USE OF THESIS

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ABELAM LAND AND SUSTENANCE: SWIDDEN HORTICULTURE IN AN AREA OF HIGH POPULATION DENSITY, MAPRIK, NEW GUINEA.

A précis

The aim of this thesis is threefold: to make a regional study of the area occupied by the Abelam people; to enquire into the reaction to stresses derived from land shortage and external influences among a population of swidden cultivators; to seek to bring some measurement and exactitude into the study of production and consumption of food in a primitive society.

The first and larger part of the thesis is a discussion and analysis of the various systems involved in the production and collection of food. Chapter 2 describes the physical setting; Chapter 3 gives some historical background and discusses some aspects of culture contacts, health and demography; Chapter 4 describes aspects of the social and territorial organization of the people that are relevant to the topic while an extra chapter (Chapter 5) is given to land tenure because of its importance to this thesis. Chapter 6 is the longest chapter in the thesis and describes the way in which land is used, the techniques employed and the ways in which man organizes himself to perform productive tasks. Chapter 7 discusses diet and the distribution and consumption of food and it is an attempt to integrate and provide a raison d'etre for the previous chapters.
The second part of the thesis which is only one chapter (Chapter 8) attempts to synthesise the material of the first section, and, by comparative methods investigate the problems of the Wosera region where stresses are most marked.

The general theme throughout the thesis is that production and land use, the usual interests of a geographer, cannot be studied in isolation from the way that society is organized and the way that the food produced is ultimately distributed and consumed. Further much use has been made of quantitative data which were collected in the field. Although much of the material is of a doubtful order of accuracy, it is felt that it was very useful in the comparative work and that it gave solid support to subjective judgements.
ABELAM LAND AND SUSTENANCE

SWIDDEN HORTICULTURE IN AN AREA OF HIGH POPULATION DENSITY, MAPRIK, NEW GUINEA.

David A. M. Lea

Thesis Submitted for the Degree of Doctor of Philosophy in the Australian National University
January 1964.
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PREFACE

This thesis was written during my tenure of a three year Scholarship at the Australian National University. Of this period 15 months were spent in the field. Field work was divided into three spells; from May to September 1961, from January to November 1962 and the month of July 1963. On the second spell of ten months I was accompanied by my wife and two children then aged three years and 18 months. I established a permanent field base in Yenigo village though a total of about eleven weeks were spent in Stapikum village on periodic visits lasting from five to twelve days. While in Stapikum I stayed in a Government rest house at Yambingei (one mile from the village) or hired a house in the middle of the village. Occasional daily visits were made to many neighbouring villages in both areas and several extended patrols were made into the Wosera area, along the Sepik River between Pagwi and Angoram, into the Chambri Lakes, to Yangoru and to some of the Mountain Arapesh villages.

The Abelam, the people studied, are a language group of over 30,000 people whose territory occupies the central part of the Maprik Sub-district which extends for a further 16 miles west of Nunguaia and about 12 miles east of Balmo (see Figure 1). The Sub-district itself has a total population of 82,957 (1962) and is 60 miles long along a WNW axis with an average width of about 30 miles. The Government station at Maprik (3°38'S., 143°03'E.) is the administrative headquarters of the Sub-district. Maprik is centrally sited in the Sub-district which has two other subsidiary patrol posts, Yangoru 20 miles to the east of Maprik and Dreikikir 20 miles to the west. Most of Abelam territory is patrolled from Maprik (see Figure 3).

Within the Sub-district the 13 different linguistic groups (Glasgow and Loving 1960) are all non-Melanesian (Capell 1954:10, 1940:44, Kaberry 1941:236, Laycock 1962:9). The Abelam, by far the largest, is surrounded by five other linguistic groups (see Figure 2). To the north and north west, between the Abelam and the coast, are the Mountain and Southern Arapesh groups who speak a language of a different language Stock to that of the Abelam. To the east is the Boikin group and to the south the Sepik Plains group which both belong to the same linguistic Family as the Abelam (called the ndu Family by Laycock 1962). Immediately to the west of the Wosera is the Gawanga group which has a
common Stock with the ndu Family (Glasgow and Loving 1960). 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 term 'Abelam' is the Arapesh name for the people and was first used in anthropological writings by Mead (1938:156). The Abelam have no inclusive name for themselves although they realise that they speak a mutually intelligible language and are socially and culturally distinct from their neighbours, except to the south, where there is a gradual linguistic and cultural transition to the Sepik Plains people, who in turn show close associations with the Iätmul of the Middle Sepik River.

Acknowledgement is gratefully made to the Australian National University for the scholarship and its attendant privileges, and particularly to Dr. H. C. Brookfield under whose supervision this thesis was written and to Drs. D. Walker and Paula Brown who provided supervision during absences of Dr. Brookfield and who offered much helpful advice and sound criticism. In New Guinea I also owe a debt to many people who co-operated and assisted me in the course of my field work. In particular I would like to mention the staffs of the Department of Native Affairs and the Department of Agriculture Stock and Fisheries in both Wewak and the Maprik Sub-district, particularly the District Commissioners Mr. R. Cole and the Assistant District Commissioners in Maprik, Mr. R. Bunting and Mr. W. Brown. I would also like to mention, in gratitude for their help and hospitality, the people of Yenigo and Stapikum villages, Drs. F. Schofield, V. Bailey, J. Hancock and R. MacLennan of the PHD, Mr. J. Womersley of the Division of Botany in Lae, Mr. D. Murty of the Division of Plant Industry (DASF), Dr. D. Bettison and his staff of the New Guinea Research Unit and Mr. W. Jeffery of the Malaria Control Unit in Maprik.

1. The term 'Abelam' is often used in this thesis to describe that limited part of the Abelam people and habitat actually studied, and no wider extrapolation is intended except where the context implies the contrary.
I also extend my appreciation to the following people who gave me much help and advice and in some cases access to unpublished material: Mr. J. Forge, Drs. R. Robbins, E. Reiner, F. Schofield, V. Bailey, Norma McArthur, Messrs. C. Walters, K. Brewer, W. Ewens for help with the statistical analysis of yields, and also Drs. V. Ackerman and E. Reiner for help in translation, the team of the Division of Land Research & Regional Survey, CSIRO, who wrote the report on 'Lands of the Wewak - Lower Sepik Area', the Summer Institute of Linguistics, Mr. H. Gunther for drawing Figures 15 and 16, and Mrs. Margaret Dando and Mrs. Joan Powell for the typing.

Finally I would like to say that this thesis would never have been written in its present form but for Mr. J.A. W. Forge, who not only gave me the benefit of his company on some of my field work, but gave me much help and advice towards an understanding of Abelam society. I am, however, most of all indebted to my wife who not only gave me support in the field but also constant help and encouragement in the final writing up.

However, apart from the help acknowledged here and in the course of the text, this thesis is the original work and basically the product of field research of the author.

\[\text{Signature}\]
ABBREVIATIONS

Administration - The Administration of the Trust Territory of New Guinea.
ADO - Assistant District Officer
AGS - Allied Geographical Section
BAE - Bureau of Agricultural Economics
CSD - Census Sub-division
CSIRO - Commonwealth Scientific and Industrial Research Organization
DASF - Department of Agriculture Stock and Fisheries
DNA - Department of Native Affairs
PHD - Public Health Department
TNGAR - Territory of New Guinea, Annual Reports

Where appropriate I have used the following abbreviations of kinship terms:

F - Father  H - Husband
M - Mother   W - Wife
B - Brother  D - Daughter
Z - Sister  S - Son

Thus WB = Wife's brother and FZS = Father's sister's son.

NOTE ON THE SPELLING OF ABELAM AND PIDGIN ENGLISH WORDS

Wherever possible I have used the same spelling as that used by Kaberry (1941, 1941-42, 1957) and Forge (1962 and personal communications). In many cases Forge made suggestions in the field but many words are spelt on the principles laid down by him but for which he cannot be held responsible. All village names follow DNA usage as spelt in the 'Village Directory' (DNA 1960). Yenigo village and a clan within the village should both be spelt 'Yanuk

but to save confusion I have used the DNA spelling 'Yenigo' for the village name and 'Yanuko' as the clan name. Both words are pronounced the same way.

For Pidgin English words I have used the orthography of Mihalic (1957). All Abelam names are underlined and all Pidgin words or Anglicized forms of Pidgin are enclosed in inverted commas. Many words in both languages are pluralized by adding an 's'.
Chapter 1

INTRODUCTION

This thesis is a geographer's attempt to analyse the agrarian problems of 'swidden' cultivators in an area of high population density. Abelam land, in the Maprik Sub-district of the Sepik District of the Trust Territory of New Guinea, has within it tracts that are more densely peopled than any other lowland area of equal or greater size in the whole island. Their populations approach in places about 400 persons per square mile. Higher densities occur in the New Guinea Highlands (Brookfield 1960:234, 1961:442), and on the Gazelle Peninsula of New Britain, and far higher densities are encountered in the Indonesian and Micronesian atolls to the north. But all these have either significant cash cropping, access to marine resources, some technology of land-use that permits more permanent cultivation of the ground, or they are on land of relatively high initial fertility (Mohr 1944:18, 501-2, 575). The distinctive characteristics of Abelam land use, by contrast, are a virtual absence of cash cropping, soil of quite low initial fertility, new gardens every year which are productive for about 18 months to two years only, long fallow periods and agricultural practices that are in the main lacking in elaboration. An important exception to the last is the unique method employed to cultivate large yams; this is confined to a limited part of the total farmed area, and the effort put into it is out of all proportion to the dietary return.

1. 'Swidden' is an old English dialect word meaning 'burned clearing' (found in the Oxford English Dictionary under 'swithen'). The word was resurrected by Izikowitz (1951:7) and has since been used by Conklin, Frake, Scott and others. Nye and Greenland (1960:6) point out that the term does not emphasize the temporary nature of cultivation but even the term shifting cultivation is not used in a consistent way in the literature (for example see Pelzer 1945:17 and 1958:126, Watters 1960:64, Conklin 1957:1-4 and 1961:27, and Simoons 1960:72). The term is vague for one is never sure what is shifting, the gardens, the settlements or both. In this thesis all swiddens planted with food crops will be called gardens.
The initial aim was to carry out an ethno-ecological study of subsistence horticulture, following methods such as those used by H. C. Conklin in his study of the Hanunóo (Conklin 1957), but with a geographer's greater emphasis on areal differentiation. This theme still persists in the finished work:

...the first step in the right direction is a thorough study of local agriculture. If only we could interpret a traditional practice in terms of its environment and traditional limitations, we could certainly find a way to improvement (de Schlippe 1956:xvi).

Once in the field, however, so clear an areal differentiation emerged between different parts of Abelam land that I decided to carry out a comparative study, employing two localities as representative of the areas in which they stand. One of these, Yenigo village in the North Abelam area, seven miles southeast of Maprik (see Figure 1), is representative of communities with adequate land, apparent balance in the ecosystem, and an absence of serious

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1. I prefer the use of the term 'horticulture' to 'agriculture' because in the Maprik area there is garden culture as opposed to the cultivation of fields or tracts of land. The gardens are fenced, only about half an acre in size and usually isolated from each other. Agriculture also means that the soil is tilled whereas horticulture implies the culture of individual plants (cf. Williams 1933:11, Ames 1939:129-132, Barrau 1958a:79-80 and 1960:4).

2. An ecosystem is a functioning, interacting system composed of one or more living organisms and their effective environment, both physical and biological (Tansley 1935:299-303 and Fosberg 1963:2).
ecological 'stress'.

The other, Stapikum village, eleven miles to the southwest of Maprik, in an area generally known by the folk -- and pays -- name 'Wosera', is representative of communities with inadequate land, apparent disturbance of balance in the ecosystem, and hence of palpable ecological 'stress'.

In the course of my work it became apparent that both communities were also suffering from 'stresses' of a different kind, deriving from pressure exerted by outside influences, especially those of Government and Mission on their cultural and social and economic organization. But the severity of these stresses was not the same in both areas. It seems that the effect of greater ecological stress in Stapikum, deriving from greater population pressure on land resources, aggravates the impact of

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1. I use the word 'stress' as defined by Webster's New International Dictionary, second edition. 'To subject to the action of external forces; to put pressure upon to cause strain to; especially to overstrain'. In plant ecology stress can lead to changes in the physiology of the plant and either temporary wilting or extinction. I think that the term can be profitably applied in a wider ecological and even social framework. Use of the word 'stress' has the advantage that it includes all external forces creating a strain on an individual organism or a group or complex of organisms; these include environmental stresses or limitations, traditional social stresses, population and land stresses and stresses caused by disrupting forces such as religious missions and exotic governments. A particular social stress, for example a land dispute, which creates a stress on society, may have social attributes such as land ownership and inheritance patterns, rights of conquest and ancestral attachments to the land but also far wider connotations; it may for example have its origins in food and land shortage, disease, drought or some other environmental factor. Use of the word 'stress' largely involves subjective judgements but it does integrate environmental and social factors.
external forces upon society, while in turn these external forces aggravate the ecological situation. It slowly became apparent that forces of both local and external origin interact to produce this observable fact: that one community is worse off, less well-fed, more slovenly in its agricultural practices, more depressed and demoralized, than the other.

In that it involves areal differentiation, this is, by Hartshorne's definition, a geographical problem (Hartshorne 1939:460). But were that all, there would be few grounds for the intervention of a geographer into a study of what is, as Spate has pointed out (1953a:22) the classic and preferred domain of the social or cultural anthropologist. However, it is not only the nature of the problem that demands a geographical approach: a wide sector of the problem is also amenable to attack by well established geographical methods. Not only is the agriculture or horticulture of a people integrated into a sociocultural matrix (Conklin 1957:2) but it is also adapted to certain environmental conditions and needs: it is necessary also to comprehend the environment, to map distribution patterns in order to perceive their relationships with that environment, and in trying to understand these patterns, to seek to comprehend the integrated whole over area (i.e. regional synthesis), as well as around the focus of the individual, local community or tribal group. Frake has defined the social system as 'a network among persons of a social community' and the ecological system as 'the network of the relationships between man, the other organisms of his biotic community, and the constituents of his physical environment'. He goes on to point out that 'in both cases the net is woven of cultural threads, and the two networks are, of course, interwoven at many points' (Frake 1962:54). But whereas to the anthropologist it is man himself, and the network binding men, that is at the centre of his thoughts, the geographer is concerned first with these networks seen as distribution patterns on the ground; man is not central but is rather the mobile and motivating element in his ecosystem, creating the distribution patterns that are, to the geographer, the initial object of observation, and later the described phenomena toward whose interpretation his inquiry is directed throughout.

This contention can be illustrated in two ways. A geographer will probably begin the study of an agricultural system by observing, mapping and describing the distribution
of land-use. The study of land-use however does not solely entail the mechanical plotting on a map of the ways in which land is used, but is rather a more penetrating investigation into the natural, social, technical and economic aspects that result in actual use of the land (Kostrowicki 1960:173). To do this, the geographer needs to understand the distribution of land holding: this draws him beyond his mapping operations into a study of land tenure systems and the allocation of resources, and on, if he can, into social structure and kinship, mechanisms for the settlement of disputes, politics, warfare, and the whole gamut of institutions that are properly the field of the social anthropologist. He may also need to understand the choice of crops, and this can lead him into studies in diet, cooking, nutrition, the economic system and its institutionalized forms. He will also be required to understand land selection, which demands that he study soils, weather and climate and plant sociology. To know how far to go into these fields and where to stop, is a test of his judgement, but the essential criterion is relevance to the initial question, which is to understand the pattern of land-use.

Ethnoecology, earlier mentioned, as developed by its practitioners, is not necessarily a geographical field of enquiry. An ethnoecological approach demands that the environment should be described as 'the people construe it according to the categories of their ethnoscience' (Frake 1962:55), and carried out by ecologically-orientated field investigators working in an ethnographic context (Conklin 1961:28). The geographer's aim is different: he may need to understand some aspects of the ethnoscience of the people among whom he is working in order to comprehend their rationale of resource selection as well as his own. But his object is to comprehend the distribution of resource use toward which this ethnoscience is a contributory factor: his context is chorographic, not ethnographic.

Anthropological studies in the area greatly facilitated this work (Kaberry 1941, 1941-42, 1957; Forge 1962 and personal communications). Working in a strange environment and among a strange people it is inevitable, and indeed desirable, that a geographer or any other field worker should use the factual material and interpretations of anthropologists and to some extent use anthropological methods. Methodologically the greatest contribution of anthropology lies in need to make case studies and to study micro-
regions 1 rather than the more usual wider regional approach of the geographer (cf. Spate 1953a:22-23). While I agree with Spate that there is more variety in societies than in land, and that man-land relationships can be studied most economically from the angle of man rather than that of land, in fact social anthropologists rarely study these relationships. As Leach points out, anthropologists have tended to treat kinship structure as a thing in itself without relating it to land and property (Leach 1961:305). 2 Specialists in other fields such as statistics, economics, pedology and agriculture have likewise tended to ignore social aspects of their own particular problems. The geographer with his interest in total environment should be in a position to redress the balance.

In short, the aim of this thesis is to make 'a thorough analysis of the structure and content of the particular systems involved' (Conklin 1959a:63) in man-land relationships. What is intended here is to make an intimate study of subsistence horticulture in two fairly small areas 'which will reveal not only the elements of order in the agricultural pattern but will also suggest reasons for these elements of order, whether the reasons lie in facets of the physical environment or whether they lie in social and economic characteristics (including land tenure)' (Farmer 1962). From this first stage it is

1. Micro-regional studies are an old geographic technique in that they provide illustrations representative of a larger region (Hartshorne 1939:456) and detailed case studies of man's utilization of resources in certain environments.

possible to go on and study stress in man-land relationships and to perhaps ultimately find a basis for the improvement of life.

Method of Field Work

From the beginning of this study it was apparent that it was impossible to make a general survey of all Abelam villages collecting data from any records available and using questionnaires. The questionnaire method is not satisfactory especially where there are so many problems in communication of ideas, and so much that is unknown about the societies and their interpretation of what are, to us, common and every day logical questions (see Farmer 1962). Secondly there are virtually no records available at the village level except the village books which are kept in the villages and which have so many patent inaccuracies and inconsistencies from year to year that they provide very little detailed information that is of use. Even the total populations of the various CSD’s show unexplained fluctuations from year to year and only after about 1956 did they become congruous and begin to show definite trends (for further details on census taking in New Guinea see McArthur 1956:324-357 and 548). To my knowledge all the village books were destroyed during the war and the earliest post-war books date from 1948. Some books left in the charge of village officials became so damaged that they are illegible. Also, though aerial photographs, flown in 1958, were available for most of the Abelam area, they were taken from 25,000 feet and have inadequate definition for detailed work even when enlarged. There were also no good large scale topographical maps though planimetric maps of the area east of longitude 143 degrees east had been prepared by the Division of National Mapping at a scale of 1:40,000 showing rivers, roads and village locations (see annotated notes on all maps in Appendix G).

It was out of the question to make a random selection of villages to be studied, because, for reasons which I shall discuss later, I felt that it was only possible to make a study of one or two villages. Therefore the two sample villages had to be carefully selected so that they were typical of the situations I wanted to describe and yet, for reasons of expediency, were easily accessible.
Plate 1 - Tambaran Houses at Bainyik Village.

The lowest row of painted faces on the facade represent the Nggwalndu.

Plate 2 - Several hamlets in Waiknakum Village.

Near the top of the picture is the back view of a tambaran house. Other houses are shown scattered along the ridge top surrounded by planted trees, the most conspicuous being the coconuts.
In undeveloped or primitive areas the need to make micro-studies calls for little justification. Generally there is a lack of 'documentary' records, statistical data and cadastral surveys. All material must be collected directly from informants and by observation, collection and surveys of the field-worker. Other practical problems are those of isolation, communications and language. None of the indigenes with whom I worked spoke English and there was considerable dialectal difference among Abelam speakers throughout the area. Also within a subsistence economy most activities are organized within small groups and small areas so that the assumption that villages or similar small groups are illustrative of conditions in larger regions is reasonably justified. In addition, if one is to study the interrelationships between factors of the land and factors of society, one must live in the area concerned and make close observation of all stages of life and make at least some personal acquaintance with the people being studied. Man-land relationships are more intimate in a subsistence economy than in our own and are closely linked with the maintenance of life, beliefs and the social system.

After a preliminary reconnaissance of most of the area by vehicle and intensive study of the aerial photographs, the two villages finally selected were Yenigo and Stapikum. I have previously mentioned the location of these villages and that Yenigo represents apparent balance in the ecosystem and Stapikum shows much evidence of ecological stresses. Also both villages had the advantage of being on or close to a 'Jeep' road. A road went through Yenigo village whilst the central part of Stapikum village was only about one mile from a road. Both villages were fairly isolated from European contact. Yenigo is about ten miles by road from Maprik and four miles from the nearest mission station (see Figure 8). Stapikum is

1. A 'Jeep' road refers to an earth road made by native labour and usually passable even in wet weather by a four wheeled drive vehicle with chains. Stones from rivers are often placed in ruts and on steep sections of the roads.
fourteen miles by road from Maprik and about two miles from a mission station. Neither village was too large for study in the time available and both are fairly representative of segments of larger village groups.

Problems of Field Work

The usual problems of language, environmental conditions, communications, logistics and of obtaining data from informants were encountered. Two other problems call for special discussion, namely those of land use mapping in the tropics among shifting cultivators, and those associated with measurement.

Linguistic Problems.

When I first went into the field I unfortunately made no attempt to learn the local language. I did all my work through the medium of Pidgin English, which is the lingua franca of Australian New Guinea. As I became fluent in the use of Pidgin I found it an imprecise language, limited in vocabulary and its range of concepts and capable of a high degree of misinterpretation. Also though most of the men under forty spoke Pidgin, many of the older men (the best informants) and many of the women were unable to speak it so with them I had to deal through a Pidgin interpreter, which doubled the chances of misinterpretation. Towards the end of my field work I was still unable to speak the Abelam language but was able to understand the drift of many conversations. Since leaving the field I have corresponded with some of the younger men who are able to write, but none of the answers to questions I have asked have been in any way satisfactory.

Problems of Informants.

Apart from the problems associated with misinterpretation through dealing in Pidgin, informants on the whole were unreliable and tended to give an answer that they thought was wanted or one which oversimplified the matter being discussed. Once having given an answer most informants would be unwilling to change their statement, modify it or repeat it and would be most indignant if I
asked another man the same question in their presence. When I first went to Yenigo village I asked several men how many varieties of yam they had. They replied that they only had three varieties and they maintained this for several months in the face of my obvious disbelief and repeated questioning. When I accidentally discovered that there were a number of varieties I questioned the natives on why they had lied. They said that they were sorry for me and wanted to save me a lot of work. There and then we sat down and they gave me the names of over fifty varieties of yams.

On the whole I was accepted readily enough in both villages and the natives were flattered and surprised that a European was living with them and trying to make personal contact. I was given village names in both villages and was to some extent adopted by the older men in some clans. Having my wife and children in the field definitely helped rapport but also resulted in me being forbidden entry to the ceremonial yam gardens during the growing season, because of the sex taboo. The most difficult thing with the natives was to explain (in Pidgin) what I was doing and to impress on them the need for accurate and detailed answers to questions.

Problems of Land Use Mapping in the Tropics.

Similar problems were encountered to the ones discussed by Wikramatileke (1959). In New Guinea there are no maps which could serve as base maps for detailed garden mapping and these had to be constructed. This was done by making a map showing all rivers, ridges, settlements and roads from aerial photographs (using a stereoscope) and, by photographic enlargement, fitting this onto a chain and compass traverse of a scale of one inch to 500 feet which went through each village. These were my base maps and on them I located all the gardens surveyed in both villages for two years, by cross bearings where possible, or by making the slope conditions and direction of the garden fit the contours, as interpreted from the aerial photographs. Each individual garden was measured and plotted by chain and compass techniques at a scale of one inch to 50 feet and for the land use maps (Figures 17 and 18) these plans were reduced by a factor of ten on a pantograph.
After the detailed work carried on in both villages had been done land use patterns were observed over the whole Abelam area from aerial photographs and from a Cessna aeroplane.

It became clear that 'the inherent characteristics of much of tropical agriculture, particularly the impermanence of many of its facets, make for qualitative rather than quantitative assessments, and the need for very frequent revision of such findings' (Wikramatileke 1959:95).

Problems of Measurement and Quantification.

Any measurement that is done is not satisfactory if investigations are only carried out over one to three years. Considerable time depth is needed in all studies of this sort in order to discern the variability which is not unusual in tropical climates and primitive societies due to variety of both environmental conditions from year to year, and to social pressures to prepare feasts and festivities at certain times. Time available for the study was however limited by the terms of my scholarship and judgements are based only on what information I could collect in fifteen months field work. All data required had to be collected in the field by the field worker without any real assistance from the indigenes, none of whom could speak English nor had any but the most elementary formal education. This meant that all data had to be collected from small samples in arbitrarily selected areas.

I have made measurements wherever possible in an attempt to test some value judgements, to make comparisons between the two villages studied, and to see, as an academic exercise, just how much quantification was possible and what are its limitations. In setting out to do this many mistakes were made and many of the final measurements are of doubtful validity for reasons set out in the text. Also I now realize that in some fields more could have been attempted, particularly in time and motion studies. A very interesting study could be made, for example, of a comparison of how much time goes into producing a given amount of ordinary yam or 'mami' (Dioscorea esculenta) which is one of the main foods, and into production of the ceremonially important yam (Dioscorea alata).
Plate 3 - Yenigo Village with Hamlet II facing the tambaran house (see Figure 10).

Plate 4 - Stapikum Village.

Most of the coffee gardens are near the village area (see Figure 18). The Nanu River is in the background.

Compared with Yenigo (see Plate 3) there are fewer trees planted around the hamlets, fewer houses and the fallow is generally lower and sparser.
I have made no attempt to arrive quantitatively at an 'optimum population' or 'land carrying capacity' (cp. Allen 1949) for such a mechanical approach to the problem is fallacious. Each part of the earth's surface is to some extent unique and has its own particular social and physical problems and capacities in terms of population. The concept of 'optimum population' assumes that man is controlled by his environment and that man and his methods of land use are static and will not change. The East African Royal Commission (1955:35-6) also points out that the concept implies the possibility of some conscious effort to control population or the means by which the society utilizes or increases the natural resources at its disposal.

A more useful concept is that of a critical population or critical population density. Farmer writing of the chena system of cultivation in Ceylon says:

...as elsewhere, the system becomes truly pernicious if the population increases beyond a critical density. It is clear in the field (my italics) that this stage has been reached in such areas as that immediately to the west of Kala Wewa, and that it will soon be reached elsewhere. It is not easy to say what the critical density is. In the Kala Wewa area, the present density may be approximately critical at about 200-250 per square mile; field research into this problem would yield valuable results (Farmer 1954:27).

Critical population is thus a subjective concept, tentative and indicative for surrounding areas and it describes an existing situation. Critical population is only apparent in the field and the symptoms are deterioration or destruction of the garden habitat and any number of social stresses.

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1. These terms are also used by Conklin (1959a:63).
There are many factors, social, economic and environmental that affect population and land use, but very few of these variables are quantifiable and by their very nature, cannot be measured (Conklin 1959a:63 and Spate 1960:125). The end result of all factors affecting population and land use can be determined to some extent by measuring areas of fields and gardens, yields, population and its trends, the amount of land available for cultivation and the duration of the full agricultural cycle. These measurable factors however are not constants and their relationship one to another may change over a period of time so that the best assessment that can be attempted is to make measurements and to use them to help make a qualitative judgement about man-land relationships: I have done this in making a comparison of the Yenigo and Stapikum areas. The state of the society in Stapikum, its depression, its hopelessness and its obsession with land disputes (all unquantifiable) were the main pointers to ecological stresses but much quantifiable evidence bore out this impression.

In a society under stress and in contact with another culture which is actively encouraging transition, the unquantifiable factors affecting land use and population are probably the most important. Change in techniques, beliefs and crops and the breaking down of old barriers and taboos are most likely to take place very quickly due to forces acting from both within and without that society.

Finally in attempting measurement, a fieldworker finds out much that he may have otherwise missed for measurement demands regular attendance and constant supervision. Thus when measuring gardens I found many crops and techniques that informants had omitted to tell me about and when weighing large ceremonial yams I was told to handle them gently and to speak in complimentary terms about them for, although yams cannot talk, they can hear and are easily offended.
The Plan of the Thesis

The theme throughout the first section of this thesis is an analysis of the various systems involved in the production and collection of food. Most of the data were collected in Yenigo village only although comparative studies were made in other villages, particularly in Stapikum village in the Wosera, for 'systems and patterns of tropical agriculture are highly peculiar to local environment. They often display a primitive dependence on varied physical circumstances and a like degree of attachment to diverse traditions and social dictates' (Wikkrama 1959:79). Because of this the thesis is divided for convenience into five fairly discrete parts which describe, and to some extent analyse Abelam systems and patterns. The first part (Chapter 2) describes the physical environment; the second part discusses some aspects of the social and territorial organization of the people (Chapter 4) and has some general introductory remarks on the results of culture contacts, the health and demography of the Abelam (Chapter 3); an extra chapter (Chapter 5) is given to land tenure because of its particular importance to this thesis. The third part forms the longest chapter (Chapter 6) and it describes the way in which the land is actually used and techniques employed. This chapter and the fourth part (Chapter 7), which discusses diet and the distribution and consumption of food, attempts to integrate and provide a raison d'être for what is included in the first two sections.

Studies of this sort too frequently neglect discussion of diet and distribution of food. Geographers have tended to emphasize production almost to the complete exclusion of consumption. But 'Hunger (or malnutrition) is an ecological phenomenon; a manifestation of dis-equilibrium between human groups and their social and physical milieus' (Sorře 1962:453). Even if hunger does not exist, diet expresses a relationship between man and his environment, climate can set nutritional requirements, and ecological conditions can determine the composition and abundance of foods (Sorře 1962:449). Diet can also reflect the cumulative weight of tradition, beliefs, taboos and prejudices. Problems connected with waste, storage, methods of distribution of food, diet, nutritional stress, times and areas of food shortage, are just as important as food production itself.
The fifth and last part of the thesis (Chapter 8) attempts to synthesise the material of the first section, and, by comparative methods, to investigate the problems of the whole region with particular emphasis on the Wosera area where problems of stress are most serious.
Chapter 2

THE PHYSICAL SETTING

The Abelam occupy part of the southern fall of the Prince Alexander Ranges, to the north of the Sepik River and its associated flood plains. Most of the Abelam live in the densely settled hill country south of the ranges. South of the hills are the Middle Sepik grass plains which are unoccupied except for a few villages in the gallery-like forest fringing the southward flowing rivers.

Geology

The oldest rocks in the area are metamorphosed rocks (mainly amphibolite and gneiss) which form the basement rock of the Ranges and are the source of the alluvial gold found in some of the rivers. In the Miocene epoch these rocks were overlain with marine deposits of mudstone, siltstone, intercalated conglomerate, sandstone and coral limestone which were at least 2,000 feet thick (Reiner and Mabbutt 1961:40). Reiner and Robbins (in press) sum up the subsequent phases of geological history thus:

In the late Pliocene or early Pleistocene the coastal range began to emerge in an anticlinal uplift, and a synclinal trough was formed between the two major structural anticlines of the coastal and Central Range of New Guinea. The areas of strong uplifting and faulting were centred in the Prince Alexander mountains which rose to 3,000 feet above sea-level. With this uplift marine deposits emerged and the loosely packed siltstone, mudstone and conglomerate were subjected to subaerial erosion. Under the humid climate rapid weathering formed deep soil mantles which now conceal much of the original rock. This initial erosion increased with continued uplift and became severe resulting in the now strongly dissected mountain ranges.

