Kere	292	599	49
Tabare	1,203	2,533	49
Total	2,559	5,006	51

* Over sixteen years.

Source: DASF coffee census of Sinasina, 1962-63, Kundiawa, 1963.

Since it was not feasible in this survey to study the coffee performance in detail for the whole of Sinasina, the Kere tribe was selected for close examination (see Fig. 3.2).

Until 1959 planting in Kere territory was relatively slow (see Table 3.4), but by 1962 it took place at a rate faster than elsewhere in Sinasina. For the Kere itself, the annual planting rate rose steeply between 1959 and 1961 and thereafter declined just as steeply to 1965.

Table 3.4

Total coffee tree numbers, Kere tribe and Sinasina census division, 1956-65

Unit	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Kere tribe*	n.a.	n.a.	n.a.	3,715	19,329	40,358	49,853	51,444	53,279	56,585
Sinasina**	49,265	107,918	157,004	175,597	n.a.	n.a.	273,260	n.a.	n.a.	n.a.

Source: * DASF coffee census, 1965-66, Kundiawa, 1966.

** DASF coffee census, 1962-63, and previous estimates by DASF officers.

The earliest record of plantings on a clan basis was in 1957 when an agricultural officer reported that twenty-two growers had a total of 1,724 trees. The count made in the 1965-66 census¹ was more reliable than the 1962-63 census and since age estimates were made for trees planted prior to the census year, which provided data on annual plantings retrospectively to around 1959, the data from the more recent survey were used (see Table 3.5). A revisit to the area revealed no more recent tree counts.

¹ This census was carried out in Sinasina in collaboration with Hughes, during his follow-up study. Minor modifications to these counts were subsequently made by Hughes to improve accuracy on the basis of his own investigations and a further count by the authors of this study.

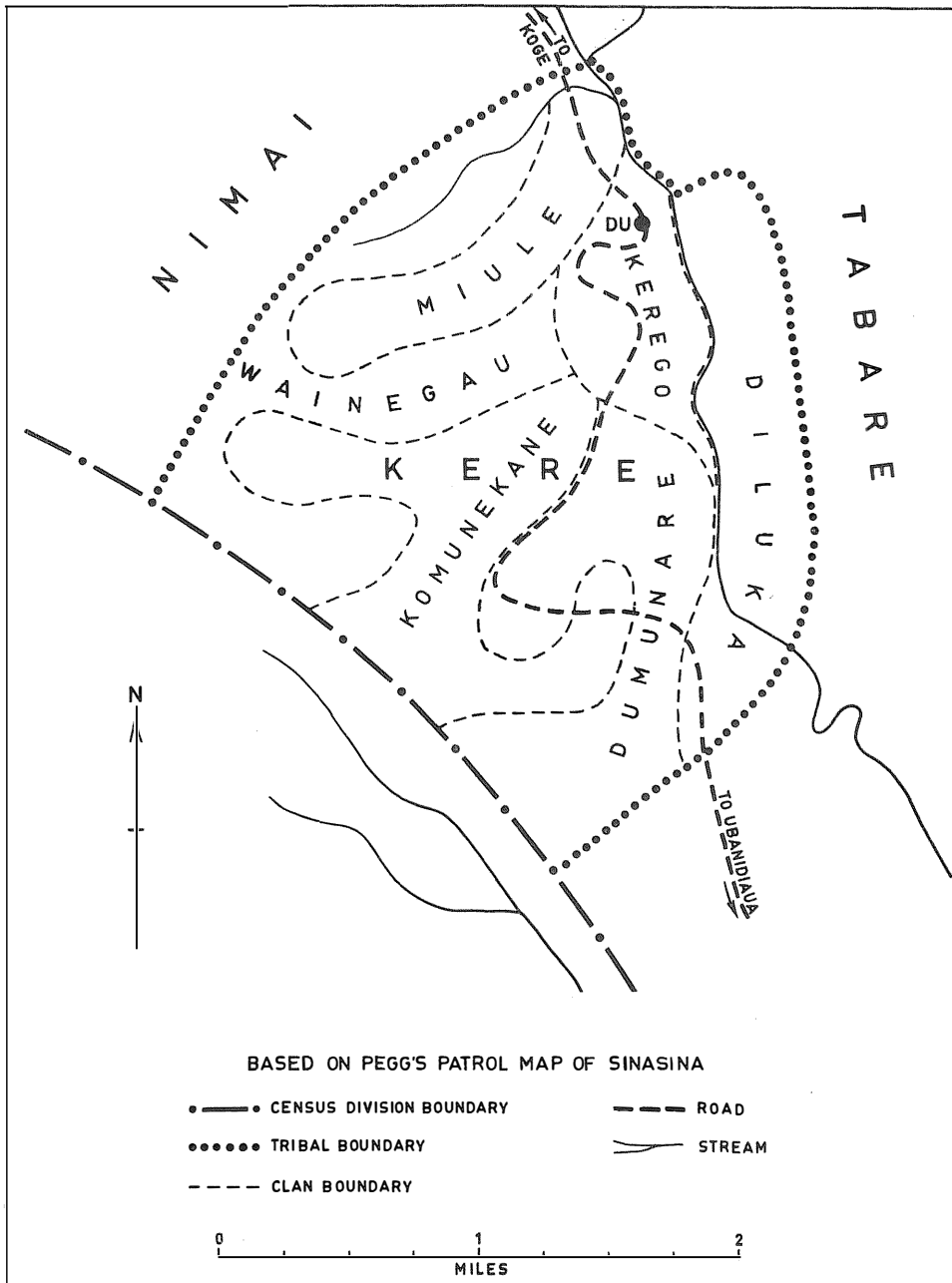


Fig. 3.2 Clan areas of the Kere tribe

Table 3.5

Participation of adult males in coffee growing* and average scale of coffee planting per grower
among clans of the Kere tribe, 1959-65

Clan	Total adult males, 1965	1959		1960		1961		1962		1963		1964		1965		Total no. of trees, 1965
		Per cent growers	Av. no. of trees	Per cent growers	Av. no. of trees	Per cent growers	Av. no. of trees	Per cent growers	Av. no. of trees	Per cent growers	Av. no. of trees	Per cent growers	Av. no. of trees	Per cent growers	Av. no. of trees	
Diluka	66	3	191	6	171	59	150	71	161	71	161	73	168	74	173	8,460
Kerego	114	-	-	3	83	59	122	65	158	65	158	66	157	66	160	11,997
Wainegau	192	5	198	43	117	59	111	64	107	66	106	67	107	68	112	14,706
Miule	108	1	5	29	102	57	88	62	93	63	95	63	95	66	99	7,025
Dumunare	147	10	89	35	83	40	86	48	90	50	91	51	91	54	89	7,082
Komunekane	154	1	152	9	94	23	94	36	89	41	89	47	89	55	87	7,315
Total	781	1	132	24	104	48	108	56	114	58	114	60	114	63	115	56,585

* The number of adult males in 1965 were used for all years in calculating percentage of growers since previous population censuses were of questionable accuracy. As a result, percentages given understate true percentages progressively back to 1959. The differences, however, would be minor over this short period and would not affect the trends shown.

Source: Hughes (1966) and DASF coffee census, 1965-66, Kundiawa, 1966.

The Kere did not plant coffee actively until around 1960. By the end of that year nearly one-quarter of all adult males had planted coffee trees and by 1965 this had risen almost to two-thirds (see Fig. 3.3). The area planted per grower averaged just under one-fifth of an acre (converted to an acreage basis at recommended spacings) throughout the period. While the first growers in each clan commenced planting at much the same time, clans varied considerably in growth of participation over the period. By 1965 there was a range of from 74 per cent of adult males in the Diluka clan, to 54 per cent for the Dumunare clan. Fig. 3.4 shows that for the Diluka, Kerego, Wainegau and Miule clans, participation increased rapidly during the first three years (1959-62) and proceeded at a relatively slow pace subsequently, while for the Dumunare and Komunekane the initial growth rate was slower, particularly for the latter, and was sustained at a faster pace later in the period. There was also interclan variation in the scale of plantings (see Fig. 3.5). Once again the Diluka clan was prominent with the highest average number of trees per grower (equivalent to 0.28 acres), roughly double the number of the Dumunare and Komunekane at the lower end of the scale.

As Fig. 3.6 shows, few Kere growers had large coffee gardens in 1965. The biggest grower had 1,650 trees, the equivalent of 2.7 acres. Less than 6 per cent of growers had planted

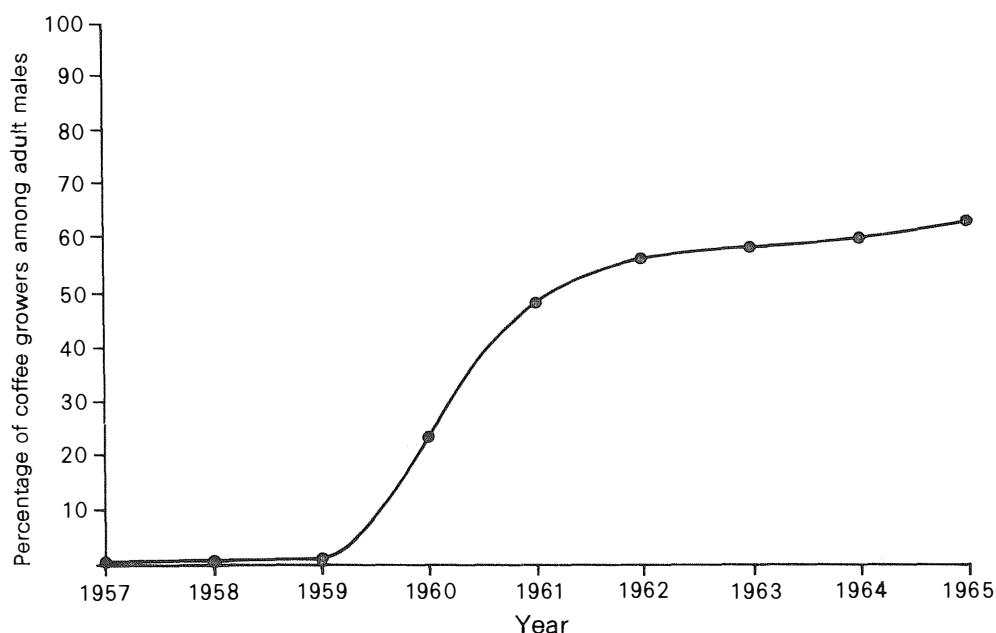
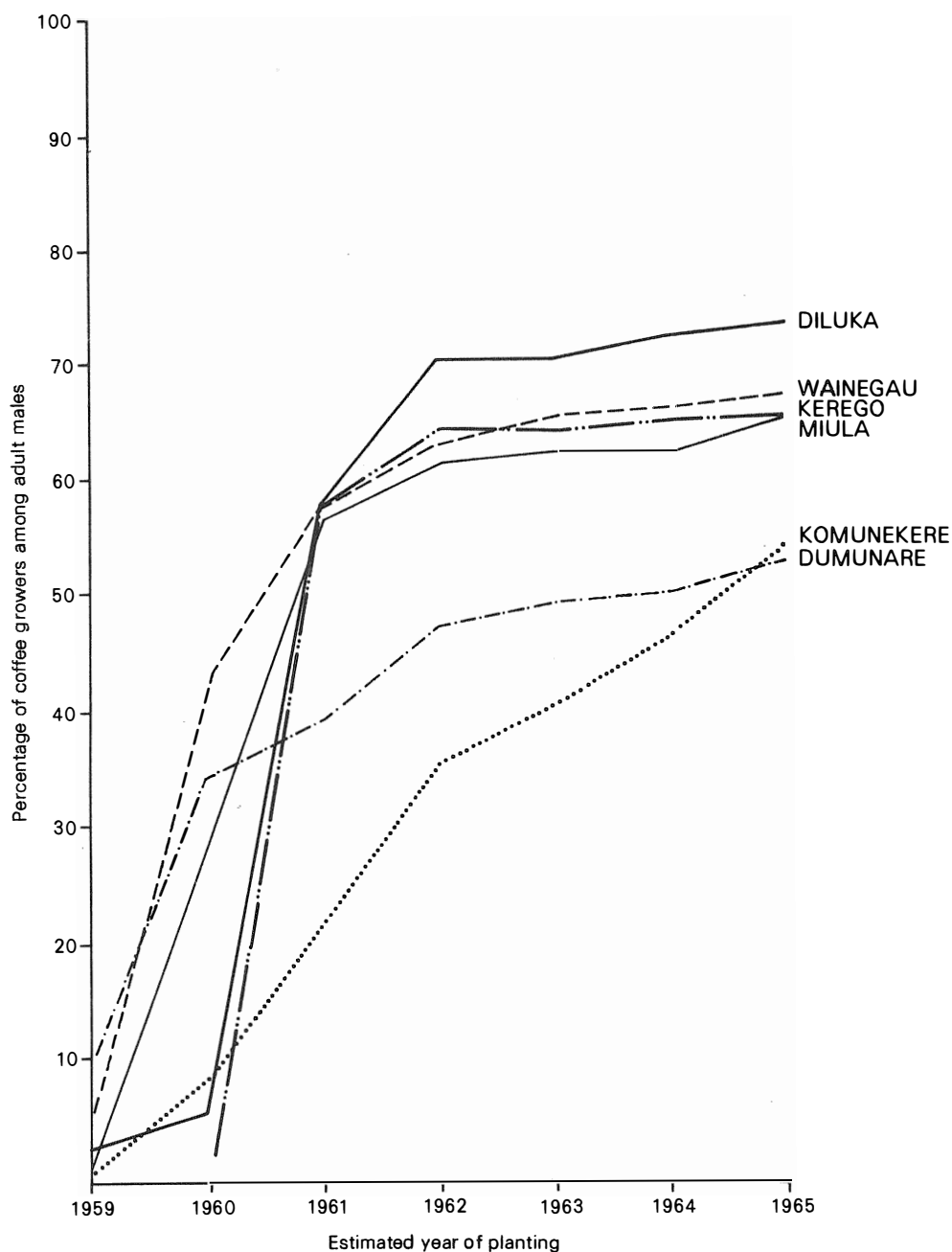
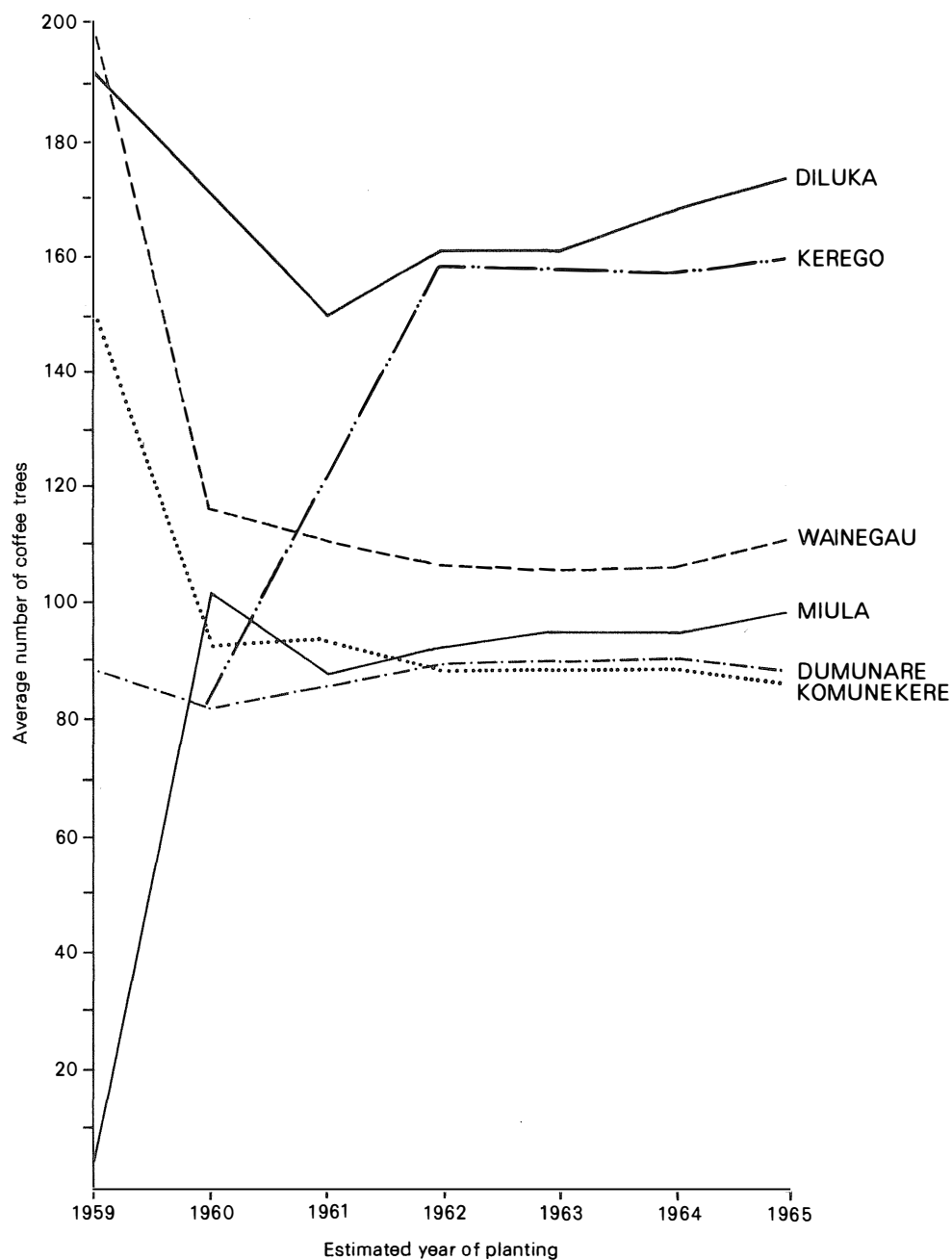


Fig. 3.3. Participation of adult males in coffee growing, Kere tribe, 1959-65



Source: DASF coffee census, February 1966.

Fig. 3.4. Proportion of coffee growers among adult males by clans, Kere tribe, 1966



Source: DASF coffee census, February 1966.

Fig. 3.5. Average number of coffee trees per grower, by clans, Kere tribe, 1959-65

less than one-fifth of an acre. Only 18 per cent (or 89) of the Kere growers expanded their gardens during the period and only 2 per cent more than once (one grower planted new trees four times). The incidence of growers who did expand their gardens was most marked in the Wainegau and Kerego clans (50 of the 89 growers).

Coffee production and income. In the early years DASF purchased any coffee brought to its office in Kundiawa but as substantial numbers of trees came into bearing, private buyers took over purchasing activities. In 1962 a privately owned coffee factory was built close to Sinasina and in 1964 it was purchased by the newly formed Kundiawa Coffee Society, a growers' co-operative with a large number of Sinasina members. The society quickly became principal buyer within the area.

The large number of buyers made it impossible to obtain records of output and yields. Some information, however, was gained from the reports of agricultural extension officers. As early as 1958 one reported that the 'vast majority' of trees were too close together, planted on old food garden land or on poor hillside soil, with little or no shade; the latter frequently resulted in premature death or retardation of trees, or trees were interplanted with food crops which competed for soil nutrients.¹ Another report² noted that practically all blocks were thick with weeds. A later one stated that despite the urging of extension officers, growers had not thinned out their trees to recommended numbers and spacing. Efforts were made to establish shade in some areas, but not in others. Pests, particularly rats and pigs, were causing damage to trees and crop losses, and die-back was still common. There was some incidence of disease (ring borer and green scale) and bench taproot was frequently found as the result of careless planting and poor planting materials. These observations were fully corroborated by our garden inspections in 1962-63.

All these problems added up to low yields from village coffee gardens. While experimental plots at Chuave (east of Kundiawa) indicated that the potential annual yield from fully mature but unfertilised trees was about $1\frac{1}{2}$ lbs, one agricultural officer estimated in 1965 that yields realised under village garden conditions varied from $\frac{1}{3}$ to $\frac{1}{2}$ lb per tree.

¹ DASF Chimbu agricultural patrol report, no.1, 1958.

² DASF Chimbu agricultural patrol report, no.3, 1961.

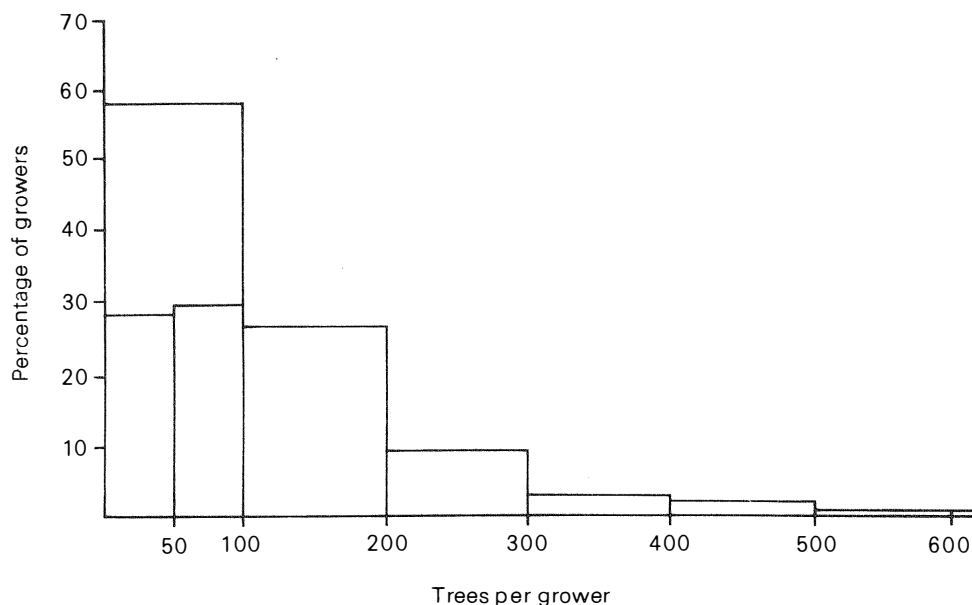


Fig. 3.6. Distribution of coffee trees per grower, Kere tribe, 1965

Growers typically pulped their own cherry, fermented, washed and dried the beans, and marketed the crop as parchment. The product, however, was frequently of low quality, especially during the early years. This problem arose for a variety of reasons: inclusion of overripe, underripe and fallen cherries for processing; fermentation was often excessive or in tins, saucepans and other metal containers which produced black and discoloured beans; delays between picking and pulping led to a high incidence of 'red-skins'; much of the crop was inadequately dried or was dried on old blankets and bags, resulting in discoloured and tainted parchment. Beans were often dried in living quarters, where smoke caused discolouration and tainting. Finally, many growers carried their parchment to buying points in sacks and old kitbags which also induced discolouration.¹

Varying quality of parchment coffee was reflected in the considerable range of prices offered by buyers. In 1963 prices ranged from 5 to 17¢ per lb. Particularly in the early years, many buyers rejected parchment outright.

¹ DASF, Chimbu agricultural patrol report, no. 4, 1959-60, nos. 3 and 6, 1961-62, and observation by the authors.

Efforts were made to rectify processing faults through extension work in the villages. Reports in later years¹ suggested that more progress was achieved in overcoming processing rather than production problems. After 1961-62 the proportion of first and medium grade parchment increased and the quantities rejected or accepted at low prices declined.

Although data were not available on actual monetary returns to coffee growers, it is possible to estimate potential and actual coffee income for the Kere tribe, given the distribution of tree numbers in 1965 (Fig. 3.6), the prevailing price structure, and assumptions about the yields and parchment grades (Table 3.6).

Table 3.6

Estimated income range for Kere coffee growers, 1965

	Tree numbers per grower							
	0-50	51-100	101-200	201-300	301-400	401-500	501-600	601-900
Maximum income with recommended practices (\$)*	9.00	18.00	36.00	54.00	72.00	90.00	108	162
Maximum income with inferior practices (\$) **	1.70	3.40	6.80	10.20	13.60	17.00	20.00	30.00
Proportion of growers in Kere tribe (per cent)	28.8	29.6	26.5	9.5	2.7	1.2	0.8	0.8

* Assumes average yield of 1 lb per tree (two-thirds experimental plot yield at Chuave) and an average price for parchment of 18c per lb (X-type parchment).

** Assumes an average yield of 1/3 lb per tree and a price of 10c per lb (Y-type parchment).

These indicate a generally modest income potential owing to limited tree numbers planted, even with high yields and high-quality parchment. At the lower extreme, they show the limitations which unsatisfactory cultural and processing practices place on the level of returns. Under the assumptions of low yields and poor-quality parchment, two-thirds of Kere growers (with 200 trees or less) would receive less than \$7 gross annually. This is less than one-fifth the gross returns possible from the same trees with recommended practices.

Within Sinasina there were no major contrasts in participation between tribes but within the Kere there were significant interclan differences. The following section examines factors which contribute to the above pattern.

¹ See, for example, DASF, Chimbu agricultural patrol report, no.6 of 1961-62.

Factors affecting development
of coffee industry

Land availability. In order to assess whether land shortage influenced the development of the coffee industry, Hughes (1966) chose the Kere tribe.¹ As Table 3.1 shows, it had the least available land per capita of the four tribal groups in Sinasina. Second, in 1962-63 it also had the lowest percentage of coffee growers among adult males. It was not possible to test the relationship between these two characteristics for the whole tribe so test groups were restricted to two subclans. One, the Kui, had the highest proportion of growers to adult males in 1965 within subclans of the Diluka clan.² The Diluka clan itself was the leading clan in the Kere tribe in this respect (Table 3.5). The other, the Dege, had the second lowest participation ratio for coffee among subclans in the tribe, while the Dumunare clan, to which it belonged, had the lowest participation ratio among clans of the Kere tribe. These two subclans therefore, like their respective clans, were at opposite extremes of the range of participation. Hughes selected one-quarter of households within each subclan for intensive study. All household land for each unit was measured and classified by current usage (coffee, food gardens, fallow, forest, etc.), by altitude and by slope. These data, summarised in Table 3.7, show that the Kui sample had less than half the area available per household of the Dege but had more than two-and-a-half times as much planted to coffee and more than twice as much planted to cash crops. On a per capita basis, this contrast was heightened further since the average size of the Kui sample household was larger than that of the Dege household.

Further emphasis was given to Kui land limitations by the fact that in 1966, only 11 per cent of fallow land was more than ten years old as against 35 per cent for the Dege sample which had twice the area per household under food gardens. Furthermore, the Dege had considerably more land below an altitude of 5,000 feet, which was more suitable for coffee. The Dege had more than twice as much land of less than 10 degrees slope, three times the area with a 10 to 20 degree slope, and nearly twice as much in the 20 to 30 degree

¹ His analysis was supplemented by a more general analysis of population pressure (Department of Territories nd).

² Hughes assumed that land shortage would affect the participation ratio before it affected the scale of planting per grower.

category. Hughes concluded there were no important differences in soils between the two groups.

Overall, the Dege had less than one-third as much land under coffee trees although they had more suitable land. Hughes found (Table 3.8) the Dege had 10 per cent more of the most economically suitable land, and double the area considered to be marginally economic for coffee. These results are therefore the opposite of those which could be expected, had land shortage been a factor. Thus, so far as these households are concerned, land availability had no influence on participation in, or scale of, past coffee planting. Hughes' sample was small though it included a large proportion of Kui and Dege subclan households, and was not randomly chosen; nevertheless, it seems likely from Hughes' evidence that the samples were representative of the two subclans with respect to the variables examined. Hughes also stated that 'other aspects of the fieldwork created the impression that the Dege and Kui were not only at the extremes of the coffee planting range but also near the extremes in availability of both total land and land suitable for coffee growing'. If 'availability of suitable land' fails to explain the difference in the scale of the response to the coffee-planting incentive in these groups, it is improbable that it will do so for the groups of the middle range (Hughes 1966:92). He also concluded that the Dege's participation in pyrethrum (the Kui had no land suitable for pyrethrum), in addition to coffee, could not explain their low participation in the latter.

Table 3.7

Land use per household and per capita for the Kui and Dege samples, 1966

Land use	Unit	Area (acres)		Proportion of all land (per cent)	
		Kui	Dege	Kui	Dege
Coffee	per household	0.54	0.19	13.2	2.1
	per capita	0.12	0.045		
Cash crops	Pyrethrum	nil	0.02	nil	0.2
	per capita	nil	0.005		
Total	per household	0.54	0.21	13.2	2.3
	per capita	0.12	0.05		
Food garden	per household	0.82	1.69	19.9	18.7
	per capita	0.18	0.41		
Fallow	per household	2.53	5.44	61.4	60.0
	per capita	0.56	1.30		
Pandanus	per household	0.23	1.72	5.5	19.0
	per capita	0.06	0.41		
Total, all land	per household	4.12	9.06	100.0	100.0
	per capita	0.92	2.17		

Source: Hughes (1966:77).

Table 3.8

Area potential for, and areas planted to, coffee and pyrethrum
for Kui and Dege subclan sample households, June 1966

		Kui			Dege		
		Potential ac.	Planted ac.	Percentage planted	Potential ac.	Planted ac.	Percentage planted
Feasible for coffee	per household	2.73	0.54	19.8	2.78	0.16	5.6
	per capita	0.61	0.12		0.67	0.038	
Marginal for coffee*	per household	1.00	0.01	1.0	1.86	0.03	1.6
	per capita	0.22	0.002		0.44	0.007	
Feasible for pyrethrum	per household	nil	nil	nil	0.8	0.02	2.5
	per capita	nil	nil		0.19	0.005	
Marginal for pyrethrum**	per household	0.34	nil	nil	1.28	nil	nil
	per capita	0.07	nil		0.3	nil	

* Half of the Dege land marginal for coffee and one-third of such Kui land is also marginal for pyrethrum, and is included in both sets of figures.

** Three-quarters of the Dege land marginal for pyrethrum and all such Kui land is also marginal for coffee, and is included in both sets of figures.

Source: Hughes (1966:91).

Extension services. The first agricultural officer was appointed to the Chimbu subdistrict in 1955 (Table 3.9). Prior to this, agricultural extension was in the hands of one fieldworker in 1952-53 and two fieldworkers between 1953 and 1955. This staff was responsible for twelve other census divisions in the subdistrict as well as Sinasina.

In 1952 the first coffee nursery was established at Kundiawa by the fieldworker, and subsequently advice was offered to growers on how to line correctly and shade coffee seedlings after transplanting. However, at this early stage most initial plantings were the result of the people's own initiative. The Administration assisted mainly through distributing seeds and establishing village nurseries.

The establishment of a small (and the only) European-owned estate (twenty-five acres) near Kundiawa had a significant demonstration effect for villagers as an example of nursery establishment and planting methods, and later as an advertisement for the potential returns from the crop.¹ The Catholic mission at Koge planted a small plot in the early 1950s on which several Nimai learned coffee crop husbandry.

Agricultural patrols began with the arrival of the first agricultural officer in 1955. He visited the nine rest-house areas in Sinasina in turn, each for a day or less. There was at least one rest-house within the territory of each tribe (Fig. 3.1).

In 1955 coffee plantings were inspected, maize seed distributed, and the planting of 10,000 trees in five rest-house

¹ Personal communication: D. Kelaart, Kundiawa, 1966.

areas supervised. In 1956 Sinasina received coffee seedlings from Kundiawa and advice on the establishment of nurseries at four rest-houses. Tree planting was supervised during a second patrol by the agricultural officer to two rest-house areas and farmer trainees subsequently supervised nursery planting at three rest-houses. In 1957 short patrols to the area were made by indigenous agricultural staff (farmer trainees) and a patrol by the agricultural officer included the five then most accessible rest-house areas (Womai, Dumun, Koge, Emai and Ninmul).

In 1958 a month-long patrol through the whole census division inspected coffee and food gardens, advised on pruning and care of coffee trees and undertook a detailed sample census of coffee trees in selected subclans. Unlike some previous years, attendance and interest were high during this patrol. Later that year rest-house nurseries were inspected by indigenous patrols. In 1958 staff were dispersed to various parts of the subdistrict (Table 3.9), Sinasina continuing to be served by staff based in Kundiawa.

Table 3.9

DASF staff, Chimbu subdistrict, 1952-63

Year	Location	Agricultural officers	Field-workers	Farmer trainees
1952	Kundiawa	-	1	-
1953	Kundiawa	-	1	-
1954	Kundiawa	-	2	-
1955	Kundiawa	1	2	-
1956	Kundiawa	1	2	4
1957	Kundiawa	1	2	4
1958	Kundiawa	1	5	-
	Kerowagi	-	2	-
	Gumine	-	-	-
	Chuave	-	1	-
1959	Kundiawa	1	7	-
	Kerowagi	-	1	-
	Gumine	-	-	-
	Chuave	-	1	-
1960	Kundiawa	1	3	4
	Kerowagi	1	2	2
	Gumine	-	1	2
1961	Kundiawa	1	3	8
	Kerowagi	1	3	4
	Gumine	-	1	-
1962	Kundiawa	2	4	8
	Kerowagi	1	1	5
	Gumine	-	1	-
	Gembogl	1	2	5
1963	Kundiawa	2*	7	15
	Kerowagi	1	2	-
	Gumine	-	2	5
	Gembogl	1 (8 mo.)	1	12

* Three officers were stationed at Kundiawa over the period, but none of these completed a full year; in aggregate there were the equivalent of two officers on the station.

Source: DASF, Kundiawa.

During 1959 the first patrol, lasting two months, was carried out by indigenous staff. The second, led by an agricultural officer, investigated land tenure and population pressure, registered new coffee plantings and growers, and

offered extension advice on coffee growing. The patrol included all rest-houses, though it reported variable attendance at meetings.

In 1960 one patrol was conducted by the agricultural officer and one fieldworker. In 1961 fieldworkers spent a total of about two months advising on pruning and coffee processing. A patrol by the agricultural officer to improve production and processing techniques was carried out following complaints of low-quality parchment from processors in Goroka and elsewhere.

A similar coffee garden improvement patrol was carried out in 1962, including all rest-houses, to assess progress and to offer further extension advice. In 1962-63 the first coffee tree census of the subdistrict was conducted over a five-month period.

This detailed record of extension work shows that inadequate staff numbers permitted only irregular patrols. Much patrol time was absorbed in travelling, especially in the early years when roads were either non-existent or in poor condition. The size and population of Sinasina precluded attention being paid to more than a few individual coffee growers and gardens during a patrol, and patrolling officers were forced to rely principally upon talks to coffee growers collectively at rest-house meetings, at which attendances were variable.

These inadequacies in staffing were most marked during the late 1950s when planting was at its peak. Although DASF distributed quality seed and encouraged village nurseries, much of the area was planted with self-sown seeds from village blocks.

Staffing limitations undoubtedly were a factor in low yields and poor-quality parchment. The special coffee improvement patrols did improve parchment quality after 1961 but patrols reported relatively little improvement in garden yields.¹ Thus, on the one hand, the extension programme stimulated interest in the crop through promotional work and by the distribution of planting material and information on production and processing methods, but on the other, it was inadequate to influence greatly, much less control along recommended lines, the activity which took place in response to it.

The extension programme may have influenced the growth pattern of coffee planting. Prior to 1959 agricultural patrols visited the more accessible rest-house areas, and the

¹ DASF Chimbu agricultural patrol report, no.3, 1961-62.

Kere and Nimai tribes received somewhat less attention than the Dinga and Tabare which were close to Kundiawa. The few patrols made to Sinasina were brief and concerned less with promoting the crop than with recording past plantings, distributing planting material and giving advice on production methods. The relatively late start made by the Kere tribe (served by the rest-house at Du) may be partially explained by isolation from extension influence. A 1962 patrol, for example, which reached Du by motor cycle, reported that only two patrols, each lasting half a day, had been south of Du. This isolation helps to explain the relative backwardness in planting of the Kere tribe in relation to the rest of Sinasina, and within the Kere, of the southernmost clans (the Dumunare and Komunekane) and subclans in particular. After 1959 virtually all rest-house areas were covered by patrols and extension efforts reached all tribes. In 1962-63 adult males in the four tribes had a similar rate of participation (see Table 3.3).

It is, however, difficult to distinguish the influence of extension effort from that of the growth of transport and marketing facilities. This latter factor, on the whole, appears to provide more convincing answers to the question of the pattern of past coffee plantings.

Transport and marketing. With the extension and upgrading of the road network in the area, the marketing system for parchment underwent considerable development. In 1949 Kundiawa, and Chuave to the east, were connected by road for the first time, and in 1950 the first attempts were made to extend the linkage to Goroka. By 1953 this route became passable for heavy-duty vehicles and by the end of 1954 there were regular road services to Goroka. A second external transport link was established in 1955 with the completion of the Kundiawa airstrip, and this too became an important route for passengers and cargo to and from the area. Thus by the time the first coffee trees came into bearing, the Chimbu subdistrict and the Sinasina census division were accessible both by road and air.¹

Important progress was also made in the development of a road network within Sinasina. In 1962-63 the main highlands road was in an all-weather condition. This road passed through the northern section of Sinasina, linking it with Chuave and Goroka to the east and with Kundiawa to the west (Fig. 3.1).

¹ The Catholic mission at Koge also established an airstrip following the second world war.

Two secondary roads gave access to the southern part of the census division; the eastern road commenced at Masul rest-house and connected with, via Iobakogl, the more westerly one, at a point between Koge and Du rest-houses. At Iobakogl, a branch road led southeast to Emimao rest-house. The westerly secondary road joined the main road near Dumun rest-house, and passed through Koge to Du, and from there, through very steep and mountainous country, reached Ubanidaua. This particular road had many bridges, most in poor repair in 1962.

A road from Koge led southwest to the border of Sinasina. In 1962 this had only recently been made trafficable for four-wheel-drive vehicles. This also applied to the road section between Du and Ubanidaua and that between Iobakogl and the Koge-Du road. Finally, there was a short road giving access to Nimmul. In 1962, however, this was only a foot-track and was unsuitable even for motor-cycles.

This system was a considerable advance on earlier facilities. In 1958 there was no road connection between Koge and Du rest-house. By 1960 this road had been roughly laid out, and by the end of 1961 it had been extended to Ubanidaua. Even so, in 1962 the road to Du was still only partially complete and was passable even for motor cycles only in dry weather. At that time no coffee buyers had penetrated south of Du and growers were forced to carry their coffee to Du, or more often, to Koge, which like Iobakogl, was accessible to coffee-buying vehicles only in dry weather. Thus up to that time, Kere tribesmen were involved in substantial carrying time to buying points. The Dumunare and Komunekane sub-clansmen were clearly at the greatest disadvantage of all. In 1962 some had a two-to-three-hour walk to Du or longer to points beyond.

The only regular and dependable buying points in 1962 were mostly located along the main road at Masul, Dumun, and a few places in between. This meant relatively satisfactory transport and marketing services for the Tabare growers. Some buyers used the road from Koge to the southwest border of Sinasina but only in dry weather and when the bridges were in good order. Nimmul rest-house, which served the Dinga growers, was inaccessible to buyers' vehicles in 1962.

Hughes (1966:116) reported considerable improvement in road facilities. In the wet season, buyers were reaching Du (and thus Kere growers) on the average of once a week using four-wheel-drive vehicles. When the road was improved to an all-weather condition buyers came to Du every second day during the harvesting flush, and further out to Ubanidaua at least once a week. Transport and marketing difficulties had been virtually eliminated for Kere growers.

A comparison with coffee tree planting data suggests that the relatively slow participation rate for the Kere tribe was due to the lack of trafficable roads to the area, and therefore of buying points during the early years. Within Kere territory the Dumunare and Komunekane clans which were the most isolated were also those with the lowest performances in coffee growing. Hughes' subclan comparison also supports the hypothesis because the Dege, with the poorest coffee planting record of all Kere subclans, was one of the last to benefit from improvements in the transport and marketing system, while the Kui subclan, with the most impressive coffee performance, was located close to Du and was the first subclan to benefit in this way.

The relative improvement of the Dumunare and Komunekane clan performances in coffee tree planting in recent years accords with the benefits they received from the improvements in transportation and marketing in Sinasina during the 1960s, and suggests, other factors remaining constant, that within a few years, their participation may be comparable to other Kere clans.

Other economic opportunities

Although coffee was promoted as the major cash crop, other economic activities both within and outside Sinasina are examined here for their possible relationship with coffee.

Vegetable production for the small Kundiawa and Chuave markets preceded commercial coffee planting. In 1959 about \$40,000 worth of vegetables was sold in Kundiawa market and of this, 10 to 20 per cent (\$2,000 to \$4,000) originated in Sinasina.¹ A smaller quantity was sold to the Catholic mission at Koge, to traders operating in the Chimbu sub-district and in the Chuave market. More than half the Sinasina vegetables sold in Kundiawa were produced by the Dinga tribe, and the remainder by Tabare growers. These two tribes were close to the main road and only a short walking distance from Kundiawa. The earnings of a number of Kere tribesmen interviewed in 1962-63 ranged from \$2 to \$14 for the year. Until 1962 the Kere showed little interest in vegetable production for the market, probably because of the poor transport facilities and the considerable walking distance to the Kundiawa market. Indeed, an agricultural patrol in 1958²

¹ DASF patrol report for the Sinasina census division, no. 4 of 1959-60, Kundiawa, 1959.