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1. Middle Sepik refers to that part of the Sepik River basin between Ambunti and Angoram.
Immediately south of the coastal anticline the slightly uptilted Pliocene marine sediments were overlain unconformably by Pleistocene gravel and sand shed from the anticline. Subsequently, in the Quaternary, marine and fluvial fine clay of floodplain origin was deposited in the marine bight partly drowning the Pleistocene gravel of the fans. Reiner and Robbins consider that the clay is the result of Pleistocene eustatic changes of sea-level. Aggradation extended back into the marine bight along the length of the Sepik and its tributaries. After this deposition there was a lowering of the sea-level and an uptilt of the land to the north, probably associated with renewed uplift of the coastal ranges. Now these deposits stand fifteen to thirty feet above the present Sepik Floodplain and the junction is marked by an extremely fretted boundary with some long penetrations by the floodplains northwards (see Figure 5). In late Pleistocene and Recent times the present Sepik Floodplain has been formed by deposition from the Sepik River.

Physiographic Regions

The area occupied by the Abelam can be divided into six physiographic regions (see Figure 4), which are expressions of the geological history already described. These regions are the Prince Alexander Ranges, the Foothills, the Wingei Hills, the Wosera Hills and the Low Grassland Hills, all basically erosional surfaces, and the Upper Middle Sepik Plain which is a depositional surface. Floodplains and alluvial terraces occur in all regions except the Ranges and are discussed separately with each region.

The Prince Alexander Ranges.

Only a few Abelam villages are in the southern parts of the Ranges. Altitude varies from the northern coast to Mount Turu (3,980 feet) but, except for a few isolated peaks, rarely exceeds 2,500 feet. Slopes are steep and local relief is often more than 2,000 feet between narrow ridges and deep-winding valleys. It is largely an area of uplifted sedimentary rocks with metamorphic rocks forming summit areas in some places, particularly to the north of Yamil and in the Mount Turu area.
The ranges are broken into parallel fault blocks, many of which are strongly tilted, and dips are steep and variable. The major faults have given rise to dissected, west-northwest-tending escarpment zones. These delimit the coast and the southern edge of the mountains, and also form the main watersheds. The intervening fault blocks give rise to the east-west trending upper catchments of larger rivers, such as the Hawain and Sowam in the north and the Screw and Nagam in the south. These rivers appear in part to be antecedent to the faulting, for they turn to cross the fault zones in deep gorges. Locally, fault basins have formed, such a basin is drained by the upper Screw. Cross-faults trending slightly east of north have controlled the courses of many upper valleys. Continuing tectonic disturbance is reflected in numerous landslides (Reiner and Mabbutt 1961:44).

In the southern parts of the Ranges there are at least four lakes, one over half a mile long, which were formed by earthquake activity in the 1930s. While I was in the field there were a number of noticeable earth tremors.

The Foothills.

The foothill zone is less strongly uplifted and faulted than the Ranges. Altitudes rarely exceed 1,200 feet and the lower limit is around 400 to 500 feet. Local relief is usually between 100 feet in the south and about 600 feet in the north. The region is traversed by rivers, approximately parallel, which to the south merge into the Sepik Floodplain as floodout deltas. These rivers and their tributaries have dissected the mudstone and siltstone deposits into a series of narrow but rounded ridges which dip to the south. Tributary valleys have steeply rounded heads and sloping floors with many well-developed colluvial aprons.

The rivers which rise in the mountains and pass through this region are fairly flat-bottomed and have a series of

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1. This is a combination of Land System 6 and part of Land System 10 of the CSIRO Report 1961.
Plate 5 - A mosaic of aerial photographs of the southern fall of the Prince Alexander Ranges east of 143°E. The Screw River is on the left hand margin of the photograph. Maprik, Bainyik, Wingei and Yangoru are located with the initial letter of each place. The Maprik - Pagwi road runs through the centre of the strip of grassland immediately south of Bainyik.

The transitions from the grassland with its gallery-like forest, to the densely populated hill zone under garden regrowth and thence to the sparsely populated and forested mountains, is clearly shown.

The scale of the photo is just over 5 inches to one mile.

(Photo CSIRO)
alluvial terraces and floodplains which are narrow in the Foothills, being rarely more than 200 yards in width. They gradually become broader until they are up to 800 yards in width on the plains. The lower terraces or floodplains which are often flooded are only five to ten feet above the normal level of the river. Some of the higher but discontinuous terraces which are twenty feet above the normal level of the river are only occasionally inundated and are therefore used for gardens, particularly in the Low Grassland Hills and Upper Middle Sepik Plains regions (see below). These high terraces are rarely more than 50 yards wide in the Foothills.

The Wingei Hills. ¹

The Wingei Hills are similar to the Foothills, but they are more varied in direction and interspersed with a number of low ridges with gentle slopes. On the whole altitude and relief are not as great as in the Foothills region. The most striking difference between the two regions is the vegetational cover. The Wingei region is dominated by long grassland while the Foothills are under secondary forest and garden regrowth. Rivers passing through these regions have very similar floodplains.

The Wosera Hills. ²

The Wosera and much of the Wora, Bumbita-Muhiang and Gawanga CSDs consist mainly of low rounded hills which, like the Wingei Hills, have not the predominant north-south orientation of the Foothills. Slopes are more moderate and ridges more rounded than the Wingei Hills and local relief is rarely more than 150 feet (see Plate 36).

Much of the area, especially west from the Central Wosera (those villages around the Nanu River including Stapikum), is

¹. The Wingei Hills region is the same as Land System 11 (CSIRO 1961).

². The Wosera is included in Land System 10 of the CSIRO report.
underlain with a fairly hard sandstone which often outcrops on the ridgetops. This sandstone probably represents an old eroded surface overlain with the Pliocene and Miocene sediments already mentioned. I would postulate that this general area was uptilted in the late Pleistocene at the same time as the Lower Middle Sepik Plain, but that uplift was greater and orientated along a northwest-southeast axis. This would account for the tendency of the streams to flow to the southeast rather than due south, as they tend to do further east.

The three main rivers of the Wosera are the Screw, the Amuk and the Nanu. They have floodplains up to a mile wide and between 10 and 40 feet above the normal level of the rivers. Unlike the floodplains to the east they are intensely cultivated and almost completely cleared of forest. Plate 5 shows a remarkable contrast between the east and west of road from Maprik to Pagwi. To the east the hilly interfluves are covered with grass and the areas around the rivers are covered with forest and garden regrowth. To the west in the Wosera the interfluves are covered with secondary forest and garden regrowth with only a few patches of grass while the areas around the rivers are covered with gardens, grass or tall cane.

The Amuk and Nanu have their headwaters in the Torricelli Mountains, more than 25 miles to the north west and sometimes remain in flood for weeks. The Screw rises approximately 12 miles to the north and is more inclined to have flash floods. Unlike the smaller rivers to the east the floodplains of these three rivers tend to become inundated instead of scoured by flooding. 1

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1. A comparison of aerial photographs taken by Adastra Airways in 1939 for the Australasian Petroleum Co. with some taken in 1958 for the Division of National Mapping show that the Screw and Amuk Rivers have changed their courses on the floodplains.
The Low Grassland Hills. ¹

These low hills occur to the south of the Foothills and are usually extensively pitted. They consist of dissected Pleistocene fans which are up to 100 feet deep and the rivers have cut into the underlying Pliocene sediments. Altitude of the hills is between 250 and 400 feet and the low rounded hills and accordant ridges have a relief of up to 80 feet. Any steep slopes are usually marked with land slumps. The valleys are shallow and open with gently sloping heads and often planted with sago palms. Floodplains and alluvial terraces occur along the major rivers but only the high terraces are used for garden cultivation. The floodplains are planted with tree crops and bananas which can survive frequent flooding.

The Upper Middle Sepik Plain. ²

The Upper Middle Sepik Plain consists mainly of marine and fluvial clay which was deposited in the Quaternary. It has flat or gently undulating surfaces and is lower than the Low Grassland Hills with relief rarely more than 50 feet. The surface is pitted and ill-drained, with a number of shallow valley depressions which are generally wider at the head than at the narrower southward-flowing outlets. The floodplains and alluvial terraces of the Low Grassland Hills continue into this region.

Soils

Apart from the reconnaissance survey carried out by the Division of Land Research and Regional Survey of the CSIRO in 1959 (Haantjens 1961:49 - 119), very little is known about the distribution of soils in this area. The following remarks on soils are based on Haantjens' classification of soils and his analyses and descriptions, and from a number of soil profiles, 36 inches deep, which I dug in the two villages where I was working. Average analytical data for the major soil groups are shown in Appendix A.

The Ranges and the Foothills have mainly brown forest soils, often very shallow in the mountains, with dark colluvial soils on many of the lower slopes and fairly course textured alluvial soils on the floodplains and lower terraces of the throughgoing rivers. In Yenigo village, which is in the southern part of the Foothills, the most common soil is the brown forest soil which occurs on all the ridges in the village. The main variation in local soil type is in the degree of sandiness or stoniness, which seems to depend on the nature of the parent material which is a browny yellow siltstone lying conformably on dark mudstone that is only exposed by landslips and stream erosion in the lower parts of the valleys. This type of soil has an A horizon which is rarely more than nine inches deep; it is brownish-grey to dark brown in colour, has a sandy clay loam texture and a pH of approximately 6.5. The B horizon, eighteen inches to two feet deep, varies little in colour from the A horizon, but is a tough plastic clay with brownish yellow weathered fragments of the C horizon in its lower portions. The C horizon, which is the weathered siltstone parent material, goes down to a considerable depth and is a yellow brown silty clay.

The soils of the Wingei Hills are similar to those of Foothills except in much of the rolling ridge country. This is covered with shallow black earth having a black heavy clay about 18 inches deep in the A horizon, which has a strongly developed fine angular blocky structure when dry, and may be granular at the surface. When moist, the A horizon is very firm to very plastic. Some lime concretions or coral fragments may be present in the lower parts... (Haantjens 1961:60). The C horizon is a weathered mudstone or siltstone containing limestone fragments or streaks and soft concretions of lime.

In the Wosera Hills region (the grass areas excluded) the most common soil is again the brown forest soil but in Stapikum, and in many other villages, it is often gleyed and strongly mottled indicating poor drainage. Iron concretions are not unusual in the sub-soil. Topsoils are thin and slightly darker than the sub-soils; occasionally topsoils are entirely absent. It is interesting that the natives classified most of the Stapikum soils as 'bad' soils for growing yams and most of the Yenigo soils as 'good'. Colluvial soils are again common on the lower slopes. The broad river terraces in the Wosera have a somewhat finer textured alluvial soil than those in the other regions; this is particularly noticeable on the higher and older terraces.
The Low Grassland Hills and the Upper Middle Sepik Plain have mainly podzolized meadow soil with patches of red and yellow earth, meadow soil, gleyed brown forest soil on the interfluvies and alluvial soil along the major streams. With the exception of the alluvial soil they are all very infertile, mainly the result of inherently poor parent material. There is evidence that the soils of the plains suffer from many trace element deficiencies (Haantjens 1961:68). All of the soils are slightly acidic and low in nitrogen. The nitrogen content may vary however in all soils depending on the amount of local accumulations of organic matter. With the exception of the alluvial soils, they are all low in phosphorus and potash (see Appendix A for some analytical data of some of these soil groups).

The Abelam evaluate soil (kupma) by its productive capacity as demonstrated by results; a soil is either good (yikngwen kupma) or bad (kaperei kupma). Most of the bad soil is a hard sandy or stoney clay which, on exposure to the sun, dries out and becomes very hard. Often, however, a soil is classified as bad if one crop grown on it fails, regardless of other factors such as the skill of the gardener or the weather conditions. This empirical classification means that those soils tried and tested and found to be good are used repeatedly for growing the ceremonially important yams (wabi). Soils which produce poor crops are given long fallow periods until the people forget their reputation or are forced to use them again because of land shortages.

The Abelam give names to different parts and different types of soil. Most of the names are purely descriptive; some examples are takwul kupma (the top part of the soil), taula kupma (weathered siltstone which is usually the C horizon), djile, ramu and wama kupma (black, yellow and white soils), kabile kupma (river or alluvial soil)¹ and vi kupma which is a gravelly soil usually under grass.

¹ Along the wide river terraces of the Amuk River on land belonging to Tugaikim village (see Figure 15) there are three clearly marked terraces and the soil of each terrace is given a different name. The highest terrace which has not been flooded in living memory has a heavy clay soil and is known as kwangea kupma. The middle terrace is occasionally flooded, and the soils are coarser and known as nimbu kupma. The lowest terrace is usually flooded at least once a year and the sandy friable soil is known as kabile kupma. The very recent sands and muds along the banks of the river also have different names.
Plate 6 - Gardens in the tall grassland of the East Abelam Region.

Dense groves of sago can be seen in the valley bottoms, and plantings of coconuts and other trees are evident on the ridge top around the village area (top left).

Plate 7 - Floodplains and high river terraces along the Screw River north of Kunjingini.
Weather and Climate

Seasonal variations in temperature are negligible and seasons are distinguished primarily by changes in the direction of the prevailing winds and by resultant variations in rainfall. Weather is controlled by the fluctuation of a low pressure zone of convergence which moves between 10° - 15° North in July and 5° - 10° South in January (CSIRO 1961:12) bringing the Maprik area into the influence of south east trade winds in winter and north west winds in summer. The north west winds are deflected north east trades after they cross the equator.

The Maprik area is comparatively dry by New Guinea standards with a mean rainfall of between 60 and 80 inches. There is a well marked dry season which does not show on the climatic classifications of either Köppen (Köppen and Geiger 1933) or Schmidt and Ferguson (Schmidt and Ferguson 1952) which are Afi and Type A respectively. Thornthwaite's classification (1948) brings out the fact that rainfall is not excessive and that the dry season is not intense enough to lead to serious water deficiencies (cp.CSIRO 1961:29), but is enough to absorb water surpluses of the wet season.

1. For a discussion on the controversies about the origins of these winds see Curry and Armstrong (1959).
3. According to Köppen's classification A = Temperature of coldest month above 64.4°F, f = Rainfall of driest month greater than 2.4 inches and i = Range in temperature between warmest and coldest month less than 9°F. According to Schmidt and Ferguson who based their work on Mohr, Type A is when the quotient Q is between 0 and 14.3 and Type B between 14.4 and 33.3. Q is the average number of dry months over the average number of wet months expressed as a percentage. A dry month has less than 60mm (2.36 inches) and allows the soil to dry out thoroughly, while a wet month, with more than 100 mm (3.94 inches), keeps the soil permanently moist. Schmidt and Ferguson used stations with ten or more years' records. Detailed analysis is not possible on all stations. Angoram with only six years' records has a Type B climate.
4. According to Thornthwaite's classification Maprik has a notation of C2A'ra' which means Moist Sub-humid with a moisture index between 0 and 20. It is Megathermal with little or no water deficiency and no marked summer concentration of temperature. This classification and estimation of Evapotranspiration is only based on one year's temperature records. For detailed discussion on climatic classifications in the tropics see Ho (1963:23-28) and Blumenstock (1958:3-11).
Unfortunately meteorological records are lacking or incomplete over all the area. Monthly rainfall data were available from the Commonwealth Bureau of Meteorology, Melbourne, for Wewak, Bainyik, Ambunti, Angoram, Maprik, Yambi and Dagua for 15, 13, 13, 6, 5, 4 and 3 years respectively and monthly averages have been plotted on Figure 5. Daily rainfall records for a year from September 1960 to August 1961 were obtained from the Malaria Control Pilot Project for Maprik and the results are plotted on Figure 6. Continuous long term temperature records are not available for any station near Maprik. Daily records of hours of sunshine, maximum and minimum temperatures and relative humidity at 0800, 1200 and 1600 hours (weekends and public holidays excepted) were obtained however from the Malaria Control Project for some of the period between 1959 and 1962.

Rainfall.

Maprik is in the rain shadow of the Prince Alexander Ranges which accounts for its low mean annual rainfall of only 65 inches. Figure 5 shows that there is a maximum period of rainfall during the so-called North west Monsoon from October to April in all stations in the Wewak - Maprik area except Wewak. The southern winter maximum in Wewak can probably be attributed to the sheltering effect of Kairiru and Mushu Islands to the North west in the path of the prevailing summer winds. Intensity of rainfall (expressed as average rain per wet day) is also highest during the North west season. Bainyik has an average total number of 68 wet days from December to March of which 22 days receive more than 0.50 inches and an average total number of 41 wet days from June to September of which 9 days received more than 0.50 inches. The periods of highest monthly rainfall and greatest intensity of rainfall occur at the beginning and end of the wet season, during and just after the two periods of greatest isolation in April and late October. The 'wet' begins and ends with the typical afternoon thunderstorms of the doldrums which are usually very localized, and is maintained throughout by the inflow of moist equatorial air from the Pacific Ocean.

Mean annual rainfall increases from the southern foothills of the Prince Alexander Ranges towards the Sepik River (Maprik 66.5 inches, Yambi 81.35, Angoram 85.36 and Ambunti 97.58). Seasonality of rainfall, especially during the periods of high sun, also becomes more pronounced; this
is due to increased convectional rain over the plains, the river and the associated lakes and floodplains. Although dry season total rainfall is slightly higher on the plains than in the foothills, intensity of rainfall is greater and rainless periods, which aid the firing of grass, are more common.

In Bainyik only 2.2 days in excess of 2.0 inches can be expected annually and only one day in excess of 4.0 inches can be expected every five years (CSIRO 1961:23-24). The likelihood of severe erosion and rapid flooding of creeks and low lying land is therefore quite low though rivers which rise in the mountains, where rainfall is probably well in excess of a 100 inches a year, are likely to flood frequently, especially in the wet season.

Droughts are rare in the Foothills although rice crops have been ruined by short dry periods. Arnold (CSIRO 1961: 29-34) using Thornthwaite's formula (Thornthwaite 1948) concludes that 'periods of water deficit of two to five months duration occur in most years usually commencing about the middle of the south-east season and extending into the north-west season'. However, too many assumptions and arbitrary values are involved to allow this analysis much significance. Crops grow in all seasons although yields seem to be better when crops are planted early in the wet season; the forest does reflect some seasonality.

Cloud cover is considerable throughout the year. All months have an average of between three to five hours of sunshine a day, with little seasonal change apart from a slight increase in the dry season.

1. Average rain per wet day varies from October with 0.54 inches to July with 0.32 inches.

2. Kaberry (1941:346) writes, 'the natives give graphic accounts of how the earth became parched, the pools and streams dried up, and the food lay rotting in the ground.'
Temperature and Humidity.

Mean monthly maximum and minimum temperatures vary little throughout the year. In 1959, the only year for which continuous records are available in Maprik, maximum temperatures varied from 88° to 91°F, with an annual mean of 89.9°; minimum temperatures varied from 76° to 71° with an annual mean of 73.5°. Maximum temperatures vary little throughout the year but minimum temperatures become slightly higher in April and October with a result that the greatest diurnal range of about 15° occurs in mid-winter during June and July. As one would expect, temperatures are lowest at dawn and reach their maximum around 1500 hours.

Humidity is consistently high throughout the year but varies during the day. Humidity reaches saturation at night quite frequently, so that dews and early morning mists which rapidly clear are common. On an average day relative humidity is approximately 90 per cent at 0900 hours decreasing to approximately 75 per cent by 1500 hours.

Winds.

Winds in general are light. Exceptions are the high winds which occur just before and during rain squalls, and the very strong localised whirlwinds which occur occasionally cutting 'paths' through the forest, and snapping through trunks of trees, causing considerable damage along narrow tracts.

Vegetation

The vegetation of the Wewak - Lower Sepik Area (which includes all Abelam territory east of longitude 143°E, and of the Middle Sepik Plains has been extensively described by Robbins (1961) and by Reiner and Robbins (in Press). It will only be briefly described here. Apart from small localised sago swamps and other swamp communities, vegetation of the Abelam area can conveniently be divided into three groups.

1. There were three occurrences of these winds while I was in the field. High winds occurred over a wide area. The type of damage described occurred only along strips 30 feet wide and 400 to 600 yards long.
Lowland Hill Forest.

Within Abelam territory very little remains of the well developed three layered forest described by Robbins (1961:128-130). Most of the land has been used for gardening and is now either garden regrowth or secondary forest. In some areas, especially in the East Abelam and Wosera regions the fallow is dominated by Imperata, Ophiuros, Polytoca, Sorghum halepense and Saccharum spontaneum all of which are tall grasses. This type of vegetation including the regrowth, secondary forest and tall grasses, is found in the Foothills and the Wosera and some remnants are found in the Middle Sepik Plains.

Alluvium Forest.

This type of forest differs slightly in structure and floristic composition. It occurs on the terraces of southward flowing rivers south of the Foothills. Along the Screw, Amuk and Nanu rivers in the Wosera, the alluvium forest has been completely cleared by cultivation. It is possible that land shortages forced the Wosera people to use the floodplains in the face of the risk of crop loss during flooding. The availability of a yam (asagwa) which would grow in moist situations is an important factor in the successful use of the floodplains.

Grassland.

The greater part of the grasslands are in the form of long continuous tracts of grassland up to six miles wide. They run from north to south and are separated by narrow strips of forest bordering the river gullies (see Plate 5). The main grassland, extending south into the Sepik River Floodplain is found over uniformly poor soils having distinct seasonal alternations of wet and dry phases.

This is reflected by the species composition which is a complex of Themeda australis and its associate, Arundinella setosa on the one hand, and Ischaemum barbatum with several common sedges, on the other .......... Where the relief is sufficiently developed the [Themeda and Arundinella] group segregates out to occupy the drier hill crowns while Ischaemum dominates the shallow valleys and depression folds. Where co-dominant the Themeda grass forms small surface-rooted tufts while the Ischaemum has a root system penetrating to the wet subsoil level (Robbins 1961:143-144).
To the north of the low Themeda - Ischaemum grasslands there is often a transitional zone of grassland community dominated by Ophiuros exaltatus and Imperata cylindrica. This tall grass zone bears tree and shrub regrowth and is frequently used for gardening. In areas of grassy fallow it is not uncommon for garden fires to escape into neighbouring fallow. As cultivation and firing continue it is probable that in time the area will change to more stable short grasslands similar to those of the lower plains.

It seems likely that the whole area between the Prince Alexander Ranges and the Sepik River was once tropical lowland forest with the exception of swamp communities near the Sepik River and a few local poorly drained areas. Robbins (1963:328) suggests that the extensive Sepik grasslands are an induced disclimax caused by native cultivation and subsequent periodic firing. He argues that although the soils of the grasslands are inherently poor, both physically and nutritionally, and frequently subject to seasonal drought, the grasslands do not represent edaphic or climatic climaxes. The remnant lowland forest which occurs on the edges of the grass have identical soils and a similar environment to the grasslands.

The Regions of the Abelam (see Figure 7)

On the basis of dialectal (Figure 2) and physiographic differences, as well as population and social differences which will be discussed later, four Abelam regions can be defined, namely the North Abelam, the East Abelam, the Wosera and the Sepik Plains. These geographic regions are to some extent recognised by the Abelam people themselves except for the Sepik Plains region which is an ill-defined transition zone between the Sepik River dwellers and the Abelam.

1. This change to short grasslands would take many years. A comparison of the aerial photographs taken in 1939 with those taken in 1958 show no noticeable change over two decades.
The people of the North Abelam region live in the Foothills on sedimentary siltstone and mudstone. Soils are generally better here than in any other region and there are no extensive areas of grassland. Except for a few patches of high forest on stony soils, vegetation is either secondary forest or garden regrowth. Population is fairly evenly distributed and the indigenes generally admit no shortages of land or food.

In the East Abelam region population is mainly in the Wingei Hills, located centrally around Wingei village; village lands tend to radiate out from this centre of settlement. Hills are less steep than in the Foothills especially in the southern parts of the region. There are large areas of long grassland, mainly Ophiuros and Imperata, which are on black earth and brown forest soils that have a better physical and chemical composition than the soils of the Sepik Plains. These areas are used for gardens.

The Sepik Plains region is covered mainly with low grasslands on very poor soils and is uninhabited except for a few villages in the remnant lowland and alluvial forest bordering the southward flowing rivers.

The Wosera region is very densely populated, with low secondary forest and many patches of both types of grassland. The people of this region are very short of land and food and there is much evidence of severe ecological stress caused by an excessive population practicing a form of shifting cultivation on soils which are unable to support it.
Chapter 3
EUROPEAN CONTACTS AND POPULATION

European Contacts

The Abelam had few contacts with the Germans before 1914. Trade goods, particularly steel implements, were traded in from the coast and the Sepik River and there was a little recruiting of native labour mainly by raiding party methods. After the change of political control during the First World War many native labourers were recruited privately and a few patrols of the Australian Administration went through the area. In the early 1930s alluvial gold was found in the Parchee and Screw Rivers and by 1937 there were fifty European gold miners in the area (TNGAR 1937-38:122). However, no permanent contact was made by the Australian Administration until 1937 when a patrol post was established at Maprik. In the following year an agricultural station was established at Bainyik.

Before permanent contact by the Australian Administration the Annual Reports for the Territory hint at bad relations between natives and Europeans and native informants have confirmed this emphatically. Many of the initial contacts with Europeans were severe (cf. Whiting and Reed 1938-19) and in August 1936 a recruiter was speared at Lehinga west of Maprik (TNGAR 1936-37:35). In 1938 Roman Catholic missions were established at Ulupu and Kunjingini but their influence, like that of the Administration, was slight before the war.

By the end of 1942 the Japanese had occupied the area and for the next three and a half years life was considerably disrupted (AGS 1944:4). Initially the Japanese were highly regarded by the natives. They were billeted in the villages and carefully maintained good relationships; sometimes they even worked with the natives in the gardens. However, in the last few months of the war when the Japanese were very short of food they competed with the natives for that which was available, killing many natives and even practicing some

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1. Kaberry (1941:236) mentions two Kalabu natives who worked for the Germans.

2. According to informants a Japanese soldier was publicly executed by his officers for raping a native woman.
cannibalism. It was only when the natives saw what enormous material resources lay behind the Allies that they began to support them. The area was heavily bombed and after bitter fighting it was 'liberated' in May 1945.

After the war it took several years for ANGAU (The Australian New Guinea Administrative Unit), and later the civil Administration, to re-establish control. The war left widespread destruction and shortages in finance and staff. The people were very unsettled having seen the might and astonishing material power of the Western countries, and cargo cults were not uncommon (Bühler 1957:11-12). The Administration was unable to do much until 1948 although a government school was established in Maprik in 1947 (Thompson 1952:479). The Roman Catholic missions returned in 1948 and they were followed by missionaries of the Assemblies of God, the South Seas Evangelical Mission and the Seventh Day Adventists with their confusing complexities of beliefs (see Figure 8). Mission impact rarely went deeper than a nominal attachment of a native to a Christian denomination, a smattering of an elementary education and often a feeling of inferiority arising from contact with European attitudes and material superiority.

1. This school ceased operations for a time and later moved to Bainyik.

2. It is interesting and, to an Australian, disturbing that many natives insisted that I was English and not Australian. Apparently I did not behave like an Australian. I talked with the natives and, to some extent associated myself with them (two anthropologists and the welfare officer in Maprik were English). There is virtually no social intercourse between most Europeans on the outstations and the indigenes. Even the missioners usually construct a European-style house set apart from the nearest village. Except for a man and his wife at Serangwantu from the Summer Institute of Linguistics no European in the area speaks the Abelam language fluently and Administration officials make only fleeting contact during the periodic patrols.
Before April 1958, when a Native Local Government Council was proclaimed in Maprik, the Administration appointed and worked through 'luluais' and 'tul tuls', who were, in the view of Administration officers, the most able native leaders in the villages. They organized the maintenance of roads and the cleaning of villages, the carrying of 'cargo' for Europeans and the 'lining' of the villagers for government inspection, census and tax collection (first collected in 1939).

The Native Local Government Council operates through elected councillors, and has the power to levy taxes and raise money from many sources.¹ There are over 10,000 people within the boundaries of the Maprik Council, nearly all of whom are Abelam speakers. In December 1961 a Council was proclaimed in the area around Yangoru and includes within its boundaries the Abelam in the Wingei and Nindepoyle CSDs. Another council was proclaimed in the Wosera area in 1963 which includes about 13,000 people from the North Wosera CSD and parts of the Tamaui and South Wosera CSDs. A further council is likely to be proclaimed shortly to the north of the Wosera, and this will mean that nearly all Abelam speakers will be within council areas. No native from the Maprik Sub-district has been elected to represent the New Guinea Coast in the Legislative Council in Port Moresby but in the February 1964 election for the new House of Assembly, two members will be elected from the Maprik Sub-district alone. The North and South Wosera together with all CSDs patrolled from Dreikikir will form one electorate and the remainder of the Sub-district will form the second electorate. In the Sub-district in June 1963 there were 104 councillors, 194 'luluais' and 209 'tul tuls'.

Economic advancement offers even greater problems than political advancement for the country is not richly endowed with natural resources, and tropical crops are notoriously unstable so far as marketing is concerned. Traditional payments

¹ In the year ending December 1961 the Maprik Council raised £3,932 from taxes and £3,908 from other sources (mainly the sale of native art). In the year ending December 1962 the Council raised £5,158 from taxes and only £688 from other sources (TNGAR).
are made with shell rings\(^1\) which are obtained from the Mountain Arapesh in exchange for pigs. Occasionally ring payments are supplemented by cash payments with notes or £5 'sticks' of shillings sewn in cloth for traditional purchases such as wives, pigs, magical paints and rings themselves. European money is usually considered to be an additional and secondary form of wealth and is used for buying trade goods, paying taxes or making any European type of transaction.\(^2\) There is a considerable amount of money in some villages. This is obtained by selling cash crops (see Chapter 6), by remittances received from fellow villagers working away from the village, by working alluvial gold,\(^3\) by casual employment or by selling native art. Some, no doubt, is left over from the £127,978 paid by the Administration as war damage compensation in the Maprik Sub-district. It is doubtful whether the income obtained by selling native art will remain quite so high as the market becomes satisfied and the quality of the work falls. Table 1 shows some of the sources of income in the Sub-district.

To the amounts shown in Table 1 must be added the incomes of Maprik men employed within the Sub-district and private sales of food to missions and other Europeans. Even so the total income is pitifully low considering that there are well over 82,000 people in the Sub-district.

1. For a description of the manufacture and use of these rings by the Arapesh see Mead (1938:317-319). See also Kaberry (1941:352) for some details of how the Abelam use them. The cash equivalent of shell rings varies from five shillings for small rings to £15 for good quality large rings.

2. I have seen sums of up to £50 change hands at 'lucky' which is a card game of chance.

3. From the natives' point of view washing of gold represents a lot of work for comparatively little return. Income now is considerably lower than in the period before 1959 when it was almost £11,000 a year. Yenigo had only one sluice which is not used now. In the period between September 1960 and August 1961 the 15 men working on gold earned only £136.
TABLE 1 - Main Sources of Native Income in Maprik Sub-District

<table>
<thead>
<tr>
<th>Source</th>
<th>1959/60</th>
<th>1960/61</th>
<th>1961/62</th>
<th>1962/63</th>
<th>Rate received by Natives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>Nil</td>
<td>Insignif.</td>
<td>£176</td>
<td>£228</td>
<td>10 pence a pound.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>used for seed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>£2,375</td>
<td>£2,341</td>
<td>£1,775</td>
<td>£3,193</td>
<td>3 pence a pound.</td>
</tr>
<tr>
<td>Peanuts</td>
<td>-</td>
<td>£482</td>
<td>Nil</td>
<td>Nil</td>
<td>Varies, about 2 pence a pound.</td>
</tr>
<tr>
<td>Food to Government Departments</td>
<td>-</td>
<td>-</td>
<td>£1,169</td>
<td>-</td>
<td>As above.</td>
</tr>
<tr>
<td>Food sold at Maprik Market</td>
<td>-</td>
<td>-</td>
<td>£2,000*</td>
<td>-</td>
<td>As above.</td>
</tr>
<tr>
<td>Gold (including Subsidy)</td>
<td>£8,986</td>
<td>£8,183</td>
<td>£7,162</td>
<td>£5,340</td>
<td>Approx. £20 an ounce.</td>
</tr>
<tr>
<td>Native art</td>
<td>-</td>
<td>-</td>
<td>£2,000*</td>
<td>£1,000*</td>
<td>Varies.</td>
</tr>
</tbody>
</table>

Source: Annual Reports from Sub-district Office.

* = Estimate, - = No information.