² DASF Chimbu agricultural patrol report, no. 1 of 1958-59, Kundiawa, 1958.

reported that fresh food was carried only occasionally from rest-house areas other than Womai, Emai, Nimul and Masul (i.e., Dinga and Tabare tribal areas).

Although the Chuave, Kundiawa and other local markets expanded over the period to 1966, they offered very limited opportunities for Sinasina growers due to the small volume traded. Improvement in transport facilities has undoubtedly given Kere growers the opportunity to enter these markets but limited demand will continue to discourage any marked expansion of output. These markets will continue to be supplied by a limited number of producers who will market small quantities grown as a surplus over and above normal household subsistence needs. As such, this opportunity can hardly be regarded as an economic alternative to coffee.

Passionfruit production was encouraged in the area soon after the road link with Goroka was established. A processing firm in Goroka tested interest widely in the highlands and in response vines were planted along the main road in Sinasina where there was easy access to transportation. The response was, however, far in excess of factory capacity so the firm purchased fruit only from the Goroka area. The industry languished in Sinasina.

Peanuts were also tested in 1960, but the Bena Bena area near Goroka was found to be more suitable so encouragement and interest lapsed.

Pyrethrum was introduced in high altitude areas to people without other opportunities for market production. The Aiyura agricultural experimental station selected 6,000 feet as a minimum altitude for the crop, above which plant longevity and crop yields improved. On the other hand, coffee was widely grown at altitudes up to 6,500 feet in the highlands so that there was an altitude zone of at least 500 feet in which the two crops competed. The limited evidence available suggests that in this zone, coffee was a considerably more profitable crop than pyrethrum (Hughes 1966:85-6). Hughes' field investigation included a number of Dege subclan members who had land suitable for both coffee and pyrethrum and who had planted both crops. His measurements, however, indicated that only a small proportion of land distinguished as being economically feasible or 'marginal' for pyrethrum had been planted to the crop (Table 3.8) and he concluded (1966:88) that for these growers, pyrethrum growing 'cannot explain their low participation in coffee growing'. Thus presumably the Dege would only consider pyrethrum growing on any scale at any altitude once available land for coffee growing was fully in use. Hughes' evidence supports the views expressed by the Kere and

by DASF officials that coffee is a more profitable crop. Sinasina people had land at a wide range of altitudes, and where they had the option of growing coffee or pyrethrum, the former was generally chosen.

Cattle were introduced to Sinasina during the 1960s but was not yet seriously competing with coffee.

Labour employment has been a significant factor in Sinasina since the war though it is difficult to determine its influence on coffee growing. There have been few local sources of wage employment - one commercial trading enterprise, some pit-sawing, limited employment in labour lines working on the main road, and some openings in Kundiawa. Most of the opportunities have been outside the area. In 1951 Sinasina men signed as indentured labourers for two-year terms under the Highland Labour Scheme for work on coastal plantations. Data on numbers involved are not particularly reliable: a 1958 Administration patrol reported¹ that absenteeism from the census division ranged from 5.6 to 8.7 per cent of total population from 1952-53 to 1957-58. Subsequent censuses² showed an absenteeism over the period 1960-61 to 1964-65 of between 5.3 and 8.3 per cent of total population. Since absentees were primarily adult males of working age, the proportion of the village workforce absent was substantially higher in these years. The 1964-65 census showed, for example, that 35 per cent of males in the 16 to 45 age group were absent from Sinasina.³

It is, however, questionable whether the motive for seeking wage work outside the area was purely economic, for a large majority returned to Sinasina after their contracts had expired. Most absentees were young men who appeared to be seeking experience in a wider world and, as Hughes (1966) stated, 'some prestige is attached to the man who had seen the world'. In any case, such employment seldom led to the accumulation of substantial cash wealth. It is doubtful therefore whether, in an economic sense, such activities were particularly competitive with participation in coffee. Indeed, some labourers had already planted coffee which they left in the care of their families or friends. For others, it may have provided a stimulus to engage in coffee planting on their

¹ Chimbu agricultural patrol report, no. 1 of 1958-59, Kundiawa, 1958.

² DDA population censuses, 1960-61 to 1964-65, Kundiawa.

³ DNA patrol report, area study no. 1 of 1964-65, Kundiawa.

return. Hughes' work suggests a positive correlation between the two occupations, for among the more advanced Kui subclan (in coffee) 75 per cent claimed to have had past wage experience while in the less advanced Dege subclan the corresponding figure was only 54 per cent. Overall, it is possible that absence from the area on wage work may have slowed down the growth in the degree and scale of grower participation in coffee, but it may well have induced a more substantial participation in the long run through a broader exposure of the people to the market economy.

Subsistence production

Up to 1966 coffee and subsistence crop production were supplementing rather than competing with each other. Coffee plantings were not affected by a shortage of land, and did not significantly affect the customary level of production of subsistence crops.¹ However, Table 3.7 showed that a large proportion of available land was used for subsistence purposes in this area (about 80 per cent for the Kui and Dege samples). Also, for some groups an expansion of coffee could encroach upon land required for food gardening and thus the two activities would become competitive.

It is difficult to predict when this point will be reached, mainly because of inadequate knowledge of the food gardening cycle and the uncertain expansion of coffee. The average household in Hughes' Kui subclan sample used a total of 3.35 acres for food gardening, for land in cultivation and in fallow (Table 3.7). Assuming this area is necessary for the long-term maintenance of food crop land productivity, the margin between this and total land availability per household is narrow (0.77 acres). In 1966 an average of 0.54 acres was already planted to coffee, which suggests the Kui were fast approaching their limit, as was implied by Kui informants (Hughes 1966:99). Although 84 per cent said they intended to plant more coffee trees, 70 per cent stated 'they had little suitable ground remaining'. By comparison, the Dege said they could and would plant more trees.

¹ Virtually all Sinasina informants during the 1962 survey claimed coffee planting had not interfered with their cycle of food gardening activities either in terms of land or labour inputs. A survey carried out for the Public Health Department in 1965 in the Chimbu concluded that the quantities of food, and rice in particular, which were being purchased in the area were negligible when translated to a per capita basis (PHD preliminary report on the uses of purchased food as a means of sustenance, Kundiawa, 1965).

Once the two activities do compete for land, would it be profitable to expand the area under coffee by using fallow land for food gardening, although this would inevitably lower the long-term yields of food crops by the more intensive use of remaining land? The ratio of food garden land to total land used for the food garden cycle (land in cultivation and in fallow) for the Kui was 1:4 which suggested that for every year under cultivation, food garden land had to be spelled, in fallow, for three years. Informants in 1962-63 stated that (on average) to be able to cultivate food garden land continuously for three to four years without a serious decline in yields, the ground had to be rested for ten to twelve years afterwards (thus giving a thirteen to sixteen-year agricultural cycle). Brookfield and Brown (1963:109) calculated for the neighbouring Chimbu that the ratio of land in cultivation to total land required ranged from 1:2 to 1:6, according to the land types used for food gardening. The Intensive Agricultural Surveys in the Chimbu which included Sinasina land found correspondence between their soil units and Brookfield and Brown's land types and concluded that the same range of ratios was applicable.

For the purposes of these calculations it is assumed the best land is involved (a ratio of 1:2) where for each year of cultivation only one year of fallow is required for long-term yield maintenance and the Kui sample average of 0.8 acres per household is taken as the area annually required under cultivation to provide food needs. It is assumed that the 0.8 acres normally left to fallow is planted to coffee while the remaining 0.8 acres is cropped continuously. If a coffee tree yield of $1\frac{1}{2}$ lb per tree was achieved on average and a price of 15¢ per lb (as in 1966), gross income from the area in full bearing would be \$112.

The second part of the calculation involves estimating the decline in food garden output which would result from continuous cropping and the estimation of the cost of purchasing locally this output foregone. In the absence of any field data on the effects of continuous cropping on such land, it is arbitrarily assumed here that long-term yields are reduced to one-half of the previous level.

On the basis of calculations made in the Intensive Agricultural Survey it is also assumed that the average calorie requirement per adult in the Sinasina was 2,643 calories per day or 964,700 per annum so that for the average Kui household the 0.8 acres previously supplied a requirement of about 4.3 million calories per annum. With a 50 per cent yield

decline, about 2.17 million calories would have to be purchased (in order to maintain previous dietary standards).¹

The PHD report (1965) on the substitution of locally purchased for home-grown food estimated that the cost of 1,000 calories in Chimbu trade-stores in 1965 was 18¢. On this basis, the annual cost of purchasing 2.17 million calories would be about \$390.

On these assumptions, it would not be profitable to forego the fallow period for food gardening in order to expand the area under coffee. It should be noted, too, that high coffee yields were assumed in these calculations. At yields current in the area in 1966 of perhaps only $\frac{1}{2}$ lb per tree, additional coffee income might be as low as \$37 from 0.8 acres. Furthermore, since coffee does not bear until the fourth year, there is a considerable period of time during which the purchase of such food would have to be financed from other sources, unless producers were prepared to reduce dietary standards substantially. The extent of the gap between coffee income and the replacement cost of food foregone is a strong economic justification against further specialisation in coffee once other land not required for the food garden cycle has been brought into use, and thus for continued self-sufficiency in food production in Sinasina.

Conclusion

In the fourteen years since it was introduced as a cash crop, coffee has made a substantial contribution to the economy of Sinasina and has become the principal linkage with the monetary sector. As a supplement to subsistence production it has caused little modification in the traditional pattern of economic activities. While a majority of adult males planted coffee trees within the first ten years, the scale of individual participation remained extremely limited. There were variations in the growth rate and scale of participation in the area over the period. Despite the heavy concentration of population, the population/land balance did not significantly influence performance. Major factors were the development of transport and marketing facilities which affected the growth rate and scale of participation in planting among groups

¹ Actually, a protein deficiency would also have to be made up as well but in the case of Sinasina people and for the purposes of this calculation, this deficiency can be ignored, with the qualification, however, that the food replacement cost can be regarded as something of an underestimate for this reason.

in different parts of Sinasina, and the availability of agricultural extension staff, upon whose advice coffee garden yields and coffee parchment quality depended.

Coffee had no serious competitors since neither land nor labour resources were in short supply. However, further expansion of coffee planting could exhaust the supply of land not required for food gardening for some groups, and competition between the activities could arise. Under 1966 conditions it did not appear economic for Sinasina farmers to transfer food garden land (in cultivation or fallow) to coffee. Planting restrictions resulting from the International Coffee Agreement make it unlikely that this choice will arise in the future.

Chapter 4

Karkar Island

Karkar Island¹ lies off the north coast of Papua New Guinea, about thirty-five miles northeast of Madang (Fig. 1). It is roughly oval, 16 miles long by 12 miles wide, and has 52 miles of coral fringed coastline (Fig. 4.1). The total area is approximately 143 square miles, having been considerably extended by volcanic eruptions which provide the porous, fertile soils of the island.

The island is rather conical with a maximum height of about 6,000 feet and an adjacent volcanic crater at approximately 3 to 4,000 feet.² A coastal plain encircles most of the island, being about one-mile wide in the northeast and two-mile wide in the southwest. The central part of the island is inaccessible and unsettled with steep and broken terrain. The population was concentrated on the coastal plain and lower slopes up to an altitude of about 1,500 feet. Population distribution was uneven, being relatively dense in the north and south, and relatively sparse in the east.

The indigenous population of about 15,000 in 1965-66³ comprised two linguistic groups: the Waskia in the north who numbered 7,000 and the Takia in the south who numbered 8,000 (Fig. 4.1). Another 500 to 600 Takia people who were living on Bagabag Island, twelve miles southeast of Karkar Island, were excluded from this study.

¹ This general description draws heavily on a geographical survey conducted during World War II (Allied Forces, South West Pacific Area, Allied Geographical Section 1944).

² In 1970 the volcano was classified as semi-active. Steam and gases have been given off for some years from the crater but there has been no eruption since 1895. Earth tremors have been frequent and at times severe.

³ DNA village population census, Madang, 1966.

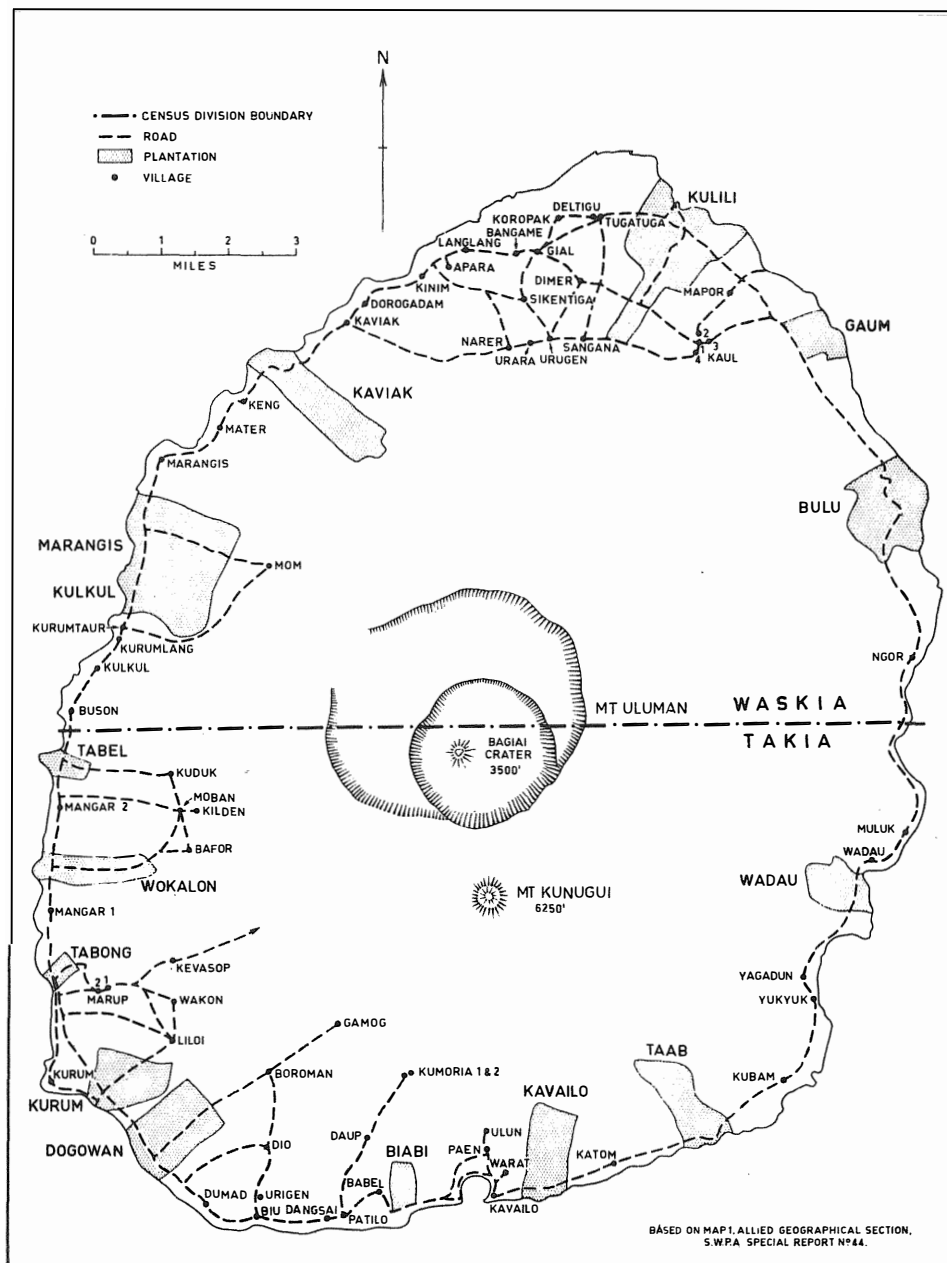


Fig. 4.1. Karkar Island survey area

In 1966 the population was organised on a village basis and divided on a clan basis. Villages were located along the main coastal road and along secondary roads or tracks leading towards the slopes. 'Ownership' of village land rested with individual household heads on a usufructory basis. Village elders adjudicated rival claims and decided on the use and ownership of previously unused land.

There were sixty-two villages in 1966, evenly divided between Takia and Waskia people. The average population per village was 254, with a range of from 68 to 804. Considerable numbers of adult males (over sixteen years of age) were absent from their villages: in 1964,¹ 34 per cent were absent, while the official 1966 10 per cent sample showed 21 per cent. The proportion varied greatly from village to village in both censuses.

Early contact and economic development

Outside contact began when, as part of New Guinea, Karkar Island came under German control. In 1890 Lutheran missionaries attempted to establish a mission station but this was reportedly abandoned in 1892-95 because of a volcanic eruption and an outbreak of smallpox.² A permanent station was not established until 1911, at Kurum. When the missionaries returned they established a coconut plantation (Kurum) which, by 1966, covered 600 acres. By 1918 three German planters owned five coconut plantations between them.³ The German administration reportedly encouraged islanders to plant coconuts but principally for home consumption, to ensure adequate nutritional standards.

German holdings were expropriated after the first world war and during the Australian Administration a number of new plantations were developed. By 1966 thirteen plantations were owned by Europeans, with a total area of more than 7,000 acres (Table 4.1). Three were owned by missions and the remainder by individuals or companies.

There was little indigenous economic development prior to the second world war. Three islanders developed sizeable plantations (coconuts, or coconuts with cacao): one (Gaum) under the guidance of a European planter, another with assistance from the Lutheran mission. Villagers also sold coconuts

¹ DNA village population census, Madang, 1964.

² Personal interviews with missionaries, Karkar Island, 1966.

³ Europeans secured land by barter, in exchange for trade goods such as axes, beads and blankets. The use of currency was still very uncommon locally.

Table 4.1
Expatriate plantations on Karkar Island, 1966

Name	Size (acres)	Year of establishment	Labour force (1964)	
			Karkar	Non-Karkar
Biabi	25	1950	6	0
Bulu	500	1936	25	50
Dogowan	780	1920	n.a.	n.a.
Kavailo	620	1912-18	10	80
Kaviak	800	1928-30	30-40	120
Kulili	930	1916-27	40-60	160-170
Kul Kul	865	1912-18	10	160
Kurum	600	1913 (circa)	64	few
Marangis	990	1912-18	10	130
Taab	500	1937	Mainly non-Karkar	
Tabel	100*	1930		
Wadau	370	1928	10	50
Wokilon	200	1926-27	20	30**
Total	7,280			

* Was planted to 200 acres but 100 acres was returned to Kilden village in a title dispute.

** Fluctuates considerably.

Source: Inquiries from the estates, 1964.

to the missions and European planters. A limited quantity of fresh staples and vegetables was also purchased by the plantations for their labour force.¹

The government extended little assistance to the island prior to the second world war due to lack of finance and personnel. Administration was based in Madang and administrative patrols to the island were infrequent.

In this situation, the plantations operated independently as virtual enclaves, since shipping services were available to link them with world markets. The plantations marketed the islanders' produce, thus providing a linkage with the advanced sector but the lack of government intervention greatly handicapped its development. No attempt was made to improve the foot-tracks which linked villages to one another and to the estates; neither did the government encourage islanders to produce for the market. As a result, progress depended largely upon the estates, upon the terms the estates offered, and upon village location in relation to the estates.

Agricultural development since the second world war

Since the second world war plantings and output of coconuts and cocoa have expanded. The estate contribution has been substantial but is referred to here only in relation to its influence upon the indigenous performance. Data on early post-war plantings of coconut and cocoa trees are not reliable in

¹ Fresh food was sold to Madang immediately after the second world war but as coastal shipping services increased, imported food was substituted.

detail but are adequate to indicate broad trends (Table 4.2).¹ There was a slow but increasing annual rate of coconut planting to the mid-1950s, a substantial acceleration towards the end of the decade and a slower rate again in the early 1960s. The high figure for new planting in 1964 is suspect. The 1963 count was the first attempt to conduct a tree census for the island and may have underestimated total numbers planted. The much higher 1964 count very probably includes a large correctional element and includes trees missed in previous counts.

Table 4.2

Estimates of early post-war smallholder coconut plantings,
Karkar Island, to 1963-64

Year	No. of trees planted (nearest thousand)	Average annual plantings
Up to 1952*	52,000	n.a.
1953-55**	21,000	7,000
1956***	16,000	16,000
1957-60#	131,000	33,000
1961-63##	42,000	14,000
1963-64###	71,000	71,000
Total trees, 1964	333,000	

* 1960 count of trees in bearing.

** 1963 count of trees in bearing minus the 1960 count.

*** 1964 count of trees in bearing minus the 1963 count.

1960 count of immature trees (planted 1953 to 1960 inclusive) minus those estimated to have been planted between 1953 and 1956 inclusive.

1963 count of immature trees (all those planted 1956 to 1963 inclusive) minus those estimated to have been planted in 1956 and 1957-60.

1964 count of immature trees (all those planted 1957-64) minus those estimated to have been established in 1957-60 and 1961-63.

Source: DASF patrol reports for 1960 and 1963, and the 1964 coconut tree census, Madang.

Data on early post-war plantings of cocoa trees were collected in similar fashion, but do indicate roughly the trends of the period (Table 4.3). Planting prior to the late 1950s was slow, but it accelerated between 1959 and 1962, and was then sustained at a lower but still substantial rate after 1962.²

More reliable counts of coconut and cocoa trees during the 1966 agricultural census³ showed total coconut tree numbers to be slightly lower (308,000 as against 321,000) than in

¹ Prior to 1963-64 rough estimates of tree numbers were made at the village level by agricultural extension officers. The counts distinguished mature and immature trees which enabled some rough backward projections of plantings during the 1950s based on age of trees.

² As with coconuts, the 1964 census count of cocoa trees probably contains a substantial correctional element and thus overestimates actual plantings.

³ This was conducted with more highly trained personnel and was more thorough than the 1963-64 census.

Table 4.3

Estimates of post-war smallholder cocoa tree plantings,
Karkar Island, to 1963-64

Year	No. of trees planted (nearest thousand)	Cumulative total
Pre-1957-58	31,000	-
1957-58	14,000	45,000
1958-59	15,000	60,000
1959-60	30,000	90,000
1960-61	34,000	124,000
1961-62	29,000	153,000
1962-63	21,000	174,000
1963-64	56,000	230,000

Source: DASf patrol reports to 1962-63, cocoa/coconut tree census, 1963-64, Madang.

1964 (Table 4.4), perhaps indicating some overestimation in the earlier count although DASf carried out a tree-thinning campaign over this period. Over two-thirds were immature in 1966 which gives an average annual planting rate of about 30,000 trees for this and the previous six years. Though there could undoubtedly have been considerable inter-year variation, this average rate suggests that new plantings were carried out in the 1960s on a scale comparable to that in the

Table 4.4

Coconut tree numbers by villages, Karkar Island, 1966

Waskia				Takia			
Village	Immature palms	Mature palms	Total	Village	Immature palms	Mature palms	Total
Apara	4,465	559	5,024	Bafor	4,879	780	5,659
Bangame	5,235	2,876	8,111	Biu	1,242	1,720	2,962
Buson	1,335	793	2,128	Boroman	3,495	668	4,163
Deltigu	2,236	1,069	3,305	Dangsai	778	1,451	2,229
Dimer	8,355	5,227	13,582	Daup	1,990	442	2,432
Dorogatom	1,570	463	2,033	Did	4,251	2,999	7,250
Gial	4,454	2,165	6,619	Dumad	596	108	704
Kaul 1	6,849	2,753	9,602	Gamog	1,474	17	1,491
Kaul 2	1,989	1,037	3,026	Katom	1,701	4,040	5,741
Kaul 3	6,799	3,576	10,375	Kavailo	1,716	2,995	4,711
Kaul 4	3,536	1,151	4,687	Kevasop	4,670	814	5,484
Kaviak	3,552	1,193	4,745	Kilden	2,978	1,042	4,020
Keng	2,685	1,840	4,525	Kuban	487	769	1,256
Kinim	2,449	647	3,096	Kuduk	3,081	2,508	6,309
Koropak	4,231	2,415	6,646	Komoria 1	5,265	1,156	6,421
Kuburne	1,380	875	2,255	Komoria 2	2,948	2,007	4,955
Kul Kul	1,607	282	1,889	Kurum	1,810	1,279	3,089
Kurumlang	595	389	984	Liloi	2,871	1,990	4,049
Kurumtaur	1,541	747	2,288	Mangar 1	3,192	2,557	5,749
Langlang	4,992	727	5,719	Mangar 2	1,909	1,725	3,634
Mapor	5,213	2,141	7,354	Marup 1	4,152	3,287	7,439
Marangis	1,874	280	2,154	Marup 2	7,639	1,599	9,238
Mater	2,956	791	3,747	Moban	1,689	1,580	3,269
Mom	2,180	198	2,378	Muluk	649	973	1,622
Narer	6,074	845	6,919	Pain	1,298	1,033	2,331
Nor	2,734	1,249	3,983	Patilo	4,445	1,301	5,746
Sangana	7,105	848	7,953	Ulan	13,531	2,717	16,248
Sikentiga	7,445	126	7,571	Wadai	3,825	1,671	5,496
Tugatuga	4,406	871	5,277	Wakon	178	1,016	1,194
Urara	1,756	806	2,562	Warat	730	1,852	2,582
Urugen	5,972	1,819	7,791	Yagadun	4,534	7,705	12,239
Total Waskia	117,570	40,758	158,328	Total Takia	93,703	55,809	149,512
Grand total	Immature 211,273	Mature 96,567	All trees 307,840				

Source: DASf agricultural coconut tree census, Karkar Island, Madang, 1967.

period 1957-60, and higher than the 1961-63 annual rates shown in Table 4.2. Table 4.5 shows that in 1966 there was a total of about 292,000 cocoa trees, of which 53 per cent were immature. This supports evidence given above of a fast rate of planting from 1961-62 to 1963-64 and indicates a continuation of annual plantings beyond 1963-64 at levels comparable to those of the early 1960s. Overall then, substantial planting activity in both crops was sustained, with some fluctuations, from the mid-1950s to 1966.

The 1966 census data enabled a comprehensive description of the pattern of indigenous cash crop participation to be compiled for a year some twenty years after post-war development commenced. This is presented below in terms of the incidence of cash crop growers in the island's population and, for these growers, the extent of their commitment to the cash crops.

The incidence of growers was assessed by relating the number of growers DASF registered in 1966 to the adult male population of the island (Table 4.6 and Fig. 4.2). The proportion

Table 4.5

Cocoa tree numbers by villages, Karkar Island, 1966

Waskia				Takia			
Village	Immature trees	Mature palms	Total	Village	Immature trees	Mature trees	Total
Apara	2,915	1,168	4,083	Bafor	1,734	1,914	3,648
Bangame	5,665	2,890	8,555	Biu	1,170	1,984	3,154
Buson	799	577	1,376	Boroman	9,996	8,217	18,213
Deltigu	686	242	928	Dangsai	729	528	1,257
Dimer	4,903	1,194	6,097	Daup	-	1,580	1,580
Dorogatom	2,637	1,340	3,977	Did	1,404	8,975	10,379
Gial	6,996	1,762	8,758	Dumad	1,630	422	2,052
Kaul 1	961	3,044	4,005	Gamog	3,969	1,684	5,653
Kaul 2	1,063	1,518	2,581	Katom	911	1,479	2,390
Kaul 3	5,722	2,401	8,123	Kavailo	1,027	370	1,397
Kaul 4	2,034	1,188	3,222	Kevasop	4,853	2,615	7,468
Kaviak	6,080	3,847	9,927	Kilden	1,678	1,192	2,870
Keng	1,452	928	2,380	Kuban	444	250	694
Kinim	5,512	865	6,377	Kuduk	1,631	1,208	2,839
Koropak	3,155	1,586	4,741	Komoria 1	1,405	7,616	9,021
Kuburne	180	1,869	2,049	Komoria 2	1,060	5,829	6,889
Kul Kul	185	92	277	Kurum	185	898	1,083
Kurumlang	377	163	540	Liloi	2,840	4,145	6,985
Kurumtaur	454	3,263	3,717	Mangar 1	1,821	3,155	4,976
Langlang	2,187	1,799	3,986	Mangar 2	943	811	1,754
Mapor	4,330	1,412	5,742	Marup 1)	7,492	10,135	17,627
Marangis	2,494	2,903	5,397	Marup 2)			
Mater	2,195	1,664	3,859	Moban	3,001	1,735	4,736
Mom	3,051	1,330	4,381	Muluk	1,623	812	2,435
Narer	6,630	3,984	10,614	Pain	1,080	1,499	2,579
Nor	992	1,136	2,128	Patilo	891	2,210	3,101
Sangana	4,430	2,229	6,659	Ulun	2,926	3,295	6,221
Sikentiga	2,932	1,780	4,712	Wadau	1,218	941	2,159
Tugatuga	2,107	1,247	3,354	Wakon	1,547	2,312	3,859
Urara	727	536	1,263	Warat	-	-	-
Urugen	7,912	8,912	16,824	Yagadun	3,699	3,838	7,537
Total Waskia	91,783	58,864	150,652		62,807	81,649	144,456
Grand Total	Immature	154,590	Mature	141,518	All trees 296,108		

Source: DASF agricultural cocoa tree census, Karkar Island, Madang, 1967.

of growers to adult males for the island as a whole was a surprisingly low 42 per cent. It was roughly the same for both the Takias and Waskias, but variation between villages ranged from 22 to 100 per cent. Growers comprised two-thirds or more of the adult male population in only 8 of the 62 villages, while they comprised one-third or less in 15 villages.

It is difficult to judge the accuracy of these proportions, for despite the efforts made to improve the quality of field data, certain problems of measurement remained. First, the population counts were not made at exactly the same time as the agricultural census and were made by different personnel. It is possible that village boundaries and populations differed and that this could have affected proportions for individual villages. Second, population enumeration was complicated by substantial village absenteeism among adult males. Third, as cash crop gardens were registered in the name of a single owner, participation may have been underestimated for partnerships between growers were not uncommon. Furthermore,

Table 4.6
Coconut and cocoa growers among adult males, Karkar Island, 1966

Village	Total no. of growers	Total adult males	Growers to adult males (per cent)	Village	Total no. of growers	Total adult males	Growers to adult males (per cent)
<u>Waskia</u>				<u>Takia</u>			
Apara	23	23	100	Bafor	29	83	35
Bangame	41	100	41	Biu	42	82	51
Buson	21	27	78	Boroman	47	108	44
Deltigu	10	27	37	Dangsai	18	38	47
Dimer	31	77	40	Daup	20	43	47
Dorogatom	13	36	36	Did	62	118	53
Gial	36	109	33	Dumad	32	59	54
Kaul 1	25	108	23	Gamog	25	83	30
Kaul 2	17	76	22	Katom	21	29	72
Kaul 3	35	103	34	Kavailo	17	68	25
Kaul 4	20	44	45	Kevasop	41	71	58
Kaviak	39	76	51	Kilden	24	63	38
Keng	25	62	40	Kuban	11	16	69
Kinim	26	42	62	Kuduk	25	85	29
Koropak	21	69	30	Kumoria 1	36	) 136	49
Kuburne	19	n.a.	n.a.	Kumoria 2	30		
Kul Kul	19	27	70	Kurum	32	118	27
Kurumlang	14	47	30	Liloi	35	126	28
Kurumtaur	21	32	66	Mangar 1	16	54	30
Langlang	15	19	80	Mangar 2	11	24	46
Mapor	25	86	29	Marup 1	40	) 257	37
Marangis	22	56	39	Marup 2	56		
Mater	24	37	65	Moban	25	50	50
Mom	29	59	49	Muluk	22	38	58
Narer	43	101	43	Pain	17	41	41
Nor	16	22	73	Patilo	45	89	51
Sangana	32	103	31	Ulun	41	82	50
Sikentiga	23	76	30	Wadau	26	40	65
Tugatuga	16	55	29	Wakon	28	72	39
Urara	15	25	60	Warat	8	19	42
Urugen	53	156	34	Yagadun	39	79	49
Total Waskia	769	1,880	41	Total Takia	921	2,171	42
Total Kar Kar Island	1,690	4,051	42				

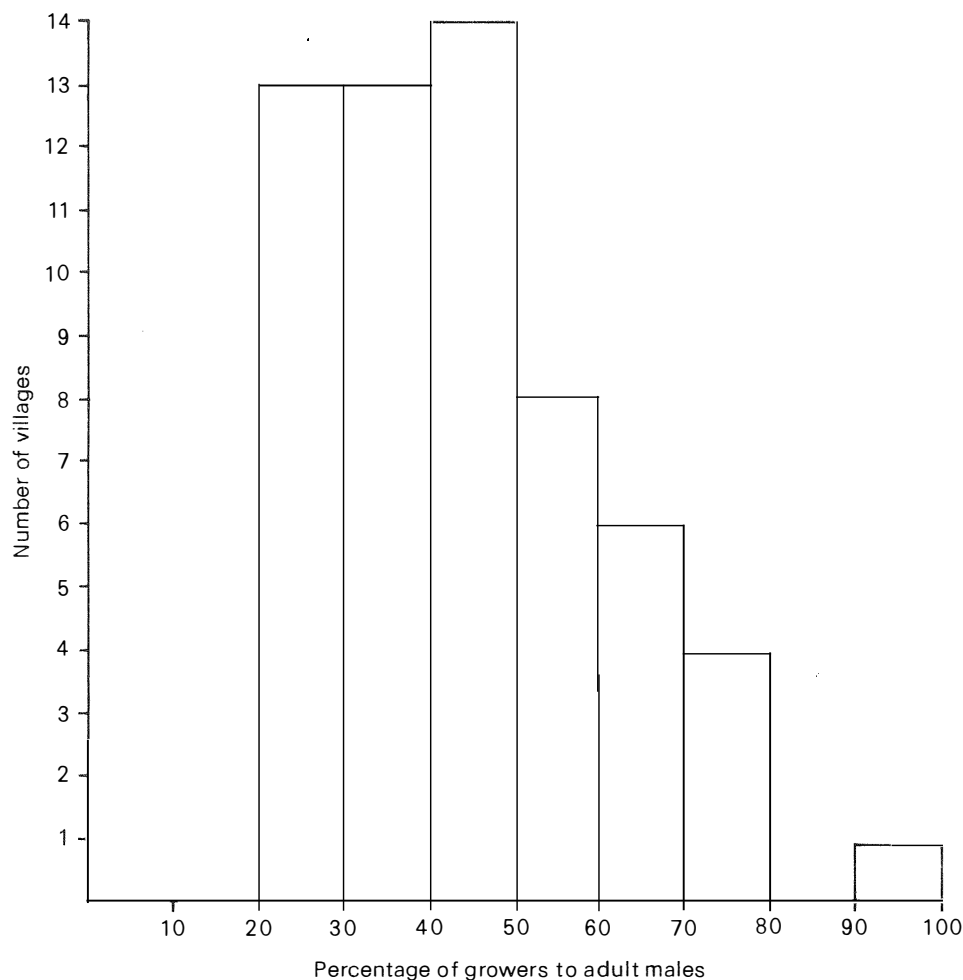


Fig. 4.2. Village participation in coconut and/or cocoa growing, Karkar Island, 1966

while a household's cash crop gardens might be registered in the name of the father as head of the household, or of the eldest son, a number of sons, or brothers of the eldest son, could be participating as well.

Coconuts were still the most widely grown cash crop in 1966 (Table 4.7). Eighty-three per cent of all registered cash crop growers had coconut trees and a majority were growing it as a sole crop. Less than half of the registered growers had planted cocoa. Of these, about two-thirds had interplanted it with coconuts and only a small proportion had planted cocoa as a sole crop. As over 70 per cent of registered growers only had coconuts in 1964, compared with 53 per cent for 1966,

a large number of coconut growers must have interplanted with cocoa trees between 1964 and 1966.

Table 4.7

Distribution of cash crop growers by crops and by villages, Karkar Island, 1966

Village	Percentage of growers with			Village	Percentage of growers with		
	Coconuts	Cocoa	Coconuts and cocoa		Coconuts	Cocoa	Coconuts and cocoa
<u>Waskia</u>				<u>Takia</u>			
Apara	52	13	35	Bafor	55	17	28
Bangame	44	10	45	Biu	50	2	48
Buson	62	-	38	Boroman	21	38	41
Deltigu	60	30	10	Dangsai	72	-	28
Dimer	26	48	26	Daup	85	-	15
Dorogadam	23	46	31	Did	66	8	26
Gial	47	33	20	Dumad	25	34	41
Kaul 1	64	24	12	Gamog	20	44	36
Kaul 2	59	24	17	Katom	67	3	29
Kaul 3	51	26	23	Kavailo	65	12	23
Kaul 4	70	15	15	Kevasop	66	5	29
Kaviak	33	36	31	Kilden	58	4	38
Keng	68	12	20	Kuban	73	9	18
Kinim	39	19	42	Kuduk	52	20	28
Koropak	28	24	48	Kumoria 1	58	17	25
Kuburne	53	5	42	Kumoria 2	53	17	30
Kul Kul	90	5	5	Kurum	81	6	13
Kurumlang	79	-	21	Liloi	54	17	29
Kurumtaur	62	14	24	Mangar 1	50	-	50
Langlang	53	20	27	Mangar 2	64	9	27
Mapor	52	12	36	Marup 1	55	10	35
Marangis	27	23	50	Marup 2	57	13	30
Mater	67	13	20	Moban	56	4	40
Mom	55	14	31	Muluk	41	27	32
Narer	47	26	27	Pain	65	24	11
Nor	63	6	31	Patilo	60	9	31
Sangana	28	19	53	Ulun	71	12	17
Sikentiga	48	35	17	Wadai	50	19	31
Tugatuga	63	12	25	Wakon	82	-	18
Urara	73	20	7	Warat	100	-	-
Urugen	32	34	34	Yagadun	33	26	41
Total Waskia	49	21	30	Total Takia	56	14	30
Total Karkar Island	53	17	30				

There was little difference between Waskias and Takias but there were significant variations between villages of both groups in the distribution of crops among growers (Table 4.7 and Fig. 4.3). As might be expected, there was a preponderance of villages where most growers (80 to 100 per cent) had coconuts (sole or interplanted) but there were a few villages where the proportion was as low as 50 to 70 per cent. In these instances there was an unusually large proportion of sole cocoa growers. There was a much wider variation among villages in the proportions of growers with cocoa (sole or interplanted), ranging from zero in one case to 80 per cent in another. The proportions of growers with both coconuts and cocoa (mostly interplanted) also varied but not as widely, with a few villages recording over half their growers with both crops.

A 1969 census of coconut and cocoa trees and growers (Table 4.8) gave the total number of growers of coconuts and/or cocoa as only 1,611. This was 79 fewer than in 1966, and, with population growth, means a fall in the proportion of growers

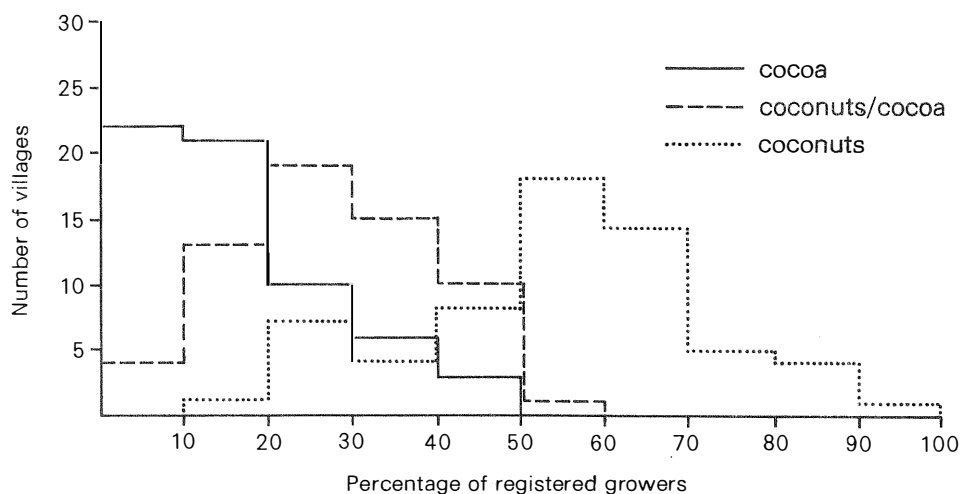


Fig. 4.3. Distribution of cash crop growers by crops grown by village, Karkar Island, 1966

among adult males below the 1966 level of 42 per cent. The grower counts for the linguistic groups are rather puzzling. Waskia growers in 1969 totalled 849, an increase over 1966 (769) while the 1969 Takia figure of 762 is a substantial fall from the 1966 total (921). This was very likely caused by differences between censuses in villages included within each group. There may also be some degree of error in either or both grower counts for the island as a whole, but the data do suggest that there has not been any appreciable growth in cash crop participation in this sense since 1966.

Table 4.8

Coconut and cocoa growers and tree numbers on Karkar Island, 1969

Crop	Total tree numbers (nearest thousand)			Number of growers	Average trees per grower	Area equivalent (acres)
	Immature	Mature	Total			
Coconuts						
Waskia	64,000	103,000	167,000	782	214	3.6
Takia	60,000	103,000	163,000	604	268	4.5
Island total	124,000	206,000	330,000	1,386	237	4.0
Cocoa						
Waskia - sole	12,000	43,000	55,000	67	821	2.4
- interplanted	28,000	85,000	113,000	389	290	1.7
- Total	40,000	128,000	168,000	456	368	
Takia - sole	16,000	41,000	57,000	158	361	1.1
- interplanted	33,000	101,000	134,000	392	342	2.0
- Total	49,000	142,000	191,000	550	347	
Island - sole	28,000	84,000	112,000	225	498	1.5
- interplanted	61,000	186,000	247,000	781	316	1.8
- Total	89,000	270,000	359,000	1,066	357	

Source: DASF village censuses of coconuts and cocoa, Madang, 1970.

The proportion of growers with coconuts (sole or interplanted) remained at the 1966 level of 86 per cent, but the proportion of cocoa growers had risen to 62 per cent, an increase of 15 per cent in the three years. This was almost solely caused by continued interplanting of the crop beneath coconuts. The proportion of growers with interplantings rose from 30 per cent in 1966 to 48 per cent by 1969. The proportion of sole cocoa growers fell 3 per cent to 14 per cent. In terms of Fig. 4.3 the frequency distribution of proportions of sole coconut growers by villages would be shifted to the left and that of the growers who interplanted, to the right.

Individual grower participation is most meaningfully viewed in acreage terms since plantings of two crops took place. The conversion of census tree numbers into acreages does, however, involve some difficulties in estimation,¹ and the data below are approximations only.

By 1966 there were over 5,300 acres planted to the two crops (Table 4.9), about three-quarters planted to coconuts as a sole crop, one-fifth interplanted and about 5 per cent planted to sole cocoa. There was an average area of 87 acres per village, with a range of from 14.5 to 276.6 acres which resulted both from variations in size of village populations and in the number of registered growers.

The average grower had a little more than three acres under cash crops in 1966. The average area for sole cocoa growers was about one acre, the area for growers who interplanted the two crops averaged about two acres and for the sole coconut grower, it was 4.4 acres. The Waskia average area for sole

¹ There are two major reasons for this. First, for lack of data on actual acreages, acreage equivalents of tree numbers were calculated on the basis of tree spacings recommended by DASF (60 trees per acre for sole coconuts, 340 trees per acre for sole cocoa, and 60 coconut/172 cocoa trees where the two crops were interplanted). Direct observation during the survey showed many cash crop gardens were not laid out as recommended (often spaced too close). Second, where the 1966 census showed that growers had both coconut and cocoa trees, there was no indication of whether they were interplanted or were each planted as a sole crop. Observations made during the survey suggested that most were interplanted and this was assumed here. However, where, at recommended spacing, there was clearly an excess of numbers of one or other crop, sole crop spacing was assumed for the excess, which predictably, occurred mostly for coconuts.

Table 4.9

Distribution of cash crop areas by villages, Karkar Island, 1966
(acres)

Village	Total area under				Average area per grower under			
	Sole coconuts	Sole cocoa	Interplanted coconuts/cocoa	Both crops	Sole coconuts	Sole cocoa	Interplanted coconuts/cocoa	Both crops
<u>Waskia</u>								
Apara	65.7	2.9	18.0	86.6	4.2	1.0	2.3	3.8
Bangame	90.5	2.5	44.7	137.7	2.4	0.6	2.4	3.4
Buson	22.8	-	8.0	30.8	1.1	-	1.0	1.5
Deltigu	54.3	2.3	0.8	57.4	9.1	0.8	0.8	5.7
Dimer	108.6	9.8	16.0	134.4	6.8	0.7	2.0	4.3
Dorogatom	23.8	6.6	10.1	40.5	3.4	1.1	2.5	3.1
Gial	84.5	12.7	26.8	124.0	3.5	1.8	3.7	3.4
Kaul 1	157.6	10.6	2.4	170.6	8.2	1.8	0.8	6.8
Kaul 2	43.6	4.1	6.8	54.5	4.2	1.0	2.3	3.1
Kaul 3	138.6	12.2	22.1	172.9	5.3	1.4	2.8	5.0
Kaul 4	70.8	5.8	7.3	83.9	4.2	1.9	2.4	4.2
Kaviak	150.5	6.4	15.0	171.9	6.0	0.5	1.3	4.4
Keng	64.5	1.5	10.9	76.9	2.9	0.5	2.2	3.1
Kinim	30.9	8.3	20.7	59.9	1.5	1.7	1.9	2.3
Koropak	94.2	5.6	16.6	116.4	5.9	1.1	1.7	5.5
Kuburne	26.5	0.4	11.1	38.0	1.5	0.4	1.4	2.0
Kul Kul	30.9	0.3	0.6	31.8	1.7	0.3	0.6	1.7
Kurumlang	13.3	-	3.1	16.4	1.0	-	1.0	1.2
Kurumtaur	24.9	4.3	13.2	42.4	1.4	1.4	2.6	2.0
Langlang	78.8	3.4	16.5	98.7	6.6	1.1	4.1	6.6
Mapor	98.4	4.6	24.2	127.2	4.5	1.5	2.7	5.1
Marangis	12.8	4.2	23.1	40.1	0.8	0.8	2.1	1.8
Mater	47.3	3.7	15.2	66.2	2.3	1.2	3.0	2.9
Mom	18.9	2.4	20.7	42.0	0.8	0.6	2.3	1.6
Narer	83.3	14.4	32.0	129.7	2.6	0.3	2.7	3.0
Nor	54.4	0.3	12.0	66.7	3.6	0.3	2.4	2.2
Sangana	104.4	5.3	28.2	137.9	4.0	0.9	1.7	4.3
Sikentiga	114.6	6.4	12.2	133.2	7.6	0.8	3.1	5.8
Tugatuga	75.8	1.0	12.2	89.0	5.4	0.5	3.1	5.6
Urara	39.3	2.0	3.4	44.7	3.3	0.7	3.4	3.0
Uruen	79.9	24.2	50.0	154.1	2.3	1.3	2.8	2.8
Total Waskia	2,104.4	168.2	503.9	2,776.5	5.6	1.0	2.2	3.6
<u>Takia</u>								
Bafor	83.9	5.8	10.4	100.1	3.5	1.2	1.5	3.4
Biu	32.1	0.6	17.1	49.8	0.8	0.6	0.9	1.2
Boroman	27.8	32.5	66.4	126.7	0.1	1.8	3.5	2.2
Dangsai	29.9	-	7.3	37.2	1.7	-	1.5	2.1
Daup	31.3	-	9.2	40.5	1.6	-	3.1	2.2
Did	79.6	8.9	41.2	129.7	1.3	1.8	2.6	2.1
Dumad	4.3	2.3	7.4	14.0	0.7	0.2	0.6	0.5
Gamog	12.2	10.5	12.8	35.5	0.9	1.0	1.3	1.4
Katom	83.5	0.8	12.2	96.5	4.2	0.8	2.0	4.6
Kavailo	72.6	1.1	5.9	79.6	4.8	0.6	1.5	4.7
Kevasop	55.6	3.8	35.8	95.2	1.4	1.9	3.0	2.4
Kilden	52.9	1.3	14.1	68.3	2.3	1.3	1.6	2.8
Kuban	17.8	0.5	3.1	21.4	1.8	0.5	1.6	2.0
Kuduk	95.7	3.5	9.5	108.7	4.8	0.7	1.4	4.3
Kumoria 1	71.9	8.8	35.1	115.8	2.4	1.5	3.9	3.2
Kumoria 2	50.5	6.9	32.1	89.5	2.0	1.4	3.6	3.0
Kurum	48.3	1.2	3.8	52.3	1.6	0.6	1.0	1.6
Liloi	65.3	12.7	15.3	93.3	2.3	2.1	1.5	2.7
Mangar 1	66.9	-	28.9	95.8	4.2	-	3.6	6.0
Mangar 2	51.4	0.5	9.2	61.1	5.1	0.5	3.1	5.5
Marup 1	81.9	3.3	42.1	127.3	2.4	0.8	3.5	3.2
Marup 2	112.6	6.6	41.4	160.6	2.3	0.9	2.4	2.9
Moban	34.3	3.7	20.2	58.2	1.4	3.7	2.0	2.3
Muluk	35.6	3.1	8.4	47.1	2.2	0.5	1.6	2.1
Pain	36.0	6.1	2.9	45.0	3.0	1.5	1.5	2.6
Patilo	79.9	1.1	15.9	96.9	1.9	0.3	1.1	2.2
Ulun	246.2	5.8	24.6	276.6	6.8	1.2	3.5	6.7
Wadai	82.2	2.4	9.4	94.0	3.9	0.5	1.2	3.6
Wakon	14.0	8.4	5.9	28.3	0.7	-	4.5	1.0
Warat	43.0	-	-	43.0	5.4	-	-	5.4
Yagadun	72.7	8.8	20.7	102.2	2.5	0.9	1.3	2.6
Total Takia	1,871.9	151.0	568.3	2,591.2	3.6	1.2	2.1	2.8
Total Karkar Island	3,976.3	319.2	1,072.2	5,367.7	4.4	1.1	2.1	3.2

coconuts was noticeably higher than the Takia average but averages otherwise were similar.

The village averages for total cash crop areas per grower showed some variations (Table 4.9). For all cash crop areas (coconuts and cocoa) the modal frequency was 2 to 3 acres per grower per village with an upper limit of 6 to 7 acres (Fig. 4.4). The low extremes by crop or crop combinations were at or around zero for sole and interplanted coconuts and cocoa in village averages. The village average maximum reached almost 4 acres for sole cocoa, 9 acres for sole coconuts and almost 4 acres for the crops interplanted.¹

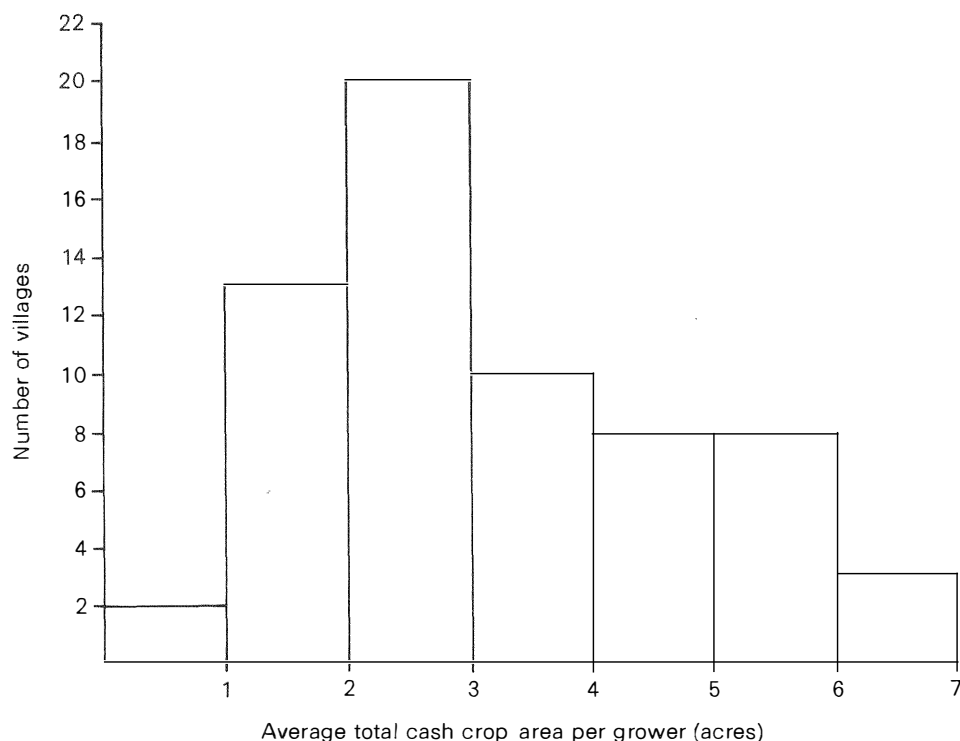


Fig. 4.4. Distribution of average cash crop area per grower by villages, Karkar Island, 1966

The ten villages with the highest average acreages per grower of sole coconuts all contained one or more growers with exceptionally large acreages, and in 6 of the 10 villages, these individuals were the sole reason for the high averages

¹ The counts do not include plantings mentioned above by a few individuals on a plantation scale, e.g., Gaum plantation.

(Sikentiga, Kaul 1, Koropak, Langlang, Tugatuga and Warat). In the remaining four, coconut plantings among the majority of growers were generally above the island average (Deltigu, Dimer, Kaviak and Ulun). The range in village average areas of the crops interplanted was very limited (0.6 to 4.5 acres).

A more detailed breakdown of the distribution of crop areas by registered growers for the whole island in 1966 (Table 4.10 and Fig. 4.5) shows that almost one-half of the growers had two acres or less (of coconuts and/or cocoa) and 84 per cent had five acres or less. Some individuals, however, had established relatively large areas. Among sole coconut growers, 44 (4 per cent) had 10 acres or more, while 45 (9 per cent) growers with both crops had 10 acres or more. In the latter group, these areas largely comprised coconut trees which had only been partly interplanted with cocoa trees. No individual growers had large areas of cocoa trees as a sole crop.

Table 4.10

Size distribution of growers' cash crop gardens, Karkar Island, 1966

Acreage	Growers with						All growers	
	Sole (no.)	coconut (per cent)	Sole (no.)	cocoa (per cent)	Coconuts and cocoa (no.)	(per cent)	(no.)	(per cent)
0-1	161	18	177	60	41	8	379	22
1-2	264	29	84	29	99	20	447	26
2-3	158	18	26	9	123	24	307	18
3-4	102	11	3	1	73	15	178	11
4-5	63	7	3	1	45	9	111	7
5-6	34	4	-	-	34	7	68	4
6-7	29	3	-	-	17	3	46	3
7-8	16	2	-	-	7	1	23	1
8-9	15	2	-	-	9	2	24	1
9-10	9	1	-	-	9	2	18	1
10-11	8	1	-	-	8	2	16	1
11-12	6	1	-	-	5	1	11	1
12-13	4	-	-	-	6	1	10	1
13-14	7	1	-	-	2	-	9	1
14-15	3	-	-	-	3	1	6	-
15-16	10	1	-	-	3	1	13	1
16-17	2	-	-	-	2	1	4	-
17-18	1	-	-	-	1	-	2	-
18-19	-	-	-	-	-	-	-	-
19-20	2	-	-	-	2	1	4	-
20-21	-	-	-	-	1	-	1	-
21-22	1	-	-	-	2	-	3	-
22-23	-	-	-	-	2	-	2	-
23-24	-	-	-	-	2	-	2	-
24-25	-	-	-	-	2	-	2	-
Over 25	-	-	-	-	4	1	4	-
Total	895	99	293	100	502	100	1,690	100

No significant relation was found between the extent of village participation (as measured by the proportion of growers to adult males) and the scale of participation (in terms of average area planted per grower). Regression analysis for the two series showed no significant relationship for the island as a whole or for either of the two linguistic groups.

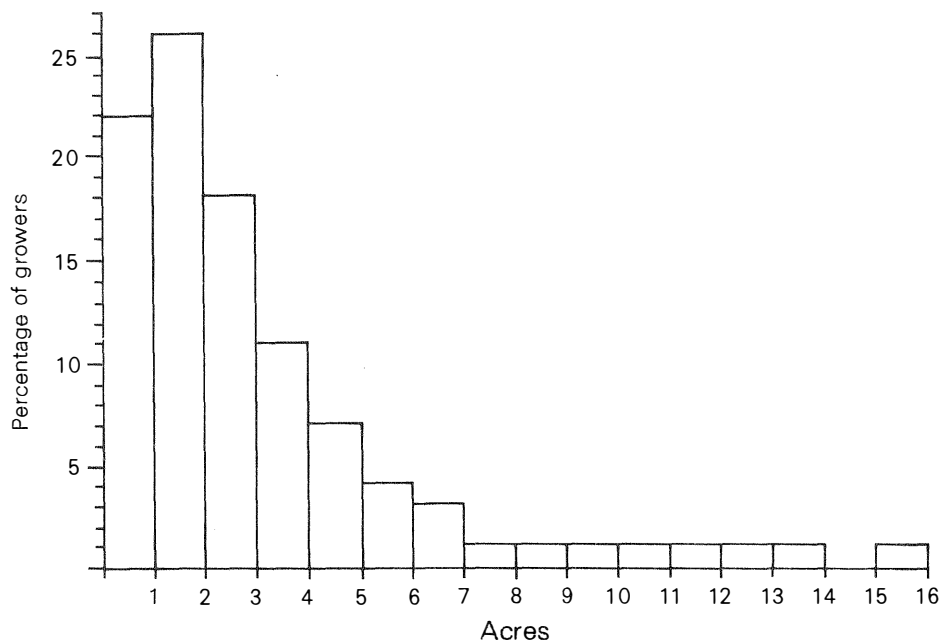


Fig. 4.5. Distribution of cash crop acreages by growers, Karkar Island, 1966

According to the 1969 census counts (Table 4.8) the total number of coconut trees increased by 21,000 (6.8 per cent) over the three years, a growth of less than 3 per cent per annum. On the assumptions used earlier (60 trees per acre), this amounted to a three year addition of 350 acres under coconuts for the island as a whole or 117 acres per annum. A similar calculation shows an area increase of only 41 acres under sole cocoa for the three years or 14 acres per annum (a 5 per cent annual increase). For the interplanted crops, the total increase in cocoa trees was 63,000 (360 acres) or 34 per cent over the 1966 figures. On an annual basis, this expansion of interplanted cocoa trees was about 11 per cent per year and was equivalent to 120 acres per annum. Taking the crops, sole and in combination, the annual average increase in crop area was less than 3 per cent. Little of this was planted to sole cocoa, and most comprised further plantings of sole coconut (possibly to be underplanted with cocoa in later years). However, considerable interplanting of cocoa trees beneath existing coconut trees does not appear in calculations on an area basis. Again the change in number of cash crop growers is not a true guide to activity since most of the expansion of tree numbers was undertaken by individuals who were already coconut growers and who were underplanting part or all with cocoa trees. The data do suggest

though that there was no appreciable increase in grower numbers among adult males during the three years.

Interplanting of village coconut trees with cocoa trees increased from 21 per cent in 1966 to 26 per cent in 1969. For cocoa, 69 per cent of trees were interplanted in 1969, a rise of 6 per cent from 1966. Among growers, 30 per cent had interplanted the two crops in 1966. By 1969 the proportion had risen to 48 per cent. The proportion of sole coconut growers fell from 53 to 38 per cent.

Factors affecting cash crop participation.

Land availability. Although 100 per square mile is not a high population density, a considerable proportion of the island comprised the steep, mountainous area of the interior. In addition, a part of the coastal plain was swampy and over 7,000 acres were occupied by expatriate estates. Thus the area of suitable land available to the islanders was considerably reduced. Furthermore, population has been growing and a substantial proportion of adult males absent from their villages may indicate a local shortage of opportunities. According to household interviews in one half of the 62 villages, the population/land ratio varied widely between villages but they revealed no widespread or frequent complaints of shortages. There were, however, local shortages which affected individuals.

Since no population/land resource study has been undertaken on Karkar Island, the existence of a land shortage could not be clearly determined. This study therefore has had to rely on indirect data and methods which were used, in particular, to investigate whether land shortages among villages significantly influenced the proportion of adult males with cash crops or the average area planted per grower in individual villages.

Opinions from agricultural, administrative and co-operatives officers, planter, and missionaries, as well as villagers themselves, showed no serious differences in their views about the availability of arable land in particular villages. However, when compared with village participation performances, no general relationship could be seen. Thus, some villages thought to be suffering from a shortage did show low proportions of growers to adult males (e.g., Gamog, Sikentiga and Gial), and some where land was allegedly plentiful recorded high grower proportions (e.g., Katom and Kuban). However, others supposedly short of land recorded relatively high grower proportions (e.g., Mater, Kevasop and Kurumtaur) and some

supposedly well off showed low grower proportions (e.g., Kavailo). A comparison of villages ranked according to land availability with average areas of cash crops per grower similarly showed no appreciable relationship.

A second indirect test of the effects of land shortage was through the use of village data on absenteeism among adult males. There was considerable intervillage variation in the proportion of absentees among adult males. This may reflect disparities in economic opportunities, which may in turn be principally the result of intervillage variation in land availability. Regression analysis with 1966 data, however, showed no significant relationship either between village absenteeism and village grower proportions or average areas per grower.

These tests strongly suggest that land shortage did not limit overall participation in cash cropping. Nor did it explain the participation pattern among the villages, though it may have been an important factor within a few villages. However, there were instances where individual households were prevented from participating or from expanding initial plantings.¹

Export prices. Table 4.11 shows the fluctuations in prices for coconut products between 1947 and 1968, and cocoa prices show price fluctuations of greater amplitude.

The question of whether Papua New Guinea prices influenced smallholder performance on Karkar Island depends, of course, upon the extent to which these trends and fluctuations were reflected in prices paid to the growers themselves. Most villagers could sell copra either to their own co-operatives or to estates after 1953. Both organisations offered roughly similar prices,² which varied directly with the nation-wide changes in average prices as shown in Table 4.11.³

Smallholders sold all their cocoa (in wet bean form) to the estates which maintained fairly stable prices during 1960-62 (around 3¢ per lb), though one raised the price to 4¢ per lb in 1962.⁴ Records of cocoa bean purchases by one estate from

¹ See Chapter 6 for case studies.

² Shown by rough comparisons of estate and co-operative prices at various times during the 1950s and 1960s.

³ Prices offered by co-operatives per lb of dried copra varied from 2 to 3¢ in the early 1950s, to 4¢ in 1959-60, 2½ to 3¢ in the early 1960s and 3 to 3½¢ in the mid-1960s. These broadly reflect the changes shown in Table 4.11.

⁴ DASF report on the marketing of indigenous-owned cacao, Karkar Island, Madang, June 1962.

Table 4.11

Index of export prices (f.o.b.) for Papua New Guinea cocoa and coconut products, 1947-68*

Year	Coconut products (1947-50 = 100)**	Cocoa beans (1947-50 = 100)
1947	68	88
1948	97	96
1949	114	118
1950	122	98
1951	131	188
1952	148	201
1953	166	177
1954	165	222
1955	166	307
1956	154	181
1957	143	141
1958	126	207
1959	181	227
1960	195	184
1961	141	148
1962	126	128
1963	132	136
1964	145	141
1965	171	113
1966	168	85
1967	140	143
1968	189	159

* Coconut product prices from 1949 to 1958 were affected particularly by the long-term contract with the U.K., which held them considerably below free market levels.

** Excludes whole coconuts, a very minor export item.

three Takia villages in 1965-66 showed a range of 2 to 4¢ per lb,¹ probably the result of adjustment to particularly low world prices in these years.

It is difficult to isolate the extent of the influence of prices on village participation. Market conditions were favourable for both crops from the early 1950s and the expectation of substantial returns from new plantings probably created much interest. This may well have been reflected in the response to promotional efforts for coconut plantings in the early 1950s. It is also likely that the favourable market conditions for both crops from 1958 to 1960 were an important factor in the acceleration of village plantings from around 1959.

While prices offered to producers probably stimulated village plantings by creating favourable expectations of returns, these expectations and the actual returns received were significantly affected by factors such as the growth of transport, marketing and processing facilities and services.

Transport, processing and marketing. Development of transport facilities on Karkar Island after the second world war was slow. In 1947 there was no vehicular road at the Takia

¹ By comparison, the Tolai Cocoa Project was paying 6¢ per lb from July to December 1965 (personal communication: T.S. Epstein).

end of the island, and at the Waskia end it was largely confined to Kulili plantation (Fig. 4.1). Around 1949-50 the Kulili road was extended to Kaviak, though at this time travel was easier on horseback than by vehicle.¹ Co-ordinated road development dates only from 1957 when the task of building a permanent main road was undertaken. At that time feeder roads were non-existent, and it was only after 1960 when the Waskia and Takia local government councils were established that villages further inland were linked with the main road. Prior to 1960 access to these villages was by foot-tracks which became impassable in wet weather. It was not until the mid-1960s that these tracks were upgraded to vehicular standards. Even in 1966 vehicular access to some villages was still difficult, particularly in wet weather.

Prior to the establishment of co-operatives in 1952-53, villagers sold their copra (green and dried) and cocoa (wet bean) to the plantations. The harvested crop was transported either by the growers, from villages near estates, or by estate tractors (at a small charge). Waskia cocoa was purchased mostly by Kulili estate but also by Kaviak and Bulu, while Kurum, Wokalon, Dogowan and Wadaw purchased Takia cocoa. Kurum withdrew from cocoa-buying in 1966. After 1953 co-operatives competed with the plantations for copra, built tradestores and transported goods to and from the mainland on a copra boat. Between 1953 and 1966 co-operatives functioned with varying degrees of success,² but with the estates, they did greatly improve marketing facilities and services for small-holders.

In 1963 the eight co-operative societies on the island had eleven shipping points and seventeen copra-buying points distributed around the island (Fig. 4.1). In the absence of a main road around the island, the co-operatives progressively reduced the marketing problems and costs for smallholders. Even so, village opportunities were still greatly limited by difficulties of access to marketing points in the 1950s. The

¹ Personal communication: Mr Tscharke, Kurum plantation, 1966.

² See McSwain (1970). It might be thought, simply judging from the membership of co-operatives in 1953, that cash crop participation was more widespread than data presented earlier suggest. In 1953 roughly \$54,000 was contributed as share capital by 2,700 islanders to establish the co-operatives. It was officially reported, however, that this money had been earned from casual employment on the island or the mainland. Membership numbers thus were initially unrelated to cash crop activity and subsequently showed no tendency to vary with the growth of cash cropping in the villages.

seventeen buying points did substantially reduce portage times, although with only a network of foot-tracks to these points, transport labour remained substantial until the development of the road system after 1959.

The construction of the road system clearly contributed to accelerated planting rates after 1959. The expansion of small-holder output, and the development of transport infrastructure and marketing services, were accompanied by a growth of transport services. Many of the plantations used their own vehicles to purchase cocoa beans and copra from the villages. The number of indigenous-owned vehicles also increased. In 1966 there were about eight of these vehicles available to transport copra and cocoa to marketing points, of which about six were indigenous-owned, some with European backing. In 1970 there were many more.

Contrary to expectations, inland villages with poor access to marketing points and thus less incentive to undertake cash crop planting, were not backward in their performances. In 1966 the average proportion of growers to adult males for the thirteen Takia villages furthest from the coast was equal to the average proportion for the Takia group as a whole (41 per cent), while the average proportion for six inland Waskia villages was little below (only 3 per cent) that of the whole Waskia group. There was similarly a lack of correlation between location and average cash crop areas per village grower for these villages. Inaccessibility may have been a factor in the early years, but it clearly was not in 1966.

While market access or cost of marketing offers no general explanation for variations in cropping performances between villages in 1966, the growth of transport and marketing facilities and the development of services based upon them were important factors in the overall performance of small-holders. While village coconut planting gathered momentum from the early 1950s, few of these trees would have come into bearing before 1960. Similarly, few village cocoa trees were in bearing prior to 1960 since most were planted after 1957. Significantly most of the cocoa trees planted prior to 1957 were in villages close to European plantations where marketing and transport costs were minor. Some 31 of 46 early Takia planters and 15 of 21 early Waskia planters were situated near plantations.

Thus although substantial planting activity took place prior to 1960, the need for improved and expanded transport, processing and marketing facilities and services did not become

urgent until around 1960 when main and feeder road construction began in earnest. If this had not commenced then, planting activity in the 1960s may not have been sustained at anywhere near the rate recorded.

Extension services. Until 1958-59 there was no agricultural extension programme for the island so the promotion of cash crop planting was undertaken initially by the district officer from Madang. He had some success in establishing ventures such as new coconut gardens, communal bank accounts and even the purchase of a communally owned boat suitable for shipment of copra and other goods.

In 1952 a co-operatives officer began visiting the island and by 1953 had established eight co-operatives. Thereupon a co-operative approach replaced the village communal approach to economic development. Co-operative activity was applied to the marketing of copra and distribution of consumer goods rather than to the production of cash crops. There was an appreciable response to the co-operative officers' attempts to stimulate village coconut plantings (McSwain 1970:37) though this may well have been limited by the sporadic occurrence of their visits to the island.

A sustained extension programme was first implemented in 1958-59 when an agricultural officer was posted permanently to the island. Observers¹ claimed that the energetic programme of promoting both coconut and cocoa crops² resulted in a greatly stimulated rate of village planting. This is borne out by the available tree counts for the period. Table 4.3 suggests that the average rate of cocoa tree planting from 1957-58 to 1958-59 was about 15,000 trees per annum, while in the following seven years to 1966 the average rate was about 34,000 trees per annum. Coconut tree data (Table 4.2) also indicate fairly slow planting rates annually until the late 1950s with an acceleration more recently. The number of immature trees (0-8 years) in the 1966 count (211,000) suggests an average planting rate of about 23,000 trees per annum between 1959 and 1966, substantially higher than during the 1950s.

¹ Interviews with Mr Tscharke, Lutheran mission, and others.

² Policy gave a new emphasis to cocoa tree planting, inter-planted with coconuts where possible or as a sole crop where conditions were unsuitable for coconuts. The objective was to achieve greater diversification as well as higher income with the two crops.

Reports of observers and Administration officers suggest that the limited official encouragement offered during the 1950s did have an appreciable effect on crop plantings. After 1959 the development of road facilities and the expansion of extension work influenced the response,¹ as did attractive export prices.

Inadequate supervision resulted in marked variations in spacings of trees planted prior to 1959. Coconuts particularly were overcrowded and about 12,000 palms were removed during a correctional programme in 1962-63. Planting from 1959 onwards followed official recommendations more closely. Closer supervision also led to better garden hygiene, improved cultural practices (e.g., nursery establishment, cocoa pruning, etc.) and greater pest and disease control during the 1960s. Although crop maintenance in 1966 was still below standard recommendations for the villages,² the improvements achieved undoubtedly raised the yield potential of gardens in the 1960s.

While the extension programme contributed to overall planting performance, it cannot explain the variation in planting performances among villages. For instance, if frequency of visits to individual villages had exerted any appreciable influence, a slower, more delayed planting performance could have been expected among the Takia, since the base for extension operations was located at the Waskia end of the island (near Kinim). Tree counts, however, show little difference in historical timing of coconut planting between the two groups. Indeed, Takia cocoa plantings were well ahead of the Waskia in the earlier years. Also, the programme of village patrols carried out by extension workers attempted to provide all villages with the same level of supervision.

Social factors. During extension patrols, staff limitations prevented maintenance of close contact with individual villages, so agricultural officers depended heavily on the support and influence of village leaders and particularly luluai and tutul to see that their advice was implemented by villagers. Two leaders in particular had strong influence in early postwar years, Salum in the Waskia and Pastor Mileng in

¹ Villagers were reported to have been keen to engage in road-making activities around 1959-60 to facilitate crop marketing (interview with Mr Tscharke, Kurum, October 1966).

² The local government council passed a regulation to make it an offence not to maintain gardens properly in an effort to ensure desired standards. This was not, however, being enforced effectively at the time of the survey and in 1970 maintenance was still below standards recommended.

the Takia, both of whom established plantations of considerable size. The bigger area was established by paramount luluai Salum as Gaum plantation (see Fig. 4.1).

At the village level, one observer¹ claimed that generally speaking, the influence of the Administration's representatives varied inversely with the size of the village. In smaller villages the response to planting instructions was more widespread than in the larger villages which were described as being 'too big for some luluai to wield control efficiently and they did not get the lazy people to start up'.

It was decided to test this opinion using the 1966 data. The number of adult males was chosen as the indicator of village size, while participation, the dependent variable, was represented by the number of growers per village and separately also by the average area per grower per village. Regression analysis failed to show any significant relation between village size and area per grower for the island as a whole or for either of the two linguistic groups. It did, however, show a highly significant relation between village size and grower numbers. The best fit was obtained with a linear function,

$$Y = a + bX \quad \text{where } Y = \text{no. of growers} \\ \text{and } X = \text{village size,}$$

as shown in Fig. 4.6.

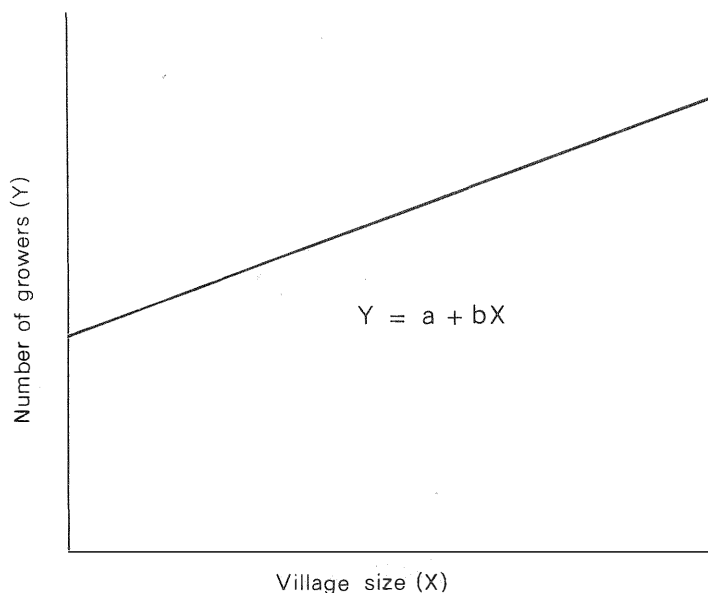


Fig. 4.6. Relation between grower numbers and village size, Karkar Island, 1966

¹ Mr Asafo, interviewed October 1966.

Group	R^2	a	b	S_b	Level of significance
Waskia	0.66	10.1	0.24	0.2368	0.01
Takia	0.82	51.3	0.36	0.3205	0.01
Karkar Island	0.76	6.35	0.32	0.3223	0.01

High correlation coefficients were obtained for the island villages as a whole and for the Takia and Waskia groups individually and all estimates of the parameters were significant at the 1 per cent level. It is not, of course, surprising to find a positive relation between grower numbers and village size. What is of interest is the slope and position of the function. Its linearity means that as village size increases grower numbers are augmented at a constant (marginal) rate, but most important, since the curve has a positive intercept on the Y axis, the proportion of growers per village among adult males declines as village size increases. This result is in accord with a hypothesis, for the island as a whole and for each group, that village leaders had more influence in smaller than in larger villages in promoting cash crop planting. This could help explain the variability between villages in the proportion of adult males participating as growers in 1966.

The major proportions of coconut and cocoa trees in the 1966 count were planted after 1958 when villages were under closest supervision. Also after 1966, extension policy shifted from a primary emphasis on increasing grower numbers. This may have contributed to the lack of increase in growers shown for 1969.

Village size did not show any significant relation to average area per grower in the villages. The average grower areas per village were most heavily influenced by the incidence of big growers. The nineteen villages with the heaviest averages all contained one or more large growers. Many of these growers were luluai or tultul who obtained assistance of other villagers through their traditional or official positions of influence.

Estates. Estates and smallholders have been closely associated in the process of agricultural development on the island and both groups appear to have benefited.

Prior to 1952 virtually all smallholder copra was marketed by the estates. After the formation of co-operatives in 1953 they continued to market and process village coconuts. All processing and marketing of cocoa beans was carried out by the estates since smallholders themselves did not have any fermentaries. This was because first, the level of output at least

until the late 1950s would not have enabled a fermentary to operate economically; and second, despite their awareness of a sympathetic hearing from the Administration for any demands for a fermentary, the islanders chose to retain their marketing arrangements with the estates.

Smallholders have benefited through the availability of large-scale processing facilities on the estates. For the estates, smallholder output has substantially supplemented their own output and has enabled a fuller and therefore more efficient use of their processing facilities. This was of particular value when the area of estate cocoa was expanding. Large-scale processing facilities had to be installed on estates in anticipation of output from an area much of which was still immature. Without smallholder output these processing facilities would have operated below capacity.

On the other hand, there have been some drawbacks. Kurum plantation purchased a large proportion of Takia cocoa until 1966 which was added to their own output and sold to overseas buyers. After discontinuing purchases from smallholders, this estate was offered a much higher premium for its own output because of its better, more even and more distinctive quality. This factor may also have reduced the gains to other estates which processed smallholder cocoa. On the other hand, smallholders may well have received a price for cocoa beans below that possible with their own fermentaries.

In any case, these marketing arrangements for cocoa were terminated in 1970 with the formation of the Karkar Company, a multiracial private venture established for the purpose of encouraging indigenous business enterprise on the island. Its initial activity will be the processing of all smallholder cocoa, which was estimated to reach 200 tons in 1971. The smallholders are represented by three directors, as are the three estates involved (Kulili, Dogowan and Biabi) and share capital similarly was contributed on a fifty-fifty basis. Individual smallholders contributed sums to their share of the capital investment and much was also raised from the sale of assets of the co-operatives which were liquidated in 1970. The expatriate participants are providing technical and managerial expertise, and the Administration is also involved in decision-making with respect to prices paid to the grower.

Since existing estate capacity is adequate to process current levels of smallholder output, the enterprise is not strictly necessary from an economic viewpoint; it represents, in fact, a diversion of capital from other possible and worthwhile investments. From the viewpoint of the Karkar islanders,

however, it represents an important and sophisticated step towards increasing their participation in the money economy and hopefully its example will stimulate other such joint ventures.

With the development of the island's road system from 1958, the plantations initially played a key role in the growth of transport services, primarily to facilitate the purchase of copra and cocoa. By 1966, however, as mentioned above, there was a considerable growth of indigenous-owned transport. This trend was greatly encouraged and even partially financed by some of the estate owners and in 1966 it seemed likely that such indigenous participation would increase further in later years.

The influence of the estates has been evident in other ways. The three individuals who planted coconuts and cocoa on a large, estate scale, were all greatly encouraged and assisted by European estate owners and in turn, many other islanders have been influenced by the example of these three indigenous estate owners. The familiarity with coconuts and cocoa growing which many villagers obtained as estate employees probably also facilitated their own progress as cash crop growers, while the close contact with and access to European goods through plantation tradestores may well have increased their incentive to commence or augment money-earning activities.

Future prospects

Transport, processing and marketing facilities and services are now reasonably well developed though the inland feeder road system could be improved. The island is also now provided with a more adequate level and quality of extension services, and although cultural techniques are still below recommended standards, this does not appear to be due to any shortage of appropriate advice.

Later agricultural censuses may not reveal the same functional relationship shown above between number of growers and village size, since the emphasis in extension policy has shifted away from its early preoccupation with increasing the involvement of the village population in cash cropping. It is difficult to judge whether the proportion of growers will rise further since the incidence of joint garden ownership is unknown, but if it does it will not be the direct result of pressure from village leaders as appeared to be the case up to 1966.

Further development in grower numbers and area per grower will depend mainly on world market prospects, the population/

resource balance, alternative economic opportunities, and the strength of motivation for money-earning.

World market prospects for tropical tree crops are notably difficult to predict and it is not intended here to attempt any forward assessment. However, as islanders are sensitive to changes in monetary returns to their (labour) efforts,¹ it is reasonable to expect that fluctuations in world prices will influence their expansion plans.² Their capacity to react, however, is likely to be more strongly influenced by available resources than in the past. While the above analysis indicated no general relationship between land availability and cash crop participation in the past, there are reasons for expecting a more positive link in the future. A number of informants interviewed in the villages in 1963-64 claimed that while current and past coconut and cocoa plantings had not encroached upon the area of land required for subsistence production, further plantings would do so. Furthermore, the island's population is apparently expanding at a rapid rate and will therefore make increasing demands on land for this purpose. Against this there is still a considerable area of potentially useful, arable land further inland on the mountain slopes. Since this is located at higher altitudes it is less suitable for coconuts and cocoa, but it could be used for subsistence production or for other cash crops (e.g., European vegetables). Although a considerable area of this land still remains unused, ownership is unevenly distributed among the villages. Accordingly, land shortage will be felt first in those villages without access to these slopes. Considerable scope still exists for underplanting coconuts with cocoa which will delay the appearance of a more general land shortage.

By contrast, the supply of labour for cash cropping is less likely to be a limiting factor. Although cash cropping has made considerable additional demands on the family labour supply, additional labour could be secured locally and growers did hire it if necessary.

Third, the extension of participation will also depend upon other available economic opportunities. During the survey the principal alternative was plantation employment on the island and mainland. These opportunities were, however, not regarded by the majority of villagers as preferable to cash cropping in their own right. Karkar Island estates were heavily dependent upon labour under contract from outside the island.

¹ Both through variations in world prices and through changes in transport and marketing costs.

² See further Chapter 6.

Nevertheless some individuals preferred being estate employees to self-employment in cash cropping. Many sought employment on a short-term seasonal basis.

New opportunities are opening up through the education system but it is unlikely that these will absorb the rapidly growing numbers of young men on the island. Thus unless low market prices for cash crops act as a deterrent, the expansion of acreage under coconuts and cocoa, perhaps with new crops added, should continue until all arable land is in use.