Communications

Compared with most areas in New Guinea, the Maprik Sub-district has a good network of paths and roads and almost all villages in Abelam territory can be reached by a four-wheel-drive vehicle. Although flooding is common, especially in the wet season, the rivers do not remain in flood for any length of time so that access is never interrupted for long. The North and South Wosera CSDs however are exceptional; the Screw River is rarely impassable for more than a few hours, but both the Amuk and the Nanu Rivers may remain in flood for days at a time.

There are eleven airstrips in Abelam territory, nine of which are used only by mission planes. Maprik airstrip handles
most of the light traffic and Hayfield, five miles south of Bainyik, receives heavier traffic including the very occasional DC3 aircraft. The movement of most light cargo and personnel, both European and native, is made in light aircraft such as the Cessna, though there is a regular weekly Piaggio service to Hayfield,\(^1\) heavy goods are brought into the area up the Sepik River, the entrepôt being Wewak and occasionally Madang. There is a road, passable most of the time by five ton trucks, between Pagwi on the Sepik River and Maprik. A jeep track 100 miles long joins Wewak and Maprik, a distance of only 40 miles by air. Army engineers are constructing a new road from Wewak to Lumi via Maprik which will be considerably shorter than the old road and surfaced with coranas.

Health and Nutrition

The Abelam are fairly short and slight in build;\(^2\) they have dark brown skin, high foreheads and dark frizzy hair. On the whole the adults appear healthy but very vigorous natural selection is exerted in infancy and early childhood by the environment and lack of personal hygiene and before resistance is built up against common infections and diseases. Infant

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1. Freight rates from Wewak to Maprik vary from 4d. to 7d. a pound. A single fare is £4.10.0 and a Cessna charter is between £16 and £20.

2. The average height of adult males in Yenigo in 1962 was 5 feet 1 inch and the average height of adult females was 4 feet 10 inches. The average weight of females was 113 lbs, and the average weight of adult males was 123 lbs.

3. Some of the old men still adhere to the traditional custom and 'shave the hair off the front of their heads, and allow the rest to mount in a fan at the back, with small pencil curls, which they keep oiled, hanging down behind the neck' (Kaberry 1941:238).
and child mortality is very high due to malaria, sepsis, neonatal tetanus, endemic bacillary dysentery, gastro-enteritis, pneumonia, infantile diarrhoea, virus diseases and infections and obstetrical complications at birth.

The principal diseases in adults, apart from malaria, are bacterial lung and intestinal infections such as pneumonia and dysentery. Amoebiasis is quite prevalent and so are helminth infestations. MacLennan et al. (1960:305) found that 90 per cent of Maprik village was infected with hookworm which is mainly a debilitating disease. Round worm is much more serious and is often a direct cause of death. Virus diseases, followed by secondary bacterial infection, tuberculosis, leprosy and gonorrhoea are also common. Infected abrasions, cuts and wounds are extremely common, often resulting in tropical ulcers, septicaemia and gangrene. There is a high incidence of 'grille' (Tinea imbricata), a fungus infection of the skin which occurs on about 20 to 25 per cent of the natives. It is unpleasant and socially most undesirable, but does not cause death.

Yaws have been eradicated from the area and all the villagers have been immunized against smallpox which has not yet appeared in Australian New Guinea, but which, like cholera, is undoubtedly moving east from Indonesia. Europeans and natives living on European settlements have been immunized against poliomyelitis and children attending child welfare clinics in the North and East Abelam regions are given triple Antigen (immunization against whooping cough, diphtheria and tetanus). Pregnant women who attend clinics are given tetanus toxoid to lower the incidence of neonatal tetanus.

1. Formerly Maprik was one of the few holoendemic malarious areas in the world (Peters 1960:242) but incidence of the disease has been checked to a large extent by widespread spraying of houses with D.D.T. by the Malaria Control Section of the Public Health Department (PHD). Endemic malaria, ipso facto, means endemic anaemia and lowered resistance to all bacterial infection, especially those associated with poor sanitation and hygiene.
There is some nutritional stress in infants and pregnant women. Infant nutrition is good as long as the supply of maternal breast milk is good. Breast feeding stops when the child is about two years old and some form of malnutrition often occurs before the child is physically capable of ingesting the large quantities of starchy foods required for the necessary concomitant supply of proteins and other nutrients. Prolonged breast feeding is the only safeguard against infant malnutrition so there are sexual taboos on lactating women which are still observed in some Abelam areas. Pregnant and lactating women are however barred from many forms of meat protein by taboos. This puts a considerable nutritional strain on women who are usually either pregnant or lactating for most of their reproductive life.

Population

If the 260 square miles of unsettled short grasslands are excluded, the Abelam live in an area of about 290 square miles, which means that the overall population density is about 106 people per square mile. Population is unevenly distributed however (see Figure 7), some areas in the Wosera having population densities approaching 400 per square mile.

Demographic interpretation from official sources must be based on information in Council tax books and village books which contain so many patent inaccuracies (see MacArthur 1956:330 and 548) that it is almost impossible to make any but the most general analyses from them. It is apparent that patrol officers use different standards and methods in the collection of data and that, particularly in the period before 1956, people who had avoided previous censuses were constantly being included in the census books and the boundary of the Sub-district was continually being changed. Censuses are not taken simultaneously, nor even at regular intervals in each village, and it is not surprising that total populations show inexplicable fluctuations. Table 2 shows population in the Maprik Sub-district from 1950 to 1962 and from this it appears that figures from 1956 onwards might record something near the true rate of natural increase.

1. See also Chapter 7 for further discussion on nutrition.
in the Sub-district. The crude rate of natural increase from 1956/57 to 1961/62 was 2.8 per cent. In some areas in the Wosera the rate of increase (adjusted to variation in inter-census periods and including absentees) was as high as 4.0 per cent. 1

TABLE 2 - Population of Maprik Sub-District (Source TNGAR)

1949/50 - 40,925 (excludes the Dreikikir area which was patrolled from Aitape).
1950/51 - 42,540 (excludes the Dreikikir area which was patrolled from Aitape).
1951/52 - 67,479 (includes Dreikikir and estimated population of 3,000).
1953/54 - 68,152
1954/55 - 67,902
1955/56 - 68,232
1956/57 - 71,411
1957/58 - 72,727
1958/59 - 77,064
1959/60 - 78,518
1960/61 - 80,741
1961/62 - 82,957

Considering the very high child and maternal mortality rates, 2 the rate of population increase is very high. Assuming that the rate of increase does not change the population will double in 24 years.

1. For more details on population in the Wosera see Chapter 8.

2. Child mortality rates (0-15 years) are about 520/1,000 live births in the Wingei and Maprik area and up to 620/1,000 in the Wosera. Maternal mortality rate is as high as 32 deaths per 1,000 total births in the Wosera (Schofield: personal communication).
Three factors may however check the rate of increase. Many natives may either emigrate from the area or desert while working under Agreement outside the Sub-district; if the economy develops they may be attracted to the towns. In some areas such as the Wosera, mortality may increase as a result of lowered resistance to disease due to malnutrition. Finally, during the next ten years, comparatively few females will reach child bearing age, due to very low birth rates or very high infant mortality rates or both before, during and just after the war (see Figure 9). Nevertheless it seems more than likely that these factors will be counteracted by the following factors which tend to augment the rate of increase.

1. The gradually increasing use of medical facilities provided by the Administration and missions. There is a government hospital at Maprik and a mission hospital at Kunjingini as well as a number of Medical Aid Posts staffed by indigenous aid post orderlies or by hospital orderlies who have completed a two year training course. Schofield and Parkinson (1963: 6-8) give many reasons for little use being made of available medical facilities but this resistance may well give way in time. The Malaria Control campaign and other special medical campaigns such as those against yaws and tuberculosis, and the work of the infant welfare clinics will certainly lower the mortality rate.

2. There has been a widespread abandonment of taboos connected with the yam and tambaran cults. In the present context, the most important of these taboos is that on sexual intercourse, which ensured that most males over the age of 30 remained continent for at least six months every year when they were growing the large ceremonial yams. These taboos are still observed among some of the men in the North and East Abelam regions but, in the Wosera the practice of growing ceremonial yams has been widely abandoned. 1 There were also taboos on

1. Schofield (personal communication) notes that each Wosera woman has 1.9 more child births than those in Wingei.
sexual intercourse with pregnant and lactating women and this led to well spaced families, for children were often not weaned until they were two and a half years old. Today many cases are seen, especially in the Wosera, of siblings separated in age by only eighteen months.

3. The desire of the people is to have as many children as possible. This desire is completely unaffected by consciousness of acute land shortage and a large family remains the ideal, even of those who have not enough food themselves.

Although the rate of population increase is very high now, even before European contact the area was densely populated and the Abelam were expanding their territory (Thurnwald 1914:81, Behrman 1924:37). Ethnological and linguistic literature indicates that the Abelam originated in, or south of, the Middle Sepik area and moved north across the Middle Sepik Plains. This theory is supported by Robbins (cf. p.29) who believes that the Middle Sepik grasslands are man made, caused by an advancing front of population clearing and repeatedly burning the land. It is impossible to say how long this process has taken although Laycock estimates on glotto-chronological evidence that the Boikin and the Abelam separated from the Iatmul between 1,350 and 1,700 years ago (Laycock 1961:40).


2. The Abelam area is more densely settled than any other area in the Maprik Sub-district.

3. For summary of various hypotheses see Laycock (1962:267-73). A survey of blood groups in the Sepik River District gave no evidence to support or disprove any theory and blood groups of all peoples tested showed marked heterogeneity (MacLennan et al 1960).
To the north the furthest extension of the Abelam is in the immediate area of Maprik station; in this area, mainly due to better soils, destruction of the garden habitat has not followed clearing and burning. Further expansion into the sparsely settled areas to the north seems to have finished well before 1937, and migration to the north west and east was checked by the Southern Arapesh and Boikin peoples who were living in areas that were nearly as densely settled as the Abelam territory. To the south west, however, the Wosera people were actively expanding.

Expansion to the west is particularly well documented. Wabindumakag has within living memory surrendered all its land to the east of its present site and cultivated land to the west and south west. Nunguaia, the most westerly Abelam village, abandoned its house sites and land under heavy pressure from Jibako, and occupied its present site taking over from a Gawanga speaking group whom they claim to have massacred to the last man. Apparently this took place just before Administration control. Similar histories can be collected in any part of the Wosera (Forge: personal communication).

Before permanent contact, boundaries were not absolutely stable and expanding groups acquired land at the expense of static or decreasing groups. When the government forbade warfare and fixed boundaries at their 1937 position, it created or accentuated the problem of maldistribution of population, by putting a stop to acts which tended to distribute the population according to the carrying capacity of the land (cf. Middleton and Greenland 1954:452). Uneven distribution of land is particularly apparent in the Wosera region where fights over land were very common before pacification. Some villages such as Rubugum and Umonoko, which were powerful groups when intervillage fighting was stopped, have plenty of land whereas other groups, such as Bapandu and Stapikum which were weak when village boundaries were frozen, are now desperately short of land.
Chapter 4
SOME ASPECTS OF ABELAM SOCIAL AND TERRITORIAL ORGANIZATION

Introduction: the Village Group

As land usage is so closely interwoven with social and cultural patterns, it is essential to comprehend culture and society, at least in outline, before any attempt is made to describe or evaluate technological, economic or other factors concerned with the production of food. In the area occupied by the Abelam and their neighbours, the pioneer ethnographic work of Thurnwald (1914, 1917a, 1917b) and Behrmann (1917, 1922, 1924) has been followed by more recent work in ethnography, social anthropology and linguistics. Wirz (1954, 1959), Bühler (1957, 1960, 1961, 1962) and Gardi (1958, 1960) have studied culture and ethnography, with special reference to the primitive art forms for which the people of the Maprik area are famous; Fortune (1942) has made a detailed study of the Mountain Arapesh language and Glasgow and Loving (1960) and Laycock (1961, 1962) have conducted linguistic surveys. Social anthropologists who have worked in the general area include Mead (1933, 1934, 1935, 1938, 1940, 1947) and Fortune who studied the Arapesh, Bateson (1932, 1936) who wrote on the Iatmul of the Middle Sepik, Whiting and Reed who worked among the Kwoma of the Washkuk Hills (Whiting and Reed 1938, Whiting 1941, 1944) and Kaberry and Forge who have worked among the Abelam themselves. Kaberry was based in Kalabu village in the North Abelam region in 1939-40 (Kaberry 1941, 1941-42, 1957) and Forge spent 15 months during 1958-59 in Bengaragum and Wingei villages among the East Abelam (Forge 1962) and a further 12 months during 1962-3 working mainly in Kwanabandu village in the Wosera.

Within the Abelam area there are many local differences, in dialect, social structure, kinship and initiation systems, agricultural techniques and even types of crops. Many of these differences will be mentioned in the text but nowhere should

1. Only works which were of some value in this thesis or were major contributions are quoted in this paragraph. For detailed bibliography see Department of Anthropology (ANU) 1963.
it be assumed that any generalization applies over the whole area.

The Abelam live in approximately 80 village groups each of which usually has a population of about 350. A few village groups are much larger and most of these, like Kwanabanu which has a population of over 800, are in the Wosera. Nearly half of the 151 Abelam 'villages' shown in the Village Directory (DNA: 1960) are one or two segments of larger village groups. They are the result of clans (kum) breaking away and forming new groups of hamlets, consolidating their land holdings by warfare and agreement to form autonomous village segments, while remaining in physical propinquity with the parent village. In what follows the term 'village' will be applied to these village segments; 'village group' designates a true village or a group of village segments. Such fragmentation of village groups is facilitated by the fact that clan land is usually concentrated in certain parts of the village group territory. The importance of the original village grouping is that close ties exist in kinship, clanship and in many exchange relationships between village segments. Also there is no clear boundary in land holdings between village segments as there is between village groups.

The Abelam are aware of being a linguistic and cultural group but there is no sense of political unity or central organization. The village group is the largest political and war-making group.

1. Both Yenigo and Stapikum are named segments of villages known respectively as Korkum (which also includes Malba No. 1 and No. 2 and Naramco) and Numbandu-Komakum (which also includes Bapandu, Serakum, Kutigum, Isogum, Numamaka, Gulakim and Kwatmagum). All village segments in parentheses are DNA villages. Both Stapikum and Serakum consist of two further segments. I worked only in the segment known as Stapikum No.1.

2. The lack of central organization is similar to the Arapesh (Mead 1938: 160). For description of the loose federated war-making groups of the Iatmul see Bateson (1932:255).
Before contact fighting was endemic and each village group stood in a relation of temporary alliance or hostility with its neighbours; 'the more distant villages were regarded as more or less neutral although chains of alliances could be and were followed out to classify any village as enemy or ally' (Forge: unpublished notes). The North Abelam formed small war-making groups which rarely included more than two or three villages. In the Wosera, where village groups are much larger, alliances were often formed with a number of surrounding villages resulting in groups of two thousand people or more. All alliances were temporary and many villages turned on their former allies and exterminated them. The segments of any one village are usually in the same war-making group; although there are exceptions. Bapandu, a segment of Numbandu-Komakum, allied itself to Moi (see Figure 15) an Arapesh village, as a result of sorcery accusations\(^1\) and land disputes with the other segments of the village group.

The Village Segment

The village groups are usually two or three miles apart. They are situated on ridges and hilltops and are usually separated by rivers, thick belts of forest or garden regrowth. Before pacification each village had ditches and stockades around the living areas (Thurnwald 1914:82) and evidence of the ditches is still apparent in most villages including Yenigo and Stapikum. A state of more or less continuous hostility was maintained between enemy villages though temporary truces were made for ceremonies and yam exchanges or when both villages wished to cultivate land near a common boundary (Kaberry 1957:38). In pre-contact times occasional

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1. Sorcery is blamed for all illnesses and deaths. After every illness or death therefore an intermediary, who is thought to have collected the sorcery material of food scraps, faeces or some other personal objects, and a sorcerer in an enemy village who has 'worked the poison' are subject to censure from the group of the dead or sick man. Much wealth mainly in the form of shell rings, changes hands over sorcery disputes. The services of a sorcerer are bought, sorcery material can be bought back, and wealth is given, usually through an intermediary, to the sorcerer who is thought to be 'working the poison', in the hope that he will be placated so that sickness or death will not occur.
visits were made to villages up to ten miles away for ceremonies and barter of rings and pigs and some trips were even made to the coast to obtain salt (Kaberry 1957:33); all such visits and expeditions would be only undertaken by a few men working through chains of friends where men introduced the visitors to kin in neighbouring village groups. Now that most men have spent some time working outside the Sub-district and warfare has been stopped, there is much more movement between villages. During the dry season in particular it is quite common for men to undertake visits to distant villages to buy pigs or to visit friends made while working on the coast or in the Bismarck Archipelago. Although barriers hindering communication between villages are being broken down both by pacification and encouragement of Native Local Government Councils, it is still true to say that the Abelam, unless they are outside the Sub-district, take little interest in life outside their own village.

Each village segment is commonly made up of 15 to 25 hamlets which are often contiguous and rarely more than 200 feet apart. In Yenigo four of these are main hamlets containing central dancing grounds or ameis (Plate 9) on which all the exchanges, disputes and dances ('sing-sings') and much of the day to day discussion and social intercourse takes place. An amei usually has a tambaran house, containing the important ritual objects, facing onto it. Hamlets vary greatly in size and population (Figure 10); in Yenigo there were 18 hamlets in 1962 with an average number of 18 structures in each hamlet and an average population of 13 people. An average sized hamlet contains four family sleeping houses, four yam storage houses, three family sleeping houses, and two

1. Kaberry (1957:12-17) uses a different terminology. What I call a hamlet she calls a hamlet section, and she calls a main hamlet a hamlet. To save confusion I shall henceforth call a main hamlet an amei.

2. A 'haus tambaran' is the Pidgin term for the huge tetrahedral cult houses storing the man's sacra (see Plate 1).

3. Some men have two yam storage houses one for ka and small wabi and one for the ceremonial large wabi.
Plate 8 - Kwanabandu Village.

The low fallow is typical of much of the Wosera.

Plate 9 - The amei of Hamlet XIV in Yenigo, with the first stage of the building of a new tambaran house in the middle background. The men are sharing food after a day's work.
In spite of this, and in spite of many other tensions between various groups in the village, the whole village presents a united front to other villages. Strong forces work towards village cohesion. All the people within the village are related, either in a blood relationship or by some classificatory or exchange relationship, and share hunting rights, lend land to each other, and help each other in day to day activities. The whole population will take pride in one man's prize yams or in an especially good tambaran house. In pre-contact times there was the mutual need to defend the village against aggression and even now the village lands have to be defended against rival claims in the DNA courts.

The Clan

In the village group containing the village segments of Malba Nos. 1 and 2, Yenigo and Naramco, there are at least fourteen clans; five of these clans are in Yenigo. According to tradition Yanuko and Naramco were both clans of Malba which broke away to form virtually autonomous village segments. Table 3 shows the structure of clans and sub-clans within Yenigo but it should be borne in mind that all clans but Nindekum also have other sub-clans in either Naramco or Malba. Yanuko and Mandjipati have sub-clans in Malba, and Gaulpilkum and Nyamitokum have sub-clans in Naramco.

The clans are totemic. Each has associated with it a bird totem (djambu), other minor totems both animals and leaves, and a whole complex of names, figures and spirits referred to as a whole as nggwal. Of these the most important are the nggwa-indu, who are represented in the largest of the carved figures and in the huge faces that appear at the bottom of the painted facade on the tambaran house (see Figure 1). Although nggwal literally means father's father there is no concept of descent from the totem or any of the spirits, although wala, a spirit living in streams and water holes, is believed to be responsible for conception (Kaberry 1941:245).

1. The cause for the break away is obscure except that it was connected with adultery, sorcery and murder. Parts of other clans in Malba broke away at the same time and other groups have subsequently been attracted to Yenigo. Sub-clan C2 is a refugee group from Unyelim and Sub-clan B1 came from Jame via Malba.

2. The function of the male in childbirth is to feed the embryo once conception has taken place.
TABLE 3 - Yenigo Clans and Sub-Clans

<table>
<thead>
<tr>
<th>Clan</th>
<th>Sub-Clan</th>
<th>Totem</th>
<th>Sub-Clan</th>
<th>Nggwalndu</th>
<th>Kumundji</th>
<th>Kwiendji</th>
<th>No. of Adult Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yanuko</td>
<td>A1</td>
<td>Wura</td>
<td>Tsike</td>
<td>Wungai</td>
<td>KW</td>
<td></td>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td></td>
<td>Kwulamba</td>
<td></td>
<td>KW</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td></td>
<td>Kwaru</td>
<td></td>
<td>KU</td>
<td></td>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>A4</td>
<td></td>
<td></td>
<td></td>
<td>KW</td>
<td></td>
<td>1*</td>
</tr>
<tr>
<td>Mandjipati</td>
<td>B1</td>
<td>Wura</td>
<td>Kwulamba</td>
<td>Kwumbat</td>
<td>KW</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td></td>
<td>Kwass</td>
<td></td>
<td>KW</td>
<td></td>
<td>1*</td>
</tr>
<tr>
<td>Nindekum</td>
<td>C1</td>
<td>Kumun</td>
<td>Kumun</td>
<td>Mbalemo</td>
<td>KU</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>C2</td>
<td></td>
<td></td>
<td></td>
<td>KW</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td></td>
<td>Mainge</td>
<td></td>
<td>KU &amp; KW</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Nyamiokum</td>
<td>D1</td>
<td>Kvarumbei</td>
<td>Nyamio</td>
<td>Bira</td>
<td>KU</td>
<td></td>
<td>8*</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td></td>
<td></td>
<td></td>
<td>KW</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Gaulpilkum</td>
<td>E1</td>
<td>Kvaru</td>
<td>Kvaru</td>
<td>Gantsel</td>
<td>KU</td>
<td></td>
<td>63</td>
</tr>
</tbody>
</table>

+ All names of birds.
+ These sub-clans also have land and members in Malba or Naramco.

All the members of a clan having the one totem and one main nggwalndu call each other by the Abelam term for brother. Clans and sub-clans are not exogamous (cp. Kaberry 1941:250) and the only prohibition of marriage appears to be when a blood relationship can be traced (see Table 6). As the Abelam are bad genealogists, sometimes being unable to name grandfathers, this prohibition can rarely be sustained. Clans are further divided into unnamed sub-clans each of which either has another totem, or has members who dwell in separate halves of the village (i.e. either kumundji or kwiendji)\(^1\) or has both. Sub-clans are

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\(^1\) In September 1962 Nindekum was sharply divided into kumundji and kwiendji groups over an adultery charge when a man from C1 abducted a young girl from C3 (kwiendji).
the land holding group and consist of one to three small agnatic groups. A man identifies himself as 'belonging' to his sub-clan totem rather than to his clan totem and it is a combination of the calls associated with his sub-clan's totem and his mother's sub-clan totem that each individual uses as his personal call on the slit-gongs or 'garamuts'. Often there is no other means of identifying sub-clans than by this self-stated association with other men.

Clans and sub-clans are nominally patrilineal but adoption of children is quite common especially if a man has no male children. If a child's mother dies the child stays with the father who usually marries again. If the father dies the child is either fostered by kinsmen or stays with the mother, who will almost certainly remarry. In Yenigo 16.9 per cent of children of both sexes were living elsewhere than with members of their true father's sub-clan.

TABLE 4 - Relationship of Children with Male Provider

<table>
<thead>
<tr>
<th>Same Sub-clan</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>True or postulated father</td>
<td>64</td>
</tr>
<tr>
<td>FB or FBS</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Different Sub-clan</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>True mother's subsequent husband</td>
<td>4</td>
</tr>
<tr>
<td>Sister's husband (ZH)</td>
<td>1</td>
</tr>
<tr>
<td>Father's ZH (FZH)</td>
<td>1</td>
</tr>
<tr>
<td>Father's FZH</td>
<td>1</td>
</tr>
<tr>
<td>Mother's father's brother (MFB)</td>
<td>1</td>
</tr>
<tr>
<td>Adopted*</td>
<td>6</td>
</tr>
</tbody>
</table>

* Sometimes rings are given to the real parents by the adopting parents but this did not occur in any of these six cases. In all six cases both natural parents were alive when adoption took place.

Forge in Bengaragum found that 19.4 per cent of the children were not living with members of their true father's sub-clan (personal communication).
Even adults become closely associated with clans and sub-clans other than their natal ones, although it is rare for a man to sever himself completely from his natal group. Many men behave in day to day affairs as if they belong to two sub-clans or even two clans. These men usually identify themselves with their natal clan until an initiation ceremony forces them to clearly state their allegiance. Forge found that in Bengaragum only 57 per cent of all men co-operated principally with the sub-clan of their true father (personal communication). Men change clans for a variety of reasons, apart from adoption in childhood. Sometimes they have active disputes with the members of their natal sub-clan which sometimes results in their migration to their wives' or mothers' village. Occasionally a man will form close associations with another clan after making mortuary payments to a dead member's mother's brother. When a man lives on land owned by another sub-clan it can often lead to a gradual and imperceptible change of allegiance caused by co-operating principally with the men of his adopting hamlet.

Married women retain their natal clan membership and have strong ties with their brothers, father and brothers' children which are institutionalised in a relationship known as djangi. However, as they age, they take an ever increasing interest in their husband's affairs and many of the aged women claim membership of their husband's clan in lieu of their own.

1. For more details see under Land inheritance in Chapter 5.

2. In Yenigo five men have built houses on the land of their wives' clan and they now seem to co-operate principally with those clans.

3. 'Djangi occurs throughout the Abelam and is primarily the custom whereby wife providers have rights to some of the produce of her labour. Wife's brother is the main beneficiary but gifts to mother's brother are also important. The situation is confusing because wife's brother gives food to his sister to feed her child and this service has to be paid for with rings, especially when the child is an adult. Djangi has no return and is an obligation; a wife will 'mark' a very fine bunch of bananas and send for her brother to come and get it and the husband has no power to stop her doing this. The payment of rings to mother's brother for food received is sometimes called djangi in the Wosera. It varies throughout the area in amount but there are always some obligations and sometimes some sanctions' (Forge: personal communication).
Within the clans and sub-clans or any other Abelam group there is no system of hereditary leadership. Leadership is acquired through the Yam Cult which is concerned with the growing and exchange of yams and is the principal focus of Abelam interests and values (Forge 1962:10). A successful yam grower acquires prestige and attracts younger and less successful men to entrust their yams to him, the yam expert. In return they support him in his exchange activities. These men are referred to as nemandu, which literally means 'big man'. They exercise leadership in all fields of Abelam life and they are the only men with the power to mobilize large groups of men for economic and ceremonial activities. Skill in oratory and artistic work confer prestige but are only of secondary importance; formerly fighting ability was also taken into account. Big men compete amongst themselves with yams and pigs and also in the allegiance of the village's younger men.

Most Abelam activities such as house building and garden work do not require leadership. A man recruits his assistants on a basis of reciprocal services based on ties of kinship, co-residence and clanship. The tasks performed are familiar to all and any signs of leadership are taken as criticisms of work and lead to disputes. The Abelam do not submit easily to any authority, except when they realise that it is in their own interests. It is recognised by both leader and led that the arrangement is of limited duration for the achievement of specific ends such as painting, yam growing or the building of a tambaran house (Forge: unpublished notes).

The Family

The basic residential and economic unit is the family. It is usually monogamous, although of the 59 married males in Yenigo, eight had two wives and one had three wives. The members of monogamous families nearly always live in the same hamlet and under the same roof. In the case of polygynous families at least one of the wives and her children will live in a separate house, either in her husband's hamlet or in her natal hamlet.

1. Nemandu also means elder brother in Yenigo.
The family is the most important of all groups as far as day to day affairs and simple economic activities such as gardening are concerned, and in many respects a family is a 'self-sufficient unit' (Kaberry 1941-42:82). The various family groupings are represented in Table 5. It is very unusual for young adults to remain unmarried for long. The nine widows and four of the widowers in Yenigo were aged and, although they had one or more garden blocks of their own, most of them who had no children ate with some kinsman.

In 1962 there were 21 temporary absentees from Yenigo which was less than in previous years. Nearly all men over thirty had spent an average of three years working as indentured or agreement labourers in the Bismarck Archipelago and in the towns of the mainland. There are a few men from most villages who have gone away to work and stayed away for periods of up to ten years. In the North Abelam region most of them finally return to their villages and keep in touch with friends and kinsmen in the village by sending messages back with returning absentees and sometimes by letter writing. Although there are many possible objections to the system of labour under agreement allowed by the Native Labour Ordinance, it cannot be said that absenteeism seriously disrupts Abelam social life. Most agreement workers are under thirty years of age, and it is not until a man is approaching thirtyfive and growing yams that he takes any effective part in Abelam ceremonial or social life.

1. In 1950 the 'Native Labour Ordinance' was amended to replace the indenture system by a system of labour under agreement in which, inter alia, all penal sanctions for breaches of contract were removed. For summary see TNGAR (1961-62: 108-110).

2. For objections to the agreement and indenture systems see Hogbin (1951:183-203), Groves (1962) and Bühler (1957). Going away to work is rather similar to the custom of bejalai of the Iban (Freeman 1955:74).
TABLE 5 - Types of Family in Yenigo, 1962

<table>
<thead>
<tr>
<th>Types of Families</th>
<th>Number of Families</th>
<th>Number of Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Monogamous Families</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childless or aged couples</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Couples with children</td>
<td>21</td>
<td>76</td>
</tr>
<tr>
<td>*Couples with husband away at work</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>(husband included)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Families absent</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Polygynous Families</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwelling in one hamlet</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Dwelling in two hamlets</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Families with Accretions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogamous (i.e. half siblings,</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>adopted brothers etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polygynous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwelling in one hamlet</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Dwelling in two hamlets</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Unmarried men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In village*</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>*Absent at work</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Depleted Families</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widows and children</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Widowers and children</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>*Widowers absent at work</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total absent</td>
<td>85</td>
<td>234</td>
</tr>
</tbody>
</table>

* Total absent from village 21.

+ It is unusual for men to remain single. This one case was a very shy and apparently impotent man. All unmarried absentees are young men mostly under 22 years of age.
The Pattern of Residence

Most men occupy those parts of each hamlet which are owned by their own sub-clan. House sites, though nominally belonging to the clan or sub-clan, are usually inherited from father to son, and residence tends to be patrilocal, but in fact only 37.1 per cent of the married males in Yenigo claimed that they were living in their natal hamlet. Reasons for changing hamlets are complex; any one, or combination of, the following factors may be involved:

1. a positive clash of personalities within the hamlet;
2. a wish to change allegiance to another sub-clan or 'big man';
3. a wish to strengthen existing ties of mutual co-operation or friendship, for common residence creates strong bonds of sentiment (Kaberry 1941:242). Often nauindu (see under exchange relationships) or men who have worked together away from the village prefer to reside in the same hamlet;
4. a desire to obtain a better house site.

Figure 10, which shows the residential distribution of adult males in Yenigo, also shows that between September 1961 and October 1962, eighteen men built new houses. Of these, ten men built new houses in the same hamlet and eight moved their residence to a new hamlet. Two of the men who moved did so because they wished to become more strongly attached to men in a sub-clan other than their own. Two others formed a new hamlet because they had had disputes in their old hamlet. There was no apparent reason for the other four men changing hamlets.

1. This question of co-operation will be discussed later, but in this context, men may be attracted to the hamlets of their wife's people or their mother's people.
In any case a man always maintains close ties with his natal hamlet where he has rights to land and to the fruits of trees which his father planted around his house. His natal amei remains the focus of his ceremonial and social life and he will always display his yams there. The tambaran house which faces onto it contains many of the ritual objects with which he is closely associated. Because of this a man rarely changes his residence from one half of the village to the other for this would necessarily mean a change in amei allegiance.

Although Yenigo is a comparatively new village segment, only having broken away from Malba two generations ago, there are a number of discarded hamlets with well established coconuts where people have lived within the last five decades. This indicates considerable fluidity in residence.

Figure 10 shows that hamlet group and sub-clan group cannot be equated. The kumundji/kwiendji and the amei allegiance are in many ways more significant and it is rare for a man to change these. The most obvious characteristic of the residential pattern is the wide freedom of choice available to the individual.