The rate at which new land is planted to cash crops or coconuts are underplanted with cocoa will also depend upon islanders' needs or demands for money. This factor will be explored in Chapters 6 and 7.

Chapter 5

Maprik

The Maprik subdistrict of the then Sepik District (Fig. 5.1)¹ lies inland from the northwest coast of Papua New Guinea and is administered from the town of Maprik. Since the second world war two annual crops, peanuts and rice, and one perennial tree crop, coffee, have been produced there.

A reconnaissance visit to the area in 1963 was followed by the main survey over five months in 1964. Data were collected from both official and non-official sources and fifty household interviews were conducted. Supplementary data were collected during two months of 1966, and a final field trip was conducted in 1970 to update and complete the study.

The Sepik District was the country's most heavily populated lowland District in 1966 (with over one-quarter of a million people) and had the third highest District population (after the Eastern and the Western Highlands). Maprik subdistrict had the highest population of all Sepik subdistricts, with over one-third of the District total in June 1966 (Bureau of Statistics 1969). The population of the Maprik subdistrict has been classified into thirteen linguistic groups (Glasgow and Loving nd), the most numerous of which was the Abelam, a centrally located tribe with more than 30,000 people in 1962 (Lea 1964: vii). Five other linguistic groups bordered the Abelam: the Mountain and South Arapesh to the north and northwest, the Boikin group to the east, and the Sepik Plains and Gawanga to the south and west respectively.²

¹ In July 1966 the Sepik District was split into East and West Sepik Districts. Maprik subdistrict now lies in the former.

² Extensive work in ethnography, social anthropology and linguistics, has been done in this region (see The Australian National University, Department of Anthropology, 1968). These introductory observations depend heavily upon these works and on Lea (1964).

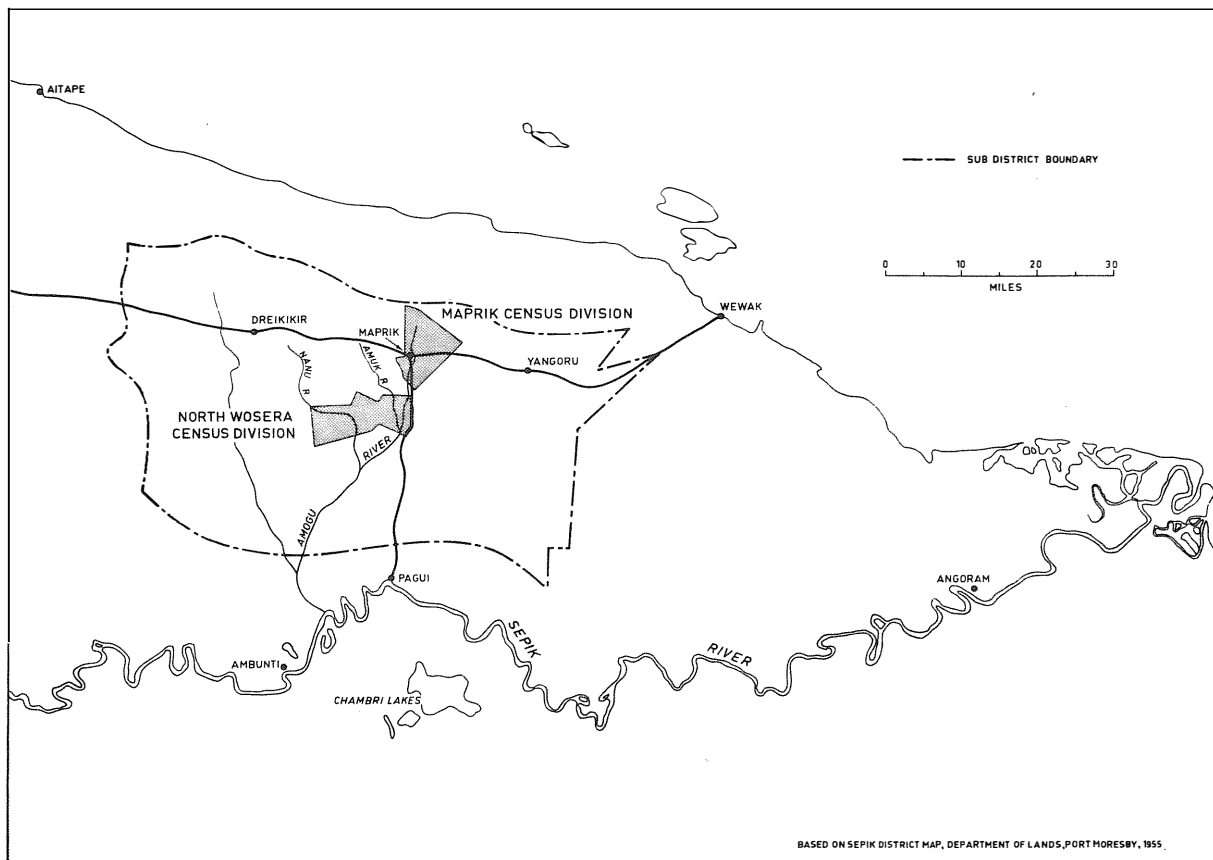


Fig. 5.1. Maprik survey area

In commenting on the Abelam, Lea (1964:viii) observed:

The Abelam and their neighbours are subsistence cultivators growing mainly yams and taro in gardens which have a productive life of about two years and long fallow periods. Some foods are collected from the forest and fallow areas outside the gardens; the most important of these is sago which forms the basis of the diet during part of the year.

The largest social grouping was the village which was generally composed of a number of clans, which in turn, often comprised a number of subclans. There were about eighty village groups in the Abelam (Lea 1964:44), located two to three miles apart with populations of about 350 but ranging to as many as 800. Clans which broke away from a village group set up separate villages termed village segments. Many villages distinguished in population censuses by the then Department of Native Affairs were in fact village segments. Within the villages, the basic unit for economic activities was the (nuclear) family group, though larger groups were involved in more difficult and time-consuming subsistence tasks.

Physical and climatic setting

The Maprik subdistrict forms part of an area identified by the CSIRO (1961) as Wewak-Lower Sepik. The following five physical zones occur in the subdistrict:

- (i) A mountain zone (Prince Alexander Mountains) runs approximately east-west across the northern part of the subdistrict with altitudes of around 8,000 feet in the west to 1,000 feet in the east. A number of rivers flow south to the Sepik River from this zone.
- (ii) A hill zone lies to the south and southeast of these mountains, closely dissected and with its relief also decreasing from around 1,200 feet in the west to as low as 50 feet in the east. The south-flowing rivers running through this zone are flanked by narrow alluvial terraces and plains.
- (iii) A low hill zone lies south of the hill zone with rounded hills of from 300 to 500 feet and lower relief of up to 100 feet.
- (iv) Further south are the Upper Sepik Plains which range up to twenty miles in width. These are flat, even and poorly drained with a very gradual downward gradient to the fifth zone.
- (v) The Sepik floodplain lies furthest south. This zone can be flooded to a depth of 6 to 12 inches for six months of the year.

Population was located predominantly in the hill zone and along the major rivers and tributaries in the low hill zone. Population was negligible in the southerly Upper Sepik Plains zone and the rugged mountain zone in the north. According to the CSIRO (1961:14):

More than three-fifths of the population (of the Wewak-Lower Sepik Area) live on less than one-fifth of the area and mostly on land that is considered very difficult or totally unsuitable for development.

The CSIRO's survey area extended beyond the Maprik subdistrict, but a large proportion of their 'less than one-fifth of the area' lay within the subdistrict.

The climate was characterised by high temperatures (75 to 80°F) and humidity with small variations through the year. The Prince Alexander Mountains created a rainshadow and rainfall was lower as a result, averaging 60 to 80 inches, with a pronounced dry season. The CSIRO (1961:28) commented:

the high uniform temperatures... are very suitable for plant growth, which could, however, be limited by other climatic conditions. The major factors likely to influence growth would appear to be water shortages at certain times of the year and persistent cloudiness and rainy weather at other times.

Early European contact and economic development

From the establishment of German administration to 1914, contact with Europeans was occasional and fleeting. Some trade goods found their way in from the coast and there was a little forced recruiting of labour for European plantations in the area. After the war when the administration of New Guinea was in Australian hands, contact was still restricted to a few patrols through the area and to some private recruitment of labour for plantation work.¹ However, gold was discovered in the 1930s, and by 1937 about fifty European gold miners were working in the area.² Maprik township, located centrally in the subdistrict, became the centre for gold mining activities in the surrounding countryside.

¹ Lea (1964:31) comments that this recruitment was achieved mainly by raiding party methods.

² Territory of New Guinea, Annual Report, 1937-38, p.122.

In 1937 an administrative post was established in Maprik township. The following year Catholic missions were set up at Ulupu in the Abelam foothills and at Kunjingini in the Wosera. In 1938 an agricultural station was established at Bainyik, six miles from Maprik, just east of the Amogu (Screw) River. An airstrip was opened at Maprik in 1938 with air services to Wewak. Internally little progress was made in developing a road system prior to the second world war.

During the second world war the Japanese occupied the area from 1942 until 1945, when it was retaken by Allied forces. Regular administrative activity was not resumed until 1948. After this, patrols were conducted by the DNA, DASF, PHD, and the Malaria Control Service. Labour recruitment expanded and by 1956 many young men had enrolled as contract labourers for work at Kavieng, Rabaul and Madang. However, recruitment declined sharply after 1956 owing to the bad record of desertion among the labourers, especially from the Wosera. In 1949 three missions (the Assemblies of God, the South Seas Evangelical Mission and the Seventh Day Adventists) commenced activities in the area.

Little economic development took place before 1939, as the Australian administration concentrated on the spread of law and order.¹ There were no specialised agricultural officers appointed at the subdistrict level, though district officers did encourage indigenous economic enterprise. Some coconuts were planted and traders competed to buy smallholder copra, but these activities did not extend far inland from the coast.

The Bainyik agricultural station began experiments with various crops, including sisal, hemp, potatoes, fruit trees, rubber, cassava, pepper, and kapok. Planting materials were distributed to indigenous farmers on a minor scale before the second world war. There were no European estates in the sub-district.

Since the early 1950s three major crops have been tried on a commercial scale: peanuts, rice and coffee (robusta). In recent years others have been assessed for their economic potential, notably castor beans and European vegetables for the local market, while a number have been grown experimentally, e.g., cocoa, passionfruit, and more recently, rubber and tea. A beef cattle industry is also now a prospect for the area.

¹ Commonwealth of Australia, Report to the League of Nations on the Administration of the Territory of New Guinea, 1924-25, Government Printer, 1926, p.37.

The three main crops are examined separately in terms of the growth and extent of village participation in planting and output and the factors which have determined this performance.

Peanuts

Peanuts had a short commercial life in the subdistrict (Table 5.1). They were introduced to subsistence producers, in the mid-1950s as a supplementary crop which could be exported to Australia.

The crop was first promoted in the villages in 1955 by agricultural extension workers who gave it priority over rice at the time.¹ Information suggests that production did not exceed ten tons annually. As Table 5.1 shows, marketed output rose to a peak of 123 tons in 1958-59 but thereafter it diminished and finally ceased.

Details of grower participation were scarce but the average area planted was estimated by agricultural extension officers and others to have been around one-third of an acre per grower while average yields were estimated at 700 lb per acre. On these assumptions, no more than 400 acres were planted by 1,200 individuals at the peak of interest.

Transport, processing and marketing. Responsibility for transportation, processing and marketing was initially undertaken by DASF in the absence of indigenous and European buyers. Extension officers purchased output in the villages and transported it to Bainyik for hulling and grading. It was then flown to Wewak on the coast and sold to agents who shipped it to Australian buyers.

Table 5.1

Peanut production and value* in Maprik subdistrict, 1957-58 to 1962-63

Rural progress society	1957-58		1958-59		1959-60		1960-61		1961-62		1962-63	
	Qty (tons)	Value (\$)	Qty (tons)	Value (\$)	Qty (tons)	Value (\$)	Qty (tons)	Value (\$)	Qty (tons)	Value (\$)	Qty (tons)	Value (\$)
Tamaui	3.5	1,040	60.1	5,608	51.1	n.a.	12.1)	481)				
Supari	9.8	910	42.3	3,160	28.5*	n.a.	8.0)		Negligible			
Mitpim	3.6	338	20.6	1,918	3.4	n.a.	n.a.	n.a.)				
Total	16.9	2,288	123.0	10,686	83.0	n.a.						
Area (acres)**	54		400		270							
No. of growers***	162		1,200		810							

* At prices paid to producers.

** Assumes an average yield of 700 lb per acre.

*** Assumes an average area of 1/3 acre per grower.

Source: Output and values were taken from DASF annual reports, 1957-58 to 1962-63, Maprik.

¹ DASF survey of the rice industry, Sepik District, 1954, p.3, mimeo.

In 1958 DASF transferred some of these responsibilities to rural progress societies,¹ five of which were established in Maprik subdistrict in the late 1950s. These societies, financed with share capital contributed by growers, purchased peanuts from the growers, provided transit storage and transported the crop in their own trucks to Bainyik agricultural station. There, DASF purchased the nuts-in-shell, hulled, sorted and graded them and transported them to Wewak for sale.

Table 5.2 illustrates the cost structure for a consignment of peanuts sold in mid-1959 and provides a breakdown of costs incurred between purchase and sale. It is not intended as a representative cost structure. The net profit of 3.2¢ per lb was apparently passed on to the rural progress society concerned by DASF.

Table 5.2

Cost structure for a peanut consignment from Maprik to Wewak, mid-1959
(¢ per lb)

Item	Cost
Purchase price (in shell) paid to rural progress society*	4.5
Loss in shelling (60 per cent recovery)	1.8
Shelling costs	2.5
Bags and handling costs	0.6
Commission and insurance	1.4
Freight (to port of shipment)	1.5
	<u>12.3</u>
Price received (at port of shipment)	<u>15.5**</u>
	Net profit 3.2

* Rural progress society paid growers 3¢ per lb for this consignment.

** 9 per cent was classified as grade B for which a price of only 11¢ per lb was received. This reduced the average price received by 0.5¢ per lb.

Source: Derived from information supplied by DASF.

From this shipment, the growers should have received a further sum from the profits earned by DASF and passed on to the rural progress societies concerned. This might have raised the price received to about 5¢ per lb (in shell) which was

¹ Further details on the role of these societies are given in later parts of this chapter. The breakdown of the subdistrict into census divisions serviced by these societies is as follows: Supari society covers the eastern half of Urat census division, Muhiang-Bumbita, Albiges and the eastern half of Wam. Dreikikir society covers the western half of Urat, the western half of Wam, Kombio, Urim and Gawanga. Tamaui society covers the southern section of Wora, Tamaui and north and south Wosera. Mitpim society covers Mamblep, the northern section of Wora, Maprik and Yamil. The Yekere-Nindepolye society covers Wingei, Kumun, Yangoru and Sepik.

roughly one-third of the price received at the port of shipment. The profits of consignments varied greatly. Lower recovery rates after hulling and/or lower proportions of A-grade kernels in many instances resulted in net losses on consignments. Indeed, overall the societies found peanuts to be an unprofitable crop and suffered significant losses. Thus it is probably more realistic to assume the 3.2¢ per lb was normally absent either owing to a higher loss in shelling with a lower rate of recovery (in which case the grower would have received only 19 per cent of export price), or to a lower average price received due to lower average quality kernels (23 per cent of export price), or to both factors.

Processing costs were high, primarily because of a poor rate of recovery. Table 5.2 shows them to be greater (4.9¢ per lb) than the price received by rural progress societies. In addition, the 60 per cent recovery obtained for this consignment was apparently higher than normal.

Aside from processing, the costs of transport to Australia clearly were an important factor in the competition with Australian producers. One significant component was the cost of air-freighting from Maprik to Wewak. At that time there was no cheaper feasible alternative, since the Maprik-to-Wewak road was not open. Transport difficulties within the Maprik subdistrict itself were also important. Rural progress societies were found wanting at times in the provision of transport and purchasing services to farmers. Largely because of the inaccessibility of many villages in the wet season, some consignments were never collected¹ while others were collected only after a prolonged storage period in the villages which often led to serious deterioration. This in turn led to lower prices or outright rejection by export agents in Wewak.

Extension services. Problems of both yield and quality arose to a large extent from growers' lack of experience and technical knowledge.² Some villagers planted on unsuitable soils. In some villages the most productive soils were used for food gardens, particularly for yams, while peanuts were relegated to less favourable areas. Frequently growers harvested nuts while they were still immature and small. Drying and grading were often inadequate: some growers even added

¹ Because of this, several villages in the North Wosera census division lost interest in peanuts in 1959.

² Our conclusion after examination of reports by extension officers and discussions with commercial firms handling the peanuts and interviews with ex-growers.

foreign matter (stones etc.) to increase weight. Long storage under village conditions also caused deterioration. Outright rejection of consignments by agents was frequent in early years and still took place as late as 1959, while many others were accepted only at lower prices due to the inclusion of small, dark, under-dried or cracked nuts. For some areas the proportion of B-grade kernels was as high as 20 per cent in 1959.

DASF attempted to overcome these problems by improving grading methods at Bainyik, particularly through extension work in the villages. However, prior to 1960, staff shortages and inaccessibility hindered extension work.¹ Nevertheless as time progressed, the overall quality of kernels did improve.

Cash returns to growers. There was a growing interest in the crop during the late 1950s and the downfall of the industry was due not to these teething problems but to fluctuations in the export market. Growers were paid about 4¢ per lb (actually about 5d per lb) in 1957-58, which was apparently adequate to maintain their interest. Assuming a yield of 700 lb per acre, growers would thus have earned \$28 per acre, or about \$10 for the estimated average of one-third of an acre per grower.

In 1959 there was a record peanut crop in Australia and prices fell sharply.² This was reflected in prices offered for Maprik peanuts and finally in cash returns to growers who received only 1 to 2¢ per lb (or say \$3 to \$5 from 1/3 acre). Agricultural officers reported discouragement among growers who virtually ceased production for the export market after 1960. The small quantities subsequently produced were consumed by the growers themselves or were sold in the small market in Maprik township.

Rice

Rice seed was distributed to villagers as early as 1951-52, though acreage and output did not reach appreciable levels until about 1958 (Table 5.3). From 1958 to 1964 output expanded, though in unspectacular fashion. Expansion from 1964 to 1969 was more notable, particularly for the Sepik District as a whole, within which the Maprik subdistrict was the leading rice producer.

¹ Extension staffing is examined more fully below in relation to rice and coffee.

² Tariff Board, Report on animal and vegetable fats and oils, December 1960, Commonwealth Government Printer, Canberra, 1966, p.26.

Table 5.3

Rice production, Maprik subdistrict, 1957-70

Year	Production		Estimated number of growers*
	Paddy (tons)	Milled (tons)	
1957-58	78	n.a.	78
1958-59	86	n.a.	86
1959-60	80	n.a.	80
1960-61	103	65	103
1961-62	74	45	74
1962-63	109	48	109
1963-64	197	130	197
1964-65	673	240	673
1965-66	804	248	804
1966-67	1,014	420	1,014
1967-68	1,088	745	1,088
1968-69	1,171	393	1,171
1969-70	1,600 (est.)		1,600 (est.)

* Assumes a constant average of one acre per grower, yielding one ton of paddy per acre. This may overestimate size of garden and yield and thus grower numbers in early years (personal communication: Mr W. Stent, 1968).

Source: Production figures from DASf survey of the rice industry - Sepik District, 1965, mimeo, and Emmery and Leentjes (1970).

No comprehensive count had been taken of acreage planted or numbers of rice growers up to 1964. In 1961 measurements were taken of twenty-four rice gardens in one census division of the subdistrict,¹ which gave an average size of one-half acre (the two largest were 1.13 and 1.19 acres, while six were only 0.1 acres). Field measurements made more recently had led to the assumption here of a higher average of one acre per grower (Emmery and Leentjes 1970:2). A total of 1,046 acres belonged to 1,033 growers in five census divisions of the subdistrict in 1970, giving an average of 1.0 acres per grower. In view of the greater reliability of this latest evidence, the figure of one acre per grower was used here, though it is recognised that considerable variation exists. Table 5.4, for example, shows an inter-census division range of from 0.5 to 1.6 acres per grower. Data for the Muhiang census division for 1970 showed a similar range between villages although there the majority averaged more than one acre per grower. Data on yields were also scarce. Estimates made by

Table 5.4

Rice sales by rural progress societies, Maprik subdistrict, 1965-69
(\$)

Period	Rural progress societies					Total
	Supari	Tamaui	Mitpim	Dreikikir	Yekere	
1.10.65-30.9.66	40,279	12,030	24,294	6,286	1,935	84,824
1.10.66-30.9.67	25,468	25,184	26,086	9,035	1,255	87,028
1.10.67-30.9.68	26,933	19,544	17,239	4,925	1,470	70,111
1.10.68-30.6.69	36,869	34,365	23,662	9,875	646	105,417

Source: Based on DASf records of sales to DASf, Baiyik, by rural progress societies.

¹ DASf annual report for Maprik subdistrict, Maprik, 1961.

extension officers averaged about 8 cwt per acre in 1962-63. However, rainfall in that year was well below average. Since then yields appear to have been higher, partly because of more favourable climatic conditions (with rainfall consistently well above the twenty-six inches recorded for Bainyik in 1962-63), but also because of improved cultivation and harvesting techniques and the use of higher yielding varieties. Emmery and Leentjes (1970:3) used a yield of one ton of paddy per acre for 1970, and this figure has been assumed in Table 5.3 for rough calculations of grower numbers.

Over the period there may have been a small increase in the average area planted per grower, and a rising yield trend. However, by far the most important factor in explaining the increase in output has been the growth in grower numbers.

Data on the contributions from the various rural progress societies indicate uneven participation within the subdistrict. For most of the early period, the Tamaui society area was the most important source, supplying 59 per cent in 1957-58 against Mitpim's 22 per cent and Supari's 22 per cent. In 1962-63 Mitpim had become inactive and Tamaui's share had risen to 80 per cent. In 1963-64 the Supari society producers provided the most (73 per cent) for the first time. Since then, the Supari society has continued as the largest contributor although, as Table 5.4 shows, Tamaui and Mitpim have almost equalled it in recent years. In Table 5.5 Supari producers are represented by the Albiges and Muhiang census division figures which show that for 1970, roughly 628 acres of an estimated total of 1,800 acres for the subdistrict were planted by Supari members. Table 5.5 also shows the high degree of geographical concentration of the industry. The 1,400 acres accounted for in 1970 by census divisions (i.e., excluding the Dreikikir area) were planted by only eighty-seven villages. Within villages the areas ranged from 1 to 140 acres. Grower numbers would follow this pattern fairly closely.

Table 5.5

Area and location of rice plantings, Maprik subdistrict, 1970

Census division	Rural progress society	Total area planted (acres)	Range of areas per village (acres)	No. of villages	No. of growers	Average area per grower (acres)
Maprik	Mitpim	166	6-52	9	136	1
Mamblep	Mitpim	66	2.5-15	9	123	1
Yamil	Mitpim	186	0.5-67	12	114	2
Muhiang	Supari	492	1-48	19	401	1
Albiges	Supari	137	0.5-18	18	259	1
Tamaui	Tamaui	20	5-20	4	n.a.	n.a.
Sepik Plains	Tamaui	267	12-140	8	n.a.	n.a.
Wora	Tamaui and Mitpim	76	1-21	8	n.a.	n.a.
n.a.	Dreikikir	400(est.)	n.a.	n.a.	n.a.	n.a.

Source: Based on records supplied by Sepik Producers' Co-operative Association, Bainyik, 1970.

A similar wide variation in participation was apparent within census divisions. In the Maprik census division, for example (Table 5.6), three villages contributed 111 of the 166 acres planted or 61 per cent, while some villages such as Maprik 1 and 2, Kalabu 1 and 2 and Cheragum displayed no active interest in the crop.

Table 5.6

Distribution of rice plantings by villages, Maprik census division, 1970

Village	Area planted (acres)
Yamikum	52
Balogwil	34
Neligum 1 and 2	25
Jame	14
Barangia	12
Loneim	11½
Kuminibus 1 and 2	9
Kinbangua	6
Imbia	2½
Maprik 1 and 2	-
Kalabu 1 and 2	-
Cheragum	-
Total	166

Source: based on records of Sepik Producers' Co-operative Association, Bainyik, 1970.

The trends in output, the uneven distribution of planting and production within the subdistrict, and the small scale of individual participation have been influenced by a number of factors including physical conditions, extension services, transport, processing and marketing difficulties, and returns to growers.

Physical conditions. Since rice was cultivated as a dry-land crop, its yield potential was limited and subject to considerable variation owing to climate. Yields may have averaged about one ton of paddy per acre, with considerable variation from year to year and between locations. Given favourable soil conditions, yields depended very heavily on rainfall incidence. The more favourable rainfall incidence from 1963-64 to 1968-69 (36 to 63 inches) than from 1960-61 to 1962-63 (26 to 34 inches) probably contributed to the higher output levels reached in the later years. Within the sub-district some of the hill areas (near Dreikikir) were favoured by higher average rainfall and had potentially higher average yields. Distribution of soils suitable for rice was uneven within the subdistrict: a shortage existed in some parts of the Maprik census division (in the Mitpim society area). Some villages in the Wosera have obtained good yields with continuous cropping of river flats where fertility was renewed by periodic flooding. Kunai grasslands, which predominated in this latter area, were on the other hand unsuitable for rice production and many villages had a large proportion of land

of this type. Where such land was used, low yields resulted (e.g., South Wosera). Villages which were short of land¹ (in relation to population) often retained the best land for food crops and consequently obtained low yields when they planted rice as a cash crop.

Overall, however, an average yield of one ton per acre under dry land conditions is high. This can largely be attributed to the pattern of land use. Generally, a rice garden was prepared on land freshly cleared of virgin bush or on land previously used for food gardens which had been allowed a substantial recuperative period (thirty years or more). Under these conditions the organic matter and nutrient content were high. It was uncommon to find growers using land only recently planted for food gardens.² Rather, food crops were frequently planted after rice.

Yields were also influenced by pests and diseases. In 1960 and 1961 smut had caused much damage to the crop while in 1961-62 brown sheath rot (Ophiobolus) ruined many fields.³ Rust, leaf miners, stem borers and caterpillars were additional field problems.

Poor farming techniques undoubtedly limited yields, particularly in the early years. One problem arose from a conflict between rice and yams - the main staple of the area - since both crops had similar planting times. This apparently led to neglect of the rice crop in some cases. For this reason, or sometimes because of ignorance, rice was planted out of season. Moreover, sites were sometimes unsuitable and were given minimum preparation and care; and inferior seed was chosen which was non-viable or produced a proportion of empty glumes. Growers often harvested their gardens in a single operation which reduced both yield and quality of the crop.

Extension services. The position of rice in the order of extension priorities fluctuated greatly. During the 1950s peanuts were emphasised more since they earned a higher cash return on labour. The market collapse of 1959-60 eliminated its competition with rice. Meanwhile from 1956 most available extension manpower was devoted to promoting coffee plantings,

¹ Central North Wosera villages were mentioned by agricultural officers in this connection. See later discussion of land shortage in relation to coffee tree planting.

² This was encountered in the most densely populated North Wosera census division.

³ DASF annual report for 1961-62, Maprik, 1962.

at least until 1963-64. Nevertheless, some village patrol time was devoted to promoting rice as a second crop after 1959-60. Technical instruction was offered by DASF at Bainyik where villagers attending the farmer training course were trained in cash crop husbandry. This generalised programme was replaced in 1963 by a specialised course on rice.

The major extension effort for rice, however, was made through the rural progress societies. Through their leaders, members were encouraged to plant areas of the crop as a community venture, at least in the preparation and establishment phases. Advice on appropriate cultural practices was similarly given to each society group.

In the early years extension guidance was not sufficiently concentrated to ensure that recommended practices were implemented. Furthermore, a number of rice varieties had not been rigorously tested prior to their release to villagers. Consequently there was a lack of uniformity in size, shape and colour of grain which led to milling difficulties. In particular, 'red' rice, which was visually unpopular with local consumers, made its appearance. It was possible to remove the red skin by polishing but its separation from the rest before milling was not an economic proposition. On the credit side, the variety El (Blue Bonnet) proved its superiority locally and over the years has been widely though not universally adopted.

In 1963-64 a determined effort was made to rejuvenate the rural progress societies which had suffered financial losses from peanuts some years earlier. Members were encouraged to plant rice as a second crop, particularly those who had planted coffee and were waiting for it to come into bearing. Since much coffee planting had taken place by 1964, villagers may have been persuaded to switch labour resources, freed from coffee work, to rice. This may partially explain the significant rise in output that year and in sales value as shown in Table 5.4.

Further extension emphasis was placed on rice in 1965 when the International Coffee Agreement prevented further promotion of village plantings. Coffee extension work turned to the improvement of field and processing techniques in existing coffee gardens. From this time on, much greater stress was given to the expansion of rice acreage.

The influence of extension effort on output was strong. The lack of growth or stagnation in the industry coincided with its years of low priority in the extension programme. Conversely, the upsurge in output of rice occurred after a

higher priority and more resources had been allocated to it, particularly in 1964-65 and 1965-66 (Table 5.3).

However, it was not simply the quantity of extension resources devoted to the crop but the nature of the extension effort. As indicated, the primary effort was made through the rural progress societies and their leaders who were enthusiastic about the crop and encouraged society members to plant. In the case of the Supari society, an influential leader supported the crop and he induced numbers to participate in rice growing after 1964. The resulting increase in output contributed a large proportion of the growth in total output from 1964 onwards in the subdistrict. In 1964-65 the Supari society contributed 53 per cent of total output, and even in 1970 its acreage was roughly one-third of the total. By contrast, the relative inactivity of rice in both Tamaui and Mitpim societies prior to 1965 was at least partly explained by an absence of strong leadership.¹ The greater extension effort devoted to rice from 1965 probably obscured this factor.

In 1970 plans were in hand for experimental trials with new high-yielding varieties and for standardisation of varieties throughout the subdistrict once a superior variety has been found.

Transport and processing. Initially DASF took full responsibility for transporting, processing and marketing the rice. Growers harvested the crop, threshed it by hand, bagged and stored it in the villages, from where it was picked up by government vehicles. The paddy was then winnowed, hulled, bagged and sold locally in Maprik by DASF.

During the early 1950s the poorly developed road network and the restriction of transport and marketing facilities to the immediate vicinity of Maprik itself meant that only a limited number of villages around Maprik were encouraged to grow rice.² Hence output was restricted in the early years.

During this period DASF attempted to hand over some of its responsibilities to the growers themselves³ by forming four rural progress societies. It was intended that each society would purchase paddy from growers, mill it and sell it to DASF

¹ This was frequently noted by extension officers given the task of re-activating these two societies.

² DASF annual report, 1951.

³ This may well have been the result of severe shortages of staff and finance at that time, though it has always been policy to withdraw from active provision of these processing, transport and marketing services as early as is practicable.

for marketing. This policy involved the encouragement of decentralised milling with processing facilities for each society, and the establishment of buying/storage points in each society's area, at which society officers would purchase paddy on designated days.

The first mill was installed for the Supari society in 1954. Two types of mill were tried. The first (an Anco) produced a white rice but with a high proportion of broken grain and only a 50 per cent recovery from paddy. The second (Cecoco) mill produced a whole brown rice and was considered economically preferable provided growers could be persuaded to offer a cleaner product which did not require winnowing.¹

The societies, however, lacked the skilled manpower to maintain and repair the mills, which greatly reduced efficiency, increased costs of operation and meant a continued reliance upon DASF. Considerable quantities were also 'spirited' away from the mills. In addition, the absence of transport facilities and services between villages and mills meant long carrying times for the growers and low returns on labour, and discouraged many from making the effort.

In 1957 DASF resumed centralised milling again at Bainyik. The societies purchased rice from growers and transported it to Bainyik. DASF then milled and marketed the rice.

The failure of decentralised (society) milling was a source of considerable disappointment to the growers² and interest in the crop declined. Another problem was that the brown rice produced by the Cecoco mill, although attractive nutritionally, was not considered palatable by local consumers and the need to improve the quality of the final product contributed to the decision to centralise milling. The different varieties of rice grown presented difficulties in processing, and prevented a clean product after hulling which further reduced its palatability.

The palatability problem was largely overcome with the addition to the milling equipment of a polisher. The gain variation had not been eliminated up to 1970 but, as mentioned earlier, the current extension programme includes plans for such standardisation.

¹ With winnowing, the Cecoco process was fractionally more expensive. Without it, the Cecoco was 11¢ per lb or 13 per cent cheaper per ton of milled rice.

² DASF annual report, 1956, Maprik. There was, apparently, considerable prestige in having a locally situated mill.

Growers became dissatisfied with the purchasing and transport services provided by the rural progress societies after 1957 since they purchased at only a few purchasing points and set their own buying times. As a result a considerable volume of rice would accumulate in villages; poor storage conditions led to losses through deterioration and grower interest declined. Sometimes societies could not make cash-in-hand payments to growers at time of sale owing to a shortage of funds. As part of a general effort to revive the societies in 1963-64 DASF established more buying points with storage facilities at each. The number and capacity of vehicles expanded and improved road facilities gave them greater access, although the lack of all-weather roads in some areas (e.g. North Wosera) continued to pose problems in the wet season. Storage facilities in the villages were also upgraded and in 1966 hand-threshers were distributed to villages. Previously threshing was carried out by a variety of time-consuming and inefficient methods, including beating bags full of paddy with sticks, etc., and even separating the paddy by rubbing it between hands.

Data on the structure of costs between grower and the mill were scarce for early years, but can be roughly indicated. Growers were paid a constant 3d (2.5¢) per lb before decimal conversion in 1965. After the currency changeover they were paid 3¢ per lb. The societies were paid 5d per lb (4¢) by DASF until after currency conversion. This more than covered their operating costs of transport, drying and winnowing the paddy and of administration, and allowed them a surplus which was used to recoup losses accumulated up to that time, principally from peanuts. In 1969 the Sepik Producers' Co-operative Association took over the collection, transportation and sale of the crop from the societies (the latter became its members) and continued to sell the paddy to DASF at Bainyik. A 1970 assessment (Emmery and Leentjes 1970:6-10)¹ estimated costs for the association at varying quantities of paddy traded (1,000 to 2,500 tons) and found a range of from 0.6¢ to 0.8¢ per lb which was comfortably below the 1¢ per lb difference between the price paid to the grower and that received at the mill. If output continues to expand, the association may be able to reduce unit costs further, as projected in the assessment by Emmery and Leentjes.

Milling costs were high, owing to the small scale of operations. They varied greatly over the period, primarily because

¹ A detailed cost breakdown is given in this study.

of the problems of adjusting the scale of mill operations to the changing supply of paddy. Table 5.7 shows milling and sales costs for 1966 to have been about 1.25¢ a lb.

Table 5.7
Milling and sales costs of rice, Maprik, 1966

Item	Costs (per cent)
Labour costs	35
Fuel and oil	23
Cost of bags	18
Depreciation - machinery	11
- buildings	4
Tractor, operating costs	4
Machinery maintenance	3
Sales clerk, wages	1
Total	99

Source: Based on data supplied by DASF, Bainyik, 1966.

DASF purchased the paddy for 4¢ per lb.¹ At that time a 62 per cent recovery was achieved in the mill which added 1.52¢ per lb of milled rice. With the milling and sales cost of 1.25¢ a lb, cost price at the sales point was 6.8¢ a lb, a near 70 per cent increase on the price paid to the societies. The rate of recovery was not high and one reason for this lay with the growers and societies. Paddy delivered to the mill had a high moisture content and was poorly cleaned so that DASF was actually paying a higher price. The state of the paddy also meant that the mill operated at well below capacity which again raised costs. More recently, cleaner paddy has been obtained from the societies, though up to 1970 the moisture problem had not been overcome.

Milling costs prior to 1962-63 were probably higher since paddy availability was well below mill capacity. After 1965 the problem was the reverse. The somewhat unexpected growth of planted area and output was not accompanied by a parallel increase in mill facilities. Continuous use of existing machinery prevented adequate maintenance and breakdowns occurred. For this reason and because in any case paddy supplies exceeded possible mill throughput, stocks accumulated which involved further costs. This situation precipitated a review of the whole processing operation which could result in the installation of new facilities with a greatly expanded capacity.

Performance tests carried out on the existing milling unit in 1970 (Emmery and Leentjes 1970:11-19) gave a milling cost of 1.71¢ a lb for brown rice and 1.93¢ a lb for white rice.

¹ All calculations prior to currency changeover have been converted to decimals here.

For brown rice the throughput was 60 per cent of the mill's capacity and the recovery rate was 64 per cent. For white rice the figures were 53.7 per cent and 62 per cent respectively. Cost of production (ex-mill) was estimated at 7.05¢ a lb for brown and 7.9¢ a lb for white rice.

These costs become most significant when the question of the viability of the rice industry is considered. And it is when the marketing (and associated transportation) situation is taken into account that this viability question becomes an important issue.

Transport and marketing. DASF initially marketed all milled rice in Maprik itself. In 1964-65, 61 per cent was sold to the Administration and 29 per cent to private enterprise. Local demand far exceeded local supply so rice was imported from Australia. As indicated above, DASF delivered rice to Maprik market for 6.8¢ a lb in 1966. Imported rice air-freighted to Maprik cost about 9.5¢ a lb¹ so the local product had a distinct price advantage (2.7¢), even with its lower quality and palatability.

From 1965 output substantially exceeded local Maprik demand and new markets were sought. Other outlying subdistricts were exploited where, owing to high transport costs for imported rice, Maprik rice retained a competitive advantage. These outlets were not, however, large enough to absorb the rapidly growing production.

The nearest substantial market was Wewak. Until 1968 the costs of airfreighting to Wewak more than absorbed the price advantage enjoyed locally in Maprik, even though the backloading charges were substantially lower than those for the forward journey from Wewak. In 1968 the completion of a road link between the two towns reduced transport costs Wewak to Maprik to 0.5¢ a lb from the coast and to 0.3¢ a lb in the reverse direction (Emmery and Leentjes 1970:appendix 9). This meant a substantially reduced price advantage for local over imported rice in Maprik (for brown rice the wholesale prices were 6.8¢ and 8.8¢ a lb respectively) though the differential (2.0¢) still strongly favoured the local product.

It also opened up the possibility of a wider market for Maprik rice, under competitive conditions in Wewak. In 1970 local (brown) rice could be landed in Wewak for 7.3¢ a lb

¹ The only alternative route from Wewak, via the Sepik River to Pagui, from where it could be transhipped by truck to Maprik. This was not considered a cheaper alternative at the time.

(0.3¢ transport and an apparent price increase of 0.2¢) and 8.2¢ a lb (white) while the equivalent wholesale prices of Australian rice were 8.3¢ a lb and 8.9¢ a lb. Thus, in the absence of any quality differential, Maprik rice could compete. However, the local product was of considerably lower quality. Emmery and Leentjes (1970:22) claimed a price differential of a minimum of 1¢ a lb was needed to counteract this, in which case Maprik brown could still compete but not Maprik white.¹

Although available data make a precise determination of the costs of local rice in Maprik and Wewak difficult, the conclusion can be drawn that the expanded Maprik rice industry was in delicate balance in 1970. It required the Wewak market to absorb its growing output but was only partially competitive on it. To the extent that white rice was sold below 8.0¢ a lb on this market, a subsidy was, and would continue to be, involved.

Short of a subsidy, several possibilities were open to the Administration. First, the price to the grower could be reduced. Second, the price to the Sepik Producers' Co-operative Association at the mill could be lowered. Third, the costs of milling could be reduced and fourth, transport costs could be lowered. These choices will be considered below, in concluding remarks on the future of the rice industry, following a discussion of the cash returns to growers from rice.

Returns to growers. Precise data were not available on labour requirements for rice but rough approximations were constructed from discussions with agricultural officers, household interviews and direct observations.

With an average yield of one ton per acre and a price of 3¢ per lb, average gross cash income per acre would have amounted to about \$67. On the basis of labour inputs estimated above, the average cash return per man-hour in rice would have ranged between 47¢ and 67¢ per man-day.² A return

¹ There appears to be some doubt remaining on prices using their figures. Our calculations based on them suggest the price ex-mill of local brown rice for 1970 in Maprik was 7.2¢ per lb and of Australian 8.8¢ per lb, thus favouring the local product by 1.6¢ per lb. In Wewak the equivalent figures were 7.5¢ and 8.3¢ per lb, a margin of less than 1¢ per lb. If correct, this would reinforce our conclusions following from this.

² Emmery and Leentjes estimated a range of from 52 to 65¢ per man-day on the basis of available Papua New Guinea and overseas data. Labour inputs were similar to the above except that no allowance for weeding was included. Both sets of estimates are rough and a more detailed examination is warranted.

Table 5.8

Task	Family labour*	
	Total man-days per acre	Total man-hours per acre**
Timber felling	8-12	40-60
Stacking and burning	12-16	60-80
Fencing	16-20	80-100
Clearing and planting	16-20	80-100
Weeding***	0-18	0-90
Harvesting	16-20	80-100
Carrying to village #	2-4	10-20
Drying and threshing #	20-22	100-110
Cleaning and bagging	8	40
Carrying to sales point #	2-4	10-20
Total	100-144	500-720

* Husband and wife work together on some tasks and times are combined. Group work has been translated to household equivalent.