Exchange Relationships

Marriage.

A marriage is institutionalized by a presentation of rings by the bridegroom, his clan brothers and often his mother's brother, to the bride's father who distributes some of the rings to his clan brothers, his wife's brothers and his mother's brothers. In Yenigo the bridegroom may give up to six shell rings but in some areas such as the North Wosera and around Bengaragum, the bride price is as high as 24 shell rings which is equivalent to about £A100.

1. Sometimes no rings are given if the bride is a widow, especially if she is elderly and being married to one of her late husband's kinsmen. A bride price depends on the beauty and working ability of the woman and also where she comes from. High bride prices are always paid when a bride comes from an enemy village.
In Yenigo and the surrounding villages, sister exchange is allowed in lieu of payment, and 12 of the 59 married males obtained wives by this means (among the East Abelam and the Moseras this practice is forbidden). Some of the young men are now married in the Council House which involves registration and a cash payment of only £5. This form of marriage is not accepted in the village and a man is abused by his wife in marital arguments and by his wife's kin in any dispute until the traditional payment is made in full. Full payment is always made if the wife comes from a neighbouring village.\(^2\) Table 6 shows place of origin of spouse.

**TABLE 6 — Place of Origin of Spouse in Yenigo and Stapikum, October 1962.**

<table>
<thead>
<tr>
<th>Intra Village Segment</th>
<th>Yenigo No. of Marriages</th>
<th>Yenigo %</th>
<th>Stapikum No. of Marriages</th>
<th>Stapikum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of same clan</td>
<td>6</td>
<td>8.7</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Of different clans</td>
<td>39</td>
<td>56.5</td>
<td>21</td>
<td>60.0</td>
</tr>
</tbody>
</table>

**Inter Village Segments**

<table>
<thead>
<tr>
<th></th>
<th>Yenigo No. of Marriages</th>
<th>Yenigo %</th>
<th>Stapikum No. of Marriages</th>
<th>Stapikum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of same village group</td>
<td>11</td>
<td>15.9</td>
<td>11</td>
<td>31.4</td>
</tr>
<tr>
<td>Of different village groups</td>
<td>13*</td>
<td>18.9</td>
<td>2</td>
<td>5.7</td>
</tr>
</tbody>
</table>

|                                           | 69                       | 100.0    | 35                        | 100.0      |

* Includes three men who married Yenigo girls and immigrated.

1. For details on courtship and marriage see Kaberry (1941:250-253).

2. Even in pre-contact times it was not uncommon for marriages to be made between individuals from enemy villages. If fighting occurred between the two villages concerned, affines would carefully avoid casting spears at or near each other.
Marriage is a form of exchange, but unlike all other Abelam exchange relationships, one party is in a more advantageous position than the other party. The wife givers give the woman and yams and, later, ceremonial services. In return they receive from the husband's group the highly prized shell rings as the bride price, at the birth of the wife's first child, for ceremonial services, and later, on the deaths of all her children. Thus a very important relationship arises between a man and his mother's brothers and their sub-clan (known collectively as waungu) and his father's mother's brothers and their sub-clan (yaingu), which does not end until he dies and his heirs make a final payment in rings to the dead man's mother's brothers. If this payment is not made, the creditors have the power to forbid the dead man's heirs to use the dead man's trees and their products. Thus every adult male is involved with three groups from which he, his father and his father's father received wives and who must, due to marriage prohibitions, be of different cognatic groups. At the same time he and his heirs are involved in a wife giving capacity with many groups which include his daughters' and classificatory daughters' husbands, his sisters' and classificatory sisters' sons and their sons spread over three generations.

With all these groups he is in an exchange relationship characterised by lack of rivalry and competition, vital ritual and ceremonial relationships, a considerable movement of the highly valued shell rings, and a more or less harmonious inequality between the individual and the groups concerned (Forge: unpublished notes).

Although a man loses wealth, marriage provides him with heirs and does open up new spheres of associations on which a man can call for services, assistance and privileges. If a man's mother's brother cannot meet his obligations, other men, by meeting them for him, may put themselves in the favourable position of classificatory mother's brother.

1. In Stapikum a bride's father gave 235 yams weighing approximately 2,600 pounds to his new son-in-law who kept the bulk of his yams for his own use, but distributed most of the big tubers to those who had helped him acquire the bride price. See also note above on djangi.
The Ara.

All men in the village are divided into two unnamed, non-exogamous and non-localized sections called ara, which are usually but not rigidly patrilineal. Every adult male has an exchange partner called tshambera, in the opposite ara for the exchange of large yams (wabi) and pigs. The ara is also the basis of the initiation system (see Chapter 7). The tshambera relationship varies greatly throughout the Abelam, differing mainly in the degree in which it cuts across relationships of clan, kumundji/kwiendji, and, in some cases moiety. In Yenigo one ara consisted of Nyamokum and Gaulplikum clans and some men from Yanuko and Mandjipati clans; the other ara consisted of Nindekum clan and also some men from both Yanuko and Mandjipati clans. Thus in Yenigo only two clans were split though men from both halves of the village were in both aras.

A man must not consume or plant portions of any large yams that he has grown himself, neither can he consume any portion of a pig that he has reared himself for both pig and yam should be given to his tshambera. Exchanges should always be equivalent and careful tallies are always kept on strips of cane of both the length and girth of the yams and pigs and they are only destroyed on the return of equivalent specimens. It is often many years before equivalence is obtained and there are numerous tallies throughout the village, the largest of them often decorating the front of the tambaran house. Tshamberas and aras both strive to outdo each other, but the relationship is essentially friendly in spite of the bombastic and derogatory speeches made about one's tshambera's offerings at the presentation ceremonies. Prestige is gained by pairs of tshambera who are able to exchange yams and pigs which are obviously bigger than those of any other pair.

Hostile Exchanges between Individuals, Groups and Villages.

If two men, two groups, or even two villages have a dispute hostile exchanges of yams and pigs usually take place. Although the proximate causes of disputes are often trivial, they usually have very deep seated origins. Exchanges between villages often reach gigantic proportions. One such exchange in Gwalip village in October 1962 resulted in

1. In the Wosera the ara is called tshamberak and is very different from the aras of the North Abelam people.
approximately 2\(\frac{1}{2}\) tons of yams and several pigs being given to Bugitu (near Bepandu village) by Gwalip village. This particular dispute started as a small exchange and gradually grew as each village successively strove to outdo the other. In this exchange, Gwalip was helped in collecting the food by its allies which included Yenigo, Malba, Naramco and Yangisagu. The allies of Bugitu, which included Unyelim, Kombikum and Wingei, received some of the presentation in payment for past help and in anticipation of future help. Such huge exchanges are recent in origin and the amassing of such large quantities of food from distant allies has only become possible by the enforcement of peace by the Administration, and more leisure.\(^2\)

In Yenigo kwieendji had an exchange with some Naramco men over the killing of a Naramco piglet and kumundji and kwieendji had a short-lived exchange over an adultery accusation. Kaberry (1941-42:215) writes of a man, who in an adultery dispute tried to 'shame' another man by sending him pigs and yams and in effect challenging him to return an equivalent amount; 'the implication was that the adulterer is more interested in sexual intercourse than in growing yams and would not be able to meet the challenge'.

When exchanges are made by a group, yam soup, tobacco and betel nut are given to the visitors who receive the presentation. When the presentation is made there is usually much disputing, shouting and mocking by both parties. Bombastic and inflammatory speeches are made about the nature of the gift or about the manner in which it is accepted.\(^3\)

---

1. The immediate cause of this dispute was a Gwalip man spitting in the face of a Bugitu man; but the two villages have had long standing enmity.
2. cf. Salisbury (1962:329). 'As an immediate result of technological change the Siane had become more prosperous, they had larger and more elaborate ceremonies, and the number and size of ceremonial payments had increased about threefold.'
3. Men threaten each other with spears and fights always appear to be on the point of breaking out. In actual fact fights are rare and tempers cool very quickly. It is not unusual to hear two men abusing each other and then to see them quietly enjoying a cigarette together a few minutes later.
To refuse to accept yams would imply inability to grow them and to refuse pigs would imply poverty in shell rings with which pigs are normally bought. These exchanges of institutionalized rivalry serve as a controlled expression of both permanent hostility and temporary disputes which could otherwise lead to conflict and the disruption of society. The exchange relationship can only be terminated when passions cool and equivalence is obtained (Forge: unpublished notes) and there is a ceremonial exchange of rings and sometimes a ceremonial planting of coconuts.

Nauindu.

In both Yenigo and Stapikum there is a wife exchange relationship in which the partners copulate with each other's wife; they call each other nauindu. In this relationship the prohibitions mentioned previously in marriage apply, and in fact all partners, male and female, are usually from different sub-clans. The relationship is only temporary and can exist only when agreeable to all four parties. While the relationship exists nauindu will often live in the same hamlet and garden together. Children of nauindu call each other brother and are fully aware of the significance of the relationship.

In Stapikum 22 of the 30 married males have nauindu and in Yenigo 10 of the 59 married males. The relationship is well known in the village and nauindu often visit each other for purely social reasons. It is, however, carefully hidden from the missions and the Administration.

The Yam and the Tambaran Cults

The Abelam are remarkable for the tenacity with which they have clung to their ancestral culture (Forge 1962:9) in spite of the traumatic culture contacts they have had with

1. One man in the Yenigo village, who rejoices under the name of Kikomban (copulating man), has this relationship with two other men.
2. In New Guinea adultery is a crime with penal sanctions.
3. The Yam and Tambaran Cults are discussed in more detail by Kaberry (1941:355-8). See also Chapter 6.
German recruiters, Australian recruiters, goldminers, Administration officials, Japanese invaders, cargo cults and Christian missioners. Traditional beliefs are still widely held and the introduction of new ideas or techniques always meets with disinterested toleration or active resistance.

The principal focus of Abelam interests and values is the cult that surrounds the growing and exchange of yams, and success within the cult can only be obtained by knowing the proper techniques and the magic which, in the Abelam mind, are inseparable (cf. Malinowski 1935:62). Before any man can play an active part in Abelam social or ritual life he must be initiated into the Tambaran Cult where he is introduced to many things that will later ensure his success as a yam grower. It is within the Tambaran Cult that a man will gain access to ritual objects, and knowledge of magical substances which will help him in the various stages of yam growing. Probably more important, by carrying out the proper rites, he will be able to invoke the nggwalindu to watch over his yams and make them grow large.

Women are rigidly excluded from both cults and they are only permitted to enter the tambaran house just after it is built, before any ritual objects have been placed in it. Women are inimical to the growth of the large ceremonial yams and are forbidden to enter gardens and store houses containing them. When the missions first came to the area, the Yam Cult, practiced to a large extent in the seclusion of the bush, escaped notice and condemnation, but the Tambaran Cult with its belief in 'idols', its beatings at initiations and its rigid exclusion of women, was an obvious target for mission hostility. Some over-zealous missioners burnt tambaran houses and many cult carvings were destroyed, particularly in the Wosera (cf. Kaberry 1941:366). In the early 1950s few tambaran houses were built and there was a general decline in the cult. Recently, however, there has been a revival among the North and East Abelam and a number of new tambaran houses have been built. It is reasoned amongst the natives

1. Destruction of cult objects may have been associated with a 'cargo cult' (cf. Burridge 1960:29). "Tantum religio potuit suadere malorum" (Lucretius, De Rerum Natura 1,101).
that there were misfortunes and poor yams during the years when there was a decline in belief, due to the nggwalndu withdrawing their support. The Abelam also feel that their own way of life appears to be the only force acting towards stability (cf. Schofield and Parkinson 1963:4). Informants repeatedly stated that first the Germans came, then the English, then the Japanese and finally the Australians. Their history is wrong but it reflects the fact that they view contacts with other cultures as transitory. The Abelam feel that these outside contacts, and in particular the missions, attempted to destroy traditional beliefs but were unable to replace them with anything better.

1. Yams in fact were smaller during this period but almost certainly because less care was taken in their cultivation.
Chapter 5

ABELAM LAND TENURE

The understanding of the manner in which a man obtains rights to land must be the first stage in any study of land utilization. Especially is this so in a subsistence society where there is little or no full-time economic specialization and where every man must have access to land to grow his own food crops. The methods by which a man gains access to land may directly affect the way in which land is used and it may aid or hinder improvements in techniques of land use (Pelzer 1941:78). A man's rights to land tie him to certain areas and closely affiliate him with certain groups within his society.

The Village Lands

The boundaries shown on the maps of the village segments of Yenigo and Stapikum (Figures 17 and 18) are either mutually agreed with a neighbouring village group, are 'kiap'1 boundaries 'suggested' by DNA officials, or are approximate frontiers, for often the interjacent lands between village segments have mixed ownership, and portions of land are owned by clans in different segments of the village group. Boundaries between village groups are usually clearly defined by a ridge top or a stream and are rarely disputed except in the Wosera region. Even in pre-contact times, fights over land were rare among the Northern and Eastern Abelam, most fights there being concerned with sorcery or sago rights (cf. Kaberry 1957:9). In Yenigo only one instance was remembered when the village fought over land.

1. For example Morgan (1959a:149) notes that where individual or family use-right in land has replaced community use-right the land is worked in a mosaic of scattered patches. Where land is held by large groups as in Owerri, large blocks are cleared and subsequently sub-divided for use by individual families.

2. The 'kiap' (Government Official) boundaries are 'suggested' by DNA officials pending a final settlement by the Native Lands Commissioner. There are penal sanctions for not abiding by a patrol officer's decision.
Within the village all the land is claimed and divided into strips 50 to 300 feet wide which run down the sides of ridges. Paths run along the ridgetops and trees or shrubs planted on the edge of the paths mark the beginning of each strip. Rights to these strips of land do not include the areas around the streams and rivers for which there are separate sago growing rights (see under tree ownership). Land is owned by clans and sub-clans which are said to consist of the descendants of the man who established a claim to the land by using it for the first time. Clan membership is always emphasised, but the head of a small agnatic group is frequently named as the land holder. Informants say, 'This land is Nambit's of Nyamiokum.' Land belonging to each clan is concentrated in different parts of village territory but one clan never owns one large continuous area of land. Yanuko and Mandjipati have most of their holdings in the south eastern parts of the village territory, Nindekum in the north east and Nyamiokum to the north west, but they also claim outliers in all other parts of the village lands.

An emigrant usually retains claims in his natal village for one or two generations but thereafter neglects them and the land passes to others in his sub-clan or other sub-clans within his natal clan. Migration of males is not usual among the North Abeilam; Yenigo had only three males who had immigrated and three who had emigrated. All these men came or went to the natal village of their wives, whose clan gave the immigrants house sites and land. In the Wosera emigration from villages short of land is much more common. Table 7 shows that at least 26 males born in Stapikum and still living in 1962 have migrated to other villages. Some of them left the village as children, but

1. A small agnatic group rarely consists of more than four adult males. As brothers age and their children grow up they tend to form separate land holding groups (see under Inheritance). The term small agnatic group as used here means only a man and his sons, though it may include his younger brothers, his brother's sons or even his father's brother's sons if he is the eldest surviving member of the group.
at least 15 left as adults who were either unable to gain access to land or unable to acquire the traditional wealth for a bride price in Stapikum.

TABLE 7 - Present Residence and Reason for Emigration of 26 Males born in Stapikum and still living in 1962

<table>
<thead>
<tr>
<th>Reason given for Emigrating</th>
<th>Present Village</th>
<th>Number</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to raise the necessary bride price</td>
<td>Umonoko</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Serakum</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Ugutagwa</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Wabindumakag</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Kumunugum</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Short of land</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Disputes (adultery and sorcery probably associated with shortages of land)</td>
<td>Utamup</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Wabindumakag</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Gulakim</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Children migrated with mother when she remarried in another village</td>
<td>Serakum</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Kutigum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Umonoko</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Unknown</td>
<td>Serakum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Kutigum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
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<td>2</td>
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<td>26</td>
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<tr>
<td></td>
<td></td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

Inheritance of Land: the Land Holder

Although land is conceived of as clan or sub-clan property, men become attached to particular sections of land which they or their fathers have used before. In 1961, for example, it was said that a certain section of land 'belonged' to Maningrau, the most senior male in sub-clan B1 of Mandjipati.

1. If the male migrates to the village of the wife, bride prices are low and often are not demanded.
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<td>8</td>
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1. If the male migrates to the village of the wife, bride prices are low and often are not demanded.
In 1962 Gwalsilu, Maningrau's father's brother's son of the same sub-clan, made a garden on that land and it was agreed that it now 'belonged' to him. In the same way a section of land which had not been gardened for at least thirty years was said in 1961 to belong to the whole sub-clan (B1) for nobody remembered who had used the land last. In 1962 Koni of the same sub-clan made a garden on the land and it then apparently 'belonged' to him.

This patrilineal inheritance through use of sub-clan land associates a man with the land in sentiment only and gives him a vague pre-emptive right to it within the sub-clan. In what follows this man will be called the 'land holder'. He must always be consulted by other men who want to use that land. However, major decisions concerning the disposal or lending of land are taken by the sub-clan as a whole, and in a large sub-clan by the big men in particular. Land and sago rights are sometimes given to the sons of daughters who have married immigrant men, though usually the sons become members of their mother's clan. If a sub-clan had only one surviving daughter, land may go to her sons, even though they may belong to another clan, if a payment in shell rings is first made to her own clan.

Land is inherited jointly by all sons but nominal ownership is claimed by the eldest male until the younger sons establish a tentative claim of their own by using parts of the land. As a man gets older he becomes nominally attached to more land. He uses his sub-clan's land, he inherits a claim to land from his father or elder brother and from close agnates and other sub-clan members who die without heirs, and he occasionally inherits a joint and rather vague claim from other sub-clans which become moribund within his clan.

Land is sub-clan and clan property and normally does not pass to other clans. An example of this occurred when a third son of a rapidly expanding sub-clan (B1) was adopted in late adolescence by Yamandi, a man without sons, in sub-clan A2. Until the time of Yamandi's death, this young man was a 'middle man' acting as if he belonged to two sub-clans of different clans. When Yamandi died the young man acted as if he were the son of Yamandi and took a prominent part in the mortuary rites and paid most of the
mortuary payments to Yamandi's mother's brothers and subsequently he became more closely associated with sub-clan A2. The general rule is that the man and not the land changes clan.

Ownership of Sago Palms and other Trees

All trees and palms with an economic use are owned separately from the land on which they grow (see Figure 11) and ownership is individual. Trees are planted near a man's residence, along the top edges of gardens that he has planted, and along paths, and roads. If a man has usufructory rights to land which does not belong to his own sub-clan, any trees planted on this land will belong to him and his sons and not to the land holder. As the trees only survive for two or possibly three generations, and because they are planted on the top edge of the gardens and do not interfere with the gardening land, disputes between land holder and tree owner are rare.

All the ground that is permanently damp or swampy is reserved for the planting and growing of sago. The streams and their tributaries are divided so that groups of sago trees (not of land) are owned by individuals or jointly by brothers. Disputes over the ownership of sago are quite common, especially where sago has been planted along stream boundaries between contiguous village groups. Because of this, ridgetops make the

1. An exception is when a man acquires land from his mother's brother who dies without heirs. In this case a payment in rings is always made to his mother's brother's clan.

2. Where a man owns trees often indicates the residence of his father or his father's father making it possible to trace out settlement patterns for at least two generations (cf. Conklin 1960:41). Some Yenigo men still own old coconut palms in Malba hamlets, where their forebears lived some 60 years ago. The fact that many Wosera hamlets are without mature coconuts, indicates the newness of the hamlets.

3. It is convenient to plant young trees in gardens because the ground is cleared and the trees are protected by the garden fence from depredations by pigs.
best boundaries between villages. Disputes between villages, especially in the Wosera, frequently stem from the fact that in pre-contact warfare, sago as well as land often changed hands. Most of the sago planted before pacification has matured and been cut, but many other palms were planted afterwards on disputed ground, before the dispute was brought to the notice of DNA officers and a temporary decision made. Such decisions are frequently not recognised by the natives and planting by the two groups still goes on.¹

Disputes between individuals arise when sago palms are cut without permission from the owner and also when emigrant men claim the palms that their fathers had planted although they themselves had never returned to their natal village to care for the palms. Trees and palms are inherited patrilineally but subject to an important qualification. They can only be inherited if a mortuary payment of shell rings and food is paid to the dead man's mother's brother.² Until this payment is made the mother's brother can forbid the dead man's sons to use the fruits and other products of the trees and palms. If the payment is made, but not to the satisfaction of the dead man's mother's brother, the two parties may both claim the inheritance and this is another cause of dispute.

¹. Patrol Report No.1 1961-62 North and South Wosera Division, mentions the destruction of boundary markers by dissatisfied parties after the markers had been put in position following a ruling by DNA officers. The report says that 'these people (the Woseras) are so short of land that they ... ignore any settlement made unfavourably to them.... As has been shown in the past, they are not afraid of any legal consequences.' In the Wosera I have heard many 'luluais' and 'tul tuis' proudly boast about how often they had been to gaol over a particular dispute.

². A man must feed his father's mother's brothers if they come from other villages, give them yams weighing about 100 pounds and finally some pig meat.
Access to Land: the Garden Operator

According to informants loans of land may be solicited anywhere within the village. In fact, about half the gardens were made on a man's sub-clan land and most of the other gardens are made on land borrowed from a fellow clansman or a close kinsman or affine (see Table 8). In Yenigo, where no sub-clan is short of land, it is difficult to understand why men should wish to borrow land when there is plenty of their own sub-clan land available. Four factors may help to determine this, namely:

1. The desire to cement ties of kinship, clanship or some other relationship, by participating in a reciprocal loan of land with a man in another sub-clan. This is probably the most common reason for lending and borrowing land. The other three reasons given below are to some extent reciprocal, but informants denied that there was ever any obligation to return the loan of land.

2. Land near the hamlet of residence is clearly preferred even although the most distant parts of a man's clan land are rarely more than an hour's walk from his hamlet. A consequence of this preference is the lower cut fallow nearer the hamlets, which is obviously cut more frequently than the fallow in more distant areas.

3. Two close associates will often wish to share a common garden boundary. This arrangement has the practical advantage in that both men only have to fence three sides of their gardens.

4. A big man or a man aspiring to leadership frequently welcomes the chance to lend land as he acquires prestige and the recipient becomes indebted to him. A man may wish to ingratiate himself with a land holder, by borrowing land.

Table 8 shows the relationship of land holder to garden operator in both Yenigo and Stapikum. In all cases where a

1. The term 'garden operator' is used to define the man who initiates and organises the clearing and fencing of the garden.
man borrowed land he was able to give a substantive of classificatory kinship relationship with the land holder. This table shows that kinship is the basis for any loan of land; most of the classificatory relationships and the tenuous biological and affinal relationships are reinforced by ties of co-residence or co-operation in some other field.

TABLE 8 - Relationship of Land Holder to Garden Operator

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Gardens</td>
<td>%</td>
</tr>
<tr>
<td>Within Sub-clan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within small agnatic group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.g. F-S, FB-BS, FBS-FBS</td>
<td>46</td>
<td>29</td>
</tr>
<tr>
<td>Within Sub-clan</td>
<td>5</td>
<td>50.4</td>
</tr>
<tr>
<td>Within Clan (not above)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class.B-Class.B etc.</td>
<td>11</td>
<td>10.9</td>
</tr>
<tr>
<td>Between Non-agnatic Kin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB-ZS, MBS-FZS</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>MZ(S)-(M)ZS</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MClass.B-Class.ZS</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>FMB(S)-(F)ZSS</td>
<td>3</td>
<td>18.8</td>
</tr>
<tr>
<td>Between Affines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WB-ZH</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>BW-HB*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WF-DH</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>More distant relation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Class.relation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class.B relationship not included above, e.g.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>half-siblings of different clans,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>class.B of different clans and nauindu</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>101</td>
<td>99.9</td>
</tr>
</tbody>
</table>

Parentheses include an extra generation which informants ignored but which existed according to my genealogies.

* Husband away working.
In Yenigo there was no resentment when one man asked another for a loan of land. As the rights do not rest solely with the individual but also with his sub-clan, all the landholder's dependants and other members of the sub-clan have prior rights to the land and are given the formal chance to take up their priority before the land is lent to another outside the sub-clan. The landholder was always willing to lend the land and he received no payment or rental. In every case when I asked why A uses B's land when he or his sub-clan had plenty of land of their own which was suitable for gardening, the answer usually ran as follows:

'A liked this land, he went and asked B (and his sub-clan) whether he could use it. B said, "Alright: when you have finished using the ground the land will again be ours."'

Rights to the land lasted from when the bush was first cut until all the crops were harvested and, if trees were planted on the upper slopes, rights to the trees continued until they died.

In the Wosera there is evidence that some villages with plenty of land have rented land to villages that are short of land. Moi village rented some ground to Stapikum No.2 on the understanding that the ground would be used for annual crops only. The rental was only a few pigs and rings. Already, only a few years after the arrangement was made, Stapikum claimed the land as their own saying that not only have they used the land, but they have bought it.

Table 8 suggests that in Stapikum, where there are bad social relations within the village and where there is a pressing consciousness of land shortage, the lending of land outside the sub-clan is not as common as in Yenigo where land pressures are not felt. Pressure of population has induced a need for security in land, and personal and group rights are more jealously guarded (cf. Meggitt 1959:271 and Brookfield and Brown 1963:125 ff).

1. Renting of land is contrary to customary practice. Morgan (1955:328) noted a similar trend in areas of unequal distribution of population in south eastern Nigeria.
The Giving of Garden Blocks: the Block User

The garden operator organises and completes the clearing and fencing of the garden site and then divides the garden into blocks or strips of land, with markers of cane, bamboo or wood, which are laid down the slope of the hill (see Figure 12). In Stapikum it is rare for a garden to have more than three blocks and they vary greatly in size; the garden operator usually keeps the larger part of the garden for his own use, giving the other blocks to men who help him prepare the garden site for planting. In Yenigo a garden may have from five to fifteen blocks which are usually of approximate equal size but much smaller than the Stapikum blocks. Table 9 summarizes some of these differences.

**TABLE 9 - A Comparison of Gardens and Garden Blocks in Yenigo and Stapikum**

<table>
<thead>
<tr>
<th></th>
<th>Yenigo</th>
<th>Stapikum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average size of Garden (acres)</td>
<td>0.69</td>
<td>0.41</td>
</tr>
<tr>
<td>Average number of Blocks per garden</td>
<td>9.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Average size of Garden Blocks (acres)</td>
<td>0.07</td>
<td>0.21</td>
</tr>
</tbody>
</table>

In Yenigo the garden operator keeps for himself as many blocks as he can use. This depends on his needs, his gardening ability and his ambitions, which in turn are limited by the amount of seed yam in his yam house which is available for planting. The usual pattern is that he keeps about half the blocks for his own use and makes the rest available to his kinsmen, affines and other associates. When he distributes blocks he does not take into account who helped him prepare the garden for planting as do men in Stapikum nor whether a man is the actual land holder. Occasionally a man may ask a garden operator if he can use a block but it is more usual for the garden operator to offer blocks to his associates. In doing this he considers whether he must return a previous gift of a garden block. Although informants always state, as they do about land which is lent, that there is no obligation to return the gift of a garden block, in fact a return gift is usually made within two years. The block giver will also consider whether any of his associates have seed yam that is in danger of spoiling or whether he has responsibilities to
### TABLE 10 - Relationship of Garden Operator to Block User

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.of Blocks</td>
<td>%</td>
</tr>
<tr>
<td><strong>Within Sub-clan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retained by Garden Operator</td>
<td>274</td>
<td>53.1</td>
</tr>
<tr>
<td>Given to Sub-clan members</td>
<td>70</td>
<td>13.6</td>
</tr>
<tr>
<td>(98.6, 77.1)*</td>
<td>344</td>
<td>66.7</td>
</tr>
<tr>
<td><strong>Within Clan</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given to Classificatory B, F or S (71.4, 9.5)</td>
<td>21</td>
<td>4.1</td>
</tr>
<tr>
<td><strong>Between Non-agnatic kin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given to MB or ZS and MBS or FZS (50.0, 5.0)</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Given to MZ(S) or (M)ZS (87.5, 25.0)</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Given to M Class. B or Class.ZS (11.1, -)</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Given to FMB or ZSS</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Given to Distant Mat. Kin</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Given to Distant Class. Mat.Kin (100.0, 25.0)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>7.9</td>
</tr>
<tr>
<td><strong>Between Affines</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given to WB, ZH or WZ (3.2,-)</td>
<td>31</td>
<td>7</td>
</tr>
<tr>
<td>Given to BW (Brother absent working)(60.0, 60.0)</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Given to WF, WM or DH (71.4, 19.0)</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Given to WZH (26.6, 26.6)</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Given to Distant affinal Relation (100.0, 33.3)</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Given to Class. Affine (33.3,-)</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>17.4</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given to Nauindu ( -,-)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Given to half-siblings of a different clan ( -,-)</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Given to Guardian of a different clan (75.0, 25.0)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Other (e.g. Tshambera)(25.0, 25.0)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>3.9</td>
</tr>
<tr>
<td><strong>Total (62.0, 33.5)</strong></td>
<td>516</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* The two numbers in parentheses refer to the percentages given to people of the same amei and of the same hamlet respectively in Yenigo.
any of his associates who are aged, widowed or whose husbands are away from the village working. Coupled with this, if he is ambitious, he will offer blocks to the big men of his clan who is a classificatory father or elder brother.

Table 10 is an attempt to show the relationship between the garden operator and the block user. As so many people within the village are interrelated or have some dual relationship (for example a man may be another man's FZS and also WZH), it is often difficult to see on what basis a block was given. When there has been doubt the relationship stated by the garden operator has been used in this table.

The percentages of garden blocks given to the various classes of kin in Table 10 give the impression that both villages have a similar pattern in the giving of garden blocks. This broadly speaking is so, but the table does not bring out the two facts that in Stapikum garden blocks are of unequal size and the garden operator keeps the larger part of the garden for his own use. Kinship forms the basis for block giving although amel allegiance and co-residence reinforce many kinship relationships especially the more tenuous ones. In Yenigo, of the 242 blocks given away, 81 (33.5 per cent) were given to members of the same hamlet and 149 (62.0 per cent) to members of the same amel.

In the preceding sections (particularly Tables 8 and 10) it has been shown that the most important relationship connected with property rights and land use are with the immediate family but other relationships, particularly those of residence, reinforce these ties. The rather fluid situation within villages where men frequently change sub-clans, tschambera and residences and, in the Wosera particularly, where they even leave their natal villages if there are real shortages of land, indicates that the individual will exploit those relationships where he can obtain access to land or the help of a big man in his yam growing activities.
Chapter 6

ABELAM LAND UTILIZATION

The subsistence economy of the Abelam and their whole way of life is based upon the cultivation of starchy tubers in gardens. There are two types of Abelam garden. The most important in terms of food production is the ka yawi (yawi = garden) in which the chief crop is a small yam called ka (*Dioscorea esculenta*), but there are many additional crops interplanted of which the most important is taro (*Colocasia esculenta*). The other garden type is the wabi yawi which is much smaller and is used almost exclusively for the growing of the ceremonially important large yams known as wabi (*Dioscorea alata*); it is in these gardens that a man establishes his reputation as a yam grower. Tree and palm cropping is also important among the Abelam, not only in providing food but also as a source of building timber, thatching materials and, since coffee has been introduced, as a means of obtaining a cash income. However in both Yenigo and Stapikum cash cropping is relatively unimportant with only 8.6 and 5.3 acres respectively being devoted to the production of coffee and no trees on the land yet producing. The secondary forest or the fallow land is also a minor source of food for men hunt and gather wild foods and run domesticated pigs there.

1. In some parts of the Wosera there are the wabi and two types of ka garden, one on the slopes and one on the floodplains. These gardens will be discussed later.

2. Ka is called 'mami' in Pidgin. The three species of yam that occur in the Abelam area will be referred to henceforth by their Abelam name namely ka, wabi and lipma; use of the word yam will refer to all species and varieties of *Dioscorea*. See Appendix F for details on the nomenclature of plants.