** Assumes a five-hour working day for both husband and wife.

*** Assumes a range of from nil to three weeding.

Varies greatly - conservative range used here. This has narrowed considerably since 1964.

Assumes method is beating the paddy in bags with sticks.

of this absolute level was probably a strong factor in limiting both the overall number of individuals who were prepared to grow the crop in the subdistrict and the areas they planted. A number of survey informants tried and rejected rice because of disappointment with the cash returns; some switched to other cash crops while some simply preferred customary leisure activities.

Rice compared unfavourably with other economic opportunities. Estimated average cash returns to labour from coffee were substantially higher and hence this crop was more popular. It was particularly notable in 1970 that coffee was the preferred crop where any significant carrying time was involved for the grower. Rice was grown only within a short distance of established storage houses. This is understandable since it is clear that, particularly prior to threshing, paddy has a low value to weight ratio, and distance would substantially increase transport labour and would reduce cash returns per unit of labour.

Nevertheless, both crops were grown in villages well served with storage and transport facilities. Indeed, as indicated in Chapter 6, some individuals grew both crops, while some preferred rice to coffee. In some instances the reasons may have been non-economic, such as pressure from local leaders. Some people may have preferred rice to coffee as the cultivation cycle for rice was in many ways similar to that of customary food crops. Some growers planted food crops after rice which in effect reduced labour inputs for food gardening and may have made rice more attractive. Some may have only had land suitable for rice.

It was also interesting to compare rice planting activity with gold mining. The latter was virtually confined to the Maprik census division which comprised a large part of the area served by the Mitpim rural progress society. An appreciation of village involvement can be gained from data on the location of licensees (Table 5.9). Gold mining was carried out under licence, and normally each licensee recruited a gang of workers to assist him. In 1963-64 gold was sold to the Maprik subtreasury at more than \$27 an ounce; most licensees were from Kuminibus 1 and 2 and Kalabu. In 1969-70 gold output had risen to over \$100,000 with activity still largely centred on the same villages. When this is compared with the location of rice growing in the Maprik census division (Table 5.6), an inverse relationship is suggested, with very little interest in rice within the two key mining villages.

Table 5.9

Gold mining in the Maprik census division, 1963-64

Village-	No. of licensees	Total output (nearest oz)	Total value	Average output per licensee (nearest oz)	Average income per licensee*
Kuminibus 1 and 2	25	123	3,352	5	134
Kalabu 1 and 2	10	66	1,798	7	180
Loneim	7	18	490	3	70
Barangia	3	11	300	4	100
Neligum	2	9	246	5	123
lmbia	3	8	218	3	73
Yamikum	1	3	82	3	82
Total	51	238	6,486	5	12

* Before payment was made to labourers.

Source: Maprik subtreasury, 1964.

The inactivity of the Mitpim society in the early 1960s probably reflected the availability of mining as an alternative enterprise. Furthermore, the revival of this society coincided with a 20 per cent rise in the price of rice from 2.5¢ to 3¢ a lb following decimal conversion.¹

It seems likely that this increase - combined with the provision of rice storage houses locally, the improvement of transport and marketing services of the rural progress societies, and the more energetic extension campaign waged through the societies and their leaders - was principally responsible for the continued growth of interest in the crop after 1965.

¹ In 1970 licensees found it difficult to recruit labourers within the census division so many were recruited from the less economically favoured Wosera area.

Concluding remarks. As mentioned, the rice industry was in delicate balance due to the necessity of becoming more competitive to enter the wider market of Wewak. The prospects for increased rice output were also in fine balance. First, cash returns to labour were not high either absolutely or relatively. Second, the history of the rice (and peanut) industry suggests that growers are sensitive to price changes. Any attempt to improve the industry's competitive ability by significantly reducing the price to the grower would adversely affect the industry. Output would fall, probably to the point where penetration of the Wewak market would be unnecessary.

An attempt should rather be made to increase efficiency and lower costs in the intermediate steps between the grower and the market. It may be possible for the Sepik Producers' Co-operative Association to absorb higher costs or accept a lower price at the mill. Emmery and Leentjes noted in 1970 that the association's costs were more than covered by the 1c a lb margin received. In view of this, the association might well be expected to present paddy which was cleaner and had a lower moisture content, or alternatively to vary the price to the association according to moisture content. This would increase the recovery rate from milling, reduce these costs and permit marketing at lower prices.

A second way would be to standardise varieties grown. The choice of a single best variety and its acceptance by growers would lead to a considerable improvement in the quality of the milled product (less broken grain, improved appearance, more satisfactory cooking performance, etc.). This could reduce the price margin necessary to ensure the sale of local rice. Plans are now in hand for conducting variety trials with a view to selecting the best performer and replacing all seed stocks with those of the chosen variety. This would be a difficult task, but one which could be achieved within a few years given adequate attention and organisation.

A third and most important way would be to reduce milling costs with larger and more efficient milling facilities. As noted, until 1970 milling machinery was small scale and, since 1966, badly overworked. Milling costs were consequently high. With the continued growth of output, however, the installation of a more substantial mill unit could mean a significant reduction in processing costs and a more competitive price on the market. This possibility was also being examined in 1970 and probably is the best means of improving the industry's competitive position. However, such economies of scale in processing require at least, and probably more than, the 1970 output level. This is a further strong argument against any price reduction to the grower which would threaten output levels.

Implementation of these measures will not necessarily secure a certain market for this industry in the long term. World prices for rice could fall with rising productivity in, and competition from, exporting countries. Against this, however, it may well be possible to raise productivity locally, particularly with higher-yielding strains. In the short run, there appear to be good prospects for lowering costs to a point where exploitation of the Wewak market will be economic. This market is large enough to absorb output increases from Maprik for some years to come.

Coffee

Coffee was introduced to the Maprik subdistrict in 1952 when some Arabica beans were sent to the agricultural station at Bainyik. This variety proved suitable only for the limited areas above 1,500 ft. Preference was subsequently given to the Robusta variety which was suited to low altitudes. Experimental work in the early 1950s was followed by an extension programme after about 1956. DASF initially maintained control over planting through its monopoly of the supply of seed.

The first growers were from Kinbangua and Jame villages in Maprik census division. They planted in 1957 and a few other growers followed soon after in Cheragum and Loneim villages in the same census division.¹ The expansion of plantings in 1958 was delayed for a year in Maprik census division villages, initially for lack of seedlings, and subsequently because of traditional singsing ceremonies. Seed was used from the first garden in bearing and in 1960 the difficulties of obtaining planting material for village nurseries were overcome. By 1960 there were 250 gardens planted. Earliest production figures (Table 5.10) indicate the locational concentration and limited scale of early plantings. In 1960 production was approximately one ton and rose to 1½ tons in 1961.

Table 5.10

Early coffee production in the Maprik subdistrict, 1960-61

Village	Census division	1960		1961	
		Production (1b parchment)	Value (\$)	Production (1b parchment)	Value (\$)
Jame	Maprik	1,666	98	199	16
Kinbangua	Maprik	883	32	1,124	94
Bongiora	Mamblep	72	6	120	10
Supari	Albiges	-	-	904	76
Albinama	Bumbita-Muhiang	-	-	651	54
Yamikum	Maprik	-	-	104	8
Cheragum	Maprik	-	-	66	6
Loneim	Maprik	-	-	44	4
Total		2,121	136	3,212	268

Source: Compiled from DASF purchase docket books, Maprik.

¹ Two of these first growers were interviewed as case studies.

By June 1964 output had not risen greatly, but substantial new plantings had taken place. As Table 5.11 shows, a large majority of the coffee trees in the Sepik District at that time had been planted in the Maprik subdistrict. Only a small proportion of these had been established by 1962 (Table 5.12), and it was not until 1962-63 that a fast overall rate of planting began. This took place most unevenly in the sub-district.

Maprik census division (Fig. 5.2) was one of the first to commence planting but has recently fallen behind in importance;

Table 5.11

Coffee tree planting and output in the Sepik District, June 1964

Subdistrict	Coffee trees				Production (tons parchment)
	Total no.	Total immature	Planted 1963-64	No. in village nurseries	
Maprik	413,636	315,097	267,503	218,335	5.3
Wewak	183,057	128,360	104,214	64,050	5.7
Ambunti	31,531	30,531	21,795	16,400	*
Lumi	13,289	12,089	n.a.	n.a.	*
Angoram	9,492	9,492	4,989	7,446	0
Aitape	8,729	1,600	1,000	6,964	*
Vanimo	831	831	0	500	0
District total	660,565	498,000	399,501	313,695	11.0

* Negligible

Source: DASF annual report for the Sepik District, Wewak, 1964.

Table 5.12

Coffee tree planting by census divisions in the Maprik subdistrict, 1961-62 to 1968

Census division	Total trees			Estimated area planted 1968 (acres)*
	1962	1964	1968	
North Wosera	3,607	54,466	207,395	415
Urat	335	60,004	160,011	320
Albiges	616	36,473	133,345	267
Muhang	3,898	45,365**	128,499	257
Gawanga	0	20,079	103,125	206
Yangoru	n.a.	n.a.	95,672	191
Wam	1,284	66,321	86,230	172
Wora	626	13,582	82,248	164
South Wosera	1,048	8,202	76,603	153
Maprik	35,313***	34,796	60,287	121
Bumbita	**	**	65,743	131
Nindepolyte	n.a.	n.a.	38,232	76
Kaboibus	n.a.	n.a.	35,929	72
Mamblap	424	6,322	34,494	69
Yamil	***	18,476	33,757	67
Kumun	n.a.	n.a.	29,489	59
Tamaui	n.a.	16,822	26,871	54
Kombio	n.a.	1,645	26,761	54
Wingel	n.a.	n.a.	26,399	53
Urim	n.a.	3,605	23,142	46
Sepik	n.a.	n.a.	12,968	26
Sepik Plains)				
Buruni kunai)	0	492	12,460	25
Total			1,499,660	2,998

* Assumes recommended spacing with 500 trees per acre.

** Muhang and Bumbita combined.

*** Maprik and Yamil combined.

Source: DASF annual reports, Maprik.

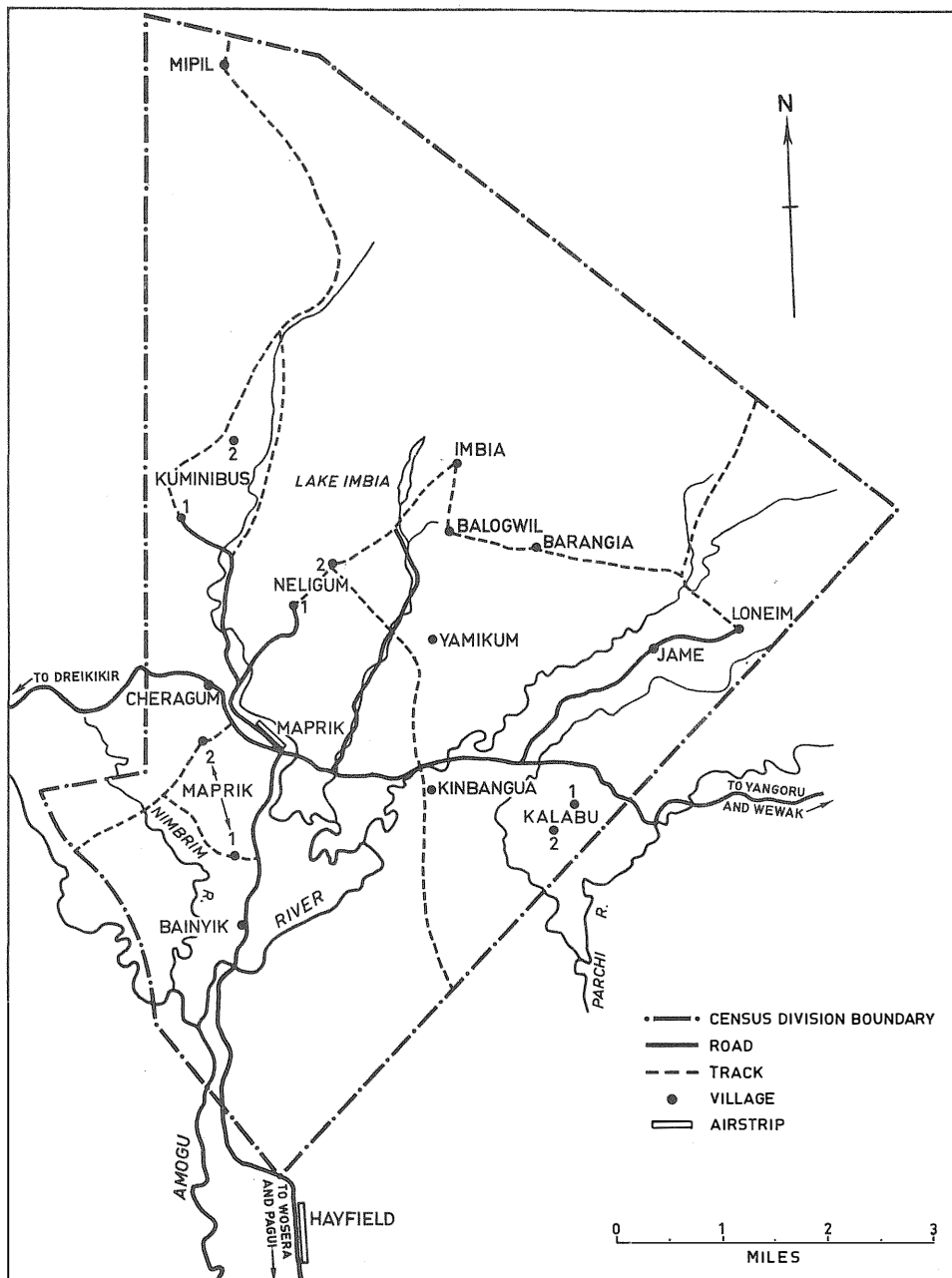


Fig. 5.2. Maprik census division

others, such as North Wosera, were slower to start but have performed more impressively since. In 1968 their respective total areas planted were about 121 and 415 acres. These two census divisions are examined more fully below. In acreage terms, the growth of the coffee industry was very limited, as Table 5.12 shows. Although the rate of planting has varied within the subdistrict, overall it has continued throughout the 1960s.

Maprik census division. Table 5.13 shows that by 1969 about 140 acres of coffee had been planted in the Maprik census division, an average area of about 8 acres per village. The most intensive planting activity took place from 1961 to 1964. The average rate of establishment for the entire census division was a mere 17.5 acres annually between 1961 and 1969.

Table 5.13

Coffee tree plantings by villages in Maprik census division, 1961-69

Villages	Total trees							Estimated area planted 1961-62 to 1969* (acres)	Average annual rate 1961-62 to 1969 (ac./village)
	1961	1961-62	1962-63	1963-64	1964-66	1966-69	1969		
Yamikum	3,672	2,090	595	0	2,974	2,096	11,427	22.8	2.9
Kuminibus 2	290	-	840	-	1,324	4,381	3,653	10,488	20.1
Kuminibus 1	107	-	1,392	-	1,131	1,211	2,036	5,877	11.8
Kinbangua	1,260	974	0	562	1,053	682	4,531	9.1	1.1
Kalabu 2	881	456	0	0	140	2,609	4,086	8.2	1.0
Kalabu 1	46	155	398	0	761	2,437	3,797	7.6	0.9
Bainyik	533	33	1,369	1,215	412	226	3,788	7.6	0.9
Jame	869	115	0	705	957	1,084	3,730	7.4	0.9
Maprik 2	0	164	0	634	1,090	1,666	3,554	7.1	0.9
Balogwil	1,633	224	304	(-)100	219	1,128	3,408	6.8	0.9
Loneim	1,236	1,026	655	506	(-)677**	222	2,968	5.9	0.7
Neligum 1	690	-	492	-	1,002	(-) 22**	416	2,578	5.2
Maprik 1	6	48	0	1,432	436	547	2,469	4.9	0.6
Neligum 2	276	-	585	-	529	541	358	2,289	4.2
Imbia	270	427	164	0	445	628	1,934	3.9	0.5
Barangia	0	0	242	760	208	569	1,779	3.6	0.5
Cheragum	571	-	372	-	789	(-)550**	393	1,575	3.6
Total	12,340	13,120	10,489	13,579	20,750	70,278	139.8	17.0	

* Assuming recommended spacing and 500 trees per acre.

** Losses may have been actual or due to an incorrect count.

Source: DASF tree counts 1961 to 1969, Maprik.

Villages varied in the extent and timing of planting. A number, such as Kuminibus 1 and 2, Maprik 2 and Barangia, were slow to commence, though some like Kuminibus 1 and 2 led in terms of total tree numbers by 1969. Yamikum, which commenced early, maintained a strong level of activity throughout the period in contrast to Balogwil and Loneim villages which were early leaders but did not sustain their performance. Although the first plantings took place in Jame and Kinbangua, these villages were not particularly outstanding in terms of total tree numbers or in terms of the indicators given below. The range of areas per village, from 3.6 to 22.8 acres, again shows the limited extent of participation in planting within the

census division. When village performances over the period are converted to an annual basis, a majority of villages are shown to have planted an average of less than one acre a year between 1961 and 1969.

In 1964 less than one-third of the 1,261 adult males in the census division had planted coffee.¹ However, the proportions varied greatly between villages (Table 5.14). In some, such as Balogwil, the proportion of growers had almost reached two-thirds and five had registered more than 50 per cent. Other villages such as Kalabu 1 and 2, Jame and Maprik 2 had displayed little interest in the crop up to that time. In terms of the average scale of participation per grower, there was remarkably little variation between villages, with most recording one-fifth of an acre of trees.

Table 5.14

Participation in coffee planting in villages of Maprik census division, 1964 and 1969

Village	No. adult males		No. of growers		Growers among adult males (per cent)		Average no. of trees per grower		Estimated average area per grower (acres)	
	1965*	1969	1964	1969	1964	1969	1964	1969	1964**	1969**
Balogwil	36	48	23	32	64	67	90	106	0.2	0.2
Yamikum	118	150	69	87	58	58	92	131	0.2	0.2
Neligum 1)	128	138	32)	79	45	57	68)	62	0.1	0.1
Neligum 2)			25)				56)		0.1	
Kuminibus 2	108	105	23	58	21	55	107	118	0.2	0.2
Bainyik	51	58	25	31	50	53	126	121	0.2	0.2
Imbia	25	46	13	23	52	50	66	84	0.1	0.1
Barangia	23	28	8	12	35	43	125	148	0.2	0.2
Kuminibus 1	169	203	44	87	26	43	60	68	0.1	0.1
Cheragum	23	42	15	17	65	40	113	93	0.2	0.2
Maprik 2	67	89	7	35	10	39	114	102	0.2	0.2
Kinbangua	78	107	20	38	26	35	140	119	0.2	0.2
Kalabu 2	77	96	9	28	12	29	149	146	0.2	0.2
Maprik 1	88	104	34	39	40	28	44	85	0.1	0.1
Kalabu 1	123	142	7	38	6	26	86	100	0.1	0.2
Loneim	62	73	21	18	32	25	163	165	0.3	0.3
Jame	85	105	11	22	13	21	154	170	0.3	0.3
Total census division	1,261	1,534	386	644	31	41	93	105	0.2	0.2

* No census was undertaken in 1964. The proportion of adult males to growers (column 6) is thus probably slightly underestimated.

** Assumes planting at recommended spacing with 500 trees per acre.

Sources: census conducted by DDA 1965 and 1969, Bainyik (population). various coffee censuses conducted by DASF, Maprik (trees and growers).

¹ As in other areas, only one grower was recorded as an owner of a coffee garden. Cases were encountered of partnerships and group ownership and to this extent participation is underestimated. Although the prevalence of joint ownership could not be measured fully, the limited evidence suggested it was not particularly common. A test was made in two villages of the frequency of partnerships. In Kalabu 1 only one grower had a 'partner'. In Loneim 5 owners had partners, sometimes more than 1. If adjusted for this factor, Loneim's proportion of growers would be raised to 50 per cent, while that of Kalabu 1 would remain virtually unaltered.

By 1969 participation, although still limited in extent, had changed significantly in pattern. Tree numbers increased substantially between 1964 and 1969, due almost solely to an increase in grower numbers. The proportion of growers among adult males rose appreciably to 41 per cent. Most villages recorded an absolute increase in grower numbers and in their proportion among adult males.¹ However, villages active before 1964 had only a slight increase in planting. But villages which had been disinterested in 1964, such as Kuminibus 1 and 2, Kalabu 1 and 2 and Maprik 2, showed substantial increases in the proportion of growers among adult males; these greatly reduced the contrast in performance between them and leading villages. By 1969 no village had less than one-fifth of its adult males as growers, although the number with more than half had risen only from five to six.

There was no noticeable relationship between village participation in terms of the proportion of growers and of average trees per grower. Moreover, there was no significant change in the scale of individual participation during the five years, as shown by the virtually identical village averages for areas and trees per grower for 1964 and 1969. Fig. 5.3 shows that over half of all growers in the census division had one-fifth of an acre of coffee trees or less, only four per cent had three-fifths of an acre or more and only one per cent had an acre or more. The biggest grower recorded in 1969 had 1,095 trees or about two acres.

In 1964 about 39 per cent of trees were bearing and produced about 6 tons of parchment (Table 5.15), with an average harvested yield of only 1 lb a tree. This yield can be partly attributed to the youth of the trees in bearing and partly to DASF's rejection of some berries as being of inferior quality. It was also due in large part to the failure of growers to harvest all the available berries. At the average price of 10¢ a lb which prevailed in 1964, average cash returns per bearing garden were approximately \$8.

¹ An examination of Table 5.12 reveals some anomalies in performance. Four villages showed a fall in the proportion of growers from 1964 to 1969. While this is possible, it is more likely that this arose for statistical reasons. Loneim and Maprik 1 recorded few growers in 1969 which could have been due to counting errors. Yamikum, Imbia, Cheragum all showed an extremely large increase in numbers of adult males over four years which suggests one of the two population counts may have been inaccurate.

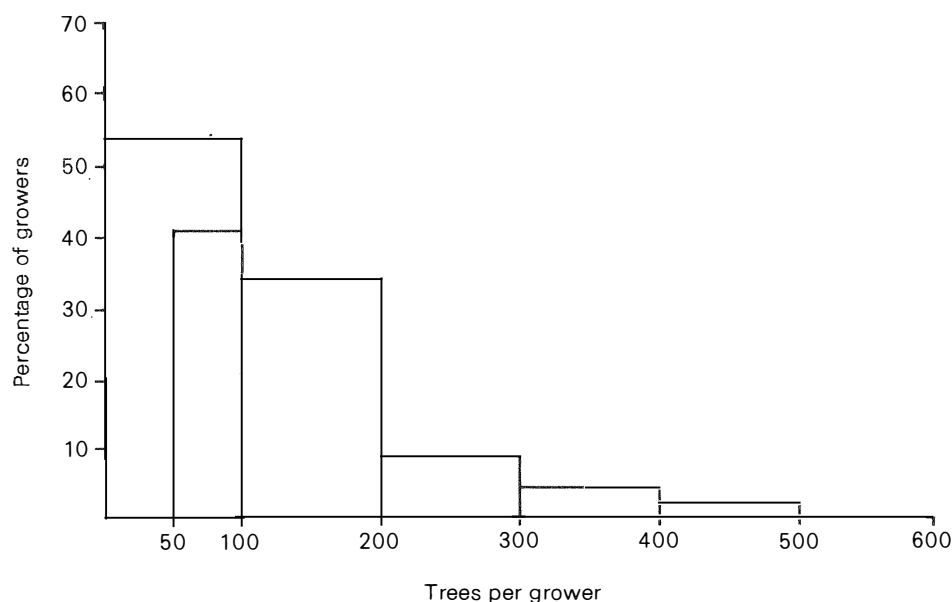


Fig. 5.3. Distribution of coffee trees per grower, Maprik census division, 1964.

Table 5.15

Village coffee production in Maprik census division, 1963-64

Village	No. of gardens		No. of trees, June 1964		Production (lb parchment)	Value (\$)	Average returns per bearing garden (\$)	Average harvested yield per bearing tree
	Total	Bearing	Total	Bearing				
Yamikum	89	78	6,357	5,433	5,577	558	7	1.0
Kinbangua	20	10	2,796	1,251	1,946	195	20	1.6
Loneim	21	10	4,423	1,194	1,727	173	13	0.9
Jame	11	3	1,689	637				
Balogwil	23	22	2,061	1,104	1,041	104	5	0.9
Bainyik	25	12	3,150	966	982	98	8	1.0
Cheragum	15	3	1,732	652	773	78	26	1.2
Neligum 1	32	15	2,184	571				
Neligum 2	25	7	1,390	245	696	70	3	0.9
Kuminibus 1	44	n.a.	2,630	200				
Kuminibus 2	23	n.a.	2,454	433	680	68	n.a.	1.1
Imbia	13	9	861	640	510	52	6	0.8
Kalabu 2	9	5	1,337	245	248	25	5	1.0
Maprik 1	34	1	1,486	30	5	-	-	-
Barangia	8	4	1,002	317	0	0	0	-
Maprik 2	7	0	798	0	0	0	0	-
Kalabu 1	7	6	599	138	0	0	0	-
Total	406	185*	36,949	14,056	14,185	1,421	8*	1.0

* Excludes Kuminibus 1 and 2

Source: Derived from produce purchase docketts and DASF annual report for Maprik subdistrict, 1963-64.

North Wosera census division. North Wosera (Fig. 5.4) was a larger census division than Maprik, with more than double the number of adult males, but had a similar participation in coffee growing.

By 1965 a total area of 170 acres had been planted and by 1969 this had doubled, with an average annual increase of

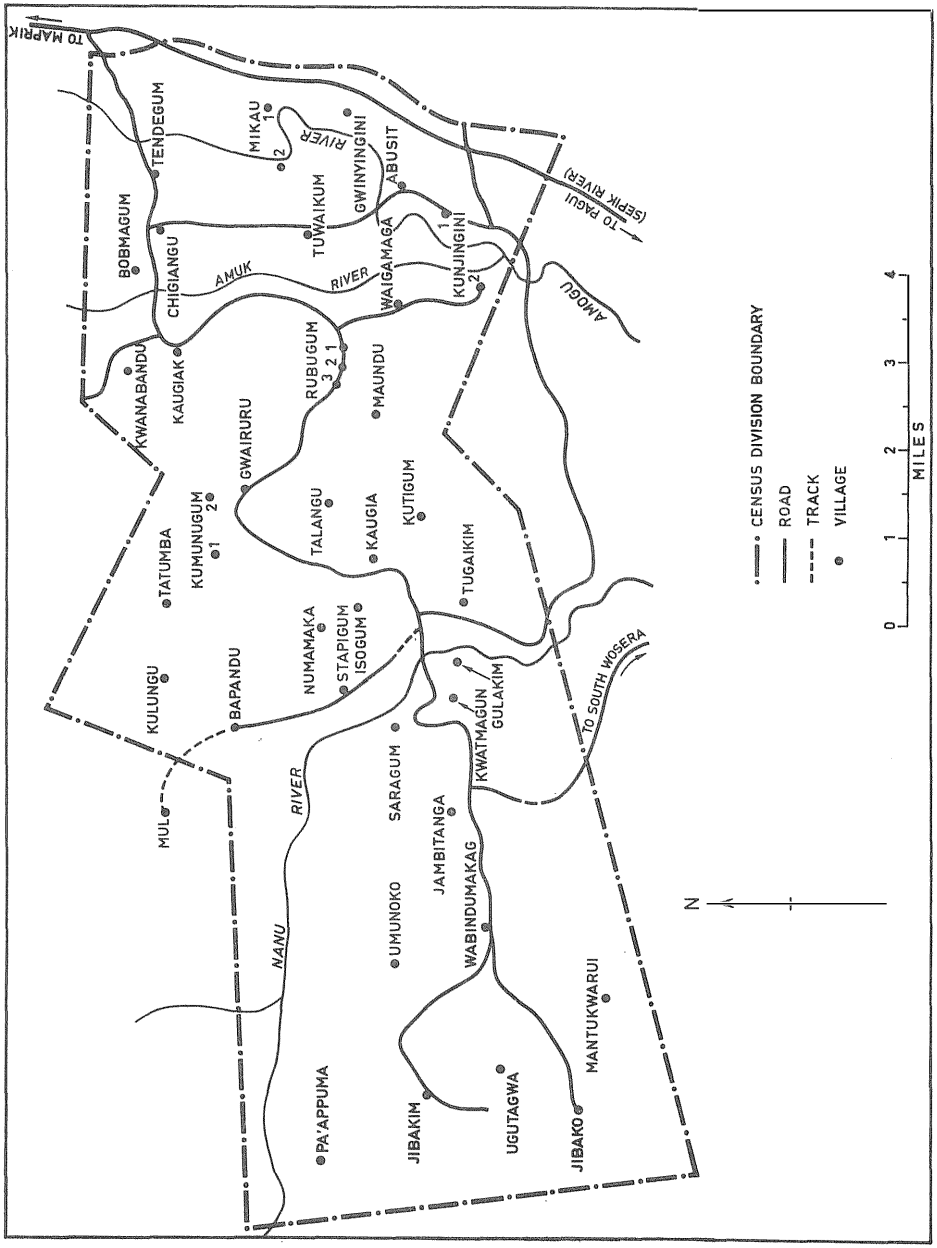


Fig. 5.4. North Wosera census division

about 43 acres (Table 5.16). Per village, however, the average increase was little more than one acre a year and village plantings ranged from 46 to 2 acres. Planting in individual villages between 1965 and 1969 similarly showed a range of from no increase to an average of more than 4 acres annually. Overall the expansion in tree numbers and areas for all villages up to 1969 can at best be described as modest.

In 1965 only about one-fifth of adult males had planted gardens (Table 5.17); in 1969 the proportion was little more than one-third. Again, though, there was notable variation in this respect between villages. The range in 1969, from 7 per cent to 88 per cent, was even greater than for the Maprik census division. Many villages showed fast increases between 1965 and 1969: Numamaka rose from 22 to 68 per cent, Gwinyingini

Table 5.16

Coffee tree planting by villages, North Wosera census division, 1965 and 1969

Village	Total trees		Estimated area*		Average annual increase in area, 1965-69 (nearest acre)	Average area per grower (ac.)	
	1965	1969	1965 (nearest acre)	1969 (nearest acre)		1965	1969
Wabindumakag	16,197	23,076	32	46	3.5	0.3	0.3
Ugutagwa	9,436	14,278	19	29	2.5	0.3	0.3
Kumunugum	2,523	10,987	5	22	4.3	0.2	0.2
Jambitanga	6,554	8,347	13	17	1.0	0.3	0.3
Numamaka	1,655	8,251	3	17	3.5	0.2	0.3
Jibakim	4,812	7,635	10	15	1.3	0.2	0.2
Umunoko	7,820	7,227	16	14	(-)0.5	0.2	0.2
Tugaikum 1 & 2	1,522	6,801	3	14	2.8	0.1	0.2
Isogum	1,433	6,587	3	13	2.5	0.4	0.4
Kwanabandu 1, 2 & 3	2,747	6,111	5	12	1.8	0.4	0.2
Rubugum 1, 2 & 3	1,421	5,189	3	10	1.8	0.3	0.4
Tatumba	1,087	4,444	2	9	1.8	0.1	0.2
Tuwaikim 1 & 2	1,366	4,251	3	9	1.5	0.2	0.2
Kunjingini 2	298	4,234	1			0.2	
Kunjingini 1	1,269	)	3	8	1.0	0.2	0.3
Jibako	3,007	4,132	6	8	0.5	0.2	0.2
Mantukwarui	2,109	4,022	4	8	1.0	0.2	0.3
Stapigum	1,919	3,942	4	8	1.0	0.2	0.3
Gwairuru	242	3,725	-	7	1.8	0.2	0.2
Abusit	1,383	3,625	3	7	1.0	0.2	0.2
Saragum	1,500	3,437	3	7	1.0	0.3	0.5
Bobmagum	648	3,017	1	6	1.3	0.2	0.2
Pa'appuma	2,019	2,843	4	6	0.5	0.3	0.3
Maundu 1 & 2	1,080	2,574	2	5	0.8	0.2	0.4
Waigamaga	1,951	2,475	4	5	0.3	0.4	0.3
Gwinyingini	-	2,351	-	5	1.3	-	0.2
Tendegum	776	2,183	2	4	0.5	0.2	0.2
Mikau	1,941	2,144	4	4	-	0.2	0.2
Kamge	125	2,052	-	4	1.0	0.1	0.2
Kwatmagun	841	1,960	2	4	0.5	0.1	0.1
Gulakim	364	1,773	1	3	0.5	0.1	0.2
Kulungu	2,063	1,707	4	3	(-)0.3	0.3	0.2
Kutigum	1,274	1,497	3	3	-	0.3	0.3
Chigiangu	152	1,331	-	3	0.8	0.3	0.3
Kaugiak	700	1,058	1	2	0.3	0.1	0.3
Talangu	328	879	1	2	0.3	0.2	0.3
Mul	134	n.a.	-	n.a.	n.a.	0.3	n.a.
Total census division	84,696	170,145	170	339	43	0.3	0.2

* Assumes recommended spacing with 500 trees an acre.

Source: DASF coffee censuses, Bainyik, 1965 and 1969.

from zero to 58 per cent and Chigiangu from 1 to 36 per cent. Almost all villages showed some increase¹ although for almost one-third of them it was small. Many villages still had only a marginal interest in the crop.

Table 5.17

Participation in coffee planting in villages of North Wosera census division, 1965 and 1969

	Adult males		No. of coffee growers		Growers to adult males (per cent)	
	1965	1969	1965	1969	1965	1969
Wabindumakag	146	199	97	175	66	88
Ugutagwa	101	131	62	94	61	72
Numamaka	64	90	14	61	22	68
Umunoko	105	132	64	86	61	65
Jibakim	78	105	45	65	58	62
Gwinyingini	47	40	-	23	-	58
Jambitanga	86	108	42	57	49	53
Tatumba	78	96	21	51	27	53
Tugaikim 1 & 2	151	170	21	83	14	49
Kumunugum	84	227	32	108	38	48
Kulungu	26	32	13	14	50	44
Mantukwarui	65	75	21	30	32	40
Abusit	80	92	14	37	18	40
Tuwaikim 1 & 2	77	109	12	43	16	40
Pa'appuma	43	56	12	22	28	39
Kunjingini 2	32	39	3	32)	9	37)
Kunjingini 1	37	47	14	32)	38	37)
Kamge	53	65	4	24	8	37
Chigiangu	78	88	1	12	1	36
Tendegum	60	73	7	26	12	36
Gwainunu	76	88	3	31	4	35
Jibako	91	102	28	35	31	34
Stapigum	88	100	19	31	22	31
Kwanabandu 1, 2 & 3	174	195	15	57	9	29
Bobmagum	98	108	6	30	6	28
Isogum	95	135	8	37	8	27
Gulakim	68	95	6	20	9	21
Talangu	29	44	3	8	10	18
Mikau	95	153	19	26	20	17
Rubugum 1, 2 & 3	144	167	10	25	7	15
Kwatmagum	69	119	12	27	17	12
Waigamaga	106	144	10	17	9	12
Maundu 1 & 2	114	159	10	12	9	8
Kutigum	117	144	9	11	8	8
Saragum	132	184	9	14	7	8
Kaugiak	90	94	5	7	6	7
Mul	57	72	1	n.a.	2	n.a.
Total, census division	3,134	4,005**	672	1,431	22	36

* Assumes 500 trees per acre.

** Excludes Mul.

Source: DDA population census, 1965 and 1968-69, Maprik (population); DASf coffee tree censuses, Bainyik (grower numbers).

This is further borne out by reference to the area or trees per grower (Table 5.16). Overall, the average number of trees per grower was 127 in 1965 and 119 in 1969, which amounted in both years to little more than one-fifth of an acre and closely approximated the Maprik census division average. There was

¹ Kulungu, Mikau and Kunjingini 1 and 2 and Maundu 1 and 2 showed decreases. Without careful checking, the reasons for this trend cannot be given.

little variation between villages with a range of only from 0.1 to 0.4 acres per grower.

When the distribution of trees per grower is examined for the North Wosera census division as a whole (Fig. 5.5), the predominance of small gardens becomes clear. Almost half the growers had planted one-fifth of an acre or less and 87 per cent had no more than 0.2 acres (200 trees). In all, only 17 of the 1,431 growers had planted an acre or more of coffee, and of these the three biggest growers had less than 2 acres each.

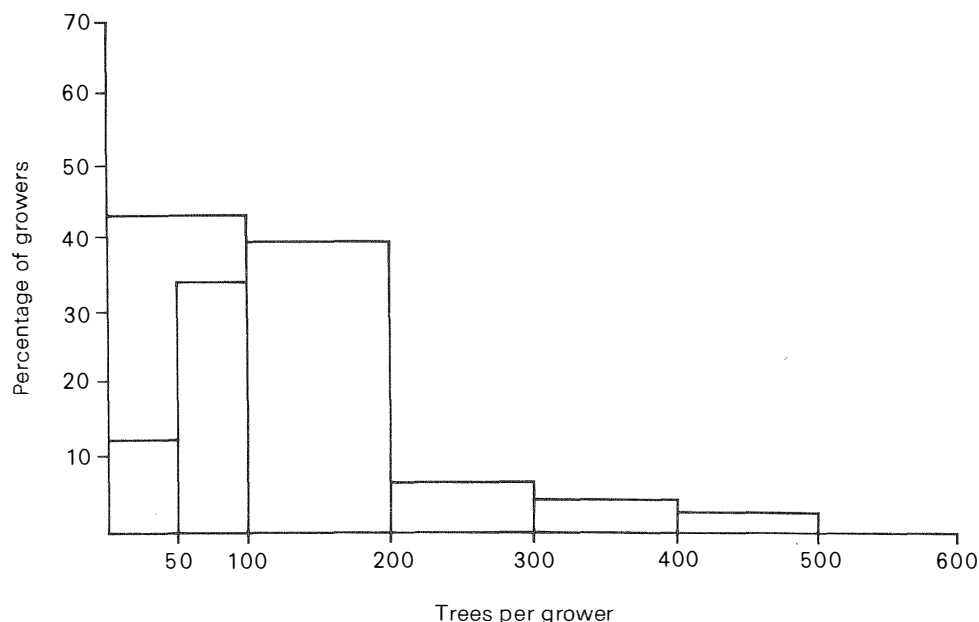


Fig. 5.5. Distribution of coffee trees per grower, North Wosera census division, 1969

There was little difference between the distribution of trees per grower in 1965 and 1969. Few growers added to their original plantings and new growers established gardens of a similar size to those of growers who had planted earlier. The increase in participation over the period resulted almost wholly from the increasing numbers of growers who planted for the first time.

Finally it is worth noting how concentrated planting has been locationally in the census division. In 1965 five villages (Wabindumakag, Ugutagwa, Jambitanga, Jibakim and Umunoko) had established 55 per cent of the total area planted. In 1969 eleven of the thirty-seven villages had established 61 per cent of the total area planted. Most of these had populations which were larger than the village average for the

census division, but more important, eight of the eleven had a high proportion of growers. Among the 17 growers with an acre or more of coffee trees, 13 came from only four villages. Most villages had no growers with (relatively) big gardens.

Factors affecting coffee planting

Land availability. The central portion of the Maprik sub-district was one of three areas in Papua New Guinea recognised as having high population densities and where it was thought a land shortage might have existed in the early 1960s. It was of considerable interest to this survey to find out whether land availability had influenced the progress of coffee planting in the area. The test was applied to coffee for it was assumed that if land shortage had been a factor, it would have become most apparent for coffee among the cash crops since, as a tree crop, it required long-term allocation of land.

Prior to our survey in the subdistrict an Intensive Agricultural Survey (IAS)¹ was undertaken to determine the incidence and severity of land shortage in relation to subsistence needs. In view of the extensive use made of it here, the methodology employed deserves mention.

On the basis of existing information, the Maprik, Mamblep, Wora and North Wosera census divisions were thought to have been experiencing the most severe pressure. These census divisions were rearranged into ten 'communities', each with a similar actual or potential land scarcity. This was done to avoid the masking, by combination, of a shortage in one locality with a plentiful supply in another.²

The boundaries of each community were surveyed to determine the total area available³ and compared with the existing population. Then a soil survey was carried out in each community, structured according to the various land types which were distinguished by soil-unit type and degree of slope. Particular note was taken of the suitability of these soil types and

¹ This was designed by the Commonwealth Bureau of Census and Statistics, Canberra, and conducted by DASF with the help of DDA officials under the direction of the Bureau of Statistics, Konedobu. We are grateful to all concerned for access to this useful study. The results are contained in Territory of Papua New Guinea (1965).

² This selective aggregation was largely but not wholly successful, as will be indicated below.