3. There are two main varieties (possibly subspecies) of taro. Mai is a small plant with axillary buds attached to a parent corm. Waula is a larger plant with adventitious buds attached by rhizomes. Usually buds of the mai and the top sections of the waula are used as propagating material.
Only about 5 per cent of the village land in both Yenigo and Stapikum is unsuited to gardening because of inhibiting physical conditions such as excessive steepness, frequent flooding or poor drainage. Most of the land which is not used for gardening is left because it has some other economic use. The village itself and the large groves of trees contiguous with the residential areas cover about 5 per cent of the village land in Stapikum and 8 per cent in Yenigo. The groves contain mainly food producing trees such as breadfruit (Artocarpus altilis), coconut (Cocos nucifera), 'taun' (Pometia pinnata) and the betel nut palm (Areca catechu) but also a number of valuable timber producing trees; all trees provide shade and shelter for the houses. Sago groves in damp areas take up 10 to 15 per cent of the village lands and roads, paths and coffee plantations about 3 per cent. Table 11 shows the approximate acreages given to different forms of land utilization in Yenigo and Stapikum. In both villages it appears that just over 70 per cent of the land is suitable for gardening.

| Table 11 - Areas Given to Different Forms of Land Utilization in Yenigo and Stapikum (in acres) |
|---------------------------------------------------------------|-----------------|-----------------|
| Total Village Lands                                          | Yenigo          | Stapikum        |
| Land Not Available for Gardening                              |                 |                 |
| Too steep or liable to regular flooding                       | 57              | 23              |
| Village area and tree groves                                  | 92              | 18              |
| Roads and paths                                               | 23              | 6               |
| Coffee plantations                                            | 9               | 5               |
| Swampy and under sago                                         | 162             | 49              |
| TOTAL                                                         | 343             | 101             |
| Total Land Available for Gardening                            |                 |                 |
| Cultivable land per person (acres)                            | 3.48            | 1.63            |
THE KA GARDENS

The ka and taro \(^1\) are the main crops of these gardens but many other crops are interplanted. The ka are planted first with a few wabi and lipma (Dioscorea bulbifera) and when they are established taro is interplanted in the shade of the yam vines. After the taro is planted many other crops are interplanted in a haphazard fashion. All gardens have bananas (Musa spp.), red and 'white' winged beans (Psophocarpus tetragonolobus) and various green vegetables such as Abelmoschus manihot, Amaranthus tricolor, and Brassica cf. juncea which are known as isague, bare and mil respectively. Most gardens have some sweet corn (Zea mays), some 'taro kongkong' (Xanthosoma sp.), various cucurbits such as squash, cucumber, pumpkin\(^2\) and melons, tobacco (Nicotiana tabacum) and the introduced long bean (Vigna sinensis).\(^3\) Some gardens may have sweet potatoes (Ipomoea batatas), pineapples (Ananas comosus), sugar cane (Saccharum officinarum), edible 'pit-pit' (Saccharum edule), which is a tall cane with an edible inflorescence, cassava (Manihot esculenta),\(^4\) tomatoes, small onions, chillies, capsicums, various other green vegetables such as Deeringia amaranthoides, Amaranthus hybridus and a number of introduced cabbages such as Brassica chinensis, peanuts and, in some areas, the leaves of some varieties of taro are eaten. Paw-paw (Carica papaya) seeds are often scattered in gardens and those plants which result, fruit about ten months later. Paw-paw is primarily a pig and dog food but is occasionally eaten in the gardens for a snack. If peanuts and rice are grown as cash crops they usually occupy separate gardens or complete garden blocks.

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1. In this thesis the word taro refers only to Colocasia spp.\(\_\_\_\_\_\_\_\) The only other cultivated member of Araceae is a species of Xanthosoma.

2. The fruit of the pumpkin is rarely eaten but the shoots of the plant are a popular green vegetable.

3. One bean from the \textit{Vigna sinensis} measured 2'5\" in length.

4. Cassava is not a popular food except in some of the most northern Abelam villages. Elsewhere it is only eaten in times of shortages.
Individual gardens are scattered throughout the village lands although they often occur in groups (see Figures 17 and 18). The gardens themselves are fenced and roughly rectangular but their shape may be modified to fit the contours of the site. In 1961 and 1962 the average size of gardens in Yenigo was 0.65 acres with a standard deviation of 0.30 acres; the average size of the Stapikum gardens was 0.35 acres with a standard deviation of 0.26 acres.\(^1\)

The Agricultural Cycle

Before permanent European contact was made the agricultural cycle to some extent reflected the seasonal rainfall distribution. Clearing took place towards the end of the dry season (August to September), planting of yams at the beginning of the wet (October to January)\(^2\) and harvesting of yams seven to nine months later in the middle of the dry season (May to August). This pattern still applies to the wabi gardens throughout the Abelam but to ka gardens only in the Wosera, west of the Amuk River.\(^3\) Elsewhere among the Abelam, ka gardens are planted in all months of the year although Table 12 shows that in Yenigo over one third of the yam planting is still done in the October to December period.\(^4\)

---

1. Values from 102 gardens in Yenigo and 92 gardens in Stapikum (see Table 18).
2. There appeared to be no calendric timing for the planting of yams in Yenigo though Kaberry (1941:346) says that the people of Kalabu associated the rising of the Pleiades with planting. In the western Abelam villages yams are planted early, and the further east the villages are, the later the yams are planted.
3. In Stapikum all gardens are planted between September and December and are harvested six to eight months later.
4. Planting throughout the year is a recent trend which had been encouraged by Administration officers in an attempt to alleviate the annual 'lean periods'.
TABLE 12 - Average Acreages of Gardens Cleared, Planted and Harvested in Yenigo, 1961 and 1962

<table>
<thead>
<tr>
<th></th>
<th>Clearing Started</th>
<th>Planting Completed</th>
<th>Harvest Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>%</td>
<td>Acres</td>
</tr>
<tr>
<td>January</td>
<td>6.5</td>
<td>14.9</td>
<td>2.2</td>
</tr>
<tr>
<td>February</td>
<td>2.2</td>
<td>5.1</td>
<td>3.3</td>
</tr>
<tr>
<td>March</td>
<td>2.0</td>
<td>4.6</td>
<td>4.8</td>
</tr>
<tr>
<td>April</td>
<td>5.1</td>
<td>11.7</td>
<td>3.4</td>
</tr>
<tr>
<td>May</td>
<td>4.2</td>
<td>9.7</td>
<td>3.6</td>
</tr>
<tr>
<td>June</td>
<td>-</td>
<td>-</td>
<td>2.1</td>
</tr>
<tr>
<td>July</td>
<td>1.5</td>
<td>3.4</td>
<td>2.4</td>
</tr>
<tr>
<td>August</td>
<td>2.9</td>
<td>6.7</td>
<td>0.5</td>
</tr>
<tr>
<td>September</td>
<td>4.3</td>
<td>9.9</td>
<td>0.5</td>
</tr>
<tr>
<td>October</td>
<td>3.3</td>
<td>7.6</td>
<td>8.2</td>
</tr>
<tr>
<td>November</td>
<td>4.0</td>
<td>9.2</td>
<td>3.1</td>
</tr>
<tr>
<td>December</td>
<td>7.5</td>
<td>17.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Year</td>
<td>43.5</td>
<td>100.0</td>
<td>36.1</td>
</tr>
</tbody>
</table>

Before European contact the year was divided into two periods. A time of yam shortage (hereafter called the 'lean period') which lasted from February to June, and when sago was the main food, and a time of plenty from June to January when the gardens were producing, and there were plenty of yams in store. Due to a more even distribution of planting throughout the year the 'lean period' is not as marked among the North Abelam but it is still clearly defined in the Wosera where all gardens mature in the dry season.

During the dry season, which is the time of intense ceremonial activity when there are initiations and yam exchanges, and when tambaran houses may be built, very little garden work is generally done apart from harvesting. From July to October 1962 no gardens at all were planted in Yenigo because of ceremonial activity mainly connected with the building of two tambaran houses. Extra gardens are planted at least seven months before any ceremonies which will involve large preparations of food.

The garden usually has a life of about two years, but it is only intensively cropped for about nine to ten months. Approximately two or three months are spent cutting the bush and clearing the garden site (in several observed cases this...
process was spread over ten months). The main planting of the yams then takes from a day to six weeks depending on the garden operator and the block users and their ability to attract labour. The period between first plantings and the final yam harvesting is between seven and ten months. Once the yams and taros are harvested the garden has a further life of about a year as bananas, *S. edule*, patches of sweet potato and some replanted *ka* mature. Table 13 summarizes the periods between main garden activities in Yenigo. The life of any one garden is longer than shown on the table. Abandonment of the garden is defined as that time when the fence is broken and pigs can enter it. In fact some bananas and *S. edule* survive the ravages of the pigs and may be harvested after the fence has been broken.

There is no definite rotation of garden sites in the village land.

TABLE 13 - The History of Yenigo Gardens 1961 and 1962

<table>
<thead>
<tr>
<th>Period Description</th>
<th>Months</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average period between first clearing and first planting</td>
<td>3.2</td>
<td>2.0</td>
</tr>
<tr>
<td>Average period between first planting and last main yam harvest</td>
<td>9.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Average period between last main yam harvest and the abandonment of the garden</td>
<td>9.5</td>
<td>2.7 (22 gardens only)</td>
</tr>
<tr>
<td>Approximate average life of garden</td>
<td>22.1</td>
<td></td>
</tr>
</tbody>
</table>
The Selection of Garden Sites

In Yenigo in 1962, 80 groups were using blocks. These block using or gardening groups each worked in the gardens as a unit, and the leader of each group was most often the male head of the family. In 1962 the leaders of gardening groups in Yenigo included 59 adult males and the other groups were led by three wives whose husbands were away at work, nine widows, seven co-wives and two young men about to be married (cf. Table 5). Not all gardening groups clear and operate their own gardens and most of those gardening groups led by women, and some of those led by young men, garden only on blocks given to them by garden operators.

Discussions about future sites for gardens and requests for loans of land take place during the year before clearing. Most men know where their close associates are going to make their next gardens about six months before any actual clearing takes place. Apart from those factors mentioned under land tenure, the Abelam evaluates the garden potential and selects the site mainly by considering its past reputation and the state of the fallow. The main criterion is that the bush that he is to clear should be tall and dark green in colour. Trees which are light green in colour such as ningrup, kwalamba, ma'am, a'lain and djungwule' indicate that the fallow is not old enough while tsarba (unidentified) is said to indicate a particularly poor soil. Some trees such as nimbi (Timonius sp.), mangge (Casearia sp.), a small species of Pandanus and the shade tolerant fern tsike (Selaginella sp.) indicate that the soil is moist and fertile. All stoney or gravelly soil is carefully avoided,\(^2\) as is ground which has white ants, which according to the natives, indicate that the ground is too dry.

After the garden site has been selected and one or two months before any clearing takes place, it will be marked either by cutting small sections of the bush at the four corners or by blazing trees or cutting narrow paths down the sides of the garden site.

---

1. For botanical names see Appendix F.

2. To my knowledge all the remaining patches of very tall forest in the Abelam area are on stoney soils.
Cutting the Secondary Forest

Nearly all the ka gardens in Yenigo were made on land that had been under fallow for between ten to twenty years. The cutting of the forest is done in two stages. First the men and the women (for summary of the division of labour see Table 15) slash the undergrowth and creepers with bush knives so that it is possible to walk freely under tall trees. Saplings are lopped about six feet from the ground with the bush knife or steel axe. The cut material on the ground and the severed lianes and creepers caught in the trees are left to dry for at least a couple of weeks before the second stage of tree cutting is started.

Slashing is usually done in a single day by the garden operator and 10 to 15 helpers both male and female, whom he recruits on a reciprocal basis from among his kindred, co-residents or any other associates. Co-operation is usual when the work is heavy but if the task can be done by the family without undue effort or loss of time or production, help will neither be asked for nor given. As previously noted there is no clear correlation between people who helped with this work and the ultimate block users.

All the large trees in the garden with trunks more than a foot in diameter are cut down. Because the trees are not very big most are cut with steel axes by men standing on the ground. If there are buttressing roots men cut above these by leaning other logs against the tree and balancing on them as they cut. When cutting tall trees they work up the slope of the garden and notch most of them through about two thirds of the trunk. When this operation is finished the tallest tree near the top of the garden is cut through and as it falls it brings down the other notched trees, the crowns being knitted together in a mass of entwining lianes and vines. As the tall trees fall they strip many of the branches and much of the foliage from smaller trees that have not been notched. The smaller trees between a foot and four inches in diameter are then pollarded and trimmed up to 30 feet high; if they survive the burn these lopped and trimmed trees and saplings will later serve as supports for yam trellises or twining posts for the yam vines (see Plates 15 and 17).
Plate 10 - A woman sweeping a garden by hand prior to planting. The sweepings containing much ash are then put behind logs or around stumps or even thrown over the garden fence.

Parallel block dividers run down the hill.

Plate 11 - A yam hole being made with a digging stick. One man holds the clods of earth with his hands to stop them rolling down the slope.

The blocks behind the tobacco plant have not yet been swept clean.
Felled trees are trimmed and cut up to facilitate drying and burning. A cleared area is usually made around the edge of the garden and debris is thrown into the centre, leaving an access road which also acts as a partial firebreak and ensures a cleared area for fences. Little material for fencing is removed from the garden before the burn. Most of the fencing materials are later obtained from the nearby fallow.

The Burning of Garden Sites

After the trees are cut, the garden site is left for three to four weeks before it is burned; this period may be lengthened depending on weather conditions and the inclination of the gardener. Usually just before burning, many stumps resprout and there is considerable weed growth. The Abelam say that this is good because, while it does not impede burning very much, the first regrowth and weed growth are checked by the fire.

The first burn requires little labour and only two or three men work for about an hour. If the garden is on a hillside, the top of the garden site is lit first and one man works down one side lighting fires with a bamboo torch, while another man works down the other side doing the same. In this manner the fire slowly works in from the outer edges and becomes fiercest in the centre of the garden where there is most debris. The fire never becomes dangerous to the burners and does little damage to the surrounding vegetation. In Yenigo the surrounding fallow is dense, green and damp so fires do not escape from the garden. In Stapikum the technique for burning garden sites is the same but because the fallow is lower, grassier and much more inflammable, many garden fires spread. Large areas are continually being reburnt making it increasingly difficult for the bush to re-establish itself.

The first burn is never complete but there are no more organised burns. Thereafter the partially burnt rubbish is heaped around the stumps and trunks of big trees and burnt spasmodically.¹ If there has been considerable weed growth

¹ Newton (1960:111) says that tests have shown that fallow regrowth can be considerably improved if, when clearing, trees and bushes are cut off at ground level rather than two or three feet above the ground and if cuttings are heaped up for burning between roots rather than on top.
and burning is difficult, dried sago fronds, which are highly inflammable, are used to encourage the fire. The earlier and heavier stages of the secondary burn are undertaken by the men, and the women burn the smaller rubbish.

Preparation of the Garden Site for Planting

Between the first burn and the first planting of yams the garden has to be cleared and fenced and a garden house has to be built. While the males within the gardening group, sometimes helped by a few associates, do the constructional work the women do the final clearing. No food crops are planted in the garden before the yams although a few tobacco seeds are often scattered after the first burn.1

Most fences are made with the cane of the *Saccharum spontaneum* which grows prolifically in abandoned gardens. They are made by forcing pairs of cane uprights into holes made by dibble sticks2 about four inches apart at nine inch intervals around the edge of the garden. Horizontal canes are then placed between these uprights and then lashed together at about nine inch intervals from bottom to top (Plates 13 and 20). Sometimes thin logs saved from the garden before it is fired are used in the fences and often gardens, well away from the village, have strong fences made of saplings and trunks of small trees, for wild pigs make determined efforts to break through cane fences. Fences are usually only four to five feet high because their sole purpose is to exclude pigs from the garden. Each garden has an entrance or gate which is a crude stile surmounted with petioles of the sago palm which can be removed.

1. Tobacco was probably introduced by early European explorers (Riesenfelt 1951:93).

2. Dibble sticks are pieces of wood, not more than two inches in diameter and five or six feet long, sharpened to a point at one end. They are made when needed and are also used for planting seeds and harvesting yams.
The garden house is a tent-like structure open at both ends (at one end the opening is smaller and lower than at the other) made of split but unplaited sago fronds lashed onto a timber frame. The garden house is usually built on the flattest ground in the garden and where possible it is placed near the garden gate, which is usually near the top of the garden, most gardens being approached from paths along the ridge tops. The function of the garden house is to provide shelter from the rain and sun during the day and to store tobacco leaves and gardening equipment which is in daily use. Occasionally men and boys will sleep in the garden houses, especially in the wabi garden houses as the wabi approach maturity, but within the Council areas this is an offence punishable by a fine, because only a few of the garden houses are sprayed with D.D.T. by the Malaria Control Section.

After the garden has been roughly cleared and all the burning is finished it is divided into blocks by the garden operator;¹ the divisions are made by laying pieces of cane or timber along the ground. Since about half the blocks are given away, blocks used by each family are scattered throughout the village lands and are planted at different times of the year, although, if the head of a family is also a garden operator, most of his blocks will be concentrated in his own garden. Table 14 below is a one-in-five sample (alphabetically selected) of blocks planted by different families throughout the year in Yenigo. This table shows that a lazy gardener such as Apugero may only plant a few blocks and harvest once a year, while a more energetic man with many responsibilities, such as Gwalsilu, will plant and harvest a large number of blocks two or three times a year. The average number of blocks per family is 6.8 but there is a standard deviation of 3.7 blocks indicating a wide range between extremes.

1. In the Wingei area blocks are given away before fencing is done and each block user is responsible for fencing those parts of his block on the edge of the garden.
TABLE 14 - Number of Blocks Planted per Month in Yenigo in 1961

<table>
<thead>
<tr>
<th>Head of Gardening Group</th>
<th>Dependents</th>
<th>Adults</th>
<th>Child</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apugero</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td></td>
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<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>*Djurikei</td>
<td></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Domi-akai (widow)</td>
<td></td>
<td>1</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>*Gwalsilu (2 wives)</td>
<td></td>
<td>5</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td></td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Kanowie</td>
<td></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
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<td>7</td>
</tr>
<tr>
<td>*Korgali</td>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Kwoumdnang</td>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<td></td>
<td>7</td>
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<td>Licininglng</td>
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<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Lipigwen (2nd. wife)</td>
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<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Marrakim (widow)</td>
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<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Narumini (widower)</td>
<td></td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Rambungwie</td>
<td></td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>*Sammelin</td>
<td></td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Tarweena</td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Wangigan</td>
<td></td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>*Wouliambu (2 wives)</td>
<td></td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

|                 | Total               | 19     | 11    | 13 | 8 | 1 | 7 | 12 | 6 | 8 | 25 | 6 | 1 | 17 |

* Also operates a wabi garden.

Most or all of the blocks underlined are in the gardener's own garden.

Once the blocks have been given they become the responsibility of the block user and the garden operator has no rights in them at all. Before any planting is done the women weed the garden if necessary, and clear it of all rubbish, actually sweeping the garden clean by hand or with brooms made from the inflorescence of the 'limbom' palm (see Plate 10) and thus leave the soil completely exposed to the elements. The unburnt trash and much of the ash are piled around stumps (where the plants can make no use of it) or put behind horizontal logs which gives a terraced appearance to the garden. The motives
for doing this in Yenigo are aesthetic and apparently not consciously conservationist¹ although in Ugutagwa in the West Wosera horizontal logs are placed at regular intervals across the garden to 'hold the soil' (see Plate 14).

About 15 per cent of the gardens cleared in 1961 and 1962 in Yenigo had an interval of more than five months between first slashing and first planting. Often this resulted in gardens being left cleared but unplanted for several months. Such time lags are inexplicable and can only be the result of laziness or bad planning on the part of the gardener, for the soil² and the ash are exposed to erosion, the physical condition of the soil deteriorates (Nye and Greenland 1960:82),³ and weed growth is considerable making extra work for the women before planting can take place.

Selection of Seed and Choice of Variety

Ka to be used for seed are usually selected when harvesting. The hard skinned and more mature specimens are kept for seed, as young tubers with a very light coloured growing point are considered the best for eating. Seed tubers must also be undamaged and without insect pests.

Whole ka tubers usually weighing between one and two pounds⁴ are used for seed. If the planter desires a larger tuber for some ceremonial purpose and is prepared to take special care with its culture, he may plant a larger seed tuber of six to ten pounds. Small bulbils weighing only a

¹ cf. Blaut et al (1959:417) who noted a similar procedure in the Blue Mountains of Jamaica but call it a 'conscious measure' of soil conservation.
² The generally fertile top soil is made more friable by the burn and is especially liable to be eroded (Nye and Greenland 1960:71).
³ See also Gourou (1959:18).
⁴ Brown (1951:394) reports an experiment done by Kinman in Puerto Rico in which it was found that generally speaking the larger the tuber planted the higher the subsequent yield.
TABLE 15 - Division of Labour

<table>
<thead>
<tr>
<th>Garden Work</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slashing of Undergrowth</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Cutting of trees</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Cutting up logs and preparing for burn</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Firing the garden</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Clearing and heaping large debris for secondary burn</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>General Clearing of garden</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Final clearing and sweeping of garden</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Fence Building</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Garden house building</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Planting of ka and wabi</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Planting of taro</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Planting of all other crops</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Weeding</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Any yam magic</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Making of trellises</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Repair of fence</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Harvesting of yams</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>All carrying of heavy objects e.g. large ka</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Cleaning of ka</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Harvesting of other crops</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Carrying of food, firewood</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td><strong>Associated work</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collecting most forest foods</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Cutting sago palms</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Extracting and pounding sago</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Preparing food for household meals</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Feeding pigs</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Killing and cooking pigs</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

* See also Kaberry (1941:346-348).
quarter of a pound are used as seed material for the lipma and any wabi grown in the ka gardens are grown from small sections of tubers weighing about half a pound. The method of preparing this wabi seed for planting is the same as that described for the wabi gardens.

Good gardeners like to have many different varieties of ka for prestige reasons but, on the other hand, the Abelam are reluctant experimenters and only want to plant tried and tested varieties, which have been proved successful, and those varieties that they like to eat. In Yenigo it is thought to be better to have each block planted with a different variety, though in actual fact this rarely happens. Men will boast that a block is all of one variety even if it contains only 20 per cent of that named.

The Abelam recognise many different varieties in their main crops. In Yenigo and Stapikum alone there were at least 108 different varieties of yam (59 varieties of ka, 42 of wabi and 7 of lipma) and in neighbouring villages there are many other varieties unknown in both Yenigo and Stapikum. Names were also collected of well over 30 varieties of both taro and banana and five different varieties of teagne (Abelmoschus manihot).

1. Wabi planted in the ka gardens are usually planted in the side of a ka mound.

2. In Stapikum there were a number of varieties which were included in a single variety in Yenigo. I always use the Yenigo variety name in this thesis, except, of course, when the variety is not found at all in Yenigo, in which case I use the Stapikum name. I was able to collect data on 33 main varieties of ka and 23 main varieties of wabi. The other varieties were fairly rare and only the names were obtained. It is not unusual for natives to have numerous varieties of their main crops. Sasuke (1953:159) mentions over 200 varieties of yam on Ponape Island. Innumerable yam varieties are also reported in Nigeria (Faulkner and Mackie 1933:146) and the Philippines (Galang 1920:63).
The varieties of ka fall into four main groups which will henceforth be called 'sub-species' for convenience. These sub-species are mar'ka, asagwa, apa'ka, and maleka, each of which has easily recognisable characteristics. In some regions certain sub-species are more important than they are in other areas and may be divided into two further groups. The apa'ka sub-species in the Wosera, for example, consists of two major groups, the maluka which is generally a high yielder and the nglamei which is a low yielder. The mar'ka sub-species in the Yenigo area consists of two groups which are called the mar'ka and the nyanka (child ka) and the only difference between these two is that the tuber of the nyanka is smaller than the tuber of the mar'ka. There are regional preferences for each sub-species. The people of the West Wosera like the strong tasting and low yielding maleka, the people of the Central and East Wosera prefer the high yielding but rather coarse asagwa and the North Abalam plant mainly the low yielding and 'sweet' mar'ka.

1. There is no critical taxonomic or genetic basis for this terminology. The sub-species names for the different varieties are shown in Tables 29 and 30.

2. The main characteristics of these four sub-species are:
   - mar'ka - has a small leaf and a small inflorescence, and is generally a low yielder.
   - asagwa - has a large hairy tuber, which is rather coarse and fibrous when cooked. It also has a long flower and is usually planted without a trellis.
   - apa'ka - has a large leaf and its tubers are fat rather than long.
   - maleka - has a small leaf and its tubers are small, round and have a distinctive taste. The tubers grow up from the bottom of the hole.

3. Nglamei is divided into a large number of varieties in Stapikum but in Yenigo it is just a variety of the sub-species apa'ka known as wolimile. For comparative purposes any further discussion of sub-species and varieties will be reduced to a simplified level which applies in both villages.

4. The terms high and low yielder are used loosely. A low yielding sub-species or variety usually yields less than 20 lbs per plant and a high yielder more than this figure. For details of the yields of each variety see Tables 29 and 30, Appendix B.
All the sub-species names mentioned above are also used for particular varieties within the appropriate sub-species. The criteria which determine different varietal names are the size, shape and colour of the leaf and tuber, the hairiness of the tuber, the colour of the shoot, the size and frequency of thorns on the vine and the taste of the yam when cooked. It is difficult to tell whether new varieties are evolving. Informants continually said that their ancestors had many more varieties than are planted now, but this is somewhat belied by the fact that new varieties are coming into all villages from other areas in Abelam territory and from other areas in New Guinea. The maleka and asagwa sub-species were either rare or unknown in Yenigo Village before pacification and likewise many of the largest wabi and many of the mar'ka sub-species were unknown in Stapikum.

The names given to many varieties are descriptive: for example tambaka means yam like a hand and wamaka means the white yam. They may also be named after an animal, bird, man or kinship term; some examples are nyamioka meaning the dove yam, apa'ka, the father yam and asagwaka, the mother yam. Many varieties have complex names such as the walangguk'ka and gilewanbaka which mean a spirit's egg yam and the black ear yam respectively. However the etymology of many yam names was obscure to the Abelam themselves.

In Yenigo, no variety of ka was considered early or late nor was any variety considered more suitable than any other for any particular environment. In Stapikum, on the other hand, wolimile (called ngiamei in the Wosera), which totalled about 27 per cent of all ka weighed in the village, was planted first, and the asagwa, which totalled about 56 per cent of all the ka weighed there, was planted about a month to

1. The introduction of new varieties of yam is just as important as the introduction of new crops. It would be an interesting avenue for research to grow all varieties under standard conditions and to see if some varieties are consistently superior in yield and protein content. For comments on the protein content of some varieties of yam see Appendix C. Many varieties are being analysed by PHD (Medical Research) but results are not yet available.
six weeks later. In the Wosera the asagwa is usually grown
on the alluvial river flats. It is the highest yielding yam
and the indigenes say that the best soils are reserved for
the best yams. The asagwa is also the variety that can best
withstand flooding and damp conditions.1

The Planting of the ka

The ka which are reserved for seed and placed in the
yam houses, begin to sprout after about ten to twelve weeks,
depending on the maturity of the tuber when it was harvested.
When the sprout is about two feet long, it is broken off from
the eye at the top of the tuber, which is left to sprout again.
If some ka sprout more quickly than others or if the garden is
not ready for planting, the sprout may be broken off as many
as four times, but usually it is only broken once or twice.
Most seed yams stay in the yam houses from four to six months.
Finally shoots are usually allowed to grow to a length of
between 12 inches and three feet and, when the garden is
ready, the sprouting yams are carried to the gardens where
they are temporarily stored in the garden houses until
planting begins.

The only implement used when planting yams is the digging
stick which is usually made out of wood from the hard black
'limbom' (Caryota sp.), and is about five feet long with a
narrow spade-like end. The first step is to dig a hole
(see Plate 11) and the soil is loosened with the digging stick
and most of it is removed by hand, although some is removed
with the stick. Holes are about 18 inches deep and about

1. Several informants said that mar'ka must have a sandy
and friable soil. As a rule yams require deep, loose
and well drained soil (Barrau 1958a:44) and this effect
is achieved by breaking up the soil and building a
mound in which to plant the yam. Faulkner and Mackie
(1933:147) report that in West Africa yams are grown in
swampy land and that mounds may be up to five feet high.
These authors state that in swampy land it is not
uncommon to see rice growing between yam heaps.
15 inches in diameter, but if the planter requires 'long ka' he will dig holes to about three feet in depth. When the hole is finished the bottom is loosened with the digging stick and the soil, finely broken up by hand, is replaced in the hole. When the replaced soil is about six inches above the natural surface of the ground, the seed ka is placed on top of it with the roots over the central part. Soil is firmly packed over the tuber with the hands to form a mound about 15 inches high (see Plate 12). The technique is different when all varieties of the subspecies maleka are planted. These varieties are planted near the bottom of the hole for their tubers grow out and upwards instead of down (cf. Massal and Barrau 1956:12).

The planting of the ka and wabi is done solely by the men. The block user is helped by a few close associates, or, if there are a number of blocks to be planted, he recruits a large group on a reciprocal basis. It is usually only an important man who can attract a large work force and after the planting is done he is obliged to feed the planting party with yam soup and make a small gift of native tobacco, betel nuts and pepper vine catkins which are eaten with the betel nut. The following table shows that less than three yams are planted per man hour.

<table>
<thead>
<tr>
<th>TABLE 16 - Time Spent When Planting Ka</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 men planted 440 yams in eight hours (2.5 yams planted per man hour)</td>
</tr>
<tr>
<td>8 &quot; &quot; 75 &quot; &quot; four &quot; (2.3 &quot; &quot; &quot; )</td>
</tr>
<tr>
<td>4 &quot; &quot; 82 &quot; &quot; eight &quot; (2.6 &quot; &quot; &quot; )</td>
</tr>
</tbody>
</table>

1. The term 'long ka' is used for ka that are especially cultivated for exchange purposes. The special techniques used which result in higher yields and large tubers are discussed in a later section.

2. Often when planting 'long ka' and sometimes even with the ka planted by ordinary methods, the planter places the soil from each soil horizon in separate heaps and replaces it in a reverse order leaving the heavy clays on top of the mound which are almost resistant to erosion.
Plate 12 - Planting ka.

Plate 13 - A ka garden shortly after it has been planted.

The stump of a tree is seen cut off above the buttressing roots and in the mound at the bottom right of the picture two wabi have been planted. A small retaining wall supports the mound and crossed supports take the vine of one plant to the trellis at top left.

Other crops, apart from ka, include taro, sweet corn and tobacco.
Each block is fully planted with ka before another is started. The taro is planted later by the women and the lipna and all the other incidental crops are planted by both sexes.

The only magic used in the ka gardens seemed to be when magic red earths, obtained from the Wosera, were sometimes painted onto the base of the shoot at planting to encourage it to grow. This magic red earth was also sometimes mixed with lemon juice and other fluids and poured into holes made in the yam mounds. This mixture was said to stop the leaves drying too quickly and to give the tuber a chance to get larger.

Yams are planted about seven feet apart although if high yielding varieties, such as asagwa or 'long ka', are planted, the spacing is usually about nine feet. The gardens in Stapikum which were planted wholly with asagwa consistently had fewer plants per unit area than those planted with other varieties. The natives say that asagwa grows better without a trellis and the vines consequently need more room in the garden to spread themselves. Table 17 sets out the densities of plants per acre in Yenigo and Stapikum.

<table>
<thead>
<tr>
<th></th>
<th>Ka per acre</th>
<th>Taro per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yenigo (all ka gardens)</td>
<td>950</td>
<td>2,000</td>
</tr>
<tr>
<td>Stapikum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asagwa gardens</td>
<td>750</td>
<td>1,350</td>
</tr>
<tr>
<td>Other ka gardens</td>
<td>875</td>
<td></td>
</tr>
</tbody>
</table>

1. Informants said that the magic used in planting 'long ka' was very similar to that used in planting the wabi (see below) except that sex taboos were not applied although women were not allowed to go too near to the plants. I witnessed many plantings of 'long ka' however and the only magic used was when red paints were applied (cf. Kaberry 1941:354).