³ Land found to be in dispute was recorded as such.

slopes for food gardening. From this survey the area of land availability by slope and by soil-unit type was calculated. This in turn led to calculation of the number of gardenable acres per head in each community. Yield trials were then conducted on each soil unit to assess productivity (yields of starchy tubers). An acre of the most productive land, as measured by the trials, was then classified as an 'effective gardenable' acre¹ and areas of other soil types were recalculated in terms of this most productive soil type according to the rate of their yields, e.g., one acre of a soil type yielding 80 per cent of the yield of the most productive type became 0.8 acres of 'effective gardenable' land.

Demographic analysis was then carried out to determine the population of each community and its rate of increase. With these data it was possible to estimate current and future availability of effective gardenable area per head. It then remained to assess what area was required per head, and by comparing this with availability, to determine the existence of, or potential for, a land shortage.

Annual calorie requirements per head were assessed for the IAS survey population, and then, on the basis of the calorie content of the local staples and yields obtained, the effective area required in production annually was estimated. It was recognised that a cultivation/fallow cycle was followed for food gardening in the area and that a certain minimum length of fallow was necessary to ensure the long-term maintenance of yields. With the calculations of area per head required in production annually and the area per head available, it was possible to estimate how long land could be left to fallow in each community, both at the time of the survey and in the future.² These were compared with existing knowledge of the minimum fallow time needed locally and conclusions were drawn as to which communities were already experiencing a land shortage, which would face a shortage in the foreseeable future, and which would not be affected.

The results showed that only a few villages located in the North Wosera census division were experiencing a shortage at that time (communities 8 and 9).³ However, because of a high

¹ Account was also taken of available swamp land used for growing sago.

² It was assumed that at least two effective acres per head were required to maintain a subsistence level of sustenance on a continuous basis.

³ This conclusion received support from the prevalence of court disputes over land in North Wosera.

rate of population growth, more pronounced and widespread shortages were likely in this census division by the mid-1970s, when pressure would also be felt in the Mamblep and parts of the Wora census divisions. The Maprik census division had ample land for existing and future food gardening requirements.

Coffee competes with food crops for the same land, so tree planting would have taken place at the expense of long-term yields in communities already experiencing a shortage, since the fallow period would have been reduced by the withdrawal of land from the food gardening cycle. For communities with a potential land shortage problem, coffee planting would tend to hasten its appearance. Accordingly, villages' performances of coffee planting were compared with estimated land availability (Table 5.18).

Table 5.18

Coffee planting and land availability in the Maprik subdistrict, 1965 and 1969

Census division	IAS community no.	No. of adult males		No. of growers		Growers among adult males (per cent)		Average no. of trees per grower	Effective area of gardenable land and swamp land (acres/head)
		1965	1969	1965	1969	1965	1969		
Maprik	1 and 2	1,261	1,534	386	634	31	41	93	4.76
Mamblep	3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3.37
Wora	4 and 5A	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5.54
North Wosera*	5B	236	269	14	68	19	25	143	3.00
North Wosera**	6	605	624	82	178	14	29	104	2.49
North Wosera***	7	606	842	72	209	12	25	118	2.20
North Wosera#	8	625	774	82	259	13	33	100	1.63
North Wosera##	9(1)♂	507	588	102	153	20	26	126	1.58
	(2)♂♂	421	480	60	96	14	20	-	-
North Wosera##	10	629	800	329	507	52	63	138	7.51

* Included villages of Chigiangu, Tendegum and Bobmagum.

** Included villages of Mikau, Abusit, Mul, Gwinyingini, Tuwaikim, Kunjingini 1 and 2, Waigamaga.

*** Included villages of Kwanabandu, Kaugiak, Maundu, Rubugum 1-3, Kumunugum 1 and 2.

Included Kulungu, Tatumba, Gwairuru, Talangu, Isogum, Tugaikim, Kutigum, Kamge.

Included Saragum, Stapigum, Numamaka, Gulakim, Kwatmagum, Jambitanga.

♂♂ Community 9 including Jambitanga.

♂♂♂ Community 9 excluding Jambitanga.

Source: Census conducted by DDA 1965 and 1969, Bainyik (population); various coffee censuses conducted by DASF, Maprik (trees and growers).

The 1965 data show a strong direct relation between the proportion of growers among adult males and the effective area of gardenable land available within the IAS communities. In community 9 the 20 per cent growers to adult males seemed high¹ but this was largely due to the inclusion of Jambitanga village; without Jambitanga the proportion became only 14 per cent which

¹ It was widely believed in the area that Jambitanga was not short of land and would have been more appropriately placed in community 10. To this extent the desired homogeneity among villages was not achieved for community 9. For the same reason some doubts were also held locally about Numamaka.

was consistent with the general relation. From these data one could hypothesise that land availability was a determining influence on participation in coffee planting: where there was a plentiful supply individuals undertook planting fairly quickly; where there was or could be a land shortage, many villagers were dissuaded from allocating land for such a long-term crop which would effectively exacerbate or hasten the onset of a shortage for food production.

The 1969 data suggest that some modification of this hypothesis might be necessary. Planting has continued in the communities currently or potentially short of land although owing to uneven distribution of land ownership within these communities, a significant proportion could have planted coffee without impinging upon land needs for food gardening. Additionally or alternatively, it may be that individuals were prepared to allocate land to coffee in the knowledge that long-term food crops yields would decline.¹ Many may well have felt (however irrationally) that the small areas planted would not cause any serious long-term yield decline. Indeed, in the perspective of available land, the areas under coffee were small in 1969. For communities 5B and 10 inclusive, less than one per cent of total gardenable area had been planted to coffee (319 acres). Community 9 had planted one per cent of their gardenable land (39 acres), excluding Jambitanga, which would have reduced per capita availability by only 0.02 acres per head. However, despite the increase in area planted between 1964 and 1969, the overall proportion of growers remained low for all five communities (5B and 6 to 9), and markedly lower than for communities 1, 2 and 10 which were not facing a foreseeable shortage. This situation still remains broadly consistent with the relationship indicated by the 1965 data which suggested that land availability was a determining influence in a number of these communities.

Two other points are worth noting with regard to land availability. First, there was no apparent association between the effective area of gardenable land and the average number of trees per grower, the second indicator of participation. There was no tendency, therefore, among those who were growers in areas suffering from a land shortage, to plant fewer trees. However, in view of the small size of coffee gardens in these areas, this is hardly surprising. Second, while actual or potential land shortage appears to have had an important bearing on coffee planting in the North Wosera census division,

¹ Villages in this area in 1963 were clearly aware of the actual or possible conflict associated with land use for coffee.

it does not assist in explaining the intervillage differences in participation noted for the Maprik census division since the IAS survey showed these villages were generally well off for land.

Transport, processing and marketing. In 1964 most coffee trees were still immature and output was only 5.7 tons (Table 5.11). Marketing services for coffee had not developed far. Producers processed their own crop to the parchment stage and many carried the coffee themselves to Bainyik; such labour inputs substantially reduced cash returns per unit of labour applied to coffee. At Bainyik it was purchased by DASF, which then hulled, graded, bagged and sent it by river to Wewak for export.

From 1965 rural progress societies began to purchase parchment coffee from growers in the villages and their vehicles transported the crop to Bainyik for sale to DASF. In July 1969 the Sepik Producers' Co-operative Association took over all the functions previously undertaken by DASF and the societies.

Marketing services to the grower have depended upon the development of the internal road network in the subdistrict and upon the transport services utilising these roads. It is beyond the scope of this analysis to present a review for the whole subdistrict but a brief outline can be given for Maprik and North Wosera divisions.

In Maprik census division no village was more than two hours' walk from Bainyik and by the early 1960s the road system had developed considerably. Some villages were served by the Maprik-Yangoru and Maprik-Pagui main roads. Feeder roads provided access to other villages. Imbia, Balogwil and Barangia were not directly served but were only short walking distances from a feeder road. The only serious impediment was in wet weather when rivers became impassable. Table 5.13 shows that by 1964 these relatively disadvantaged villages were among the leaders in terms of participation in coffee, indicating that the transport and marketing system was not a significant deterrent to coffee planting here.

In the North Wosera census division most of the road system development took place in the 1950s with the mobilisation of village labour under Administration guidance (Fig. 5.2). The last section of feeder network was the extension of the road from Wabindumakag through Jibakim¹ in 1965. By that time

¹ DDA patrol reports, Maprik, 1965-66.

there were fifty miles of vehicular roads which gave easy access to all villages except during wet weather when, as in the Maprik census division, rivers became impassable and the area could be isolated for up to three months in some years.

Had transport and marketing problems been an inhibiting influence on coffee planting in this census division it might have been expected that villages most remote from Bainyik (Jibakim, Ugutagwa, Pa'appuma, Mantukwarui, etc.) would have been most affected. However, Table 5.16 shows the reverse. Most of these villages (comprising IAS community 10) were among the leading villages in terms of growers among adult males, which again suggests that transport and marketing had no significant influence on locational variations in coffee plantings.

Plans to build bridges across the three main rivers in the South Wosera census division will provide all-weather access to this area but it seems doubtful whether this will generate much further activity in these villages.

When coffee was introduced the road system was better developed in the above two census divisions than in most others in the subdistrict, probably because of their proximity to Maprik administrative centre. Thus, while transport and marketing facilities and services appear to have had no marked influence on coffee planting in Maprik and North Wosera, no such conclusion is warranted for the subdistrict as a whole.

Extension services. Experimental work with Robusta coffee commenced early in the 1950s but an extension programme was not started until 1956 when the first village garden was established in Kinbangua (Maprik census division). In 1956 also, eighteen fieldworkers were stationed in the subdistrict (Table 5.19) to conduct extension patrols. The limited development of the subdistrict road network and a shortage of vehicles made patrolling arduous and slow, and greatly limited the area which could be brought under extension influence. A 1957 report emphasised these limitations and indicated that extension work was necessarily concentrated in the Maprik census division with some spread to the Supari rural progress society area (Muhiang-Bumbita, Albiges and the eastern halves of the Urat and Wam census divisions). Table 5.12 shows that these census divisions were among the earliest to plant coffee and were most active in planting up to 1963-64. There seems little doubt that the planting performance was largely the result of early extension work in these areas.

Extension patrols were undertaken throughout the period to 1970 by fieldworkers, at times accompanied by agricultural

Table 5.19

Agricultural extension staffing, Maprik subdistrict, 1951-65

Year	No. of extension officers	No. of agricultural fieldworkers	Total extension staff
1950	1*	-	1
1951	1*	-	1
1952	2	-	2
1953	2	-	2
1954	2	-	2
1955	3	-	3
1956	3	18	21
1957	3	19	22
1958	3	20	23
1959	4	20	24
1960	2	20	22
1961	4	20	24
1962	6	20	26
1963	3	20**	23
1964	4	20**	24
1965	4	20**	24

* Based in Wewak, with periodic visits to the Maprik subdistrict.

** Approximate.

Source: Compiled from DASF records, Maprik.

officers. Patrol reports suggest that coverage of the census divisions and villages was extended as transport facilities and services improved. An analysis of patrols undertaken in 1966-67, for example, shows that all census divisions were visited during the year. Some received only a single visit, e.g., South Wosera and Urim, while others received more concentrated attention, e.g., Wam and Maprik divisions were each patrolled four times and North Wosera and Wora divisions each had three visits. At that stage frequency of patrolling appeared to be correlated with the total tree numbers established by that year.

During these patrols extension workers established village nurseries and planting was highly dependent upon this method of disseminating material, particularly in the early years. It was a number of years before seed was available in adequate quantities. A 1958 report¹ commented on the shortage of supply in that year.

In 1965, with official disencouragement of coffee planting, extension work was devoted to improving cultural practices and particularly to improving the fermentation process in order to raise the quality of beans produced. Table 5.12 shows that further planting did take place after 1965. Seed was then available from established gardens and villagers could plant at will. Planting continued with a momentum which was independent of promotion.

¹ DASF annual report, 1957-58, Maprik.

Cash returns and alternative economic opportunities

Comparisons between returns from coffee and other enterprises are difficult to make for lack of precise data on inputs, particularly labour. For coffee, the only available assessment was one prepared by DASF officers on the basis of general field observations (Table 5.20). This shows a return of 80¢ per man-day for an average grower, rising to \$1 per day for one who follows recommended practices more closely. Our own field observations suggest that yields might have been somewhat lower for the average grower, at little more than 1 lb per tree, and that labour inputs were also lower, particularly in harvesting (only forty days). Realised (harvested) yields were substantially below actual yields as growers did not allocate the labour required for a full harvest throughout the year. Also, garden maintenance appeared to take up less time for the average grower (possibly twenty days). Finally since pulpers were shared by growers, we would allocate considerably less of the cost annually to each grower (say only \$5). These modifications tended to balance out and our calculations also suggest cash returns were close to 80¢ per man-day. The efficient grower earning \$1 per day was the exception. Growers were reluctant to follow extension advice aimed at raising productivity, particularly where additional labour inputs were required and even though there were obvious cash returns to be gained.

Cash returns of 80¢ per man-day show coffee to have been a more attractive cash crop than rice, which was estimated above to have earned growers an average of 47¢ to 67¢ per man-day. This differential appears a sufficient explanation for the considerably greater popularity of coffee-growing. It does not explain, however, why some preferred rice to coffee and why others grew both. Some reasons for this were suggested in the above discussion of rice; others will be commented upon in Chapter 6.

It was also pointed out in the discussion of rice that some villages in the Maprik census division (Kuminibus 1 and 2 and Kalabu 1 and 2) were actively mining gold in 1964. Table 5.14 shows that in 1964 they were among the lowest in terms of coffee participation even though they were among the first to have the opportunity to grow coffee. Household interviews in these villages indicated that many individuals found gold as attractive as coffee and up to that time had not switched to coffee. Data on participation in 1969 (Table 5.14) show that all four villages had a higher participation in coffee and indeed Kuminibus 1 was then one of the leaders. The other

three were well between the village average for the census division. Mining data for 1970 showed an output value of around \$10,000, considerably higher than 1964. It was also reported that licensees were still mainly concentrated in the same villages but that labourers were being employed from the Wosera census divisions. This suggests that over time, coffee had become more popular among those in the four villages who had been mining employees and that some had switched to the crop, thus forcing licensees to look further afield for their workers. The coffee participation for three of the villages nevertheless still suggests that mining was retaining its popularity for a considerable number of men. It is worth noting that while coffee makes seasonal demands on labour, gold mining does not so that it is possible to combine both, and household interviews indicated that some were doing this.

Table 5.20

Costs and returns to Robusta coffee at full production

Input/output	Average grower performance	High yields, careful pruning, efficient harvesting
<u>Labour inputs (man-days/acre)</u>		
Maintenance and weeding	30	30
Pruning coffee and shade	8	15
Harvesting	59	56
Pulping, fermenting, washing and drying	22	28
Fencing repairs, drain maintenance	1	1
Carrying and selling	2	3
Total	122	133
<u>Cash costs (\$/acre)</u>		
Bush knives, spades and secateurs	2	2
Pulper (\$65, lasts 3 to 5 years)	22	13
Total	24	15
<u>Returns (\$/acre)</u>		
Gross income (15¢ per lb and 800-1,000 lb/acre)	122	153
Less cash costs	24	15
Net cash returns per acre (\$ per man-day)	\$98	\$138
Return to labour and land (\$ per man-day)	\$0.80	\$1.00

Source: Emmerly and Leentjes (1970: appendix 1).

Other activities provided only limited economic opportunities. Truck crop sales expanded greatly over the period to 1964 (Table 5.21) and were attractive to those close to Maprik township, particularly when the roads were poorly developed. Sales were, however, typically made in small lots. Individual average cash returns were also small and this venture did not appear to constitute a serious competitor for coffee. There were a few employment opportunities locally with the Administration, missions and private enterprise. Some produced artefacts (woven masks and wood carvings) and made blinds (plaited bamboo matting for walls). Others took employment outside the

Table 5.21

Truck crop sales, Maprik subdistrict, 1961-62 to 1963-64

Purchaser	Estimated sales volume		
	1961-62 (tons)	1962-63 (tons)	1963-64 (tons)
Missions	27	79	196
Hospital	40	30	32
Tradestores	-	32	39
Department of Agriculture	3	6	13
Department of Education	n.a.	4	6
Malaria control unit	4	2	-
Total sales	74	153	286
Estimated total value (\$)*	2,338	6,366	10,576

* Includes fruit and vegetables; assumes an average price of 2¢ per lb.

Source: DASF annual report, Maprik subdistrict, Maprik, 1963-64.

Sepik District, particularly as contract labourers, though this became progressively less popular in the 1960s, possibly as a result of improved local economic opportunities. Overall, aside from gold mining in a restricted area, the alternative economic opportunities were few locally, and with this one exception were little competition for rice and coffee.

In all, the factors reviewed have provided a partial explanation for the pattern of participation in coffee over time, at least in relation to the Maprik and North Wosera census divisions. The slow start to the industry can be attributed principally to the initial shortage of seed. This problem was largely overcome by 1960 from which time participation greatly accelerated.

It was clear that in all villages the growth in participation, which was virtually confined to an increase in the number of adult males involved, required considerable time. It was facilitated in parts of North Wosera by a plentiful supply of land; it appeared to be greatly inhibited in other parts by the existence or prospect of a land shortage. Extension services were clearly an enabling factor in the early years but more recently, growth in participation was spontaneous. Transport and marketing services in both areas were well developed by the time output became significant and apparently imposed no limitations upon the growers.

Despite the fact that coffee was an attractive cash enterprise both in comparison with alternatives and in terms of absolute returns on labour inputs, the growth and scale of participation was by no means outstanding. As mentioned, the growth rate of participation since its introduction was not fast. Even in villages without resource problems and with easy access to markets, a large proportion of adult males still had not adopted the crop by 1969. Among those who had,

few had large gardens. Thus the factors examined above by no means provide a complete explanation for the performance outlined. Chapter 6 will attempt to provide a more complete assessment.

Chapter 6

Case studies

This chapter attempts to extend the understanding of cash crop adoption patterns with an analysis of data gathered directly from growers (and non-growers). As indicated in Chapter 1, these data were collected in detailed household interviews which were conducted with a large number of individuals in each area. Since these were case studies, there is no guarantee of representativeness in relation to the communities from which they were drawn. Accordingly they provide suggestive rather than conclusive evidence.

Broadly, the interview questionnaire was constructed to serve two related objectives: (i) to document the extent of smallholder participation in cash cropping for individual households, and (ii) to provide information on factors which had influenced participation at the household level.

A wide range of possible factors for investigation included: (i) the composition of the individual producing unit, (ii) resources available to the unit, (iii) the availability and nature of technical assistance, (iv) the availability and cost of facilities and services for transporting, processing and marketing cash crops, (v) the pattern of disposal of cash income, (vi) the availability and cost of consumption and investment goods, (vii) attitudes towards cash cropping per se and in relation to other economic and non-economic activities.

Some of these factors were also examined on an 'area' basis and the interview approach complemented the 'area' approach by providing useful additional data. On the other hand, several were not amenable to an 'area' approach and therefore the case studies could usefully extend the scope and depth of the whole analysis.

The decision to plant

Data obtained from interviews and other sources provided insights into the factors which underlay original decisions of smallholders to plant (or not to plant) the crops.

Not surprisingly, virtually all growers indicated that a desire to purchase European goods had strongly influenced their decision to introduce cash crops. Some had been exposed to European ways of life for many years. One Maprik informant, for example, had been employed for more than twenty-five years in most parts of Papua New Guinea. Many informants, particularly Karkar islanders, referred explicitly to the stimulus of previous contacts with European society as a key factor in their decisions to commence cash cropping; some such individuals had planted cash crops on their own initiative. Such previous contact did not, however, necessarily lead to active involvement in cash cropping. Several of those interviewed who had not planted, had extensive records of previous employment outside their home area.

Although a number of informants had commenced cash cropping independently, most, particularly those with little or no experience outside their home area, had been influenced by the actions or views of others. Almost all Boana growers stated they had commenced at the instigation of DASF.¹ Many mentioned the personal influence of local leaders recruited by the DASF as fieldworkers. These interviews provide corroborative evidence of the grass-roots influence which these men had exerted on the growth of coffee planting within the survey area.

In Sinasina most growers quoted the influence of DASF on coffee planting. Many simply accepted the assurance of extension officers that the crop would be a worthwhile venture. A few mentioned the Lutheran mission as a positive influence. Some claimed they had followed the example of others who were planting, sometimes singling out leading individuals within their villages. Often these leaders had not only been active themselves as early growers but had promoted planting throughout their community. Whether their influence was exerted by example, by persuasion, or by both, such men had an important bearing on the overall progress of villages in the survey areas. Sinasina interviews suggested, for example, that successful coffee growers were regarded with considerable respect by the community as a whole.

In Maprik the persuasive influence of agricultural extension officers was again very strongly evident in interview responses. Individuals were prepared to plant cash crops on DASF's advice²

¹ A few also mentioned DNA, which had been active, though rather irregularly, in coffee promotion during the early years after its introduction.

² Though in relation to the cash returns to growers from these crops, their acceptance in this area was by no means unquestioning.

that the crop being promoted would bring the highest returns. Several informants stated that extension officers selected one or more individuals in a village to plant the crop. Sometimes these were the Administration representatives (luluai and tultul); in other instances they were simply individuals with initiative who were eager to try out the crop. Villagers in this area took much notice of their progress both within their own and in neighbouring villages.

On Karkar Island where cash cropping commenced somewhat earlier than in the other areas, the influences affecting individual decision-making were more diverse. In some instances local encouragement was given by the Lutheran mission and by particular plantations. Others were stimulated by the two exceptional early indigenous planters. Some mentioned specifically the promotional work of DNA and co-operatives officers during the early to mid-1950s while, as in other areas, the agricultural extension worker was still the most commonly mentioned influence. Some growers gave various combinations of the above. Others simply followed the examples of other small-holders.

According to interview data, promotional work involved persuading villagers that a particular crop would bring worthwhile cash returns which would be higher than available alternatives. In Boana the only serious competitor for coffee at the time of the survey was vegetable production for the Lae market. Those interviewed who were located within easy walking distance of the airstrip and had grown vegetables, considered coffee a more lucrative enterprise. Many others, more remotely located, had no local alternative. In Sinasina some individuals raised and sold pigs and poultry and produced vegetables for the Kundiawa market but considered there was more money in coffee. Karkar islanders also had a local market for pigs, poultry, fruit, vegetables, tobacco and nuts but informants expressed a clear preference for coconuts and cocoa because of higher returns.

The choice of crop in Maprik was more complicated for villagers were initially encouraged to grow both rice and peanuts and later coffee and rice. Many informants referred to the poor returns they had received from peanuts and rice in the early years. Although disillusionment with cash crops generally did not follow, people expressed caution in relation to the then current promotional campaign for coffee and rice. A number of informants claimed they had either not planted coffee or had only planted a few trees up to that point because they wanted to observe the cash returns others received when gardens came into bearing. The cautious reaction to

coffee may help to explain the fairly slow growth in participation shown within the subdistrict (Chapter 5) in terms of the increase over time in the proportion of growers among adult males.

Faced with an extension campaign for, and a choice between, coffee and rice, Maprik informants did not display a marked preference for either one. This perhaps supports the evidence already given in Chapter 5 that there was no marked difference between them in the level of cash returns per unit of labour. Neither did informants appear to wish to choose between them. Indeed, several were growing both crops and some with only one crop expressed an intention to add the other in the future. No informant with both crops complained of labour shortage. This was probably because of the limited involvement in each crop which meant that total labour requirements did not impose a strain upon the available household supply. The only conflicts occurred at harvest time when, according to extension officers, growers attended to rice harvesting at the expense of the coffee crop.

Rice had specific attraction for informants. Some had no land suitable for coffee and rice provided a source of cash income.¹ Some older informants indicated they had no interest in planting a long-term crop such as coffee and an annual crop such as rice served their needs better. Others who had planted coffee found rice a useful cash source while coffee trees were still immature, and indeed this was one of the ways in which the extension programme could feasibly advocate both at the same time.

The only attractive local alternative to coffee and rice was gold, at least for those with access to the rivers with deposits. Some licensees found the returns from gold mining consistently attractive, and several combined or intended to combine this activity with coffee growing. Their comments suggested that the two ventures were somewhat complementary in timing of labour inputs during the year. One informant, however, gave up gold for coffee, because, he said, he was unable to obtain labour from his village for mining gangs. This suggests that for the labourer, as against the licensee, returns from cash cropping were relatively more attractive.

It is worth noting finally that no informants from any area mentioned contract labouring on plantations as an attractive alternative to cash cropping although many of them had been so employed in the past.

¹ Conversely some indicated they had no land suitable for rice.

Garden rights

At the time of fieldwork in each survey area, agricultural extension officers were promoting individual rights to cash crop gardens and, as the preceding chapters have shown, were registering garden ownership in one name. During interview work in each area, individual right was in fact stated to be the predominant arrangement, with the male head of the single household registered as the owner.

There were, however, some exceptions. Some were the result of an earlier departmental policy whereby community planting and rights were encouraged in villages. In Boana particularly, many villages had planted community coffee gardens. There, whole villages had participated in timber clearing, ground preparation and planting. Maintenance and harvesting operations were still carried out co-operatively at the time of the survey on one day a week; proceeds from the sale of coffee harvested were placed in village bank accounts. Despite the subsequent encouragement of individual rights, many communal gardens were retained¹ and informants from this area indicated responsibilities for allocating family time and labour to the community garden as well as their own. Many Boana villages also had 'mission' gardens, again established by community effort. Proceeds from these gardens were donated towards the support of the local Lutheran mission. One day a week was also formally set aside for communal work in these gardens. Informants from other areas did not indicate the same responsibilities.

A number of what could be loosely called 'partnerships' were encountered in interviews: some had already been terminated while some were still current. One of the earliest coffee planters in Maprik indicated he had formed a 'partnership' with a friend for the purpose of planting a coffee garden. Once established, the two had agreed to divide the area between them and to assume rights to each section individually. Another who had business interests outside the subdistrict which prevented him from personally working on his coffee garden placed the responsibility upon close relatives who were apparently rewarded with a share in the proceeds. This arrangement was made to meet a particular set of possibly temporary circumstances and there was no thought on his part of foregoing long-term ownership of these coffee trees. A third Maprik coffee grower indicated that he shared proceeds

¹ Some were split up, with trees allocated among original participants.

with some men from his village. These men had helped to establish the trees and to perform subsequent tasks in order to gain experience, and were therefore entitled to their share.¹ He indicated that he intended to accumulate money to pay these helpers for the work they contributed during the establishment phase, after which he would become sole owner of the garden. Two others who had no coffee of their own, claimed to have income-sharing arrangements with registered growers whom they had assisted during the establishment phase. It appeared likely that these partnerships would be shortlived and garden ownership would revert to the individual who had usufruct.

Maprik rice production was encouraged initially on a community basis. Although the emphasis in extension work and in plantings had changed to individual ownership by 1963-64, a number of informants indicated that some rice gardens were still being prepared, maintained and harvested by villagers as a group and proceeds were shared between them.

In contrast to Maprik, interviews in the other three areas revealed no notable incidence of 'partnerships'.

Overall, cash crop ownership centred on the single household in the four areas studied and was said to be vested in the male head of household. It was therefore important to consider the resources available to the household in relation to its participation in cash cropping.

Resource availability

Land. It was apparent from interviews in all areas that the question of rights to land was basic to the question of long-term rights to cash crops. Land rights were of particular significance because the cash crops concerned were almost all perennial tree crops. Their establishment involved a long-term use of the land and rendered it unavailable for other purposes. Such long-term land use was broadly a departure from customary land use in subsistence production.

In each area, subsistence food crop production traditionally followed a cultivation/fallow cycle. While land rights were ultimately vested with the clan or subclan, individual households could establish usufructuary claims to areas they wished to use for food crops. The strength with which such rights were held varied. In Boana informants indicated that when

¹ In a number of other instances when such labour assistance was given it was repaid in kind. Learning by practical experience, as a preliminary to commencing planting, appeared to be a common occurrence, at least in the Maprik area.

such land was returned to bush fallow, the rights to it reverted to the clan. In Sinasina individual land usufruct rights appeared to be more strongly defined. Not only did household heads traditionally hold rights to land they were currently using for food crops but they retained these after such land was returned to fallow.

Informants in all areas indicated a strong preference for using their own land for food crops, but it was evident that some flexibility existed in the system for this purpose. In the Boana area one grower had planted food crops on his father-in-law's land and another on his wife's clan land. In Maprik many informants had one or more food gardens on land belonging to friends or relatives of the same or even different villages. These individuals typically explained that their rights extended only over one crop season and that their relatives and friends were entitled to similar, reciprocal rights to their land.

The introduction of rice as a cash crop in Maprik did not appear to pose any new problems for growers with regard to land rights and land use. While the majority of those interviewed had used land over which they themselves claimed clear rights, a few had made reciprocal arrangements with relatives for the right to use the latter's land for one rice crop season. According to one grower, this was easily negotiated, principally because rice was an annual crop.

This degree of flexibility was not apparent with the introduction of perennial tree crops, coffee, coconuts and cocoa. Interviews in all areas indicated that clans were strongly opposed to allowing outsiders to plant and few exceptions were encountered. Thus at this stage of socio-political development, individuals were limited to the areas available to them within their own clan boundaries.¹

A few growers planted trees on land of other clans. One in the Boana area with no available land himself had planted on land belonging to another clan that resided in the same village, with the permission of that clan's headman. However, this grower expressed serious doubts as to the long-term security of his rights to the trees. In Sinasina one grower had planted trees on a friend's land. He subsequently harvested coffee from this garden and returned the land and trees to his friend. This service was apparently performed to teach the owners how to grow the crop. In a similar situation in Maprik the

¹ The only instance of outright land purchases or exchanges between clans or villages were found on Karkar Island.

informant was unsure about the eventual tree ownership but expected a partnership would result. A second planted coffee on his wife's family land. He considered he had established strong rights to the land by establishing his domicile in the village. A similar case was encountered on Karkar Island.

The availability of land for individual clan members appeared to depend upon the area to which the household had customary usufructuary rights and on the extent to which these rights were recognised by clan headmen. In Maprik and on Karkar Island informants stressed the hereditary aspect of land rights. These were all the more readily recognised when one or more previous generations had used the land and had laid claim to it. Conversely in two cases individuals had little or no land for cash crops because their fathers had not established claims over a substantial area.

It is worth noting the process by which an informant who was one of the earliest to plant coffee in the Maprik sub-district and the first in his village to do so, secured recognition of his rights. When he first declared his intentions, a meeting of the village was held to discuss his plans. He indicated his wish to plant on certain land which he claimed had been farmed by him and by his father and grandfather before him. The clan elders agreed this claim was correct and as a result the village allowed him to plant the long-term crop on the land.¹

Such formal procedures may well have been commonly followed in each area when planting first commenced, but interview data suggested that once the crop had been more generally accepted, the requirement of obtaining formal agreement from clan elders was by no means universally met. Indeed, most informants stated they had decided independently to plant on land over which they considered they had rights, and that consultation with clan leaders had been unnecessary. On Karkar Island only three informants indicated that they had found it necessary to consult clan leaders to clarify their individual rights and to ensure their clans' acceptance of their claims. Consultation was, however, required in each area when growers wished to expand cash crop gardens using land over which they had not established rights previously.

Informants from the North Wosera villages of Saragum and Stapigum, which were among those suffering from the most acute land shortage,² did indicate village consultations were under-

¹ Recorded in the Cheragum village book, DDA, Maprik.

² See Chapter 5.

taken prior to coffee planting. The Stapigum informant stated that the whole village was short of land and that all members had had to discuss individual plans before planting proceeded. The Saragum informant stated that prior consultations had taken place to ensure that growers did not plant on others' land and that no planting took place on land which would be needed by the village later on, thus indicating a general awareness of the long-term consequence of allocating scarce land to coffee trees.

Although in some cases consultation had been necessary prior to planting these perennial tree crops, there was no evidence that problems of establishing recognition of land rights had significantly limited the area of cash crops planted. Several informants stated that community acceptance of customary rights to land was sufficient security for the planting of tree crops and that further proof, e.g., through registration of title, was not needed.

The interviews did, however, reveal instances where individuals had been unable to secure suitable land for cash cropping and where limitations on further planting would arise in the future. In the Boana area, for example, two informants from Gevak village claimed that, although they themselves had not had trouble securing land for coffee, a general shortage was developing and it was proving difficult to obtain more. In Sakalan village most of the ground was grasslands, which, if it was, as suspected, unsuitable for coffee, would result in a general shortage in the future. In Kiakum village growers complained that the communal coffee garden had absorbed a considerable proportion of the land suitable for coffee trees and that many had little opportunity to expand their gardens beyond their current size (in 1963). This evidence suggests that although participation in the Boana area had been high in terms of growers among adult males, the area planted had not been large enough to exhaust the available supply, but that if planting were to continue, the distribution of garden size might well become considerably wider within the area, with increasing numbers being denied the opportunity of expanding garden size.

In Sinasina one informant stated he had not commenced coffee growing for lack of land, and a second claimed this was true of others he knew. Two had planted coffee but thought it would be difficult for them and others to obtain more suitable land. Another stated he could plant up to two more gardens but his ground would be too stony and steep for more. In one interesting case an informant stated he was a member of a weak, small lineage in the Nimai tribe, which had lost its best land to others (in his grandfather's time). The lineage still had some poorer land, on some of which this individual had planted coffee trees. He claimed that his brother had then taken

control of this land and that he now had no coffee trees and no more land suitable for planting.

These discussions of land availability suggested that there had been no general shortage of land in Sinasina and thus supported other evidence in Chapter 3, but there had been instances where the unevenness of distribution of rights to suitable coffee land had prevented individuals from commencing, had limited the area some had planted, or would obstruct expansion in the future.

Informants in the Maprik survey area were drawn from only the Maprik and Wosera census divisions. In the Maprik census division they were distributed among twelve villages. Those interviewed claimed that general shortages did not exist in their villages. In one case (Neligung 2) the grower said some had little spare land left in the village; in two others (Kinbangua and Kuminibus 1) growers stated a shortage could develop in the future with further coffee planting. Another grower from Kinbangua, who actually had more land than any in the village due to favourable inheritances, claimed that two or three families were short because their fathers and grandfathers had not worked hard and had therefore not passed on rights to substantial areas.

The evidence of land shortage as inhibiting coffee development in the North Wosera census division largely followed the pattern described.¹ Informants from Stapikum, Gulakim and Saragum all claimed land shortages either existed or were imminent, and that available land was mostly needed for food crop production. One grower from Stapikum (with 73 trees and 26 holes to be planted), who indicated that he himself had enough for some further expansion, commented that some had a little land for coffee, some had none, and most had considerable difficulty in finding any for planting. One from Gulakim had been prevented from starting coffee for lack of land, while another (with 63 trees and 28 holes to be planted) who could expand himself, stated some were short but most had a little land available for cash crops. One grower from Saragum (135 trees and 48 holes) stated that any planting was impossible for him, while another indicated that any further expansion for him would be impossible. These villages are among those which were shown in Chapter 5 to have had least land available, and were most limited in coffee plantings at the time of the survey. One grower from Isogum thought there was no general shortage at the time but that one was likely later on with further planting.

¹ See Chapter 5.

A number of North Wosera informants who appeared to be conscious of possible future shortages, were from villages for which land shortages were predicted in the near future (Chapter 5), viz. Kwanebandu, where an informant said some were experiencing a shortage at that time and that a general problem would develop later; Kunjingini 1, where a grower stated there would be a shortage unless the grasslands could be used for coffee. Finally, it was also consistent with land measurements already presented that informants from Jibako, Jibakim, Ugutagwa, Bobmagum, Chigiangu, Rubugum, Kumunugum, Mul and Mikau 1 claimed there were no general shortages there.

Among the Karkar islanders interviewed, a few claimed to have had land problems. One who had no ground of his own had a form of partnership with a grower whose cocoa trees he cared for while the latter was away as a school-teacher. A second was living in his wife's village and could not obtain land there for planting. He had not commenced cash cropping despite the fact that land was available to him in his own village. Another who had not commenced was not keen to start cash cropping on his land owing to its inaccessibility. A more common claim encountered among informants was that, while they had been able to secure land and plant coconuts and/or cocoa in the past, they had little or no opportunity for further expansion. Four growers with sizeable gardens stated they were near their limits. Another claimed he had only enough land for 500 coconut and 1,000 cocoa trees, while another said he would be limited to only 120 coconut trees which he could interplant later with cocoa trees. Yet another, who planned to begin planting, indicated that his opportunities were severely limited by the fact that his father had not attempted to secure land to plant cash crops and had passed on little to him. This case contrasted with one where a son had inherited large areas from his father, partly because the latter had been active early in the planting of cash cropping on Karkar Island and partly because he was the only son and received it all.

Overall, the case studies suggest that land for cash cropping was not in short supply on a village-wide basis in the four areas, with the notable exception of a restricted number of villages in the North Wosera census division of the Maprik area and the possible but unconfirmed exception of a few villages on Karkar Island. Some Karkar informants suggested there were general land shortages in certain villages, for example in Bangame, Gial, Langlang and Dangasai, and that members of families were limited in Dorogatam, Kurum, Sikentiga, Mangar, Mapor, Kavailo and Mater. Reference to Table 4.4 shows

that those claimed to be suffering generally had above-average proportions of growers to adult males. Some of the other villages mentioned were below average but so too were a number of villages mentioned as having a plentiful land supply. Informants' comments, unsupported by further data, were thus inconclusive. Shortages in villages other than these were probably confined to isolated, individual instances which arose principally from an uneven distribution of land rights or from residential difficulties and disqualifications.

Labour. Considerable attention was paid to labour inputs in household interviewing both to gain an understanding of how manpower was mobilised and organised at the village and household level for cash cropping, and to investigate whether its availability had influenced the course of cash crop development in the four areas.

Boana interviews clearly indicated that coffee work involved both sexes. The main division of tasks was made between heavier labouring jobs (clearing, fencing, etc.) which were carried out by the men and lighter ones, generally performed by women. Children joined the household workforce at times but often they were either too young to be of much assistance or were attending school and could only help on weekends and holidays.

In some instances, villages chose a large block for coffee with the help of an extension worker and large numbers of men cleared the land co-operatively. The fieldworker then marked out boundaries for individual gardens within the block, each of which was taken over by a single household which subsequently developed and planted it. In other cases, individual households developed their gardens separately. Several informants indicated they had enlisted the help of relatives and friends for major tasks of establishment, e.g., clearing and fencing. Helpers were given food and reciprocal assistance rather than cash by the growers. Casual help, however, was sometimes obtained for harvesting, processing and transport, and cash payments were frequently made for these tasks, particularly for carrying coffee to the Boana airstrip.

So far as private or household-owned coffee gardens were concerned, most tasks from establishment to transportation were carried out by household members. In Boana, however, responsibilities often extended beyond privately owned gardens, partly because coffee planting was initially undertaken on a community basis. In the villages where survey informants were located, these gardens had not been split up and villagers were still obliged to maintain the gardens and to harvest and market the crop one day a week. The amount of work involved

varied considerably during the year, partly because the gardens varied in size (the range was from one to seven acres among villages observed directly) and partly because labour requirements were seasonal.

Many villages also had mission gardens, again established on a community basis. Among those represented by survey informants, the gardens varied in size from less than one-fifth to about two-fifths of an acre, considerably smaller on average than the village community gardens. Here again a day was formally set aside for work in these gardens, though a few demands were placed on household work time.

Aside from cash cropping work, households also produced their own food requirements, and many were involved in other work commitments such as the construction of new airstrips (e.g., villages around Kisengam) or maintenance of existing ones, and various tasks of village maintenance. Several informants said that the combined demands of cash crop work and of local capital works had resulted in less labour being devoted to food gardening with an appreciable though not serious fall in output. Several informants with only modest areas of coffee claimed that with all their commitments they could not expand their coffee gardens further without having to switch labour inputs from food gardening which would lead to a reduction in food output below customary levels. One other grower with almost one-half acre of coffee stated that since he was reaching an advanced age and had no sons to assist him, he would not expand his coffee gardens.

It is clear from these cases that a number of growers considered themselves too busy to expand their coffee gardens themselves. When asked whether they could hire labour, they claimed it was not available locally as everyone was similarly busy and that in any case they did not have the money to employ hired labour.

It was difficult to judge whether such views were indicative of a labour shortage in the area. As data on labour inputs were not available it was not possible to judge how fully committed household labour was; nor was it possible to determine whether labour could be hired locally, though since Boana was isolated, the possibilities may well have been limited. At the same time these growers did not give the impression that they had made serious efforts to obtain such labour or money to finance it. They appeared reasonably content with the existing areas of coffee gardens, which could be handled with available household resources.

In contrast to Boana, coffee growing in Sinasina was encouraged as an individual household enterprise from the begin-

ning. Most informants had only small coffee gardens, and labour inputs for establishment and most other tasks were supplied by household members (mainly by the husband and one or more wives); there was apparently little reliance placed on assistance from relatives and friends. Where given, such assistance was repaid on a reciprocal basis.

Two 'big' growers, with about four and five¹ acres respectively, were among those interviewed. Both growers claimed to have established, and subsequently maintained, the areas themselves with family labour. Both, however, hired casual workers for harvesting and for carrying coffee to sales points. These two, and others, indicated there was no difficulty in hiring labour in Sinasina when this was required.

None of the informants reported any reduction in the level of food production. Indeed, two claimed that production had increased as a result of the cessation of intertribal fighting prior to the introduction of coffee.

In the Maprik area rice and coffee work was undertaken by both sexes, as in Boana. Several informants indicated that rice was planted as a communal effort in order to provide many with their initial experience in the husbandry of the crop. Two informants who were among the first in their villages to commence coffee planting explained that, as with rice, this combined effort provided experience for the helpers which enabled them in turn to undertake plantings. One grower stated that about 100 men and 75 women had assisted him in the establishment phase. While both coffee and rice growers appeared to rely principally upon their own household for labour requirements, very few of those interviewed did so wholly. One exceptional grower with more than one-half an acre of coffee did, but his household comprised himself, three wives, nine sons and four daughters. Other informants obtained outside assistance during at least some phase of crop work, particularly during the establishment and harvesting periods.

Methods of compensating outside helpers varied. In many instances the method was that customarily adopted for assistance rendered in food gardening: helpers were given food during the work and would receive reciprocal assistance when

¹ This grower had two wives which he claimed was advantageous in establishing such an acreage of coffee. Another grower with almost an acre of coffee and two wives was of the same opinion. These instances do not, however, necessarily indicate a general relation between size of gardens and the number of wives. A third informant with two wives had only one-quarter acre of coffee.

they needed it. In other cases, growers indicated that money payments had been made. This appeared more common when large numbers of helpers were involved which rendered the customary system or labour reciprocity unworkable. It also appeared more common for harvesting and coffee carrying, presumably because proceeds were realised soon after. For coffee, payments for help in establishment were typically delayed some years until the first and second harvests.

Maprik informants indicated that there was no difficulty hiring labour when needed. Since few had planted substantial areas (among those interviewed few had more than one acre) there was no great demand evident for assistance outside household resources for cash crop work. A number of growers indicated limitations in available household labour. One grower was physically handicapped and had to rely heavily upon friends and relatives; old age had prevented others from planting or they had planted only a few trees. Another had been affected by the desertion of his wife. Several who indicated they could not expand their areas of cash crops further disclosed other activities which absorbed much of their time. One was a Member of the House of Assembly and as he was away much of the time he had to pay people of his village to maintain his coffee garden. Another carried on gold mining as well as coffee growing and was also involved in local government council and village work. A third grew rice, carried out village work and road building and was helping to build a school for a nearby mission. In all cases, these growers claimed that levels of food production were still maintained at customary levels. Clearly labour shortages for these individuals arose from a diversification of their household activities rather than from difficulties in securing additional labour. For those who wished to expand their areas under cash crops, labour was no hindrance.

It was shown in Chapter 4 that the scale of individual participation among growers was greater on Karkar Island than in the other three areas: planting had taken place over a somewhat longer period and many growers had established sizeable coconut and/or cocoa gardens. This progress was reflected in the interviews conducted on the island. Two individuals had inherited plantings of plantation size; other gardens were smaller but were well established and had been bearing for some years.

Not surprisingly therefore the use of labour varied widely. At one extreme were those who claimed they relied exclusively on their own household labour resources. Some had fairly large areas, e.g., four with about two acres of sole cocoa each, and

another with ten acres of sole coconuts. Many hired labour for particular tasks, e.g., in the establishment phase, for garden maintenance or harvesting, processing or for transportation to sales points. Some with smaller or younger tree stands stated that they intended to hire labour to continue expansion once they were earning sufficient income to pay the wages. As in other areas, some secured outside assistance with on-the-job food payments and by incurring a reciprocal obligation to help those who rendered assistance. Some informants mentioned that the biggest growers in their respective villages were those who had started early and had continued to expand, and particularly those who were able to call on a large number of people to help them.

The two exceptional families, with plantations, employed labour on a permanent basis. The bigger of the two (Gaum) covered an area of around 100 acres and was planted to coconuts and cocoa. Planting started prior to World War II and at the time of the survey the plantation was run jointly by three brothers who were sons of the original grower. At times this plantation employed a permanent and largely specialised workforce of 6 men for grasscutting, 4 men for copra production and 4 men as firemen.

Once again growers, with few exceptions, claimed they had maintained customary levels of food production. Even the largest plantation still met its own needs. A few growers did indicate that their food output had declined somewhat owing to the demands of cash crops upon labour, but not to the extent that reliance was placed on purchased foods.

There were no indications of any difficulties in securing labour in these Karkar interviews. Not only was local island labour available for employment, but a supply of casual labour from the mainland was also available, largely as a consequence of opportunities for employment on the European plantations on the island.

Capital. It was strikingly apparent from interviews in all four areas that the development of cash crop gardens had involved little investment of money capital. Production equipment was confined to a few simple and cheap tools such as axes, picks, shovels, hoes, grass and bush knives, saws and pruning scissors. Total outlays on these items varied from zero to a maximum value of \$50 (at cost price). Some items had been issued to individuals during the second world war by the Allied Army so that actual money outlays were often much less than inventory value might suggest. Furthermore, many of them were also used in food-gardening so that at most only a proportion (often small on a use basis) should be assigned to cash cropping.

The investment of labour in the establishment phase was of primary significance though these inputs were largely supplied by the household itself. Where outside assistance was obtained, payment was very often non-monetary and in kind. Substantial money payments for such work appeared to be confined principally to the few growers with large cash crop areas, though even among this group some were able to secure assistance without such outlays. Investment in land for cash cropping was not encountered during interviews in these areas.

The only instances where development of cash cropping may have been limited by a capital shortage were those where growers were waiting for trees to come fully into bearing, and before cash income would allow further labour to be hired for the purpose of extending the area of cash crops. However, this appeared to be relatively uncommon, and in any case was a short-run problem.

Most of the evidence pointed rather to a reasonably plentiful supply of capital in relation to needs for expanding cash crop areas. Informants were questioned on cash income disposal during interviews and responses generally revealed little interest in hiring labour to enlarge the area under cash crops. Active investment did nevertheless take place in other directions. Some had made modest purchases of processing equipment. Many village groups had contributed to the purchase of coffee pulping machines, and some growers owned them individually and rented them out. Several informants on Karkar Island had their own copra driers.

A number of growers had invested (or intended to do so) in transport equipment, particularly on Karkar Island. There three had bought rowing boats to carry copra and cocoa beans to sales points and one had contributed towards a motor vessel owned by a plantation. One was saving for a small boat, another for a car, while another had a share (\$40) in a land rover, which among other uses carried timber to a sawmill. Two claimed they each were saving to buy trucks for copra and cocoa bean transport. These individuals had all financed or were intending to finance these investments from savings, and were not involved in any borrowing. In Maprik one informant was co-owner (\$200 share) with two others of a car.

The most impressive investment performance was recorded by the large Gaum plantation on Karkar Island where a considerable sum had been spent on interplanting coconuts with cocoa, and on accommodation and facilities for employees. A copra drier and bulk store had been built and a new cocoa fermentary (\$2,500 for materials) installed. The plantation also owned

a motor vessel for shipments to and from Madang, and a truck which carried wet cocoa beans to a European plantation while the fermentary was being built. This plantation had secured a loan to supplement savings for investment.

Other investments which came to light during these interviews will be discussed in a later section on income disposal. It will suffice here to point out that cash savings were available to growers in each area for investment though there were no indications from these interviews that a high priority was given to using them for the expansion of areas under cash crops.

Availability of technical assistance

Informants were asked about the type and frequency of technical assistance they received from agricultural extension officers. So far as frequency was concerned, growers in Boana, Maprik and Karkar Island indicated they received advice on the average about once every two months. In Sinasina visits appeared to have been once or twice a year. In each area extension contact was made primarily by indigenous field-workers on patrols, though a more senior agricultural officer usually visited villages once a year as well. As foregoing chapters have shown, the period immediately preceding this survey in each area was one in which there was a steady build-up in extension staff, particularly of agricultural field-workers, and the interviews reflect the closer attention to cash crop gardens which this build-up made possible. Growers themselves were generally content with the frequency of extension patrols to their areas.

Informants indicated that extension workers at various times taught correct cultural procedures for cash crops including shade establishment, seed nurseries, optimum tree spacing, garden maintenance, harvesting and processing techniques. Our own assessment of cash crop gardens, based on practices recommended by DASF, showed a wide variation in standards of gardens. In Boana coffee gardens examined were, with exceptions, generally well shaded (where special problems of altitude had not been encountered) and trees were well spaced but gardens frequently were badly maintained and required weeding. In Maprik high standards had been achieved for shade and spacing though garden maintenance was less satisfactory. On Karkar Island an extension programme to correct coconut tree overcrowding had been started prior to the survey and this had improved garden spacing by the time of the survey. Garden inspection there, however, showed only poor to fair shade availability for cocoa trees, and garden maintenance was rarely better than fair.

The fact that cash crop gardens seldom approached DASF standards could not be attributed to scarcity of advice. Rather, it appeared to be due in most cases to a general lack of interest among growers in following the advice tendered, particularly where additional work was involved.

While the majority of informants stated that their technical knowledge for cash cropping was derived from advice of agricultural extension officers, a number had learned partly or wholly from other sources. This was least apparent in Sinasina where villagers had had only a short history of outside contact. It was particularly noticeable among Karkar islanders who all had experienced continuous contact with Europeans on the island over several decades and many had travelled and worked in other parts of the mainland and islands of Papua New Guinea.

Among Sinasina growers, a few had been previously employed in other parts of the highlands, one as a labourer in Bulolo, another as a policeman in Goroka, but only two had worked on plantations. Many of the Maprik informants had worked outside the subdistrict, mostly as contract labourers on coastal plantations. Some had been gold miners (Wau/Bulolo) and a few had had a variety of jobs and experience. One, now a leader from the Maprik census division, had been a domestic for eight years and a policeman for two years prior to the second world war. During the war he assisted the Allied military efforts, rejoined the police force for seven years after the war, returned to his village and was appointed luluai, and later became president of the local government council.

While such outside experience may have inclined many informants towards starting their own cash crop enterprises, it is unlikely that it greatly assisted them technically. Those from the three areas who did work on plantations were involved with crops other than the ones they themselves finally planted in their own areas.¹ Benefit to them from such employment would have been restricted to gaining familiarity with the operations associated with cash cropping, from establishment through to marketing.

Most benefit in this regard accrued to Karkar islanders who had worked on copra/cocoa plantations on and off the island. Their experience could be directly translated to their own village conditions. Many of these informants explicitly referred to the value of such work, some indicating that this

¹ With the exception of Sinasina informants who had worked on highland coffee plantations.

had been their sole source of information. The most striking examples of this technical demonstration effect were the two European-sized plantations which were established along similar lines to the European-owned estates on the island. For most who had taken plantation employment, however, familiarity with cultural techniques was the more significant benefit. It is worth noting that these two indigenous-owned plantations themselves engendered further wider benefits, for several informants said they had commenced planting after a period of work with the owners.

Transport, processing and marketing

Details of transportation, processing and marketing arrangements were obtained during interviews with informants. Data indicated a particularly strong awareness of and reaction to the level of transport costs. In the Boana area growers from villages within a short distance did not consider carrying time a hardship or problem. Those from more remote villages indicated they would be inclined to plant more coffee if carrying times could be reduced. Two growers from Kisengam village and two from nearby Lowai village, for example, claimed that they would plant more coffee trees if and when aircraft landed regularly at Kisengam airstrip. These growers had become impatient at waiting for aircraft to commence using the airstrip which they had helped to construct and at having to carry coffee to Boana in the interim.¹

In Sinasina most informants had only short walks to roadside sales points, and complained only that buyers were occasionally unreliable about purchase times. One Tabare grower claimed that the poor access road and bridges often meant that buyers could not reach the nearest sales point which was a 1 to 1½ hour walk away, and consequently had to carry for 5 hours to the next. This grower claimed he would expand his garden if buyers had more assured access and carrying times were reduced. Another, a Dinga tribesman from Nimul, complained he had a 1½ hour walk to a marketing point. His area was mentioned in Chapter 3 as being one of the more remote, poorly served by access roads, with a track suitable only for a motor cycle. This grower claimed that with better transport and marketing services he would increase his plantings of coffee trees. A third grower who was from the Dumunare clan of the Kere tribe, which was among the most inaccessible in the survey area in 1962, said he had to carry coffee 3 hours to his nearest marketing point (Du), but because

¹ There was a delay in obtaining approval for flights from civil aviation authorities.

of irregularity (buyers could only reach Du in dry weather) he had had to carry the coffee 8 hours to Kundiawa. Again this grower indicated he would expand activity if road access was improved.

Informants from the Maprik census division indicated no transport problems. North Wosera growers claimed that the lack of river crossings had posed problems in the past, particularly in the wet season, but did not claim their interest in rice or coffee had been limited by this essentially temporary problem. A few individuals complained of difficulties in disposing of coffee production and of having to carry it long distances to market points. At that time, significant quantities of coffee were only just coming into bearing and no firm marketing arrangements had developed. This problem can be disregarded now since coffee-buying services developed rapidly as output rose.

Karkar Island interviews revealed no transport difficulties which, although not conclusive evidence, was consistent with the advanced state of access roads and the proximity of most villages to them.

Of the limited number in the four areas who claimed to be at a disadvantage, all were in the more isolated and inaccessible parts which meant at best irregular marketing and transport services and at worst long carrying times to the nearest marketing points. Case study data supported the evidence of locational effects of transport costs which were presented in previous chapters.

Cash income and its allocation

No accurate record of past earnings from cash cropping could be obtained from survey informants. With few exceptions, growers could not recall precise income over lengthy time periods largely because their thinking was not guided by conventional financial periods, and they were also illiterate. Precise measurement would have required the application of recording techniques which were beyond the scope of this survey.

However, it was felt that much could be gained from a qualitative approach at the household level, supplemented by information from other sources. Accordingly the survey questionnaire included a series of questions which explored the range of uses to which cash income had been and was to be put. In particular, informants were questioned about goods purchased for consumption and investment, levels of savings and purposes for holding cash, any loans or debts, and gifts of

money given and received. In addition, a full inventory was taken of European goods belonging to each household with rough details of time and place of purchase, and cash costs, if any. This inventory provided a useful guide to past expenditure on durable and semi-durable goods for subsistence and cash crop work and for domestic purposes. Finally, efforts were made in each area to secure tradestore data which would provide a representative picture of the pattern of local spending, both on durables and perishables. Despite the necessarily personal nature of the interview questioning, no insuperable problems were encountered in securing the co-operation of the selected households and answers were thought to have been reliable.

Boana interviews included a number of households whose coffee was still immature and who were not yet earning cash income. Interviews with those earning income showed that food and clothing were the most important consumption items in cash expenditures. A large number, however, had used part of earnings for small but productive investments. These included shares in village or clan coffee-pulping machines and in cattle purchases, purchase of pigs and galvanised roofing sheets for coffee drying. Individual investments varied from as low as 30¢ to \$10.

Most had savings at home and/or in the savings bank near Boana airstrip. These ranged in total to as much as \$50. The majority stated they had no special use in mind for their savings. Some indicated they would use them for food and clothing as the need arose or for weddings and celebrations. Very few had lent money. One had lent a small sum to a relative for his children's education costs and had received the money back; a second had lent \$2 to a cousin for a clothing purchase. Similarly, informants had not borrowed to any significant extent. No exchanges of money in traditional fashion were revealed; one informant claimed that brideprices had disappeared under the influence of the Lutheran mission.

Households exhibited a very limited quantity and variety of durable and semi-durable goods. Average total value per household was about \$34, with a range of \$15 to \$60. Three categories were of significance. Kitchenware averaged \$11 per household and comprised mainly cutlery, plates, cups, pots and pans. Clothing was of equal importance while tools were third, averaging \$7 per household. There were other categories of minor importance such as sleeping and toilet equipment (blankets, pillows, towels and mosquito nets), lighting equipment (kerosene lamps), travel goods, storage boxes and miscellaneous items.

Most of these goods were purchased either in the late 1950s or early 1960s with income earned from vegetable or coffee sales. For many, however, the period of accumulation dated back to the 1930s. Some items were army issue or disposal and were obtained during the second world war. Others had been purchased by household members during travels to other parts of Papua New Guinea, particularly Lae but also Port Moresby and Rabaul.

Almost all Boana households had one or more steel axes, bush knives and grass knives. Most owned one or more shovels or combination pick/shovels. A few owned a hammer, one owned a hoe and one owned a pair of pruning scissors. Over half the tools were accumulated prior to 1955 and many were army issue. They had originally been obtained for subsistence gardening but were subsequently used for cash cropping as well.

In addition to the consumption and investment items outlined above, travel was an important expenditure for Boana informants. The air company serving Boana offered a cheap passenger service to Lae and visits to the town were very popular. In 1962 a total of \$2,700 was spent on airfares, which, as will be seen below, placed travel second only to food in terms of overall outlays.

At the time of fieldwork in 1962-63 there was one central tradestore near Boana airstrip, and a number of small village stores scattered through the survey area which drew their stocks from the main store. The survey area population made most of their purchases from these stores but also spent some of their income in Lae and other more distant towns. Although the records of the central Boana store could not be relied upon for an indication of total expenditure on goods for the area, they probably were a fairly accurate guide to the pattern of expenditure. Accordingly records¹ from the store were analysed for 1962.

¹ Sales records from the Boana store were not available; however, those of stocks purchased by the store were. It is likely that these closely approximated actual sales made during the year as the store's policy was to keep only a small stock of any one line and to replenish on a monthly basis. It is thus unlikely that any accumulation could have developed which would have produced a sizeable difference between beginning and end-of-year stocks so that stock purchases could safely be considered as being representative of sales made during the year.

From total sales of approximately \$20,000 for the year, almost half was spent on food items (Table 6.1).¹ Other important categories were clothing and toiletry which together comprised almost one-quarter of the total. The emphasis placed on food and clothing in interviews was clearly supported by these figures. Categories which could be regarded as capital investments for economic activities - fencing materials and tools - comprised only 4 per cent, though as interview data showed, tradestore sales did not include some important items such as livestock and coffee processing equipment.

A breakdown of food items shows that starchy food was the most important category. Rice had become popular locally and comprised almost one-third of store purchases. About ten tons of white and six tons of brown rice were purchased by the store over the year.

Table 6.1
Stocks purchased by the Boana tradestore, 1962

Category	Main items	Total cost (\$)	Relative importance (per cent)
Food	Rice, canned meat and fish, flour, biscuits, sugar, salt, lard and dripping	9,488	48
Clothing	Cotton goods, shirting, trousers, drill shorts, skirts, underwear, belts, hats, shoes, raincoats, cardigans, handkerchiefs	2,718	14
Toiletry	Soap, powder, hair oil, razor blades, toothpaste	1,968	10
Educational materials	Readers, church books and bibles, slates, exercise books, writing utensils	1,326	7
Building materials	Roofing iron, ridge-capping, guttering, glass, timber, paint, varnish and nails	1,362	6
Smoking materials	Cigarettes and tobacco, newspapers, matches, lighters, flints, lighter fluids	930	5
Fencing materials	Barbed and plain wire, pig fence, rope, staples	658	3
Kitchenware	Buckets, basins, pots, pans, glasses, billycans, plates and cutlery	560	3
Travel goods	Suitcases	332	2
Tools	Knives, spades, pruning shears, axes	248	1
Lighting	Batteries, torches, bulbs, lamps	188	1
Miscellaneous	Rat traps and pesticides 30) Needles, pins, machine-oil 16) and scissors) Locks 64) Toys 10) Twine and bags 48)	168	1
<u>Total purchases</u>		19,946	100

Source: records of the Boana tradestore, Boana, 1963.

¹ In 1962 this would have meant an average of well below \$1 per capita over the whole survey population.

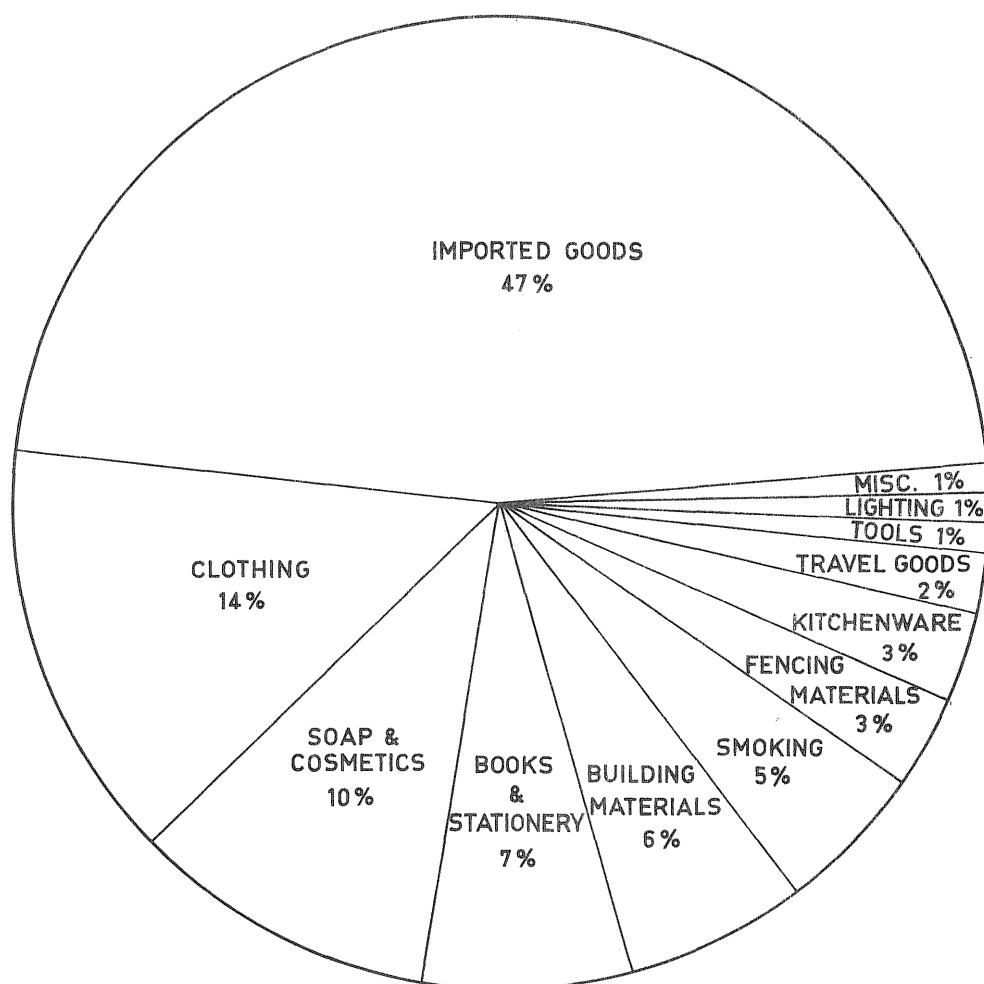


Fig. 6.1. Distribution of expenditure, Boana tradestore, 1962

Protein foods, consisting of tinned meat (various kinds of corned beef) and fish (imported mackerel and pike), were of equal importance, individually only a little less important than rice. Together these two made up little less than one-half of all food purchases. This provides some evidence for the prevailing view at the time of the survey that the customary diet in the area was protein-deficient. Other significant items were flour and biscuits, sugar and salt.

Observations made of the small village tradestores in the Boana area showed that only the more popular items such as sugar, salt, dripping, canned fish and meat, rice, soap, tobacco, matches and some clothing were stocked. Store owners often purchased in bulk at a discount from the Boana store. A number of store owners broke up some of these lines into small

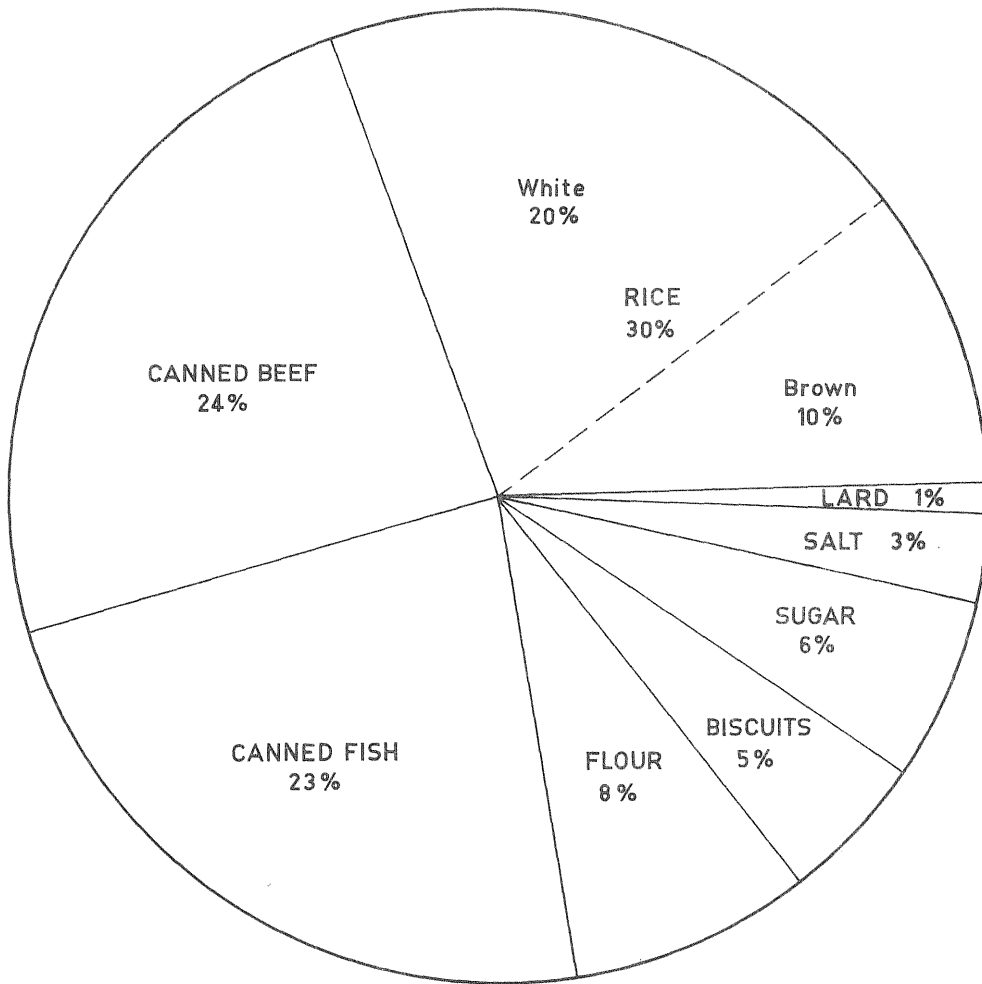


Fig. 6.2. Pattern of food purchases, Boana tradestore, 1962

lots which were marked up at higher unit prices. They typically used their own house as a store and traded spasmodically in response to an irregular village demand and to suit their other activities. Total sales in these outlying stores appeared to be small in relation to the central store. There were reports, however, that the opening of the Kisengam airstrip as a market outlet for coffee had stimulated local trading activity at the expense of Boana.

Sinasina interviews showed a similar concentration of expenditure on store food and clothing although money was used more readily for traditional purposes. A number of informants purchased pigs or fowls for money while several indicated that money was included in bridgprice payments. One grower claimed to have paid \$70 in addition to feathers, shell and three pigs

for his son's wife (without any contributions from relatives). A second had recently spent \$40 on pig or fowl for the bride-price of a relative. He also contributed \$10 and \$4 respectively to brideprices of two brothers. A further \$40 was spent on food for a party. Some claimed some earnings were used to pay the local government council's annual tax; others used some for gambling.

Several stated they had saved much or most of their earnings in preference to buying goods. One was accumulating funds to obtain a wife for his son. Another was saving and holding the money for his absent son. A third had saved \$39 over three years towards the brideprice of a wife for a nephew. A fourth had saved \$60 for the same purpose. Savings of around \$800 which had been accumulated over a number of years by one informant and his brother had recently been stolen. This individual then had \$3 in a bank account and \$42 in winnings from gambling. Another had lost \$292 the same way. This grower had a married sister in the United States of America and had saved \$40 for his sister's daughter. He had banked \$40 himself towards a coffee-pulping machine. A grower with no savings was intending to accumulate enough for a return trip to Port Moresby. Others admitted they had tried to save but without success. The range in savings among informants earning cash income was from 50¢ to \$180. All but the above two, who had had their savings stolen, held their savings at home. The two exceptions now used bank accounts.

It was not easy to distinguish between repayable loans or borrowings and gifts. In some cases the necessity to repay had been clearly stated, while in others there appeared to be at most only a vague, long-term and informal obligation to repay. Many informants stated they had not been involved in any loans or borrowings. Others indicated significant sums (in relation to earnings) had been involved. One had borrowed \$8 from his parents to buy store food. Another had lent \$14 to relatives. A third had made a loan of \$10 to friends of which \$4 had been returned. One friend had used \$4 for gambling. This informant had himself borrowed \$10, of which \$3 had been used to buy an axe, some had been used to pay legal costs of a court case and \$1 remained. He commented that he had to return the \$10, or its value in kind - one pig. Another informant had given some money away and he himself owed a total of \$18 to four men. Others had lent or borrowed sums to entertain visitors, to cover the cost of a car trip, to purchase store food and to gamble.

Details of possessions gathered from nineteen Sinasina households ranged from zero for one with no coffee garden and

no cash income from any other source, to \$118 for one who had spent an appreciable sum on clothing, tools and equipment, including a \$50 coffee-pulping machine. One household with \$100 worth of durables and semi-durables also had livestock (pigs and dogs) valued at \$32, and \$160 cash-in-hand. Table 6.2 shows that the average total value of possessions was \$40, of which clothing, tools and equipment, and kitchenware contributed most. Inclusion of the monetary value of livestock would raise this figure modestly.

Table 6.2
Value of possessions of nineteen Sinasina households, 1963
(\$)

Category	Total value all households	Average value for households	Upper limit among households
Clothing	248	12	68
Toiletry	8	1	2
Travel goods	32	2	8
Sleeping gear	42	2	10
Lighting	20	2	6
Kitchenware	138	8	32
Tools and equipment	206	10	64
Miscellaneous	42	2	12
Total	736	39	202

Most households had made some investments in steel axes, spades, hoes, bush knives, etc., which were typically used both for food and coffee gardening. Two households owned coffee-pulping machines (costing \$40 and \$50 respectively) which were rented out at 10¢ a time to other growers.

Very few households possessed items purchased before 1950 and few had been purchased prior to the mid-1950s. A considerable number had been bought in the late 1950s, presumably with the first income from coffee plantings, while the bulk of the possessions had been bought in the early 1960s. Roughly one-half of the items had been purchased within the survey area, from one of three European-owned stores. Indigenous-owned stores were not a significant source, at least for these households. About one-quarter of the possessions were purchased in Kundiawa township, a few in Chuave on the main road to Goroka, while the balance had originated from more distant townships, particularly Goroka, but also Rabaul, Lae and Madang.

The three European-owned tradestores within Sinasina in 1963 were at Masul, Dumun and Koge. There were, in addition, a number of indigenous-owned village stores which purchased their stocks from the Masul store where prices were slightly lower than at the other two. The smaller village stores sold rice, canned fish and meat, sugar, salt and tea, while some larger stores also stocked bread, dripping and clothing. Village stores carried little or no hardware.

Records were obtained from the largest of the three European-owned tradestores (Table 6.3). Details of counter sales were not available but as in Boana, stock purchases were well documented for a nine-month period prior to the time of fieldwork. The store owner was confident that stock purchases reflected counter sales accurately, and that the pattern of expenditure changed little over the year so that in view of the large proportion of purchases apparently made by households within the survey area, the data probably reflected expenditure patterns fairly accurately, though they were, of course, no indication of the magnitude of total expenditures in the survey area.

Clothing purchases were close to one-half of the total, and with food items, comprised 70 per cent. This was the reverse of the relative importance of these two items in Boana. Once again productive investment in tools and equipment was of minor significance though admittedly not all possible items were carried by the tradestore. Vehicles and livestock were two obvious exceptions, but neither had absorbed sizeable sums at the time. Other categories of store purchases shown in Table 6.3 were individually of little importance.

Table 6.3

Stock purchases by a Sinasina tradestore, September 1962 to June 1963

Category	Main items	Total value	Relative importance (per cent)
Clothing	Laplap, shorts, singlets, blouses, dresses, handkerchiefs, shoes, hats, belts, underwear	9,282	46
Food	Canned meat and fish, rice, biscuits, bread, milk, sugar, salt, soft drinks and dripping	5,094	24
Smoking materials	Tobacco, cigarettes, lighters, flints, newspapers	2,176	10
Tools and equipment	Axes, spades, bushknives, pitsaws, saws, hammers, coffee pulpers, bicycles	894	5
Luxuries	Playing cards, chewing gum, beads, rings, toys, betel nut, ukeleles, watches	964	4
Toiletry	Powder, razor blades, peroxide, perfumes, toothpaste	922	4
Bedding and travel	Blankets, umbrellas, suitcases, mats, handbags	528	3
Kitchenware	Billycans, pots, pans, cutlery, plates, glasses, cups	286	2
Lighting	Kerosene, lamps, torches, batteries, globes, wicks, lamp glasses	242	1
Building materials	Hinges, door locks, nails, latches	202	1
Stationery	Pens, pencils, exercise books, notebooks, envelopes	96	1
Total		20,686	101

Maprik informants indicated a wide variety of uses to which cash crop income was put. A number of coffee growers had used earnings from the first and successive harvests to pay off those who had helped during the garden establishment phase. Others were still accumulating harvest income with this objective in mind. Most growers indicated at least some expenditures

on store goods, especially on food and clothing. Two had purchased goods and had contributed cash as part of brideprices. Several had invested earnings, most commonly in the construction and stocking of village tradestores. One such individual ran a joint venture with \$10 contributed by a partner and with other capital supplied by nine others (\$2 each). A second ran his own village store and a car business in addition to his coffee garden. Local government council taxes absorbed some cash income and other assorted expenditures included, for one grower, purchases for a party (3 pigs, 2 fowls, 3 bage of rice, one carton of meat, one carton of beer, 6 or 7 bottles of rum, 10 lb of sugar, 20 packets of cigarettes, 3 loaves of bread, one drum of kerosene for light, 20 packets of biscuits plus a range of utensils, 2 tins of coffee and one tin of dried milk).¹ Six or seven other men also contributed food and drink to this party. Purchase of pigs was undertaken by another grower for a traditional tambaran ceremony.

Most of the Maprik informants had savings, some in bank accounts but most at home. Some had no specific purpose in mind for these funds, while others were definite about future uses. The individual with most funds² was the one mentioned above with coffee, a tradestore and a car interest. He kept (joint) bank accounts for the store and car and in total had accumulated \$830. His own coffee account was currently exhausted and his intention was to accumulate funds in it to pay off his past helpers. Some were saving for future expenditures on store food and clothing or on travel; one exceptional individual with a tradestore had accumulated \$570 for store business and travel. He had had wide European contact over a long period and had developed extensive business interests. He spent eleven years as a plantation labourer before the second world war and a number of years as a shiphand. He returned to Maprik after having to work for the Japanese in Rabaul during the war and over the post-war period grew first peanuts and later coffee and rice. He mined gold for a period in addition to establishing his tradestore. He had four wives, nine sons and four daughters and was then president of the Supari rural progress society.

¹ This party had been held a week before the interview. It appeared to be primarily for those who had assisted him in building his house and tradestore.

² In his case the funds might better be described as undistributed profits.

Very few informants had lent or borrowed money and among those who had, the amounts were small. The largest loan was \$10 from one to a friend to buy two pigs. The largest debt was \$8 to a cousin, a contribution to a brideprice. One had paid council tax for some people, another had lent money for the hire of a car and a third had lent \$5 to friends and relatives to enable them to buy clothing and pay their taxes. One grower had paid money to friends who had looked after his wife while he was away as a contract labourer. Very few informants earning income had debts of any kind. There was a notably greater frequency of loans and gifts among them.

The estimated value of household inventories for the 51 Maprik informants (Table 6.4) showed there were few with possessions worth in total more than \$20.¹ Among the forty-five households with \$20 worth or less, possessions comprised a very limited quantity of clothing (laplap, shorts, shirts, blouses, belts, sandals and hats), some kitchenware such as cutlery, plates and saucepans (though not in every case), and tools such as axes, knives and spades. A few had blankets and mosquito nets. The two informants with the largest inventories were of some interest. One had possessions worth \$426. These included a \$200 share in a car, \$14 clothing, \$14 toiletry and sleeping equipment, \$40 in tools and equipment (including a shotgun), a bicycle, wrist watch and a clock. The second had an inventory worth \$280 in which clothing (\$80) and kitchenware (\$36) were important, together with a sewing machine, clock, lighting equipment, toilet and sleeping equipment. Neither man had a markedly wider range of tools and agricultural equipment than the remainder.

Table 6.4

Value distribution of household inventories of fifty-one Maprik households, 1963

Range of value (\$)	Number of households
10- 20	45
21- 50	2
51-100	1
101-200	1
Over 200	2
<u>Total</u>	<u>51</u>

The main purchasing points for household goods had been within the Maprik subdistrict, either tradestores in Maprik itself or in the surrounding villages and mission tradestores. Records of purchase dates were poor.

¹ The value of tradestores and inventories were not included in this valuation, nor were livestock (pigs and poultry).

In Maprik census division a number of small village trade-stores catered for immediate village needs and carried only small stocks. Their main items were rice, tinned fish and meat, sugar, salt, tobacco, watches, some laplap and blouses. There was also a larger tradestore run by the Assemblies of God mission which catered for European, mission and village needs. Aside from these sources, many from this census division purchased in Maprik itself since it was conveniently located for most villages. In North Wosera the situation was similar with mission-owned stores and indigenous-owned village stores, though owing to greater isolation fewer goods were purchased in Maprik township.

To gain an impression of the range and relative importance of goods bought by the people of the North Wosera, a medium-sized village tradestore was selected for analysis. This store was supplied by the Assemblies of God mission which made records available for the survey. Choice of a store in Maprik census division was more difficult. The village stores were generally small and by no means stocked all of the goods in demand in the villages, while the mission store catered for non-indigenous customers. It was decided therefore to select a store in Maprik township which catered almost solely for indigenous customers.

Sales in the Maprik store were over twenty-three weeks during 1964 and those in the Jambitanga (North Wosera) store were for six months, from January to June 1963 (Table 6.5). These data showed food and clothing were the two key categories, together contributing 52 per cent and 61 per cent in the two stores. Buyers from the Maprik store probably included numbers employed in the township who had to purchase all or

Table 6.5

Details of sales in two tradestores, Maprik subdistrict, 1963-64

Category	Total value (\$)		Relative importance (per cent)	
	Maprik	Jambitanga	Maprik	Jambitanga
Food	4,442	416	38	21
Clothing	1,636	812	14	40
Tools	1,576	180	13	9
Smoking	1,078	6	9	-
Luxuries*	762	-***	7	-***
Lighting	608	112	5	6
Toiletry	424	174	4	9
Bedding	292	12	2	1
Kitchenware	280	164	2	8
Travel	186	14	2	1
Stationery	62	-	1	-
Building materials	-	106	-	5
Miscellaneous**	360	6	3	-
Total	11,706	2,002	100	100

* Luxuries included watches, confectionary, beads, musical instruments.

** Miscellaneous for Maprik store included radios, bicycle parts and equipment, boxes and locks.

*** Included in miscellaneous.

the greatest part of their food needs, while Jambitanga customers depended largely upon their own subsistence gardens for food supplies. This might well explain the greater importance of food purchases in the township store. Other expenditures were spread over goods covering a wide range of uses.

A breakdown of food sales in the two stores shows some interesting features (Table 6.6). Calorie-rich foods, including rice, bread, flour and biscuits, comprised 40 per cent in the Maprik store compared to 18 per cent in Jambitanga where home-grown staples were available. Sales of protein foods were much more important in Jambitanga (69 per cent). Such heavy emphasis on protein foods in village sales strongly suggests that the customary village diet was deficient in such foods. The greater importance of the miscellaneous category in the town store sales indicates the greater range of available foods, and probably the greater sophistication of consumers' dietary demands in the town.

On Karkar Island informants showed a heavy emphasis on store goods in answers to questions on disposal of cash income. They also frequently mentioned cash contributions towards marriage payments. One individual claimed that when he married, prior to the development of cash cropping, three pigs represented payment for a wife, and no money. Since cash cropping was introduced two pigs and \$20 were required.¹ A few indicated they had contributed their earnings towards the mission, shares in a co-operative society, store goods and a savings bank deposit. A few allocated part to investment in tradestores, a dinghy for copra transport, a share in a boat (\$200), a bakery and materials for a copra-drying house.

Table 6.6
Food sales in two tradestores, Maprik subdistrict, 1963-64
(per cent)

Item	Relative importance	
	Maprik	Jambitanga
Rice	15	18
Tinned meat	20	12
Tinned fish	20	57
Flour/biscuits	20	-
Bread	5	-
Sugar	8	3
Salt	2	8
Miscellaneous*	10	-
Total	100	100

* Miscellaneous for Maprik store included cordials, coffee, tea, dripping and confectionary.