2. Plate 33 shows yam vines laid out along the ground parallel to each other.
Figures in this table are based on accurate counts of the yams and taro in seven gardens in Yenigo and of the yams in nine gardens and taro in two gardens in Stapikum. Probably the main difference influencing planting densities in the two villages is that trellises are fewer in Stapikum even in the non-asagwa gardens. Also ditches, outcropping rock and patches of weeds are common in Stapikum gardens. Taro and all other crops are interplanted between the yam mounds though if there are any damp places in the garden, such as small hollows, taro only is planted there. Table 18 below shows the number of gardens and the total areas of gardens planted in both Yenigo and Stapikum in 1961 and 1962.

**TABLE 18 - Area and Number of Gardens planted in Yenigo and Stapikum**

<table>
<thead>
<tr>
<th></th>
<th>1961</th>
<th>1962</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Gardens</td>
<td>No. Gardens</td>
<td>No. Gardens</td>
</tr>
<tr>
<td></td>
<td>Acres</td>
<td>Acres</td>
<td>Acres</td>
</tr>
<tr>
<td>Yenigo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ka gardens</td>
<td>54</td>
<td>48</td>
<td>51</td>
</tr>
<tr>
<td>Wabi gardens</td>
<td>30</td>
<td>45</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>94</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>37.42</td>
<td>27.77</td>
<td>32.59</td>
</tr>
<tr>
<td></td>
<td>3.04</td>
<td>4.45</td>
<td>3.75</td>
</tr>
<tr>
<td></td>
<td>40.46</td>
<td>32.22</td>
<td>36.34</td>
</tr>
<tr>
<td>Stapikum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ka gardens*</td>
<td>42</td>
<td>50</td>
<td>46</td>
</tr>
<tr>
<td>Wabi gardens</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>16.89</td>
<td>16.99</td>
</tr>
</tbody>
</table>

* No wabi gardens in Stapikum

The main task between planting and harvesting is weeding which is done by hand with the aid of a bush knife. Weeding is done mainly by the women but the work is never difficult as long as the preceding fallow has been more than about twelve years and the garden is clean weeded when planted, for the yams and other crops soon provide a good cover and there is little difficulty in keeping them above the weeds (cf. Nye and Greenland 1960:77). In Stapikum, where the fallow period is sometimes less than ten years, weeds and grasses are much more prevalent, even appearing in great numbers shortly after planting. The dominant and most persistent of the garden weeds is *Imperata* grass, which is usually prominent in all
gardens about ten months after clearing takes place. Other common weeds are *Erechthites* sp. (prominent with its flowering head but very easy to weed), *Ageratum conyzoides*, *Emilia*, various ferns, *Synedrella nodiflora*, and many grasses such as *Paspalum* sp., *Sorghum halepense*, *Eleusine indica*, *Saccharum spontaneum* and *Polypogon macrophylla*. Many seedlings spring up and sprouting stumps are cut back. In the early stages of the yam growth the garden is kept very clean but as the yam matures weeding is more carelessly carried out and the seedlings of useful trees are deliberately left if they are recognised.

After the *ka* are planted the men devote most of their attention to the *wabi* gardens though they go to the *ka* gardens to inspect the yams and the fences and to do a few odd jobs. About three weeks after the yams are planted, the quick growing *ka* are pruned by breaking off the growing point between forefinger and thumb. This encourages the vine to branch for it is generally believed that the more growth there is above ground, the better the tuber below the ground. The men also make trellises and train the vines onto them, for they believe that a trellis will improve the yield for all varieties except *asagwa*. The *ka* shoots are carefully wound to the left and the *wabi* shoots to the right. The *ka* trellises are never elaborate except in the West Wosera where yams (mostly maleka varieties) are planted in a circle around a trimmed tree or a planted pole (see Plate 14). From the top of the pole strips of bark from the *Althoffia pleiostigma* (ma'jam) run to the top of each yam mound and the yam vine climbs up this rope. Elsewhere in the Abelam area most of the trellises are merely canes or light pieces of wood leant against stumps and lopped trees, although poles about six feet long are sometimes planted in the ground. Occasionally cane 'wigwam'-like structures are made from the cane of the *S. spontaneum*.

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1. This also applies to the *wabi* in the *wabi* gardens where huge trellises are built. There is a similar belief in Ponape (Mahony 1959:4).

2. Experiments elsewhere support this belief (Faulkner and Mackie 1933:148, Galang 1920:64), although Defningin (1959:55) notes that *D. esculenta* does not climb poles more than 24 feet high because strong winds damage the vines.
Plate 14 - Several contiguous ka gardens at Ugutagwa.

The maleka vines are climbing up 'ropes', and the logs horizontal to the slope are said to hold the soil.

The "rope and tree trellises" are also found in Ponape (Barrau 1956a:399).

Plate 15 - A Yénigo Garden about 4 months after the yams had been planted. Flowering sago palms are evident below the garden.
The tubers of the 'long ka' are inspected as they grow. About two months after the plantings the mounds are opened and the tubers are inspected from the downhill side and all the tubers but the largest one are removed. Later the mound is opened again and the soil under the growing point of the tuber is loosened to aid growth; this may happen two or three times in the final three months before the yam matures. The 'long ka', like the wabi, are only planted in the October to January period so that they are ready for exchanges between June and September. In Yenigo, in 1962, not more than one in thirty of all ka planted were 'long ka' but this proportion varies from year to year depending on ceremonial activity. Many gardens, in particular those of widows, co-wives and very young men, have no 'long ka' at all.

Stapikum gardens provided many interesting contrasts with those of Yenigo: trellises were rare, 'long ka' were not cultivated, fencing was much poorer and lower and frequently non-existent (see Plate 29), the gardeners often being content with covered pig traps on each side of the garden. Most of the Stapikum gardens had ditches running at right angles to the contours and along the top edge of the garden. It was said that they were necessary because without them the tubers tended to rot. This is undoubtedly due to the stickier nature of the Stapikum soils which can hold water in yam holes, encouraging rotting. Construction of the ditches is an attempt to carry away as much water as possible on the surface and so to reduce seepage.

**Harvesting**

In Yenigo a complete block is usually harvested at one time, although any very immature plants are left to mature or,

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1. The 'long ka' usually take about eight months to mature which is a little longer than the ordinary ka.

2. There are fewer wild and domesticated pigs in the Stapikum area but nevertheless many yam plants are rooted up by pigs.

3. I have seen holes which were prepared for planting coffee on a 20° slope holding water even though it had not rained for three days.
if harvested, are casually replanted in the same hole and may be harvested about six months later. It is considered that the best time to harvest yams is just after the leaves on the vines have dried. Then the tuber is at its greatest size yet still light brown and tender to eat. Most of the yams mature together but any that do mature early are left in the ground for several weeks or even a month before the rest are ready for harvest. Although they are edible, these yams have coarse skins and taste slightly bitter and are generally used for seed.

Before the harvest the women completely weed the garden. The yams are harvested by the gardener and he is usually helped by one or two of his close male associates. One man harvests one yam hole at a time. The ground is loosened on the downhill side of the ka mound with a dibble stick and the soil is removed by hand until the sides of the tubers are exposed. The stems are cut with a knife well above the head of each tuber which is then carefully eased out of the soil. Each hole may contain from one to fifteen tubers and generally the more tubers there are, the smaller their individual size.

As the ka are dug out, the men roughly clean them by breaking off any large portions of earth attached to them. The women then collect them, and carry them in their net bags to the garden houses where they scrape the yam clean of both rootlets and earth and apply lime to any injured portions of the tubers (cf. Galang 1920:65). The garden house is a temporary storage place and the yams will be left there until they can be carried to the yam houses in or near the village.

1. After the leaves are dry the tubers can safely remain in the ground for about a month before any marked deterioration sets in. One ka garden, which matured during the building of a new tambaran house, was not harvested for six to eight weeks after the leaves had dried. Many of the tubers sprouted and some were immediately replanted in the old holes. In Ponape some yams are left in the ground for 20 years (Mahony 1959:2) and in Yap small yams are left in the fallow to be used in times of shortages (Defngin 1959:40). Morgan (1959a:148) says that it is necessary to dry the seed yam before it can sprout though if there is a well marked dry season this can be done in the ground.

2. All weighing of tubers was done after they were roughly cleaned.
In Stapikum where gardening activity is more seasonal than in Yenigo, the *wabi* are planted first within the *ka* gardens¹ and are followed closely by varieties of *apa'ika* (mainly *nglamei* in the Wosera) and then *asagwa*, either in different blocks of the same garden or, more often, in entirely different gardens. Thus the harvest is spread out over about 16 weeks only and, like the planting, is done in successive stages.

All other crops are harvested as they mature. Usually sweet corn and most of the green vegetables are ready about three months after they are planted and some varieties of taro are mature after about four months. All crops except the yams are eaten shortly after harvesting for they do not keep.²

**Storage**

The yam houses are similar in shape to the garden houses, but are closed at both ends, larger, better constructed and very dark inside. The taller end has a small raised door in it while the other end is completely closed off with stems of the sago frond, or by the roof and the two sides of the houses running together like the inverted prow of a ship. The yams are placed side by side on the floor of the yam house and the heads or sprouting ends are slightly raised by a stick placed at right angles to the yams, thus as the

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¹ In Stapikum there were no special *wabi* gardens in 1961 or 1962 (see Table 18). In the northern parts of the Wosera there are three different types of gardens. The *wabi* and *nglamei* gardens on the slopes and the *asagwa* gardens on the floodplains.

² In contrast to this in November 1962 I saw considerable quantities of taro stored in pile houses in Kaboibus, an Arapesh village (these houses are described by Mead 1938:237-57). Also at that time taro was being dried in the sun for a day preparatory to being stored. I have no idea how long taro will keep under these conditions. Mead (1938:220-21) mentions a 'nonperishable type of taro' and also says that taro cannot be stored for any long period.
roots develop they do not touch the ground.¹

As the yams lie on the floor of the yam house they are liable to be attacked by rot, rats and insect pests, the most destructive of the latter being Planococcus dioscoraeae (Williams 1960: 39-40).² Drains around the outside of the yam house prevent the floor from becoming damp.

Yields of Ka

The Aim of Yield Estimations.

Neither time nor man-power permitted a properly planned and carefully executed yield trial. All weighings were of native planted crops planted under variable conditions, at different times of the year and by different techniques. The purposes of the weighings described in this section were:

1. Tubers will keep for about nine months if the sprouts are broken off periodically although they become increasingly bitter with age. The Abelam method of storing yams makes an interesting comparison with the well ventilated storage methods used in Nigeria (Morgan 1959b: 61-2), the Trobriand Islands (Malinowski 1935: 228-32) and Efate (Barrau 1956a: 393, 400).

2. After spraying the yam houses with DDT as part of the Malaria Control Project, this insect, P.dioscoraeae, either by chance or because the DDT killed its natural predators, was far more prevalent. Spraying was never popular because it spoiled the appearance of houses but as soon as it looked as if the yams were being affected, opposition became very pronounced. The people built new yam houses hidden in the fallow to avoid spraying. In 1961 half the yam houses in Yenigo were outside the immediate village area but, in 1962, because the Administration agreed never to spray any yams or the inside of yam houses, all new yam houses were built in the village.
1. To make a rough estimate of yields in the Maprik area so that comparisons could be made with other yam growing areas. It was thought that mere acreage statistics were not of much value when crops are grown mixed and yields vary from variety to variety and from area to area (see Dent 1957:viii).¹

2. To make a comparison of yields in Yenigo and Stapikum in order to test a subjective valuation that yields were much lower in the latter village.

3. To find out whether the yields of different varieties differed significantly.

4. To find out, in general terms, what factors influenced the yields of ka.

Field Methods.

Field methods were rather crude and may be summarized thus:

1. The areas of all gardens planted in 1961 and 1962 in both Yenigo and Stapikum were measured (see Table 18 and Figures 17 and 18).

2. An approximate idea was obtained of the number of plants per acre (see Table 17).

¹ When I first went into the field the Bureau of Statistics (Papua) in conjunction with DASF and Bureau of Census and Statistics (Canberra) were undertaking a survey of Indigenous Agriculture in Papua and New Guinea (since published, Bureau of Statistics: 1963). Initially these people were using a yield factor of 5 lbs. per hole which was obviously too low for the Maprik area. This yield factor was subsequently changed when rough yield trials were made in most of the different land types of the survey. In land type 4 of the Sepik District which included all Abelam territory (two Abelam villages Mikau and Malba were included in the sample) the revised yield factor was 16.85 lbs. per hole which was higher than anywhere else in the Territory (Trobiand Islands were not sampled). The highest yield factor outside the Sepik District was 9.5 lbs. per hole in the Northern District of Papua. Most of the other yield factors in both Papua and New Guinea were less than 7.5 lbs. per hole (Brewer, personal communication).
3. Yields from each ka hole were weighed to the nearest pound with a spring balance just after they were dug out. Each variety was entered separately for each village and notes were made of the environmental conditions within the garden, the time of the harvest and the general history of the garden.

The Problems of Measuring Yields.

The practical problems of working on all crops were too many, so it was decided that work should only be done on ka which is the main crop throughout the Abelam. All other crops are harvested throughout the year and some are perennial or only partially harvested.

In the two villages, 32 varieties of ka were weighed but identification of varieties was always a problem. My young assistants and I could easily identify to the sub-species level but we were unable to identify many varieties. This meant that we had to be accompanied by the yam planter and at least one of the elder men to check each identification. Identification in Stapikum was particularly difficult. A variety found in Yenigo could well be found in Stapikum also, but it might have a different name. Also in Stapikum many informants were unreliable, since they were unwilling to contradict another man even when he was patently wrong. These problems were eliminated to some extent by taking fairly reliable informants from Yenigo into the Stapikum gardens and they verified or denied each identification. Some Stapikum varieties did not occur in Yenigo (and vice versa) and with these varieties no check was possible.

Weighings took place over a period of only ten months and therefore seasonal or annual differences are not taken into account in the results. There is no doubt that at times of intense ceremonial activity production of ka, 'long ka' and wabi is considerably increased. Many of the 'long ka' planted in Yenigo in 1962 were planted to initiate or reciprocate a hostile exchange, and probably extra land was planted in October 1961 to cope with festivities associated with the building of two tambaran houses in 1962.

Finally, it was impossible to use good sampling methods. Sometimes it was impossible to visit a garden when harvesting was taking place, often reliable assistants were not available
Plate 16 - A number of contiguous Yenigo Gardens which are reverting to fallow. Two small cleared wabi gardens can be seen within the ka gardens from which the ka had been harvested only 13 months before.

Sago palms are in the valley bottoms, part of Naramco village is at centre left, and the Medical Aid Post is behind a Naramco hamlet at the upper right.

Plate 17 - Looking towards the same gardens pictured in Plate 16, but before the two wabi gardens were planted and while the ka gardens were mainly planted with bananas and S. edule. Regrowth is much more advanced in Plate 16. The garden in the foreground had been planted for about two months.
to help with the weighing and to identify varieties, and sometimes I was not informed that harvesting was taking place. In order to obtain a wide dispersion of weighings I never weighed more than 50 yams from any one garden. In all 903 ka were weighed in Yenigo and 850 in Stapikum and these yams came from 25 garden blocks in Yenigo and 28 blocks in Stapikum.

The Results (For Statistical Analysis see Appendix B).

1. The arithmetical average yield of all varieties in Yenigo was 19.76 pounds per hole, and in Stapikum 17.95 pounds per hole even though Stapikum grew high yielding sub-species (apa'ka and asagwa) almost exclusively, and Yenigo only grew about 60 per cent of high yielding sub-species. If it is assumed that 60 per cent of the crop in Stapikum is asagwa (56 per cent of ka weighed in Stapikum were asagwa) approximate yields of ka would be 8.4 tons per acre in Yenigo and 6.5 tons per acre in Stapikum. Individual varieties vary greatly. If high yielding varieties or 'long ka' only were planted in Yenigo gardens yields would probably be as high as 18 tons per acre. Yields in both villages were high when compared with other areas considering that so many other crops (especially taro yielding at least two tons per acre)

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1. I was informed of about 60% of the harvestings for this was the only information for which I always gave rewards.

2. All holes containing wabi planted with ka were omitted.

3. The average yield of asagwa in Stapikum was 22.18 pounds per hole and all other varieties had an average yield of 12.47 pounds. For the number of plants per acre see Table 17. By referring to Table 18 the total yields of ka in Yenigo is about 285 tons per year and in Stapikum 110 tons per year.
were interplanted.¹

2. Yenigo has significantly higher yields than Stapikum though there are some varieties for example asagwa and wamasukwus for which this is not true.

3. There are considerable differences in the yields from the different varieties, and the differences are not the same in both villages, for example mbiat was an extremely high yielder in Yenigo but was one of the lowest yielders in Stapikum.

4. The techniques used in the cultivation of yams affect the yields. Table 19 shows the frequency of yields per hole, by five pound weight classes of three varieties that occurred in both villages. In Yenigo these varieties show a secondary peak in the range 40 - 44 pounds per hole. Unfortunately I neglected to distinguish 'long ka' when weighing yams but it is probable that most yields in excess

1. The following are some statements of yam yields, but it should be noted that most of the figures quoted below are for pure stands, not mixed crops. It is also not always clear whether the figures given are for individual holes or row cultivation as described by Galang (1920:67).

<table>
<thead>
<tr>
<th>Area</th>
<th>Source</th>
<th>Yield (tons per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Pacific</td>
<td>Barrau (1958a:45)</td>
<td>3 - 8</td>
</tr>
<tr>
<td>Owerri</td>
<td>Morgan (1959a:146)</td>
<td>4.6</td>
</tr>
<tr>
<td>Mindoro</td>
<td>Galang (1920:67-68)</td>
<td>Up to 15.4 with a specially selected variety planted only a metre apart.</td>
</tr>
<tr>
<td>Philippines</td>
<td>Wester (1924:191)</td>
<td>8 - 12</td>
</tr>
<tr>
<td>Malaya</td>
<td>Milsum (1926:395)</td>
<td>7 - 7.4 (D. alata)</td>
</tr>
<tr>
<td>West Africa</td>
<td>Milsum (1926:396)</td>
<td>7.8 (D. esculenta)</td>
</tr>
<tr>
<td></td>
<td>Faulkner and Mackie (1933:149)</td>
<td>About 3 tons on native farms, To 6 on experimental farms,</td>
</tr>
<tr>
<td>West Africa</td>
<td>Johnston (1958:115)</td>
<td>3.2</td>
</tr>
<tr>
<td>South Pacific</td>
<td>Barrau (1956a:400)</td>
<td>8 - 16 (D. alata)</td>
</tr>
</tbody>
</table>
TABLE 19 - A Comparison of Yields by Weight Classes between Yenigo and Stapiku

<table>
<thead>
<tr>
<th>Pounds</th>
<th>Wolimile</th>
<th>Ka'waka</th>
<th>Nyimbikwaru</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>1</td>
<td>14</td>
<td>1</td>
<td>3</td>
<td>1.8</td>
</tr>
<tr>
<td>5-9</td>
<td>10</td>
<td>64</td>
<td>5</td>
<td>21</td>
<td>12.7</td>
</tr>
<tr>
<td>10-14</td>
<td>31</td>
<td>93</td>
<td>15</td>
<td>67</td>
<td>40.4</td>
</tr>
<tr>
<td>15-19</td>
<td>18</td>
<td>40</td>
<td>6</td>
<td>26</td>
<td>15.7</td>
</tr>
<tr>
<td>20-24</td>
<td>16</td>
<td>14</td>
<td>1</td>
<td>17</td>
<td>10.2</td>
</tr>
<tr>
<td>25-29</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>4.8</td>
</tr>
<tr>
<td>30-34</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>4.8</td>
</tr>
<tr>
<td>35-39</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>40-44</td>
<td>6</td>
<td></td>
<td>1</td>
<td>8</td>
<td>4.8</td>
</tr>
<tr>
<td>45-49</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>50-54</td>
<td>3</td>
<td></td>
<td></td>
<td>6</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>98</td>
<td>231</td>
<td>35</td>
<td>23</td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>Yenigo</th>
<th>Stapiku</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number weighed</td>
<td>166</td>
<td>275</td>
</tr>
<tr>
<td>Average weight (lbs.)</td>
<td>15.61</td>
<td>11.45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>Less than 40 pounds per hole</th>
<th>Yenigo</th>
<th>Stapiku</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number weighed</td>
<td>151</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>Average weight (lbs.)</td>
<td>15.11</td>
<td>11.45</td>
<td></td>
</tr>
<tr>
<td>Standard deviation (lbs.)</td>
<td>6.99</td>
<td>5.41</td>
<td></td>
</tr>
</tbody>
</table>

of 40 pounds per hole are in fact 'long ka' grown by the special methods described above. Even if these 'long ka' are excluded yields are still significantly higher in Yenigo.

5. In Yenigo eleven varieties made up 83.50 per cent of all weighings (by number), whereas in Stapiku only two varieties (asagwa and wolimile) comprise 83.65 per cent of all weighings. From this it appears that there is a much wider range of varieties grown in Yenigo. This is not necessarily so for the Yenigo classification of varieties was always used and in Stapiku both asagwa and wolimile were further sub-divided in a manner not recognised in Yenigo.
This examination reveals a rather complex picture. Variety, environment and agricultural techniques are seen as independent variables. While it is possible, for example, to compare the yield of any given variety grown by the same technique in two environments, or of two varieties grown by the same technique in the same environment, it is impossible to make any generalized statements about variety, environment or technique that does not need to be hedged around with qualifications regarding the other variables. Probably the closest we can get to direct comparison between the two environments is shown in Table 19 where values of over 40 pounds per hole are ignored in order to eliminate the 'long ka', and where the main varieties are grouped together. At this level of generalization, it does appear that Yenigo has significant advantages over Stapikum. These advantages are not apparent with high yielding varieties such as asagwa and wamatsikwus for neither techniques nor yields differ in the two villages.

The Garden after the Main Harvest

During the fifteen months after the yam harvest the garden is not weeded and slowly passes into desuetude and reverts to bush. At the time that the yams are harvested, the banana plants in the garden will be three to five feet high and there may be some paw-paw, *S. edule*¹ and mature taro. Often after the yam harvest, small patches of sweet potato are planted from cuttings. Each patch continues to bear for several months for only a few tubers are removed at a time. Sweet potatoes are primarily a cash crop but are becoming a very common pig food. Incidental harvesting of all crops will continue until the fence is broken or collapses. When this happens the garden is abandoned to the pigs although any bananas and *S. edule* which survive competition with the invading fallow, and do not get broken by pigs, will be harvested when mature. However one of the main functions of the garden after the yams have been harvested is to provide seed material, especially taro and bananas, for new gardens. This stage of a garden's life will occupy anything from four to fifteen months (see Table 13) and its duration will depend largely on the state of the garden fence.

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1. *S. edule* seems to be the only strictly seasonal crop. It is planted at the end of the dry season and harvested at the end of the following wet season. It is propagated by planting small clumps (about three stalks) with a small part of the root stalk and about six inches of each stalk.
The Fallow

The Abelam give three reasons for the necessity of having a long fallow period. If the ground is not rested the soil is said to dry out, insects and other pests invade the gardening site, and finally weeding becomes very difficult. Nye and Greenland (1960:130) estimate that a 10 year fallow is necessary to control Imperata grass. Drying out of the soil, or perhaps loss of its water retentive capacity, seems to be the main factor, for in this type of horticulture much of the ground is exposed for long periods. In the wabi gardens, which are often used for three or four years in succession, holes are much deeper and not so easily affected by surface drying and hardening of the top soil. It is said that good magic and very careful cultivation control weeds and insect pests in the wabi gardens.

If the land available for gardening (Table 11) is divided by the acreage used each year (Table 18) the theoretical length of the fallow would be 21.6 years in Yenigo and 14.6 years in Stapikum. In fact length of fallow is shorter because some cut over land is never planted, especially around the edges of gardens, and in some years extra land is planted to cope with initiation ceremonies. It was difficult to date when each garden was last used but I was helped by being able to use as yardsticks genealogies in Yenigo, an earthquake in 1937, the war from 1942 to 1945, and the advent of various missionaries and government officials. Aerial photographs taken in 1958 exactly dated some garden sites. In Yenigo the average length of the fallow was 17 years but there was a wide deviation from this figure. In Stapikum the average length of the fallow was ten years, but I think there was a tendency for the natives to over-estimate the length of fallow in gardens which had been abandoned for more than eight years as nearly all these garden sites were 'last cut when the Japanese were here, a long time ago'. Neither my genealogies in Stapikum nor the Woseras' inability to count, allowed more accurate assessments.

The forest takes much longer to re-establish itself in Stapikum than in Yenigo. A seven year old fallow in Stapikum for example is usually dominated by Imperata grass and Saccharum spontaneum with a few low fallow trees. In Yenigo on the other hand a seven year fallow is usually dense regrowth with trees about twenty feet high and few grasses
and canes. This poor state of the fallow in Stapikum is due to frequent cutting, inherently poorer soils and fires escaping from garden burning.

In the first year of the fallow the abandoned garden site is dominated by weeds, canes and grasses and many climbers and scramblers such as Aristolochia, Cardiospermum halicacabum, Combretum, Passiflora foetida, Lygodium and Ipomoea. Later, in the second and third years, small shrubby regrowth trees become more abundant in the sequence and, with the bamboo and Saccharum spontaneum, form a dense thicket. The most common of these trees are Macaranga quadriglandulosa, Kleinhhovia hospita, Melanolepis multiglandulosa, Commersonia bartramii, Picus spp., Abroma augusta, Pipturus spp., Timorus spp., Mallotus spp., Callicarpa spp., Trema cannabina, Pandanus palms. These regrowth trees are often 15-30 feet high in the fifth year of the fallow though growth is much slower in some areas such as the Wosera and on ridge tops with well drained sandy soils. Some of the ridges in the north eastern part of Yenigo territory with these sandy soils are dominated by S. spontaneum even though they have not been used for garden for over six years. The moister soils in the valley bottoms are far more conducive to rapid regrowth of the forest. After about ten years trees of the forest become more frequent, but the well developed three layered lowland hill forest described by Robbins (1961:128-30) is rarely allowed to develop because the sequence is usually interrupted before twenty five years by further garden clearing.

The nutrient status of the soil is increased by the fallow vegetation. Pests, diseases and weeds are suppressed, the physical condition of the soil is improved and the land is given some protection from erosion. The fallow is also a source of timber trees; some examples are Intisia bijuga or 'kwila' a very strong and durable timber, and Vitex cofassus which is used for making the slit gongs; both these timbers only occur in well developed forest which is rare in Yenigo and non-existent in Stapikum. Other timber trees are Pometia pinnata, Celtis, Aglaia, Zizyphus, Casearia, Gmelina, Homalium.

1. Other plants are mentioned in CSIRO 1961:131. I have mentioned only those I collected or recognised and which I thought to be most common.
All the trees already mentioned can be used for curtain walling or similar light constructional work. The fallow and the forest also provide numerous medicines, foods (see below), rattans from the climbing palms (*Calamus* sp.), fibres for making masks, armbands and netbags (e.g. *Lygodium* and *Abroma augusta*) and paints and dyes (e.g. *Bixa orellana*, red, *Leucoskye*, black, and *Curcuma longa*, yellow).

1. It is not known how effective most of the medicines are. The leaves of *Cassia alata* rubbed on the skin are said to cure *Tinea imbricata*, the pounded bark of *Pipturus* is used as a plaster and crushed leaves of *Mallotus* are boiled with water to sooth a sore throat. Nettles are often used as counter irritants. See also Appendix F.
It was a difficult task because each yam was attached to a pole. Two men had to hold the ends of the pole, one had to adjust the cradle and read the scale, one man had to lift the scale while I watched the rattan supports to see that they were all loose when the reading was made. The operation was done twice and the scale reader and myself reversed jobs. Not one yam was damaged by using this method and after the first few weighings I was allowed to weigh all yams without being watched, advised and admonished by the owner of the yam.
THE WABI GARDENS

The wabi gardens planted in Yenigo in 1961 and 1962 (see Table 18) produced no more than 30 tons of food. In terms of time and effort expended this is a very low return. The wabi from the wabi garden is however very important for the part it plays in the ceremonial and ritual life of the people. The 'Yam Cult' has been described elsewhere (Kaberry 1941, 1941-42, 1957 and Forge 1962) and the following sections are primarily concerned with the techniques of growing the large wabi.

The gardens are usually hidden from the casual observer by dense regrowth and by one or two barriers of sago fronds and canes. In Yenigo all the wabi gardens were on or near ridge tops on the friable soils originating from yellow siltstone, avoiding the heavier mudstone and colluvial soils on the lower slopes. Figure 12 shows a typical wabi garden. Inside the outer barriers are a garden house and a high, strong pig-proof fence around the actual growing area. If two or more gardens are together, high but flimsy sago frond fences separate each garden (see Figure 12 and Plate 21). Wabi gardens are often in groups of two to nine contiguous gardens. The only common factor in these groups is that all the gardeners come from the same kumundji/kwiendji group; men gardening together may be from different clans, hamlets, ameis and aras.

Wabi gardens are small (see Table 18) and in 1961 and 1962 there were respectively 33 and 47 wabi gardens with an average of 30.7 yam holes per garden which gives a density of 340 wabi holes per acre. Many of the yams were in small holes three to five feet deep. Only about six wabi in each garden were planted in holes up to ten feet deep which produce the huge tubers, which often weigh over 100 pounds and measure more than six feet in length. The smaller holes usually produce tubers weighing between 25 and 60 pounds.

1. The tender white fleshed varieties of wabi, especially the mambatap and kwandjel varieties, are the most popular of all foods.
Most villages have their favourite wabi garden sites; each site may be used for four years in succession and only left fallow for three to five years. Sixteen of the 1961 gardens in Yenigo were on the same site as 1960 gardens and ten gardens were being used for the fourth year in succession. 1 The procedure for gaining access to gardening land is the same as with the ka gardens.

Only the wabi which produce long or heavy tubers are grown in the wabi gardens. Of the 41 varieties known to the author in Yenigo, only four were planted in nearly all wabi gardens, seven were commonly planted and nine were only occasionally planted (see Table 20). The remaining 21 varieties were seen only in the ka gardens. Occasionally a few taro are grown within the wabi gardens but their consumption is reserved for ceremonial occasions.

The Seed Wabi

The wabi are stored like the ka, though any tubers over five feet long are hung from poles (see Plate 18) and suspended from the roof of the yam house or some other house within the village which is not used for any domestic purpose. The largest of the yams are often allowed to rot after they have been exchanged and some of the other tubers used in exchanges are allowed to rot if an exchange is rejected. 2 The yam sprouts at the head of the tuber about four or five months after the harvest and when the sprout is about a yard long it is taken to the garden, which has been completely cleared and prepared for planting.

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1. Figure 17 also shows those gardens which were used in both 1961 and 1962. It should be noted that two wabi gardens in 1962 were in 1961 ka gardens.

2. In a hostile exchange between a man in kwiendji of Yenigo and a man of Naramco, the Yenigo man let some Naramco yams hang in the rafters of a 'talking' house until they were rotten. This made the Naramco man very angry and resulted in a new series of exchanges in which the Naramco man refused to accept a yam. This also was left in a prominent place and left to rot.
Immediately before planting takes place the top 12 inches of the tuber, with the sprout attached, is cut from the rest of the tuber. This section is then hollowed out to prevent the seed tuber from rotting and planted in the mounds of the deepest holes where the largest of the yams will be grown. The rest of the tuber is cut into sections about a foot long. Some of these are hollowed out and planted immediately in the sides of the large yam mounds even though they have no shoots. Other hollowed out sections are put in the garden house and covered with mounds of moist earth taken from the wabi garden; this procedure is said to encourage the rapid development of the sprout. After two or three weeks the sections of the tubers have shoots and are planted in the gardens.