¹ Provided there was no sister who could be given in exchange.

Savings varied from zero to about \$1,200. Many informants claimed to have definite intentions for their use, particularly for investment. Many investment objectives centres around transport. One was saving to buy a car for copra and cocoa transport (\$200 accumulated) in which he would take a share with others. A second had saved \$600 towards a three-ton truck, a third wanted to use his savings for a boat, and another two wanted bicycles. Other intended investments included in one case a tradestore and a battery for egg production for which the informant had accumulated \$1,160. Informants were aware of the risk of loss through theft or fire and most who had sizeable sums kept them in bank accounts.

The above observations did not include the two European-style indigenous-owned plantations. Their incomes were, of course, on a different scale, and they had a different pattern of income allocation. It was with the smallholders that we were primarily concerned in this study, and interesting though these two cases would have been, their detailed analysis was outside the scope of this study.

The majority of Karkar Island informants claimed they were not involved in loans or borrowings. Among those who were, some had definite thoughts on the subject. One said he had too many outstanding loans and that whenever he had money, men came to borrow from him in order to buy store goods. Another admitted helping many people who wanted money for store goods, pigs, mission contributions, taxes and brideprices and claimed he did not ask for repayment of such money. A third refused to give loans, indicating they only caused trouble. Various small debts and loans were enumerated by a number of informants for such purposes as council tax, store goods and cost of a boat trip.

Details of household possessions were recorded for twenty-five cash crop growers on the island. The estimated total value of their inventories (Table 6.7) was generally more substantial than that of informants in other areas and reflected the higher earnings of growers.

Table 6.7

Value distribution of household inventories of
twenty-five Karkar Island households, 1964

Range of values (\$)	Number of households
0 - 20	3
21 - 50	4
51 - 100	9
101 - 200	8
Over 200	1
Total	25

Levels of expenditure on clothing, stationery and books, toiletry, sleeping equipment and lighting were not obviously higher than in other areas. Kitchenware was more extensive, however, and often included items such as irons, primus stoves, kettles, teapots and a more numerous and wide array of plates and cutlery. Karkar informants frequently had a wider array of tools and household equipment including bicycles, copra driers, roofing, wire, saws, motor boats and dinghies, hand-planes, oil stoves, sewing machines and radios. One individual had recently spent a large amount of his savings on the construction of a European-style three-roomed house of wood and masonite with concrete floors, an iron roof and a verandah. The estimated value of the business inventory of Gaum plantation, the larger of the two owned by indigenes, was about \$20,000 and included a small vessel worth \$11,200, a truck (\$3,260), a cocoa fermentary, copra house, employees' quarters, and bulk stores.

Purchase of goods by informants had been widely dispersed by location and over time. On the island, consumers could choose between plantation-owned tradestores, those run by co-operatives and a number of privately owned village stores. The village stores were expanding at the time of the survey. The authors counted a total of fifty-two in 1966. Thirty villages had one store each, seven had more than one. The village of Marup 1 was recorded as having six stores in 1966.

Turnover data were collected from three co-operative trade-stores on the island for 1964. One was chosen from each of three parts of the island in an effort to gain a balanced overall picture (though no assurance can be given of this). Table 6.8 shows the distribution of sales by particular categories for the three stores individually and in combination.

Table 6.8

Relative importance of categories in sales of three
co-operative tradestores on Karkar Island, 1964
(Per cent)

Category	Tradestore			Total
	1	2	3	
Food	46	63	53	59
Tobacco	19	10	9	10
Clothing	13	11	10	11
Sleeping	2	1	2	1
Travelling	1	-	-	-
Kitchenware	-	2	2	2
Toiletry	1	5	4	4
Tools	-	2	1	1
Lighting	18	2	12	7
Building materials	1	2	2	2
Stationery	-	-	1	-
Miscellaneous	-	3	4	4
Total	100	100	100	100

The volume of sales varied appreciably. Store no.1 on the south or Takia end of the island recorded only around \$1,000 turnover, no.2 in the northern or Waskia end recorded about \$10,000, while no.3 in the east sold \$6,300 worth of goods. The combined figures were thus most influenced by nos 2 and 3. These indicated a heavy predominance of food expenditures (59 per cent) with only clothing, tobacco and lighting materials contributing substantially. Although the proportions varied between stores, these four categories maintained primary importance in the three individual stores and in combination, and varied in total from 93 per cent of the total for store no.1 to 84 per cent for store no.3.

A similar breakdown for food items (Table 6.9) showed a high proportion of 50 per cent or more for calorie-rich foods and a lower proportion of 25 per cent for protein foods (meat and fish) with primary emphasis among the latter on fish. This lower emphasis on protein foods on Karkar Island may well have been due to the plentiful supply of fish offshore and its inclusion in the normal diet of the islanders. Miscellaneous foods included such items as condensed milk, coffee, soft drink, tea, dripping and fruit juice.

Table 6.9

Relative importance of food items in sales of three
co-operative tradestores on Karkar Island, 1964
 (Per cent)

Item	Tradestore			Total
	1	2	3	
Rice	41	43	44	43
Flour/biscuits	5	14	13	13
Meat	17	7	6	7
Fish	9	19	20	19
Sugar	16	9	10	9
Salt	-	-	-	-
Miscellaneous	12	8	7	8
Total	100	100	100	100

Plans for cash crop expansion

Growers' answers to questions about their future plans for cash cropping provided further insight into the picture of cash crop participation although, of course, one needs to be cautious in interpreting and using statements of intentions, and little importance could be attached to detail in interview responses.

The general impression from interview data and from other personal field observations both in the Boana and Sinasina areas was that there was no marked planting activity in progress or planned. In Boana Kisengam villagers were still

planting but few others had any immediate plans for expansion. One who had planted on another clan's land intended to plant on his own because of uncertain tenure over the former. Another two were planting because of shade problems in their first gardens. A few others stated vague intentions of expanding gardens in the future, while a number stated definitely they had no plans to expand, principally because they claimed to be busy enough with the existing level of activities. At the time DASF was still encouraging Boana people to continue planting if they had the time to care for their areas and though they were aware of this, few of those interviewed were prepared to act upon their advice.

In Sinasina a number were not planting coffee for lack of suitable land or because they were not interested in the crop at the time. Three were in the process of planting new areas and had the gardens marked out. The areas envisaged, however, were small. One was adding to an existing garden comprising only twenty-six trees. A number had positive but vague plans for further planting but there was no assurance that their plans would be implemented. Two of the biggest local growers were among those interviewed (four and five acres respectively) and both definitely intended to expand.

A large number of informants in the Maprik area were undecided about expansion. Some had only recently planted their first garden while the trees of others were still immature. These growers would not commit themselves on expansion until they had received income and could judge for themselves how rewarding the monetary returns were in relation to the labour inputs. Most of the cautious individuals referred to previous unfavourable experience with peanuts and/or rice crops. One who had not planted coffee himself was watching others to benefit from their experience before making a decision. Several informants from North Wosera villages claimed to be prevented from planting by land shortages. Others claimed to be fully committed with their existing tasks, while one, with rice only, claimed he was too old to plant a long-term crop like coffee. A number were in the process of expanding their gardens. Two had very small numbers at the time. A third had previously planted an acre of coffee and intended to plant a further sixty trees for which land had already been prepared. One was delaying his decision as he was leaving for a trip to Rabaul. Another was awaiting the results of a soil analysis of the grasslands to which he had rights.

Among those who had not yet planted any cash crops, few had plans to commence. One had recently returned from contract work outside the District and had not made any decisions concerning crop work. Another ex-plantation labourer was assisting

his brother with his coffee and thought he might decide to plant coffee and rice 'later'. Several gave advanced age as their reason: one helped his three sons, another taught the traditional tambaran fashion. Four preferred gold mining: of these one helped a 'business brother', and expected to share the first harvest with him at which time he would make a decision himself. The second and third had land which they regarded as being too isolated (two hours' walk from the nearest road in one case). The third simply did not like coffee garden work, though he was prepared to help a brother in his garden. One other, a village big-man, stated he left money-earning to his sons and led the traditional tambaran singsing. He looked after the food gardens with other big-men. As in Sinasina, two of the growers with large coffee gardens planned to continue their expansion.

Karkar Island case studies showed strong evidence of continued and substantial expansion of areas under cash crops. Among those who were growers at that time, a large majority stated definite plans for future planting and many knew how many trees they would plant. Many said they were encouraged by extension officers to expand their plantings of coconuts and cocoa, though the desire to earn more cash was the uppermost motive. Some with sole coconuts intended to underplant with cocoa. Others had done so and planned to extend coconut plantings, while some planned to plant sole cocoa under existing shade. For a few, plans were vague, especially where current plantings were not yet in bearing.

Among the few growers who did not intend to extend plantings, one older individual claimed he already had planted enough and would raise his income by investing further in his tradestore. Old age was given as the reason in another case and shortage of land in two others. Among non-growers who were interviewed, one had been hampered by a paucity of inherited land and another was physically handicapped, but both claimed they had worked out ways of overcoming their problems for the future. Two others saw no way out of their land shortage: one claimed a mission had taken his land and the other was living in his wife's village.¹ One individual had divided up his land among his sons and had retired. Another was not keen to grow cash crops and preferred employment as a plantation labourer. One other claimed he disliked hard work and preferred his job as a mission employee; aside from selling a few bananas he avoided cash crop work.

¹ He claimed he could secure land in his own village if he wanted some.

Reactions to price fluctuations

An attempt was made during the interviews to obtain informants' views on what their reactions might be if circumstances were to change. In particular, they were asked if prices rose or fell, what action they would take in relation to their area under cash crops, to the care they took in maintaining their gardens and to the quantity or proportion of the crop they harvested. There was no way of ascertaining whether these individuals would follow the line of action they indicated and so the findings can only be treated as hypothetical. Nevertheless, they illuminate grower attitudes at this early stage of contact with the market sector.

In all four areas a number of growers who had only recently planted cash crops, which were still immature, could give no opinion on their reactions. A few others, with market experience, said it would depend on the circumstances at the time. Four Maprik informants indicated they had no firm views on such questions themselves and usually deferred to the opinions of others in their villages and/or DASF officers. One Karkar informant stated he also took DASF's advice on such matters.

Most informants, and virtually all who were growers, had definite views on how they would react. First, practically no 'perverse' reactions were encountered in the four areas. There were no informants who, in experiencing a price rise, claimed they would cut back their area expansion plans, reduce garden maintenance or the quantity harvested. Nor, under conditions of a price decline, did anyone claim they would attempt to increase the area already intended for planting. The only exceptions found were three individuals in Sinasina and one in Boana who claimed they would harvest more at lower prices in order to maintain income.

Probably the most striking feature of the replies was the number of informants who claimed they would act independently of price changes. In each area, and particularly on Karkar Island, where market contact has been established longest, a large proportion claimed that expansion plans (or lack of them), the standard of garden maintenance and the efforts devoted to harvesting would be unaffected by price changes, either upwards or downwards. Some gave reasons for this attitude. Several claimed they were planting to provide for the future of their children, and often each child was provided with at least one cash crop garden which he or she (more commonly he) would inherit. Each was to receive such an inheritance regardless of how prices shifted. Several growers commented that they realised prices fluctuated, both up and down, but that they pursued planting objectives and maintenance and

harvesting plans regardless of such movements. Others stated they wanted all the money they could get and so ignored price fluctuations. In relation to price falls, growers commented they might as well keep harvesting the crop to get what little money they could, that it was a pity to let the crop rot on the ground, that the gardens would deteriorate with less care, or that they wanted cash badly even at low prices.

A sizeable number of growers in each area said their reactions would vary directly with price changes. These growers claimed they would expand on areas already intended for planting to take advantage of enhanced income prospects. Several said such an expansion would only follow a steep rise, while a number of non-growers also indicated they would only become interested in commencing to plant under such conditions. Some said they would make greater efforts to care for gardens and harvest more of the crop though many doubted whether much improvement was possible, as they already attended to the crop as diligently as they knew how. Conversely, some growers claimed they would cut back on expansion plans and devote less attention to the crops if prices fell because of the less attractive returns, though such reactions to price falls were encountered less often than positive reactions to rises, that is, several growers who were prepared to react positively if prices rose, preferred to maintain activity in the face of a price decline. In all areas, in the event of a fall in price, particularly a substantial one, many growers were prepared seriously to consider other money-making ventures to the crop in question. In Maprik these were gold mining, rice, trade-store business and labouring; on Karkar Island they included vegetable growing or skilled and unskilled employment opportunities on and off the island.

If these interview replies are any guide to smallholder reactions, they suggest positive but rather low short-term (harvesting reactions) and long-term (planting reactions) price elasticities of supply, except perhaps when price movements are particularly sharp and sustained over time.

Chapter 7

Conclusions

This study has been concerned primarily with the response over time of a number of communities to new economic opportunities. Previously these communities had been subsistence-oriented and virtually self-sufficient and had experienced little contact with an advanced market economy. The opportunities considered in this study took the form of new cash crops introduced under governmental direction. Interest lies first in the manner and effectiveness in which the opportunities were offered, second in the nature of the response of these communities, and third in the lessons which the analysis holds generally for the study of economic development.

The development strategy

The development strategy was a package approach which centred on the selection, introduction and promotion of one or more cash crops in each area. The objective was essentially to generate the maximum income-earning response in each community within the constraints of limited public resources available for the task.

Agricultural extension officers played a crucial role in encouraging the adoption of cash crops in each area. They introduced the new crops, distributed planting material, and organised village-level multiplication (e.g., seed nurseries) and quality control of parent material and product. They also promoted the selected crops, and their techniques of persuasion had a special significance in these areas which had experienced little previous contact with the monetised market system.

Factors which affected the scale and efficiency of extension activity plainly influenced the pace of development in each area. Limitations on available staff and finance were apparent throughout the period but particularly during the 1950s when they were exacerbated by the absence, or slow development, of transport facilities. Restricted access to villages made extension patrolling difficult and time-consuming and allowed

only infrequent visits to villages (e.g., in Sinasina even in 1958-59, it still took up to two months to patrol the whole survey area). As a result, there was much poor crop husbandry arising from ignorance, and in addition, adoption and planting in more remote areas (e.g., in Sinasina and Maprik) were delayed.

From the late 1950s onwards and particularly in the early 1960s, extension staff grew, supporting funds and equipment (e.g., for vehicles, etc.) became available, and local transport facilities improved. Extension worker/farmer ratios improved (though they were still far too low by normal standards). Extension worker efficiency also rose, for with better access to villages and with vehicular transport less time was spent in travelling, the frequency of visits was increased and more attention could be given to individual villages and even to individual growers.

Extension officers attempted to overcome the long periods between patrol visits to villages by enlisting the assistance of men who were influential locally. Where these men were powerful and were convinced, they became effective agents, as in Boana. In other areas this technique met with only mixed success as some leaders had only restricted influence in their own and other villages; some villages had no such leaders, while some choices were not appropriate. The presence or absence of such men was a significant local factor in intervillage variation in participation.

Largely because of the isolated, independent nature of these communities the involvement of the public sector in encouraging development was of necessity heavy, i.e., the 'package' was extensive. There was little or no existing economic infrastructure so that transport facilities frequently had to be provided to enable linkages with the market system. Similarly, since historically trading had been of marginal economic significance between communities, and non-existent with the outside world, marketing facilities had to be developed. Finally, given the provision of such facilities, service industries were required to ensure that farm output would reach its destination in an acceptable, marketable form.

On Karkar Island market linkages were already in existence owing to the presence of European estates, and smallholders could avail themselves of these services and facilities. In the early postwar period before the road network had developed, marketing of goods by this system was, however, difficult. Villages close to plantations did have easy access, but their dependence upon a single plantation outlet left them in a weak bargaining position. The more remote villages were at a great

disadvantage, and evidence presented in Chapter 4 suggested that transport costs severely discouraged smallholder progress in these years.

The facilities and services offered by the Karkar estates were clearly inadequate to encourage a fast and widespread rate of smallholder development on the island and the need for improvement was recognised early. The establishment of co-operatives and the attendant growth of buying points improved market linkages for the islanders. They improved the bargaining position for some growers, who now had an alternative outlet for their produce, while for others they provided easy marketing access and thus provided a first incentive for the commencement of cash cropping.

While development of co-operatives materially assisted smallholder progress, it by no means solved all transport and marketing problems. This first development phase was in fact primarily useful for the coconut crop. Smallholders, if they did not sell the whole nut to estates, were able to process the crop themselves. It was a crop relatively well suited to a limited market contact situation since, compared with most other crops, delays between harvesting and marketing did not necessarily mean a severe loss of quality through deterioration, and processing techniques were simple. For a crop like cocoa, no such delays could be afforded owing to the critical influence of the time factor on the final quality of the product.

For Karkar Island, development of the road system was necessary for the adoption of cocoa as a smallholder crop. Here again the existence of plantations with processing facilities was advantageous. Without them, the Administration would have had to provide processing facilities and services itself or at least in partnership with growers at considerable expense. In the early years, while output was still limited and widely scattered, a probably substantial subsidy would have been inevitable. As it was, the availability of plantation processing and market services, facilities and expertise allowed considerable savings in public resources. Smallholders obviously did not receive the benefits of profits made by the plantations in providing services in these early years but with the formation of the Karkar Company, this disadvantage should be overcome. Smallholder cocoa bean output in 1970 enabled the operation of processing facilities without subsidy, a significant factor underlying the formation of the company. The inevitable financial (infant-industry) difficulties of the early years were thus largely if not wholly avoided by taking advantage of privately owned facilities. The saving of public moneys

allowed a greater concentration of capital on other productive uses such as the promotion of cash crop plantings in this and other areas.

By contrast, there were no such private processing, transport or marketing facilities in the other three areas. However, it was not necessary to spend particularly high levels of public money to overcome the problem, particularly in the case of coffee which, like coconuts, was a suitable crop for smallholders. Even without sophisticated facilities and services, and allowing for the effects of inadequate technical knowledge and supervision, it was possible to secure a marketable product which would earn monetary returns sufficiently attractive for the smallholder to maintain his involvement, if only on a small scale. Thus, in Boana, Sinasina and Maprik the early limitations and inadequacies of market linkages and technical assistance were not sufficiently critical to discourage production. Reasonable standards of production and processing could be attained by smallholders themselves, which meant that the Administration had only to be concerned with transportation and marketing facilities and services.

Provided a reasonable volume of coffee was forthcoming from any area accessible to transport and marketing services, these studies showed that little time would elapse from the first harvests to the entry of private traders. In Boana it was only necessary to provide an airstrip from which buyers could operate and the first of these was constructed by the mission and local people. In Sinasina a much more substantial transport infrastructure was required: a main road to link the area with its export outlets (Goroka and coastal ports) and an internal feeder or access road network. Maprik also required an internal feeder road network to link up with an air, river and finally road outlet to an export port. However, in all three areas the Administration provided public marketing facilities for the coffee crop until private traders were attracted by the growing volume of export and import business.

For rice, the situation was more complicated, as the Maprik study showed. It was not successfully processed at the village level and suffered serious deterioration in storage under village conditions. Early experience clearly showed that centralised facilities and services after harvest were needed if the crop was to retain its popularity, i.e., if a favourable monetary return was to be maintained. Private enterprise was not locally attracted to this crop and thus the Administration had no alternative, at least initially, but to take over virtually all operations¹ in order to maintain interest. First,

¹ Except collection from growers and transportation to the mill which were the responsibility of producer organisations.

it was necessary to expand output locally and for this purpose a price had to be struck which at least maintained grower interest. Second, there was the problem of securing markets for the output which the price to the grower brought forth. The price for the local product had to be competitive with the imported product. Third, intermediate costs of transport, processing and marketing had to be held down to a level which, when added to the price paid to producers, did not overprice the local product in relation to imports.

As Chapter 5 indicated, this was no simple set of calculations. Initially the price to the producer was set low¹ and the output response was also low but was successfully absorbed on the local Maprik market. This market was, at that time, effectively captive because of the isolation and high transport costs of importing rice to it. However, while the local product could compete in this market, it was clear that there were few prospects for a fast growth of output locally at the price level paid to the grower. Indeed, it seemed likely that growers would completely lose interest in the crop.

A price increase rectified this problem and set the industry on an expansion course which soon meant the local markets were oversupplied and new ones had to be found. An improvement in transport facilities and an accompanying steep reduction in transport costs between Maprik and Wewak brought the exploitation of the Wewak market within the realms of possibility. Here, however, a fresh problem arose. While this market could absorb a sizeable volume, market competition from imported rice was stiffer and Maprik rice had to be offered at a lower price in order to compete. Potentially the most fruitful answer to this problem lay in reducing intermediate costs, and there was considerable scope for reducing processing costs through the introduction of more efficient machinery though this meant a further rise in local supplies of paddy. The alternative was to lower prices to the producer. This, it appeared to the authors, would set the industry on a declining path. Production would be discouraged and the economies of scale, available in processing and transport because of the rising volume of output, would be lost.

Some element of subsidy was undoubtedly involved in the public financing of the Maprik rice venture, and indeed its history indicated periods of inefficiency, arising largely from inadequate attention to the problems outlined above. Provided economies in transport and particularly in processing can be effected and the expansion in output can be achieved,

¹ And facilities and services were poorly organised.

however, the historical 'subsidy' could be justified, as a short-term measure, on an infant-industry basis. This is an instance where private enterprise would probably never have been interested in making the investment involved and therefore is an important example of, and lesson in, the role which the public sector can play in supporting an emergency industry which has long-run prospects of viability even if they were somewhat marginal as in this case.

These area studies indicate that a highly flexible strategy was adopted in promoting agricultural development. The particular strategy of applying a development package to an area was moulded greatly by the nature of local conditions. In the interests of conserving scarce public funds and technical skills, the Administration made use of the facilities and services of private enterprise, particularly in the fields of processing, transportation and marketing. Private enterprise in effect meant primarily European enterprise, since indigenes have been slower to avail themselves of available opportunities, though examples of the latter are growing as described for Karkar Island and Maprik.

Where, however, such services and facilities did not previously exist, as in Boana,¹ Sinasina and Maprik, the Administration provided them as required in support of its programme of production encouragement. The extent of this assistance varied greatly, from the provision at Boana of airstrips to encourage private enterprise to service the area, to strong and sustained Administration support at Maprik over the whole range of facilities and services for the rice crop.

For most industries and over most areas the extent of government involvement necessary to support production declined over time. In Papua New Guinea where market contact had been so undeveloped, government agencies necessarily played a particularly important role. Their activities largely determined the level of cash returns to the producer, which as discussed below, in turn determined grower reactions and attitudes to a large extent, and thus the rate of growth of marketed output. Over time, provided growers were not disappointed with the level of cash returns to their efforts, the growth of output attracted private enterprise to the various service activities associated with each crop. In some instance Administration withdrawal was in favour of European concerns, in others it was in favour of grower co-operatives or societies or individual indigenous entrepreneurs. The general strategy was to

¹ Excepting, of course, the assistance rendered to villagers by the Lutheran mission.

intervene on behalf of smallholders only when needed, to effect or maintain market linkage by involvement in activities other than those directly associated with production, and to withdraw from these as soon as practicable in order to concentrate resources more fully on encouraging further smallholder output with extension services.

In summary, the growth of cash crop production in each area followed the implementation of a government-sponsored 'package programme' of inputs for agricultural development. The introduction of one or more cash crops with technical support formed the basis, combined in each instance with the development of transport facilities of various kinds both to provide external market outlets and internal linkages for the population. Establishment and maintenance of law and order was a preliminary feature, while other facilities and services (marketing and processing) were added to the first two where and for as long as was necessary.

While the programme can be regarded as a 'package' in retrospect, it was less obviously so in operation. The elements of it were by no means always planned and co-ordinated either in advance or during implementation. This was particularly noticeable in relation to the provision of agricultural opportunities and transport facilities. These functions were the responsibilities of different departments within the Administration and there were many instances where prior consultations had either not taken place or had been ineffective. Some villagers had planted cash crops before transport facilities were provided while others had helped construct access roads before planting material became available. While some of these problems could be explained by shortages of funds and personnel, there was often a discernible lack of co-ordination between the departments involved.

The response

The data of the foregoing chapters enable some comparisons to be drawn between the responses of the four communities to the new agricultural opportunities.

First, the patterns of response over time show some similarities. These are particularly evident in the three areas growing coffee. There, tree plantings exhibited a slow start, then a fast rate of increase over a short period followed by a declining rate of increase. The overall pattern in each area was thus very much a sigmoid curve. On Karkar Island this pattern appeared to be largely repeated for coconuts, and with some delay, for cocoa which was mostly underplanted

beneath coconuts, though the rate of increase of plantings of both crops appeared to be more sustained than it was in the other three areas.

This pattern almost exclusively reflected the growth of grower numbers who were establishing their first cash crop gardens. Very few individuals were recorded as having subsequently expanded beyond their first gardens during the periods reviewed except on Karkar Island where it was possible to raise productivity and income per acre by adding cocoa to coconuts. The pattern of response therefore showed how the decision to participate in cash cropping was taken. The first group of adopters were the innovators or leaders in these communities who provided the example for the followers or imitators, most of whom decided to participate within a short period of time. However, a number of other factors contributed. In the early years, for example, there was a shortage of planting material. The slow start may be due to some extent to the period within which seed were multiplied for wider distribution, using material harvested from the gardens of the first growers. Had planting material been more readily available in the early years, there may well have been a faster incidence of participation.

Another partial explanation lay in the changing circumstances affecting these communities and in community reactions to these. The two most important factors were the growth of transport and marketing facilities and services and the increase in extension staff and services. In Boana the opening of the Kasanombe airstrip brought a response from the previously disadvantaged Naba people. In Sinasina the response of the Kere tribe and of clans within it was closely related to the upgrading of transport and marketing facilities and the more frequent provision of extension advice. The most active period of planting on Karkar Island coincided with the development of the island's road system.

This response pattern for the perennial tree crops was not apparent for peanuts or rice, the two annual crops of the Maprik area. One reason may have been the lack of a gestation period for these crops; another was probably the lower cash returns they offered. Thus one must be cautious in reaching a firm conclusion about the existence and nature of a typical pattern of response over time.

The most striking feature of participation in the four areas was its limited extent and, for individual growers, its limited scale. In all areas except Boana, a sizeable proportion of adult males did not take advantage of the new opportunities. Some 27 per cent of the Kere tribe and 58 per cent of adult

males on Karkar Island were not growers. In Maprik 72 per cent of North Wosera and 59 per cent of Maprik census division males had not chosen the most remunerative enterprise, coffee, and a somewhat lower but still substantial percentage was growing neither coffee nor rice in 1969.

Among those who were participating, the limited scale of their involvement was also strongly evident in all areas except Karkar Island. In the three coffee-growing areas, the distributions of trees per grower showed a remarkable similarity. In Boana the average was 100 trees per grower, for the Kere tribe (Sinasina) it was 115 trees, while in Maprik and North Wosera census divisions it was 105 and 118. These figures represent crop areas of one-fifth of an acre or less per grower. By contrast, on Karkar Island areas per grower were notably greater (at about three acres). More broadly, 90 per cent of Boana growers and over 50 per cent of Kere growers had tree numbers equivalent to one-fifth of an acre or less. The proportions for Maprik and North Wosera growers were 53 and 46 per cent respectively. Again, by contrast, 78 per cent of Karkar Island growers had planted an area equivalent to more than one acre of cash crops.

Why then was the response so limited in these areas, and why was there a greater response shown by Karkar Island growers?

It was clear that the supply of resources was not a generally limiting factor. A careful examination of land availability in two of the areas which were reputed to be among the three most heavily populated in Papua New Guinea, revealed no association between this factor and participation in the Sinasina, and a likely positive relation was found for only a small number of villages in the Maprik subdistrict. Other than in these villages, land shortages were definitely apparent for only a scatter of individuals in these and other areas.

Households were generally well placed for labour resources. Traditionally activities associated with subsistence production made limited demands upon the household supply and there was typically in each area an ample surplus which could be used for cash cropping. A number of households with heavy commitments to other, often non-economic, activities indicated that with their existing areas of cash crops, their household labour supply was fully engaged but most gave no indication of such pressure. In most areas it was, in any case, possible to hire labour for cash crop tasks and there was little reason for believing labour could have been anything but a minor and temporary limiting factor.

Money capital was of relatively minor significance in the activities of most growers. The few who claimed to be in need for the purpose of expanding their cash crop gardens usually indicated that it was a temporary shortage, requiring a period in which they would save to be able to pay for hired assistance. Land was seldom exchanged for money and requirements for equipment were few and generally cheap, even for processing purposes. On Karkar Island, where cash crop areas and cash earnings per grower were highest, the limited evidence suggested that the volume of investment used for expanding cash crop areas was comparatively small. Preference among investments was given rather to such ventures as tradestores and particularly to the purchase of vehicles for goods and passenger transport.

Nor can this record of participation be attributed in any significant degree to the attractions of alternative enterprises or employment. In Boana the only local alternative, vegetable growing, was generally considered to be less remunerative than coffee growing. Vegetable and pyrethrum production were similarly regarded by Sinasina growers. Gold mining was preferred only by a limited number in Maprik located in close proximity to the river deposits. Others had only vegetable growing and artefact manufacture as local alternatives. Karkar Island showed a similar lack of diverse opportunities. Plantation employment was open to men of all areas but there was little interest shown in this during the survey.

Time which was not taken up in subsistence tasks, cash crop work and community responsibilities (road or village maintenance duties) appeared to be devoted to social and leisure activities. Most households in the four areas had available or could obtain the resources necessary for the commencement or the further expansion of cash crop gardens if they had so chosen. The major limitation appeared to be one of motivation, i.e., their desire to do so.

It is possible that measurements of participation in later years would reveal a higher proportion of growers among adult males in these areas though recent revisits to most areas suggest this is debatable at least in the short term. Individuals in all areas had had ample time to consider the merits of cash cropping in terms of others' experiences and in terms of their own activity preferences, and there is no reason to expect that increases would be particularly dramatic, unless local circumstances changed markedly. Furthermore, also on the basis of past experience, it seems unlikely that the scale of participation among these new growers or among those already participating would be found to be much greater in the short

term, except perhaps for those on Karkar Island, where plans for expansion in 1966 were borne out by the 1969 revisit data.

Individuals in all areas reacted positively to improvements in their economic environment, particularly where cash returns to labour inputs improved. As already shown in each of the four areas, improvements in transport, processing and marketing facilities and services produced marked localised increases in participation, notably where labour requirements to carry cash crops to the nearest marketing point were substantially reduced. However, by the end of the periods under review, most growers enjoyed easy and quick access to markets or trading points, and had no processing problems which greatly reduced prices received. It was difficult to visualise further local improvements which could significantly increase prices received by growers per unit of output. The main hope for such increments would lie with higher world prices for their commodities.

Interviews clearly suggested that higher prices would stimulate further cash cropping activity. Precisely what price rise would be required to generate further substantial activity could not be forecast. Some non-growers indicated they would be prepared to commence planting if prices rose, while many growers claimed they would undertake an expansion or raise current planting targets of cash crop area under these circumstances. On the other hand, many statements by growers and non-growers suggested that these decisions were largely independent of price changes and that they would not alter their plans with price changes. We would not expect therefore that such changes would induce the majority of people in these areas to engage in a sustained increase in cash crop activity.

The reason for this view lies in people's generally limited interest in earning money. Opportunities were available for earning more money either by expanding the area under cash crops or by increasing yields (more complete harvesting, better garden maintenance, more careful processing, etc.) and on rough calculations, marginal cash returns for extra effort applied appeared to be attractive. The evidence, however, points strongly to a lack of motivation among the majority for making the effort to increase income.

The distributions of cash crop garden size per grower did indicate the existence of growers who were making a sustained effort to expand their income. This upper end or 'tail' of the distribution could be regarded as a statistical indication of the frequency of incidence of entrepreneurs in these communities.

In Boana it was virtually non-existent. Only one per cent of growers had gardens approaching or greater than one acre

in size. Only a handful of Sinasina growers had more than an acre under coffee while less than one per cent of Maprik and North Wosera census division growers had an acre or more of coffee. On Karkar Island there was a more marked incidence of big growers, 14 to 15 per cent of growers having five acres or more under cash crops. Although size of cash crop gardens is not an infallible guide to entrepreneurship, it probably bears a close relation in these communities, for cash cropping has typically provided the initial income and source of savings for investment activities. Even though entrepreneurs have often diversified into other ventures such as transport and tradestores, this generally appeared to have been made possible by a substantial early commitment to cash cropping.

These 'entrepreneurial'-types apart, the great majority of individuals in all areas were clearly content with very limited cash earnings. This was reflected in the tradestore expenditure patterns and in the inventories of household possessions. Though there was a relatively heavy proportion of cash income spent on food, the quantity purchased was small on an annual per capita basis. Furthermore, subsistence food production had been almost universally maintained so that purchased food was bought as a supplement to the normal diet. To some extent the supplement was useful, particularly with the purchase of high-protein foods such as tinned fish and meat, although it was generally minor in quantitative terms. Other components such as starchy foods were simply additional to the customary staples and could only be regarded as 'luxury' items. These purchased foods were frequently used on special occasions and could scarcely be regarded as permanent or regular dietary components.

Among household goods, possessions were largely restricted to a range of relatively inexpensive cooking and eating utensils and to some sleeping equipment such as blankets, mosquito nets, etc. Housing itself was still almost exclusively constructed with traditional bush materials. Periodic replacement of housing was carried out by the household assisted, without monetary payment, by relatives and friends who, in their turn, would receive similar help. Examples of European-style housing, for which purchased materials were used and paid labour was employed, were few and were found only on Karkar Island.

Personal possessions were similarly very restricted. While most people in each area had some items of purchased clothing, preference was still commonly shown for traditional styles of dress, for which bush materials were used. Store clothes in any case comprised only a few items such as shirts, shorts, shoes and dresses.

When all the typical uses to which money was put by individuals in these areas were considered together, they did not require large-scale, sustained money-earning efforts from the population. Rather, these communities could be satisfied by the low level of annual cash income which was being earned from the average cash crop garden already established. Actual monetary needs were still few. Most needs were still met through the traditional production system and its attendant social organisation. New wants, stimulated by contact with the monetary economy, were developing only slowly, in a discontinuous fashion, so that very often the demand for money still centred around particular identifiable items, for the purchase of which individuals were prepared to work and save. Sometimes these were of a traditional nature (e.g., bride-prices), sometimes they were imposed externally (e.g., local government council taxes and education costs), and sometimes they were newly developed wants (e.g., new foods and clothing). Occasionally they did require both large-scale and sustained effort (e.g., purchase of a vehicle, construction and stocking of a tradestore), and the few individuals with unusual ambition generally were identifiable by their exceptional level of cash cropping.

At the other extreme were individuals who openly admitted they had no interest in modern ways of living and expressed no interest in engaging in cash cropping activity for the purpose of earning money. There was therefore a spectrum of attitudes towards cash cropping which existed primarily because of variations between individuals in the importance or value they placed on the opportunity to earn money relative to other (primarily non-economic) activities for which cash cropping substituted.

The majority were prepared to make only a very limited commitment of time and labour to cash cropping in Boana, Sina-sina and Maprik. On Karkar Island the commitment was significantly greater among those who chose to participate in cash cropping though there was a surprisingly high proportion who had, to 1969, decided against participation. This greater commitment appears to have been associated with, and probably caused by, a long and close contact with European plantations on the island, proximity to Madang township, and the ease of travel around coastal New Guinea. In addition, the cash returns to Karkar islanders from coconuts/cocoa appear to have been higher than returns to coffee growers in the other three areas, partly because of international price levels and partly because of the high fertility of Karkar's volcanic soils.

Taking all other factors into account, the pattern of cash crop participation indicated for each area in terms of the

proportion of growers among adult males and in terms of the distributions of areas planted by growers at the end of the survey periods, was primarily a reflection of the value placed upon money by individuals within the four communities in relation to the effort required, compared with alternatives, both economic and non-economic. For each, the calculation was essentially one of comparing the relative satisfactions gained from using money earned from labour allocated to cash cropping with alternative economic occupations and the alternative pleasures of what can be broadly called leisure activities which were possible in the absence of cash cropping. The pattern showed that at one extreme some remained fully committed to traditional life, and for these any displacement of customary activities, at least by cash cropping, was unacceptable. At the other extreme, a few were prepared almost wholly to sacrifice leisure activities for the benefits of money-earning from cash cropping. For most it was a matter of degree, but a heavy emphasis remained on leisure activities and a low emphasis on cash cropping.

Policy implications

The strategy implicitly followed by the Administration of encouraging production for the market within the existing framework of village social and economic organisation (a 'village garden' strategy) appears to have been appropriate for the circumstances. The population/land ratio was relatively low in most areas which left considerable areas available for use in cash cropping. Subsistence production, with its often long cultivation/fallow cycle, was land-demanding, but with soil fertility maintained, labour productivity was high. Subsistence requirements were met with limited inputs of household labour. This left a considerable labour reserve potentially available for use in cash cropping, given adequate economic incentive. So far as individual growers were concerned, such labour could be employed in establishing cash crop gardens, i.e., in creating capital assets, and there was little need for capital inputs in monetary form to generate such initial agricultural development. The principal problems were to create adequate incentives, to provide the opportunities and to allocate scarce public resources of money and manpower most effectively. These problems reduced to ones of establishing effective linkages between producers and the market by the development and encouragement of transport facilities and services, to a choice of cash crops which, with market linkages established, would offer producers an attractive return, and to establishing priorities between areas for agricultural development.

The fact that limited motivation is the underlying brake on development poses problems for policy-makers. Since the freedom to choose a preferred pattern of activities is a basic individual right, policy-makers are debarred from coercive action, which in any case would probably be ineffective. There are two feasible ways of approaching the problem. The first, a familiar one, is to attempt to raise the level of cash returns to producers' inputs. As was shown in previous chapters, this occurred in each area by reductions in transport, processing and marketing costs, which either raised the unit price received or enabled significant reductions in inputs of grower labour and in many instances led to a reduction in the costs of imported goods. As also noted, there is now considerably less scope for further progress in this direction in these areas.

The second approach is indirect and more difficult; this is to raise the utility of money for the individual so that he is prepared to allocate more time and effort to money-making or in this instance to cash cropping. In the absence of special direct policy measures to this end, some increases in money utility for the individual can probably be expected over time, though these will be slow. First, increases in cash income within the four areas, as greater areas of cash crops mature, should lead to the availability of a wider array of goods in tradestores which may in turn stimulate consumer interest in the villages. However, income growth in these areas still largely arises from an increase in the number of growers rather than from a growth in per capita incomes of those already earning money, so that increases in demand will probably be manifest principally in terms of goods already on sale and the existing consumer buying pattern will tend to be repeated and accentuated.

Second, growers with the largest gardens and cash incomes, the small but important innovative and entrepreneurial group, may well have some positive demonstration effect upon their own communities. Their particular consumption and investment patterns, arising from higher per capita incomes, will be different and may well persuade others to emulate them, and thus could indirectly lead to a general increase in the level of income desired and cash crop production.

Third, contact with the advanced monetary sector is increasing. Local administration has expanded substantially in all four areas. Educational facilities in particular have grown and can be expected to have a significant broadening influence on the minds of the younger generation, though this could well be accompanied by outward migration from the villages which

would greatly lessen the local impact. The growth of transport facilities both within these areas and externally has greatly increased population mobility. The Boana study, for example, showed how important travel was in the expenditure pattern of the area. It can be expected that people in all of these areas will develop a range of experience outside their own Districts which is wider than that obtained by the majority in the period examined. Again, much will depend on the extent of the drift of such people from their home areas and whether the energetic, the ambitious and the entrepreneurial types will be among them.

Government policy could materially assist in this process in various ways. Agricultural extension policy might fruitfully shift from an emphasis on encouraging cash crop development generally within villages to one where individual leading farmers are selected for special attention and are promoted as examples for others to follow. Such attention could well enhance the influence of these growers both with respect to their production activities and to their entrepreneurial approach. In addition, school education could maintain a favourable image of agriculture as an occupation to prevent the bias against it which is all too familiar among the educated in developing countries. More positively too, course work in agriculture, in business management and in related subjects could be included in syllabuses.

Even with such methods, however, the process of securing greater individual participation in cash cropping will be slow and frustrating for those policy-makers entrusted with the task of raising gross national product, export income and the country's living standards at a fast pace.

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Abstract

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Transition from subsistence

The study documents and analyses the growth of indigenous participation in Papua New Guinea's monetary economy at the household and village levels. More broadly, it presents an empirical study of individual and community responses to new economic opportunities and incentives at an early stage of economic development. Areas chosen were Boana (Morobe District highlands), Sinasina (Chimbu District), Karkar Island (Madang District) and Maprik subdistrict (East Sepik District). In each of these, a detailed record of progress in the expansion of cash cropping is presented, together with an analysis of factors that influenced the patterns. Policy implications are drawn from this experience for future development.

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