The Preparation of the Garden for Planting

Clearing of the garden sites in Yenigo begins when the wabi first sprout which is between late September and early October. The clearing is not difficult and a garden which has been used for growing yams the previous year only needs to be weeded. A new garden site usually has a five year fallow growth of low bush dominated by S. spontaneum, and the only difficult work is removing the roots of the stumps of cane. The men do all the work in the wabi gardens with the exception of the final clearing and sweeping of the garden which is done by young girls and old women (i.e., those women who do not menstruate).

Food and sex taboos are observed by all the ceremonial wabi growers for about seven months of each year which is the time from planting until the final harvest. Most of the married males over 30 years of age are ceremonial wabi growers. The younger men, who help with the planting and who entrust one or two yams to the care of an older man, observe temporary taboos but relax them after the planting has finished. After the planting, only those men observing all the taboos are allowed in the gardens until the harvesting takes place. Women are inimical to the growing of the yams and the strongest of all the taboos is on sexual intercourse. Other taboos prohibit the eating of meat and fish, and they are not allowed to accept any food from anyone but their wives, who are assumed to be observing similar taboos.

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1. 'The cultivation and distribution of long yams may be termed a phallic cult.' (Kaberry 1957:7). Mahony (1959:9) and Defngin (1959:61) note similar taboos in Ponape and Yap. In one yam garden in Yenigo, nearly all the yams died and the planter admitted that he had had sexual intercourse.
The Planting of the Wabi Garden

By late October both the gardens and the seed tubers are ready for the planting. Holes from eight to twelve feet apart are dug to depths varying from three to ten feet. One boy or young man digs each hole and two to five men break up the clods of earth as they are thrown up. The top soil is kept to one side, separate from the sub-soil. Usually two to four holes are dug at the same time so the work force within the garden will consist of about 15 men, some working, some resting and some just looking, supervising or talking.

On the day after the digging, the boys are dismissed and the men proceed with the planting. A long piece of cane is first placed in the middle of the hole and then the soil, carefully broken by hand, is put back into the hole; top soil goes into the centre of the hole and the sub-soil around the outer edges of the hole. Additional top soil is collected from the surrounding area, six to twelve feet from the centre of the hole (Plate 19) and is added to create a cone-shaped mound three to four feet above the surface of the ground which has been slightly lowered by the removal of the top soil (Figure 13). The cane down the centre of the hole is then removed leaving a small hole and the hollowed out seed tuber is placed on top of the mound with the roots over the small hole. The tuber is then carefully covered with soil so that the shoot comes out of the top of the mound. The mound is patted firm with sub-soil, which is more resistant to erosion than the top soil, in a layer over all the outside of the mount (see Plate 20).

1. Like the ka, planting of the wabi among the Woseras and the Abelam west of Maprik is earlier than in Yeni-go. Planting in the Wingei area is even later than in Yeni-go.

2. A somewhat similar practice is reported to occur in Tonga (Watters 1960b:47).

3. Before the seed yam is planted it is first rubbed with strong smelling magical leaves and grasses. Each wabi variety has an acknowledged expert who is sometimes called in to do these tasks and to generally supervise planting. More often the yam planter performs his own magic.
Plate 19 - Planting wabi.

All the soil removed from the hole has been broken up and replaced and the men with spades are collecting top soil from the area surrounding the hole and building up the mound. Spades are rarely used in the ka gardens. The seed wabi has not yet been planted, neither has the cane down the centre of the hole been removed.

Plate 20 - The wabi has been planted and two men are firmly patting down the earth on the outside of the mound and making it smooth.
The mounds are decorated with hibiscus flowers and a sprouted coconut is placed alongside the yam and will remain there until the harvesting.

Most wabi gardens contain about six to ten large wabi and each one takes between 25 - 35 man hours to plant. The smaller wabi, usually at the bottom of the garden, are each planted in about four man hours for the holes are only about three feet deep and they are not planted with as much care as the large wabi.

The Care of the Wabi

The growing point of the shoot is nipped off with thumb and forefinger when the shoot is three or four feet long; below this cut two to eight new shoots develop. Pieces of cane radiating out from the top of the mound guide each shoot onto the main trellis which is 20 to 30 feet high (see Figure 14 and Plate 21). If the land is level, rows of wabi may be planted on both sides of the trellis. Smaller yams at the bottom of the garden usually have a lower and more simple trellis.

After the trellis is made the garden is kept clean weeded by the yam grower, errant shoots are trained onto the trellis, much magic is performed and the tubers are periodically

1. cf. the Fijian practice where '...planting of best seed yams [is] at the bottom of the slope where the soil is deepest' (Watters 1960b:44). In Stapikum the biggest of the wabi were also planted at the bottom of the garden because on the top slopes soils were generally shallow and hard sandstones often outcropped or lay close to the surface. In Yenigo the higher, friable and better drained soils originating from siltstone were considered infinitely better than the lower, heavier and often colluvial soils.

2. After planting there are three main periods of magical activity and the magic varies a little with each variety of wabi. The first stage is when the garden is cleansed of all female influence; the second is when the vine is encouraged to climb to the top of the trellis and the final stage is when the development of a large tuber is urged. Cooked mixtures of strong smelling leaves are the main ingredients though leaves of large creepers are important ingredients in the second stage and pounded roots of the same creepers are important in the final stage. The mixtures are poured into small holes made in the yam mounds. In all stages appeals are made to the nggwalndu to look after the yams. Carvings representing the nggwalndu are placed in the wabi garden houses to watch over all stages of the wabi growing.
inspected. The first inspection hole is made into the top of the yam mound about two months after planting and, if more than one tuber is developing, all but the largest are removed. After about four months inspection holes are dug to see how the tuber is developing¹ (see Figure 14). Soil is carefully loosened around the growing point, magic paint is put on the side of the tuber² and the soil is replaced. There may be two to four of these inspections before the harvest. At the last inspection the approximate length of the tuber is measured and pieces of cane of equal lengths to the tubers, are put in a line in the amei or hamlet of the grower. These tallies advertise the proficiency of the grower and herald the coming exchange and associated 'sing-sings'. The yam is considered mature when the creeper dies and short rootlets appear at the growing point of the tuber.³

The Harvesting of the Wabi

The wabi are individually harvested as they mature, about seven months after planting. The kurpi varieties (nggwokurpi, mbalepane and ambekurpi) usually take about eight months to mature and they are harvested and exchanged later than the other varieties.

When each yam is dug out, a narrow trench about two feet wide and six feet long is made so that the tuber, which grows vertically downward, is at the head of the trench (Plate 24).

1. Mahony (1959:9) notes similar techniques in Ponape.

2. Forge (1962:10) writes, 'The supposed action of the paint was described to me as follows: the paint is so "hot" that it irritates the sides of the yam, . . . , and the yam squirming and stretching to relieve the irritation drives itself further into the ground thus getting longer and longer.'

3. As soon as a yam grows to more than about five feet six inches it is given a name. These names are the same as may be given to a man, for example they may be named after an ancestor, a nggwalndu or they may even be given satirical names. In an exchange in 1961 a man was called 'driman', which is Pidgin for a dreamer, by his tshambera. This man grew a large yam in 1962 and he called it 'driman',
Plate 21 - Inside a wabi garden.

Some of the smaller wabi are planted down a slope, and small cane retaining walls support the mounds. Part of the guide trellis and the main trellis can be seen and the block dividers of split sago fronds are in the background. While the wabi are growing the soil remains exposed like this.

Plate 22 - The wabi 'lined' and decorated and about to be exchanged.

The carved face and headdress on the tuber, the bird of Paradise plumes and the shell rings can be clearly seen.
Most of the soil is removed by digging sticks and hands though spades are sometimes used for removing soil from that part of the trench furthest away from the tuber. Near the plant dibble sticks and fingers carefully pry away the soil from around the tuber. Because wabi are often over six feet in length they need very careful handling and as many as six men may be needed to lift them out and carry them to the garden house. Here they remove all soil from the tuber with their fingers and small sticks until it is quite clean. The yam is then suspended from a pole by cane rope, tied so that it is supported every nine inches. The pole is then lashed to the rafters of the garden house until the yam needs to be decorated and prepared for exchange.

Yields from the Wabi Gardens

Although of some value the yield data shown on Table 20 should not be regarded as giving accurate data nor will it stand any sort of analysis. It was impossible to collect valid yield data from the wabi gardens for the following reasons:

1. There were numerous taboos and a desire for secrecy in the wabi gardens. When my wife was in the field I was asked not to go into the wabi gardens between planting and harvesting and I had to make observations from over the fences.

2. No one would let me weigh the tubers until they had been presented to the tshambera. This was mainly through fear that the tuber might get damaged but also partly because they thought that the yam, almost humanized, would be offended. It was impossible to check on all yams for the small ones often were not exchanged and the long wabi frequently changed hands again after they had been given to tshambera.

3. All large wabi were weighed while attached to a pole (Plate 18). It was impossible to watch all lashings and the scale at the same time so some of the readings are probably inaccurate.

1. Often the yams are spoken of as being 'like men' for they have spirits and can hear but cannot speak (Kaberry 1941:356).
4. The number of big wabi planted in each wabi garden depended on the ambitions of the yam grower and the amount of labour on which he could call. Thus the density of planting varied greatly from garden to garden.

5. Sometimes two wabi were planted in the same hole. In the 30 gardens counted (2.66 acres) there were 921 wabi holes which gives an average density of 346 holes per acre; however I estimate that there were about 1,150 tubers harvested.

6. Many of the gardeners were ashamed of small specimens which were either discreetly hidden in the yam houses or eaten immediately by the yam grower and his family.

**TABLE 20** - Some Yield Data of the Wabi Gardens, Yenigo 1961

<table>
<thead>
<tr>
<th>Variety of Wabi</th>
<th>Total holes</th>
<th>Number weighed</th>
<th>Average weight lbs.</th>
<th>Maximum weight lbs.</th>
<th>Maximum length</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yepmane</td>
<td>176</td>
<td>23</td>
<td>30.75</td>
<td>117</td>
<td>7'2&quot;</td>
<td>A</td>
</tr>
<tr>
<td>Mambatap</td>
<td>173</td>
<td>57</td>
<td>47.63</td>
<td>100</td>
<td>7'8½&quot;</td>
<td>A</td>
</tr>
<tr>
<td>Kwandjel</td>
<td>154</td>
<td>52</td>
<td>51.29</td>
<td>140</td>
<td>8'11½&quot;</td>
<td>A</td>
</tr>
<tr>
<td>Ngwokurpi</td>
<td>148</td>
<td>30</td>
<td>29.10</td>
<td>52</td>
<td>?</td>
<td>A</td>
</tr>
<tr>
<td>Mbalepane</td>
<td>54</td>
<td>20</td>
<td>29.80</td>
<td>49</td>
<td>?</td>
<td>B</td>
</tr>
<tr>
<td>Yame</td>
<td>42</td>
<td>8</td>
<td>49.63</td>
<td>76</td>
<td>7'0&quot;</td>
<td>B</td>
</tr>
<tr>
<td>Landji</td>
<td>42</td>
<td>7</td>
<td>27.14</td>
<td>40</td>
<td>6'5½&quot;</td>
<td>B</td>
</tr>
<tr>
<td>Tswagap</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wundunggul</td>
<td>28</td>
<td>9</td>
<td>26.89</td>
<td>42</td>
<td>?</td>
<td>B</td>
</tr>
<tr>
<td>Ambekurpi</td>
<td>23</td>
<td>8</td>
<td>24.00</td>
<td>43</td>
<td>5'8½&quot;</td>
<td>B</td>
</tr>
<tr>
<td>Yaimbu</td>
<td>20</td>
<td>4</td>
<td>35.50</td>
<td>41</td>
<td>3'2&quot;</td>
<td>B</td>
</tr>
<tr>
<td>Tseam</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Kwandji</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Mane</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Yilan</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Kwaringdingil</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Mbut'inggup</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Ambnummuna</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Masu</td>
<td>1</td>
<td>1</td>
<td>50.00</td>
<td>50</td>
<td>?</td>
<td>C</td>
</tr>
<tr>
<td>Vi'a</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Muna'</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C</td>
</tr>
</tbody>
</table>

Total holes planted (30 gardens only).
Frequency of occurrence in the 30 gardens counted.
A. Abundant. In more than 20 gardens.
B. Common. In more than 8 but less than 15 gardens.
C. Rare. In less than 3 gardens.
Plate 23 - Inspection holes being dug into wabi mounds.

The mound in the centre has been opened up and is about to be harvested. Part of the main trellis can be seen behind the men and again at the top right of the picture. The sprouting coconuts are associated with magic.

Plate 24 - Harvesting a Mambatap wabi.

This particular tuber weighed 98 pounds and was 7 feet 8½ inches long.
The average yield of all wabi from the wabi gardens was 39.65 pounds, but, as many of the smaller ones were not weighed (see 6 above) the actual average yield per tuber is certainly somewhat lower, probably around 33 pounds. However, as there are sometimes more than one tuber per hole, the yield would be approximately 41 pounds per hole, giving a total yield per acre of about 6.3 tons. By referring to Table 18 the total product of wabi in Yenigo is only about 24 tons a year which is very little compared with the 285 tons of ka.

Maximum weight and length of various varieties are also shown in Table 20. The kwandjelwabi weighing 140 pounds and measuring 8 feet 11½ inches in length was the longest tuber seen in 1961 or 1962 though cane markers showed that in previous years yams up to 11 feet 8 inches in length had been grown. Such huge tubers make the Abelam rather unique among yam growers although yams up to 8.5 feet long have been found in New Caledonia (Barrau 1956a:399, 1958a:45) and yams weighing 250 pounds have been reported on Rotuma (Hartley 1963:60). Burkhill (1935:815) mentions yams up to 130 pounds in the Malay Peninsula.

Different varieties have different colours and shapes. Those forked or lobed are called female wabi and are decorated accordingly at the exchanges. The long, straight and white wabi (particularly the mambatap variety) are the most liked and highly prized of all yams.

1. This yam was grown in Naramco just before the war. It was called tsimban and was a mambatap wabi. Cane markers are always accurate for tshambera see to it that there is no exaggeration. Kaberry (1957:41) measured one yam 11'2" long in Kalabu.
OTHER SOURCES OF FOOD

With the exception of sago (*Metroxylon sagu* Rottb.)¹ and some bananas all the staple foods are grown in the gardens (see Figure 16). Most foods discussed in this section are relishes and between meal snacks although the nuts and green leaves are a very important source of protein in what is generally a protein deficient diet.

The Sago Palm

The sago palm is always planted from suckers and takes about ten to fifteen years to mature. The only attention that it requires during its growth is the cutting back of the encroaching bush. Most of the well developed leaves are cut off and are used for thatching roofs, and leaf stems and petioles are used in building fences, houses and sago washers, and for many other purposes.

The palm usually grows until the trunk is twenty five to forty feet long. Each tree produces only one inflorescence during its life cycle and this rises in an enormous cluster straight from the top of the tree (see Plate 15). The starch in the trunk is a reserve used in the final flowering and fruiting and each palm dies after the fruiting (see Barrau 1958a:38). Trees are therefore cut either just before flowering starts or in the early stages of flowering.² The tree owner clears a site around the tree, cuts it down, removes the cortex and exposes the pith, and finally builds a crude shelter of sago fronds over the log. The rest of the work is

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1. There are at least six native varieties of sago some of which have thorns on the leaf petioles and some of which have smooth petioles. In the Wosera there are mainly thorny varieties but elsewhere among the Abelam smooth and thorny varieties are mixed although the smooth varieties are more common in the north. It is said that the smooth varieties were introduced from the north west. Spinescence is probably a character with little diagnostic value especially as the progeny of thorny varieties are often thornless (Barrau 1958a:37). All gradations of spinescence were seen so there seems little justification for calling the spiny varieties by a species name (viz. *M.Rumphii*).

2. It has been shown that yields decrease as flowering progresses (Brewer, Personal communication; Edwards 1961:6-8).
left to the women. The log is divided up and the wife of the tree owner invites her own and her husband's kinswomen to work on, and to have the produce of, a section or sections of the log. Each woman sits crosslegged in front of her own section and pulverises the pith with a blunt adze-like instrument, which she swings in front of her with a predominantly wrist action until the pith is like a fine sawdust (see Plate 25). The pulverised pith is then threshed with a long stick and placed in an inclined trough made from the leaf petiole of the sago frond. Water is drawn from a river or creek by means of a half coconut shell fixed to a long stick and poured onto the pith (see Plate 26). The mixture is then pressed through the fibrous spathe of the coconut leaf which sieves the fine sago flour from the coarse pith. The water with the sago flour in suspension, runs into a basin made from the leaf sheath of the 'limbom' palm where the flour is collected by sedimentation. After about half an hour, the water is poured off and the flour is wrapped in fibrous matting and taken to the village where it is slowly left to dry into a hard cake. Sago stored in this manner will keep for about one month.

In Yenigo sago is plentiful and some trees were allowed to flower and die. Usually two or three trees are cut each year by each family and a palm yields from 450-700 pounds of moist sago flour which would represent about 110 to 175 days

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1. Sago would keep better if it were properly dried (Barrau 1958a:73) or kept in a half wet state 'because sour fermentation then protects against the formation of moulds' (Oomen and Malcolm 1958:20).

2. Weighings carried out during 1963 by the Bureau of Statistics (Papua) in conjunction with DASF indicate that the average yield of sago palms in the Maprik Sub-district is between 650 and 700 pounds of sago flour (Brewer, Personal communication). I only weighed and measured two sago palms. One trunk 22'6" in length contained 31 cubic feet of pith which weighed 1,583 lbs. and yielded 483 lbs. of moist sago flour. The other palm was 35 feet long and contained 35.9 cubic feet of sago pith which weighed 1,828 lbs. and yielded 528 lbs. of sago flour. In Malaya yields are said to be as high as 1,200 lbs. (Burkill 1935:1461). Zwollo in the Netherlands New Guinea (see Massal and Barrau 1956:4) found that sterile palms can yield up to 900 lbs. of crude sago though the average yield is only between 250 and 350 lbs.
Plate 25 - Women pounding sago pith.

Plate 26 - Washing sago.

With her right hand the woman is pouring water on to the pounded sago pith and with her left hand she is working the sago flour through the sieve of coconut matting. The water with the pith in it runs into a basin made of the leaf sheath of the 'limbon' palm.
food for one man (Edwards 1961:21). The complete process from cutting to the production of the flour takes about 100 man hours for every 500 pounds of flour produced.\(^1\)

As each tree is divided up among three to six families, each family will in fact get about 100 pounds of fresh sago six to ten times throughout the year, though mostly in the lean period.\(^2\) Each woman keeps for her own use the flour that she obtains from the section of the trunk that is allotted to her (cp. Kaberry 1941:351), though often a close relative may help one of the women, join the gossip, and when the work is done, receive a portion of about 20 pounds from the woman she has helped.

In Stapikum I was unable to get any reliable data on the number of palms cut or the yields of sago for most of my visits to that village were between June and October when the yams were being harvested. However, it appeared that each family cuts at least four trees a year and that the trees are generally cut well before they flower. To my knowledge there were no flowering palms in Stapikum in 1962 (cp. Plate '15), and this indicates that there was such a demand for sago there, that no palms were allowed to waste and die; possibly the demand was so great that many trees were cut before they were at maximum yield.

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1. Edwards (1961:21-22) reports a similar survey near Angoram. In 100 man hours between 680 and 700 pounds of moist sago were produced. Part of the explanation of this difference between Yenigo and Angoram may lie in the fact that around Angoram 3.7 pounds of pith produced one pound of moist flour, whereas in my two weighings, extraction was more thorough, and only 3.4 pounds of pith were necessary to produce one pound of moist sago flour.

2. Some of this sago would however be consumed by pigs.
Other Tree Crops

The Coconut Palm.

The coconut palms (Cocos nucifera) are usually planted near the hamlets (see Plates 2, 3 & 4) but are also grown in clusters on the highest parts of some ridges. The water from the 'kulau' or green coconut is often drunk during the day and the flesh is often used as a between meal snack. It is mainly used, however, as a condiment in the white yam soup which is the most highly esteemed of all foods. The shredded flesh of the 'dry' coconut is also used as a condiment in many other dishes. The coconut palm has a multitude of other uses. It yields timber, fuel and the materials for thatching, fibres, spoons, bowls and eating utensils. Every adult male owns at least eight mature palms.

The 'Tulip' Tree.

The 'tulip' trees (Gnetum gnemon) are usually planted to form narrow avenues along paths, but in the Wosera they are often planted in groves on the lower hill slopes just above the sago plantations. The edible young leaves and the unripe fruits are a popular food and are eaten in thick soups made with sago or yams. The leaves have definite food value and are rich in mineral content, vitamin A and protein (Massal and Barrau 1956:33, Brown 1951:76, Peters 1958:48), and provide a very important source of protein in the lean period (see Figure 16).

The Betel nut Palm.

The betel nut palms (Areca catechu) like the coconut palms are planted around hamlets and along ridgetops and the tops of gardens. The seed is chewed with lime, and the leaves and flowering spike of the Piper betle and sometimes with tobacco leaves or some other aromatic substitute. Children occasionally chew it but without much lime. Chewing the seed of the Betel nut palm is said to be stimulating ('whisky bilong kanaka') and to make men strong.2

1. 'Tulip' is Pidgin for two leafed.

2. Almost certainly it is the cause for a high incidence of cancer of the mouth in the Maprik area. Cancer of the mouth is rare in the Highlands where betel nut is not chewed (Hancock, Personal communication).
The Breadfruit Tree.

The breadfruit tree (*Artocarpus altilis*) is a seasonal producer bearing fruits from August to February. There are two main varieties of the tree in the Abelam area. The *wal* is the larger of the two and both the flesh and the seeds of the fruit are eaten. The *talumba* is smaller and only the seeds are eaten. In Yenigo there is a taboo on young men and women eating the seeds of the *talumba* for doing so is said to shrink the genitals. The fruit is usually roasted on an open fire and the seeds are removed when cooked, then peeled and eaten.

The 'Taun' tree.

This tree (*Pometia pinnata*) produces a fruit and a kernel which are both edible. The fruit is eaten raw and the inside nut is put in water for about a week before it is taken out and dried in the sun. After it is dry the nut is cracked and the inside kernel eaten. The 'taun' is a seasonal tree and produces most of its fruits between January and April. It is a forest species (Massal and Barrau 1956:44) but is very common around the villages where it is co-dominant with the breadfruit. This concentration of the two species is probably caused by selective cutting and some planting (cf. Grove 1951:293).

Other important trees are the bananas and paw-paws which are grown both within and without the gardens. Near many of the hamlets there are small areas about 30 feet square which are roughly fenced and used entirely for the growing of bananas. On the lower floodplains of the Wosera rivers and on the floodplains of the rivers passing through the grasslands, groves of bananas and other trees are planted on land that is frequently flooded and which is unsuitable for gardening. The young leaves of both the *kwarmbi* (*Ficus copiosa*) and the *kwandjel* (*Ficus wassa*) are commonly eaten with sago and yam soups and the young green fig of the *kwarmbi* is often eaten as a snack. Both trees are planted around the hamlets. The *kwandjel* also occurs in the fallow and when clearing takes place, the trees are cut back to encourage the sprouting of young tender leaves. The *kwandjel* is particularly common in the Wosera and around Kwimbu and Dumbit.
There are many other trees, some native and some introduced, which produce edible fruits. Some examples of these are the native mango (Mangifera minor), the recently introduced mango (M. indica), the Morinda citrifolia, various citrus species such as the lime, lemon, sweet and bitter oranges and grapefruit, the Malay apple (Syzygium malaccense), the soursop (Annona muricata), and a species of Pandanus (P. conoideus ?) from which a blood coloured and rather sweet oil is extracted. Many palms also have edible shoots (see Appendix F). 1

**Domesticated Livestock**

Pigs are the most important animal to the Abelam. They are an index of wealth and are important in ceremonial exchanges, feasts and intervillage trade. Pigs are however never killed for family consumption and pig meat is irregular in the diet being consumed in large quantities during feasts and after exchanges but rarely at any other time; some members of the community, particularly women and children, rarely eat it. The only other useful domesticated animals are the dog, which are always underfed and in a pitiful condition, and fowls. Dogs are useful when hunting wild pigs but otherwise they have no value except for prestige. 'Consumption of poultry products is a rarity, the principal purpose for which people keep fowls being to use their feathers for decoration' (Conroy 1953:27). A few parrots are kept as pets.

Pigs and fowls are fed on scraps and are also allowed to forage around the village and in the fallow and old gardens. Women however prepare special meals for the pigs and the food given to three average sized pigs during one week is shown in Table 21.

1. Appendix F. also lists some other food producing trees.
TABLE 21 - Food Given to Three Yenigo Pigs, during one week in Sept. 1962.

<table>
<thead>
<tr>
<th>Food</th>
<th>Pounds</th>
<th>Ounces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw Paw</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>Banana (mostly overripe)</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Taro</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>'Taro kongkong' (Xanthosoma)</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Sago (usually fairly old)</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>'Tulip' leaves</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Yams (old and rotten specimens)</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Various greens not eaten by natives</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>127</strong></td>
<td><strong>7 oz.</strong></td>
</tr>
</tbody>
</table>

In August 1962 there were 83 pigs and 26 piglets in Yenigo. Assuming that each pig eats about 40 pounds of food a week and that piglets eat about 20 pounds, the Yenigo pigs would eat about 90 tons of food a year though it must be borne in mind that food intake by village pigs would depend on the bounty of each harvest, the time of the year, the aspirations of the owner and the diligence of the wife. Pigs are an important indication of wealth, and also a means whereby surplus food can be converted into wealth. It is interesting to note that after the war when food was extremely short there were very few pigs and in the Wosera today where food is short there are also very few pigs. Thus it can be stated that a permanent pig population indicates a regular surplus of food.

1. In August 1961 there were 77 pigs and 30 piglets in Yenigo. The distinction between pig and piglet was fairly arbitrary and any pig less than 15 inches high was called a piglet. In August 1962 there were only 5 pigs in Stapikum but this was by informant count only. No boars are kept in the village and female pigs mate with wild pigs.

2. Six shell rings are usually paid for a pig though if the rings are small additional money payments are made.

3. Not only was food too short to give to pigs but the wealth (i.e. the pigs) was converted back into food. During the latter stages of the war the Japanese, who were extremely short of food, shot and consumed any pig they saw. A Patrol Report dated 13/2/48 reports only one pig seen in all the villages visited.

4. In spite of keeping few pigs, the Woseras sell most of those they do have to the North and East Abelam at comparatively low prices, this being one of the few ways in which to obtain rings or money.
The care of the pigs is left entirely to the women but the men are considered to be the owners and do all the buying, selling, exchanging, butchering and cooking. There is a considerable exchange of pigs. During the ceremonial period, from June to October in 1962, three or four large pigs valued at £30 or £40 each, were carried through Yenigo village every week. At the Naramco Aid post there was also a small herd of goats. They were supposed to provide milk for infants but to my knowledge they were never milked. Two goats were killed and eaten at ceremonial occasions. The Administration hesitates to encourage goat keeping because it is thought that the animals would cause destruction in the gardens. However even though the Naramco goats often broke out of their enclosure, to my knowledge they never entered a garden before pigs had first forced an entry.

**Hunting and Gathering**

Groups of men often hunt wild pigs with nets and spears but, apart from this, the Abelam do little hunting and wild flora and fauna are not systematically exploited. Since the introduction of the shotgun, however, much of the bird life has been destroyed and all things that move are considered fair game; parrots, ducks, plovers, hornbills, cockatoos and even tiny kingfishers are eaten, though the most popular of all edible birds are the native dove and the flying fox; the latter is often smoked and preserved. Before contact an occasional bird was shot with bow and arrow, or caught by becoming stuck to the sticky gum of the breadfruit tree which had been placed on the top branches of trees or near natural bird baths. An occasional opossum and bandicoot is caught and the natives say that they sometimes catch the cassowary, wallaby and crowned or Goura pigeon. There are some edible fish up to eight inches long in the larger rivers such as the Screw and Parchee and they are caught by young boys using small forked spears. According to informants fish are also caught by blocking off pools and stunning the fish trapped in the pools with the pounded bark of the djawmaraw tree.

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1. The DNA usually only permits one shotgun per village, the councillor is usually the titular owner but many men use it. The gun is occasionally used in pig hunts but it is considered better to capture live pigs.

2. Bows and arrows are not used by men and they are considered mainly play things for boys.
In the bush and fallow there are many food producing trees, shrubs and creepers, apart from those already mentioned (see pp.110, 125); many more are listed in various sections of Appendix F. Mushrooms, fungi and larvae, young shoots from the bamboo, leaves and shoots from many different ferns, and eggs of birds, of which the cassowary's are the most esteemed, are also collected from the bush. A variety of Manihot grows wild in many places and though it is not a popular food it is a handy reserve in times of shortage. The bark of some trees (e.g. the mbikal, a tree of the high forest) is used to flavour food. In the Middle Sepik Grasslands a salty grass is collected from swampy places and is often traded north where it is cooked with the food.

The Trade Store as a Source of Food

As more money comes into the area an increasing quantity of food is bought from the trade stores. Among the North Abelam it is quite common for a tin of fish or meat to be mixed into a sago gruel or for rice and tinned meat bought from the trade store to form the basis of a meal. Other foods that are commonly bought are sugar, salt and tea. Some of the natives who have worked for Europeans have developed more sophisticated tastes and may occasionally buy other tinned foods such as baked beans and tuna, and condiments such as curry powder and soy sauce.

There are three European operated trade stores in Maprik and nearly all the mission stations have stores as well. There are also 39 native owned stores in the Sub-district whose owners use the missions as suppliers. The native owned stores show little or no profit and their ownership is more

1. The most highly prized of all larvae is the kauwia which lives in the stumps of cut sago palms.

2. There are taboos on young men and women eating bamboo shoots.

3. All the sugar and nearly all the rice sold is grown and refined or milled in Australia. There is also a large range of other goods such as peanut paste and peanut oil, cordials and tinned meat which are offered for sale. These goods are imported from other countries but could well be grown and processed in New Guinea.
for prestige than anything else. Giving and sharing have been inculcated from an early age and the temptation to dissipate capital and earnings in 'lucky' and lavish entertainment is too strong to allow the holding or accumulation of large quantities of consumer goods or money (cf. Salisbury 1962:331).

There is no doubt, however, that the trade store acts as a stimulus to the acquisition of money. Gradually demand is becoming more sophisticated not only in food goods but also for items such as bicycles, pens, kerosene pressure lights, radios, clothing, cooking utensils and liquor.

1. The right to drink liquor was given to the natives in 1962.
CASH CROPS

Food production is geared primarily to local consumption but cash cropping is gradually becoming more important. Within the last decade effort has centred around the production of peanuts, dry rice, robusta coffee and fresh vegetables, but the history of cash cropping in the Sub-district has not been a happy one, and the natives in most areas are suspicious of attempts by the Administration to extend plantings because of past failures and low prices.

Peanuts and rice were the first cash crops introduced to the villagers. After considerable extension work by the Administration in the early 1950s there were extensive plantings of peanuts and by 1958/59 over 120 tons were grown in the Sub-district. Peanuts were initially sold for 5½d. a pound but since 1959/60 the price obtained by natives has fallen to 2d. or 1½d. a pound. Enthusiasm for planting has dropped with the returns, and now peanuts are grown only for home consumption and the Maprik market. No processing of peanuts was attempted in the area and the high freight rates to the coast are alleged to be the main cause of 'adverse marketing conditions' (see Table 1).² Production of rice has fluctuated greatly over the past few years but generally there has been only a slight increase.² The growing of rice demands much more effort than the growing of other cash crops and the price paid to natives for paddy is only 3d. a pound. Most of the more sophisticated natives in the North Abelam region believe that the return for growing rice is too low to warrant the effort. There is a similar tendency with coffee growing. Even although the Maprik CSD is now receiving most of the coffee income of the area, very little planting is being done there now (see Table 23).

All paddy is bought by the Tamaui Rural Progress Society who then sells the milled rice to Government Departments for about 9½d. a pound.³ Trade stores sell Australian rice

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1. Although commercial plantings of peanuts by natives have decreased over the last five years total exports from the Territory have increased. It should be noted that European plantings have considerably increased while native plantings have decreased (Source TNGAR).
2. 89 tons produced in 1960/61, 64 tons in 1961/62 and 114 tons in 1962/63.
3. Rice is milled by DASF at Bainyik.
for prices ranging from one shilling to 1/6 a pound. The main problem of growing rice is that it is more susceptible than other crops grown in the area to the vicissitudes of climate and insect pests. In Yenigo in December 1961 four blocks (about 0.3 acres) were planted but due to unseasonably dry weather in January the whole crop was lost. In 1962 stem borers caused havoc in many rice gardens and resulted in total loss of the crop in some gardens. Transportation of the grain to the rice mill is also a problem for there is no home threshing. Normally the Administration collects the grain from the villages but often, because of pressure of work or because the rivers are flooded, the rice is not collected and it becomes spoiled by rats or dampness.

The Maprik weekly market, the mission stations, the hospital, the various Administration departments and European householders, offer a means whereby surplus food, and vegetables especially grown for the purpose, can be converted into cash. Prices obtained by the natives for all foods range from 1½d. to 2d. a pound but the market is limited and usually glutted. Interest in this form of cash cropping depends largely on the distance from the villages to the markets. The total income obtained from the sale of fresh vegetables was little more than £5,000 in 1963 and it is unlikely that the market will expand significantly.

Robusta coffee (Coffea canephora) was first planted in the Sub-district in 1957 and is now considered to be the most promising cash crop for the area. Since 1957 plantings have considerably increased (see Table 22) even although the Administration's policy is to curtail planting where population densities are up to 200 people per square mile (BAE 1961:60). Also, even though the Australian Government won many short term advantages within the International Coffee Agreement, it is almost certain that the production of New Guinea coffee will be in excess of the Australian and allotted overseas markets by the end of the sixties (Shand 1963, BAE 1961:133-35). It is now the policy of DASF that

1. 'The hospital diet is sweet potato, which is despised by the Abelam, and rice and tinned meat, which are appreciated, but not thought suitable foods for sick people' (Schofield and Parkinson 1963:7).

<table>
<thead>
<tr>
<th>Year</th>
<th>Under shade trees acres+</th>
<th>New Plantings acres+</th>
<th>Immature trees acres+</th>
<th>Mature trees acres+</th>
<th>Total trees acres+</th>
<th>Production of Parchment lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959/60</td>
<td>N.A.</td>
<td>4*</td>
<td>N.A.</td>
<td>N.A.</td>
<td>14</td>
<td>NIL</td>
</tr>
<tr>
<td>1960/61</td>
<td>285*</td>
<td>26*</td>
<td>N.A.</td>
<td>N.A.</td>
<td>60</td>
<td>1,200*</td>
</tr>
<tr>
<td>1961/62</td>
<td>486*</td>
<td>43*</td>
<td>119</td>
<td>14</td>
<td>133</td>
<td>4,183</td>
</tr>
<tr>
<td>1962/63</td>
<td>745*</td>
<td>171*</td>
<td>298</td>
<td>71</td>
<td>369</td>
<td>6,015</td>
</tr>
</tbody>
</table>

+ Assumes 500 trees planted per acre.
* Does not include the Yangoru area.
≠ Six months only.
∅ Data used in this Table was obtained from three different sources (DASF Bainyik Sub-district Office, Maprik and DASF Konedobu).

N.A. No data.

Native plantings of coffee should neither be encouraged nor discouraged, and Europeans in the Highlands are being refused extensions to their plantations. Nevertheless plantings are still being actively encouraged in the Maprik Sub-district, particularly in the Wosera where land is short and there are few other ways of earning cash (see Table 23).

In 1963 only 10d. a pound was being paid for pulped, fermented and dried beans which were purchased from the villages, and then sold to dealers by the Administration. It is anticipated that in 1964 the price will rise to about one shilling a pound and that the Rural Progress Societies will ultimately undertake marketing. In 1962/63 6,015 pounds were purchased within the Sub-district by the Administration but DASF estimate that production will be over 200 tons by

1. Although robusta coffee has a better actual and potential market than arabica, which forms the bulk of New Guinea production, there is still great danger of overproduction, especially if surplus poor quality arabicas compete with robustas.
TABLE 23 - Coffee Statistics by CSDs, 1962/63.

<table>
<thead>
<tr>
<th>CSD</th>
<th>Area under Shade (acres)</th>
<th>Coffee Trees Planted (acres)</th>
<th>Non-bearing</th>
<th>Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maprik</td>
<td>3.6</td>
<td>30.8</td>
<td>24.6</td>
<td></td>
</tr>
<tr>
<td>Tamaui</td>
<td>10.9</td>
<td>15.3</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>Wora</td>
<td>77.2</td>
<td>3.9</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>North Wosera</td>
<td>277.3</td>
<td>53.5</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>South Wosera</td>
<td>67.0</td>
<td>18.0</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Rest of Sub-district *</td>
<td>308.6</td>
<td>117.2</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td>Total Sub-district *</td>
<td>744.6</td>
<td>238.7</td>
<td>57.6</td>
<td></td>
</tr>
</tbody>
</table>

(Source DASF Office, Bainyik)

* Excludes Yangoru area.

1967/68. It is estimated that in 1963/64 twice as many trees will be planted than in 1962/63. Table 22 shows the areas planted with coffee or the shade tree Leucaena glauca, which in this area, is planted at least a year before the coffee. Although robusta coffee is selling well at the moment the natives in many areas are already disillusioned about cash cropping for the work seems difficult and unrewarding. If there is a fall in the price of coffee or if markets fail, there would be considerable discouragement and resentment, for the natives have great difficulty in understanding the mechanisms of the international market.

Cash Cropping in Yenigo and Stapikum

Both villages have only recently started planting coffee and, as yet, no trees are bearing. In Yenigo, rice and peanuts were enthusiastically planted in the 1950s under DASF guidance; when the prices of these crops fell the villagers became very suspicious of cash cropping; now many plantings are made more to satisfy extension officers, rather than in the hope of a cash return later. This is shown by the fact that in many gardens shade trees had been planted for two or three years but little planting of coffee had followed. As in most villages plantings were made by village officials such as councillors, 'luluais', 'tul tulis' and committee members of the Rural Progress Societies, who wished to create a
favourable impression with Administration officers. Very little interest has also been shown in the village coffee nursery in Yenigo and between June 1961 and July 1963 only 0.3 acres were cleared and planted with shade trees. In 1960 and 1962 no rice at all was planted in Yenigo and only a few peanuts were interplanted in the ka gardens and were later consumed in the village. In 1961 the two blocks planted with rice failed and two blocks of peanuts were planted (approximately 0.1 acres). About half of these peanuts were eaten uncooked in the village and the rest were taken to the Maprik market and sold for about 2d. a pound.

The sale of vegetables is probably the main method of obtaining cash from produce but carrying heavy loads ten miles to Maprik for a return of only four to eight shillings, assuming that all the load is sold, is not popular. When the native hospital was short of food in 1962, PHD offered to collect food from the villages and Yenigo sold nearly two Land Rovers full of food. Sweet potato was the main food sold for it is easy to grow, yet sells at the same rate as yam and taro.

In Stapikum the natives are far more enthusiastic about the planting of coffee and although planting commenced much later there than in Yenigo, both villages have the same acreage per person under shade trees, and plantings in Stapikum are continuing. Some natives of Stapikum sometimes raised doubts as to whether food producing land could be spared but others always answered this objection by saying that coffee was the only way in which they could get cash. In the Wosera where the ancestral cults are not at present strong, the pursuit of money is far more important than among the North Abelam.

1. In 1962 it happened that the yams grown in two old rice gardens were very small. The natives said that this was because a fungicide (Agrosan) which is put on the seed rice is 'bad medicine'. In 1962 Yenigo natives said that they were not going to plant any more rice for rice 'ruins the land'. No complaint was made to DASF officers.

2. Neither rice nor peanuts were grown in Stapikum in 1961 or 1962.
Chapter 7

CONSUMPTION, DISTRIBUTION AND EXCHANGE

Even although the discussion of feasts, ceremonies and exchanges takes up nearly half of this chapter, it must be borne in mind that it is the family as a unit that produces and consumes the bulk of the food (cf. Kember 1941:353). Like many other field workers (e.g. Malinowski 1935:230) I found that I paid more attention to the ceremonial and dramatic than to everyday events; as a result my note books are full of detailed accounts of yams exchanges but contain very little data about daily eating patterns. In order to redress the balance here, many aspects of Abelam life involving distribution or consumption of food, such as marriage payments and the associated $jangi$ (pp. 51, 56-8), hostile exchanges (pp. 59-61) and death distributions (p. 69), which have been mentioned briefly in previous chapters, will be omitted here to avoid over emphasis of the dramatic. Only some important distributions and exchanges will be mentioned in this chapter to illustrate the modes of the apportionment of food and to give some idea of the amounts involved.

Unfortunately I was unable to obtain adequate data on the quantities, or even the proportions of all food eaten by the people, given to pigs, used as seed or wasted. If, however, it is assumed that infants under two years of age eat no yams and that children under fifteen and aged people over 50 years of age eat three quarters of a full yam ration, 204 full rations are required daily in Yenigo and 132 full rations in Stapikum. Further if it is assumed that a full ration of yam is about three pounds a day (1,300 calories) the annual consumption of yams would be 100 tons in Yenigo and 65 tons in Stapikum. Also it could be assumed

1. In Yenigo there are 159 adults, 53 children, 6 aged people and 16 infants. In Stapikum there are 84 adults, 60 children, 4 aged people and 4 infants (cf. Figure 9).

2. This is almost certainly an overestimate. According to my weighings only about 34% of the calorie contribution in the diet comes from yams in August and 9.3% in March. In Stapikum about 79% of the calorie contribution comes from yams in August and 5% in March.
that about one tenth of the total production of ka is reserved for seed and that each pig consumes about one pound of ka a day (see Table 21). In Table 24 estimates of total consumption and production are made for Yenigo and Stapikum. It is difficult to understand why there should be such great surpluses in both villages, especially in Stapikum where severe food shortages are said to occur.

<table>
<thead>
<tr>
<th>TABLE 24</th>
<th>Estimates for Annual Total Production and Consumption of ka in Yenigo and Stapikum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ka production (tons)</td>
<td>Yenigo</td>
</tr>
<tr>
<td>Eaten</td>
<td>100</td>
</tr>
<tr>
<td>Seed</td>
<td>28</td>
</tr>
<tr>
<td>Pigs</td>
<td>16</td>
</tr>
<tr>
<td>Estimated total</td>
<td>144</td>
</tr>
<tr>
<td>Estimated Surplus (tons)</td>
<td>143</td>
</tr>
<tr>
<td>Average daily surplus per person (lbs.)</td>
<td>3.7</td>
</tr>
</tbody>
</table>

However in subsistence societies it is essential to aim to produce a surplus to ensure against losses by flood, drought, wild pigs and insects. Also some food is sold for cash. Very little appeared to be wasted for all the stale, rotten or surplus food is given to pigs. It was difficult to obtain data on waste from each meal for all food scraps and half eaten foods are carefully disposed of since these are the materials with which it is possible for an enemy to work sorcery. It is also possible that total production has been over estimated for only yams actually harvested were weighed. The year 1962 when weighings were done may have also been a very good year.

1. Surpluses are reported elsewhere in New Guinea. The Bureau of Statistics (1963:15) estimates that throughout New Guinea 11 pounds of food are produced per person per day. This is obviously more than a person could eat. Hogbin (1951:69) estimated that in Busama village, about 15 miles south of Lae, there was an apparent surplus of 12 tons a month, and that then 'everyone persisted in regarding the gardens as too small.' Brookfield (personal communication) reports that yield and acreage measurement in Chimbu suggest that at least 10 pounds of sweet potatoes are available per head of the population per day for human consumption alone.
Qualitatively I have already indicated that a large pig population in a village can indicate the existence of a regular food surplus (see pp. 125-26). This will be further developed in this chapter to show that an active ceremonial life also exists when food surpluses are available. Because of this it is pertinent to remark that all the payments, distributions and exchanges described in this chapter were seen in Yenigo. Except for the bride exchanges already described, no feasts and only a few exchanges were seen in Stapikum. Because the Woseras are unable to indulge in ceremonies, feasts and exchanges, the cultural decline which is described in Chapter 8 may well have been brought about, inter alia, by the absence of a sufficient surplus. This chapter is intended to show the patterns of food consumption and also the incentives for producing surpluses which can be used in payments, distributions and exchanges. Neither production nor consumption can be discussed without reference to the culture as a whole.

CONSUMPTION

The uncooked and unprepared whole product (including waste) ultimately consumed each day by selected families was weighed for short periods between March and August 1962. Households in which weighings were carried out were selected from among simple families with only one child living near the field worker's house, where the husband was not growing large wabi and where the wife was neither pregnant nor lactating so that various taboos, particularly on meat eating, did not apply to them. The main purpose of these weighings was to get some idea of the diet patterns in both villages but I also wished to check that a complete coverage was being made of all sources of food. Only one attempt was made to assess the calorie and protein intake of the people in Stapikum. This experiment was not repeated because it was too cumbersome; each individual

1. It is unfortunate that these taboos are observed at the times when animal protein is most needed. The yam growing period, when men observe taboos on meat, coincides with the 'lean period' when the diet is low in proteins, and of course pregnant and lactating women need the protein. Numerous other taboos at childbirth, girls' puberty, initiations, marriage and death are also observed (see Kaberry 1941: 364-5) but they are only observed for comparatively short periods.
member of the family selected had to be followed throughout the day by a native in my employ, who collected equivalent quantities of food to that eaten and brought it to me to be weighed and I had to supervise all weighings. All other weighings were done, at least in part, by natives whom I trained to read a scale. The weighing methods were crude and I was never sure how many people were eating the food weighed.¹

The main problem in collecting these data was that some of the food eaten each day is eaten away from the village; also food is commonly shared with visitors, kinsmen and friends. Although the family eats most of the food produced it is rare for the single family without accretions or depletions to sit around a common 'table' and have a meal that has been prepared solely by the women of the household. The main meal of the day, often a thick soup, is the evening meal prepared by the women in the late afternoon; leftovers from this meal are usually eaten as a quick snack in the morning. Except for Mondays and Tuesdays which are the days given to government and council work, the villages are practically deserted. All but the old and sick are in the gardens, working sago or visiting other villages. Around midday the women prepare a small meal wherever work is being done. This meal usually consists of baked, boiled or steamed² yams, taros or sweet potatoes. Often in the course of a day both men and women have snacks of coconuts, paw-paws, sugar cane or sweet bananas or have some breadfruit, S. edule or bananas which can be quickly cooked over an open fire. Some of these garden meals and incidental snacks were missed in the weighings although estimations were attempted by asking the natives what food was eaten away from the hamlets during the day and weighing equivalent amounts.

¹ When all the weighings were finished, one of my native assistants proudly boasted that he was always given some of the food weighed.

² Steamed foods are cooked in stone ovens which are described in Oomen and Malcolm (1958:27-8) and Barrau (1956a:400),
Diet Patterns

The Abelam have three main categories of food; the starchy staple foods such as yams, taros, bananas and sago which are collectively known as kandumu; greens of all descriptions which are called kidendjo; and meat which is called kwami (Kaberry 1947:353). Figure 16 which shows the percentage contribution of calorie and protein in the diet of both Yenigo and Stapikum during March and August shows eight classes of food. The classes are as follows:

<table>
<thead>
<tr>
<th>Class</th>
<th>Notes</th>
<th>Native Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>yam</td>
<td>ka, wabi and lipma.</td>
<td>kandumu</td>
</tr>
<tr>
<td>taro</td>
<td>Colasasia esculenta and Xanthosoma sp.</td>
<td>kandumu</td>
</tr>
<tr>
<td>sago</td>
<td>Both bananas that need cooking and those which can be eaten fresh.</td>
<td>kandumu</td>
</tr>
<tr>
<td>bananas</td>
<td>Mainly leaves from the Gnetum gnemon but also all other leaves from trees and green vegetables.</td>
<td>kidendjo</td>
</tr>
<tr>
<td>greens</td>
<td>Mainly tinned meat and tinned fish but also a little pig meat, and an occasional bird or fresh fish.</td>
<td>kwami</td>
</tr>
<tr>
<td>meat</td>
<td>Sweet potato is not a traditional food but is becoming increasingly important in the diet.</td>
<td></td>
</tr>
<tr>
<td>sweet potato</td>
<td>Includes fruits and nuts (e.g. paw-paw and coconuts), S. edule, all trade store foods excluding tinned meats and fish and all other foods not mentioned above.</td>
<td></td>
</tr>
</tbody>
</table>

The months of March and August are selected for detailed study because they are in the 'lean period' and 'time of plenty' respectively. Actual weighings were only made in Stapikum between June and August 1962 and the diagram showing percentage contribution of calorie and protein in the diet of both Yenigo and Stapikum during March and August shows eight classes of food. The classes are as follows:

1. This is not an unusual classification of food. See Barrau (1958a:35) and Malinowski (1935:31).
and protein for Stapikum is an estimate based on information received from Miss J. Whiteman, a nutritionist working in Serakum village between November 1961 and July 1962, and from my own observations and questions. Study of Figure 16 shows that the diet consists almost entirely of vegetable products, and in Stapikum no animal protein at all was included in the weighings. Oomen and Malcolm (1958:134) advocate an approximate daily per capita intake of 1,500 calories and 25-30 grams of protein. The only assessment of calorie and protein intake made in Stapikum was made in June which was in the transitional period between the 'lean period' and 'time of plenty'. Daily intake by adults was 1,493 calories and only 15 grams of protein. The amount of food consumed per person was always heavier in Yenigo than in Stapikum so Yenigo intakes would probably be well above the intakes recommended by Oomen and Malcolm. Figure 16 also shows how the pattern of food consumption changes between a yam eating period, around August, and a sago eating period, around March. This contrast between consumption in March and August is more marked in Stapikum than in Yenigo. There is more variety in the Yenigo diet and a larger quantity of meat, predominantly tinned meat, consumed there. It is very significant that in Yenigo more foods are being bought from the trade stores and that these foods and sweet potato are to some extent replacing sago in the diet especially during the 'lean period'.

Dr. K. V. Bailey of PHD (Medical Research) made examinations of the adults in both Yenigo and Stapikum in August 1962 and found that the adults of Stapikum were

1. Occasionally pig meat is eaten and birds and bandicoots are often caught by ingenious traps. Some dried fish is occasionally traded north from the Sepik River in exchange for sago or clay saucepans.

2. During the lean period calorie intake would probably be higher and protein intake lower because large quantities of sago are eaten. Sago is almost pure starch and has about 1,500 calories per pound and virtually no protein (McKee 1957:3).

3. The quality of trade store food should be carefully watched. McKee (1957:15) writes that in Rabaul 'some experienced observers consider that the standard of nutrition of the people has gone down as their income has increased.'

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yen.</td>
<td>Ø</td>
</tr>
<tr>
<td>Numbers examined</td>
<td>69</td>
<td>39</td>
</tr>
<tr>
<td>Height in cm.</td>
<td>156.2</td>
<td>155.7</td>
</tr>
<tr>
<td>Weight in kg.</td>
<td>54.5</td>
<td>51.6</td>
</tr>
<tr>
<td>Weight/Height Ratio cm/kg.</td>
<td>0.35 *</td>
<td>0.33</td>
</tr>
<tr>
<td>Subcutaneous fat in mm.†</td>
<td>4.7 **</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Ø Middle columns indicate significance of differences between the people of Yenigo and Stapikum. * significant at 1.0% level (P < 0.01)
** significant at 0.1% level (P < 0.001)
† Subcutaneous fat is the thickness of a double layer of subcutaneous fat and overlying skin measured with Harpenden calipers.

significantly lighter and had considerably less body fat than the adults of Yenigo. Among two groups of people of the same culture group, separated by only twelve miles, diet seems indicated as the main cause of this difference although patterns of mortality, marriage, absenteeism or migration, or some genetic factor may also affect it. The same people were also weighed again in December 1962 and June 1963, and the three weighings showed that there were significant weight fluctuations throughout the year in Stapikum in both males and females. Differences in weight were not significant in Yenigo males but Yenigo women showed a seasonal weight fluctuation that was significant but not as marked as that of the Stapikum females.

1. The average weight of adult males and females dropped by nearly two pounds between December 1962 and June 1963 (information based on figures received from MacLennan).
DISTRIBUTION OF FOOD

Most evening meals are eaten near the family hearth but if a husband is talking in a nearby hamlet, his wife will take a bowl of soup or some cooked yams or taro over to him and he will then share it with the men who are with him. It is quite common to see men grouped around a bowl of soup or over a banana leaf which serves as a plate for other food. Sharing of food is inculcated from an early age and any friend is invited to partake if he happens to be around when food is being eaten. A man will always eat at a hearth other than his own, usually that of his mother or his sister, when his wife is menstruating or giving birth, or even after an argument with his wife.

In this section I will only describe how food is a part payment for services and how food is essential to the ceremonial and ritual life of the people.

Payment for Services

Food can form the basis for part payment for work and services. It had already been mentioned how a woman is given some sago flour after she has helped one of her kindred with the work of extraction (p. 122) and how when a whole garden or a large part of a garden is planted at the same time all the helpers are given food (p. 94). The only other occasions observed when this type of food payment was made was during and after the construction of ordinary village houses and the tambaran houses. The individual and his immediate family do not provide all the food given to the helpers: close kindred and others from his hamlet are expected to provide food and to help cook it. Help for the tasks of garden planting and house building is given on a reciprocal basis although many of the helpers are kindred, some often coming from neighbouring villages. It must be emphasised that any payment of food or services is never complete: 'immediate equivalence is never obtained for there is a chain of rights and obligations extending through the whole life of the individual' (Kaberry 1941-2: 86).

It is not unusual for the Abelam to become destructive after an argument. I have seen four nearly mature ka destroyed in a garden after the block user had had a dispute with his wife. According to informants a wife may destroy her cooking pots in similar circumstances.
Food Distribution at House Building

The future owner of a house levels the site on his own and builds the timber frame of the house with one or possibly two helpers. However, for thatching he assembles fifteen to twenty-five helpers who thatch the house by well-known methods, without any direction from a leader. Around midday the wife of the house owner and her helpers give the men a simple meal of steamed or baked yams, cooked bananas or taros. When the work is finished in the afternoon, the women provide a final meal of the highly esteemed white yam soup. Housebuilding is done on a reciprocal basis and any food given is only part payment.

When a tambarán house is built, payments in food are somewhat similar although the amount of food given is greater and payment is made with greater ceremony. Surrounding villages, mainly allies but a few enemies, send some form of help. Some villages send skilled artists, others building timbers and some groups of labourers who help with big tasks such as the thatching. When the work is going on or when the delivery of building materials is made, all visitors are given soup and large quantities of cooked yams; sometimes portions of uncooked pig meat are given to the visitors to take home. When the tambarán house is finished there is a large ceremonial distribution. In Yenigo in September 1962 a tambarán house was completed on the amei of hamlet XIV of kwendji. The following is my description of the final distribution (see Plate 28):

Placed in a line across the middle of the amei were 35 bowls of white yam soup each containing about twelve pints of soup. Accompanying each bowl and placed in a leaf sheath of the 'limbom' palm, was approximately 40 pounds of yam (some large wabi were cut up but it was mainly ka), two coconuts, some native tobacco, some betel nut, some leaves and inflorescences of the Piper betle and an uncooked piece of pig meat - in all 35 lots of food. Most of the food was provided by men of kwendji but men from kumundji and from other parts of the village group of Korkum helped. Malba provided three lots of food and Naramco five. All 35 lots of food were given to men from various

1. For details of the techniques of housebuilding see Kaberry (1941-2:84).
hamlets from Suambukum (north west of Sagisik), Yangisagu, Kombikum, Ulupu, Waiknakum, Malba and Naramco. It seemed that food was given to each hamlet that helped. The cooked food was immediately consumed and the other produce was divided among the helpers from the various hamlets.

These distributions need considerable preparation, foresight and planning. This particular distribution alone required almost one ton of yams. This and other distributions associated with the building of two tambaran houses in Yenigo in 1962 may well have been the reason for the planting of more land with ka in 1961 than in 1962 (see Table 18).

Initiations and other Feasts

Unfortunately no initiations took place in Yenigo while I was in the field and the material in this section has been gathered from informants, observations in other villages, from Forge who witnessed part of these ceremonies among the Eastern Abelan in 1958-59 and from a short article by Neve (1960).

During the initiations the young male initiates are segregated from the rest of the village in an enclosure near the tambaran house. One ara of the village acts as initiators for the other ara and feeds the initiates with white yam soup, all other foods are taboo. The soup is eaten out of half coconut shells that are only used once. When all the soup is eaten the plates are put to one side and are later threaded on a cane rope and hung in a prominent place before the tambaran house. It is the aim of the initiators to make the initiates as fat as possible and to be able to boast of the large quantities of food consumed. The initiating ara receive a presentation of pigs from the other ara after the initiations have taken place. Each ara takes it in turn to act as initiators.

Rather ambivalently the women are told that the initiates have eaten nothing but what they were able to find in the bush (Neve 1960:123).
Apart from the initiates visitors are often fed and there are a number of associated feasts. The initiations require such vast quantities of food and wealth to buy pigs that a gap of several years is necessary before any further ceremonies can be undertaken. Forge (Personal Communication) estimates that the minimum time for each full initiation cycle is about ten years and he thinks that it may even be longer. The feasts bolster the prestige of a village and may establish or reinforce ties between groups and individuals and will make individuals clearly state their allegiance to certain groups. The timing of each individual ceremony is not fixed by any astronomical, ceremonial or ritual calendar but they are always held after the yam harvest and usually at a full moon. Like hostile exchanges, feasts connected with building tambaran houses and even marriage payments, initiation feasts can be delayed until surplus of food can be built up. Other smaller feasts such as death distributions, girls' puberty and feasts and exchanges connected with birth and the yam harvests, must be held when the events take place.

1. Divination of yam soup eaten at death payments is practiced among the Eastern Abelam to determine the cause of death.
EXCHANGE

The distinction between distributions and exchanges has been somewhat arbitrarily made for both require equivalence and reciprocity in some form. Exchanges as discussed in this thesis can be defined as events at which careful tallies are kept, and where the stated object is that equivalence with the object exchanged should be obtained as soon as possible. However, 'exchanges' are also the occasion of 'distributions'. The essentials of the exchange relationships have already been discussed in Chapter 4 and the following description of the wabi exchange shows the mechanics of the most frequent and the most important of the exchanges.

The Wabi Exchange

The preparations for a yam exchange and all the associated ceremonies take about a week. The men carefully decorate the tubers (see Plate 22) and both the men and the women collect food, firewood, betel nut and leaves of the pepper vine; new skins have to be put on some of the drums and there is general excitement. During the night before the yams are paraded, there is dancing and singing lasting until dawn. Just after dawn all the big wabi are carried on their poles into the centre of the amei and are put in lines under shelters made of coconut fronds. The wabi are extensively decorated with both basketry and wooden masks, shell rings, feathers, leaves, berries and many ceremonial trappings; some of them are made to look remarkably like human figures.

During the day the yams are admired, compared and criticised by men from the home village and from other villages. There is a lot of formal talk where a man, shaking spears in an aggressive fashion, struts to and fro across the amei and chants his speech. Most of the men parading yams and a few of the visitors also do this and the chants are mainly bombastically abusive or self-congratulatory. Some chants are about the nggwalndu, the ancestors and their yam growing activities; some are merely admonitory and exhortative and directed at the young men to encourage them to take up yam growing and to stop being so interested in women. A visitor often congratulates the village publicly but makes maledictory comments around the amei. It was interesting to note that during a yam display on the
amei of hamlet XIV of kwiendji, the Naramco men, who were having a hostile exchange with some men in kwiendji, came and had a cursory look at the Yenigo yams. They went back to their village saying that the yams were 'insignificant'. The Yenigo men said that the Naramco men were 'afraid' of the yams and were ashamed because they were not able to grow similar ones. There seemed to be more justification in the latter claim as the biggest Yenigo yam was at least a foot longer than the longest Naramco yam.

During the day the yams are displayed and the visitors fed. The decorated yams remain on the amei overnight and the men sit up talking and watching over them. The following morning the exchanges take place and all the yams displayed are given to the tshambera, the ceremonial exchange partner in the opposite ara, who may later give the yam to one of his kindred or use it later himself for food, planting or in some hostile exchange. After the exchange the decorations are removed and returned to the original owners and the yams are taken to the yam house of the new owner, stored in a tambaran house or hung in the rafters of one of the 'talking houses' which contain the slit gongs.

The day after the exchanges are made, some of the men from both aras in the village set out and buy pigs from other villages. In a Yenigo exchange there were 12 pigs exchanged and only three of these came from the village. Large pigs are carried to the village lashed onto stretchers carried by four men (see Plate 27); smaller pigs have their ankles lashed to a single pole which is carried by only two men. When all the pigs are assembled in the village, three or four days after the yam exchange, they are each lashed onto a single pole and placed alive over a fire which burns the hair off the pig but does not always kill it. The pigs are then cut up and all the portions of raw meat are given to tshambera. Groups of men from one ara give the pig to their tshambera in the opposite ara who may give small portions to visitors from other villages. These gifts are either reciprocating a similar gift already made or creating an obligation which will ensure equal hospitality in later exchanges in other villages. The final exchange associated with the wabi exchange is when each ara prepares and gives yam soup to the members of the other ara.

1. In Yenigo in one exchange 46 bowls of soup (about 60 gallons) changed hands.
Plate 27 - A hostile exchange.

All the yams which can be seen on the amei and the two pigs, which were given before this picture was taken, was a return and equivalent exchange. The pig (foreground) being given by Yenigo to Naramco, is a very large pig and is a hostile action for it means that the exchange must go on.

Naramco men on the left of the picture are threatening the Yenigo men with spears in their anger.

The tallies of the Naramco exchange can be seen to the left of the picture behind the pig.

Plate 28 - Gifts of food ready to be made to those who helped build a tambaran house.

These are bowls of soup covered with banana leaves, yams, rolls of tobacco leaves, betel nuts and coconuts. Pepper vine leaves and inflorescences are obscured and parcels of pig meat have not yet been placed with the other food.
At this time some ka are also exchanged and each ara presents a large conical heap of ka to the other ara. All these exchanges associated with the original wabi exchange may last for about a fortnight and nearly every night of that fortnight there is dancing and singing throughout the night.

Hostile exchanges of all types (pp. 59-61) are basically institutionalized forms of hostility but they may also be deliberately instigated or continued as a means whereby a village may dispose of some of its surplus food and, in so doing, acquire prestige at the same time. Exchanges vary greatly throughout the Abelam. In the Wosera and to the south of Yenigo the bulk of the ceremonial exchanges are with large ka, particularly the asagwa subspecies, but the general principles of rivalry and ultimate equivalence still apply. In Stapikum in 1962 and 1963 only three men were growing wabi in the ka gardens; there were no wabi gardens or tambaran houses. Generally ceremonial activity is at a very low ebb throughout the whole Wosera. During my time in the Wosera I saw or heard of only a few poor yam exchanges, girls' puberty and marriage celebrations.

Conclusion

Three rather diverse conclusions emerge from this brief chapter. Firstly, food is not only produced as a means of subsistence, for it also serves as a form of payment, a means of exchange and a way of acquiring prestige and of creating and meeting obligations. It also has its social and aesthetic value, for the Abelam are hospitable people and 'take a keen delight in contemplating large quantities of food' (Kaberry 1941: 35). Secondly, a regular supply of food is the only means of acquiring security against want, and to make sure he has this security the native will aim to produce more than he actually wants for subsistence and all the other purposes mentioned above. Much of this surplus is given to pigs which are a means whereby surplus food can be converted into wealth or a meat reserve. Finally, the diet and the physique of the people of Stapikum are much poorer than that of the people of Yenigo. Subjectively there seem to be real shortages of food but on the flimsy quantitative evidence available there seems to be a little surplus available. If this surplus does exist, however, it appears that it is inadequate to support many pigs or to allow for the numerous ceremonial feasts which are part of the Abelam culture. Also during bad seasons or high floods this small surplus would not exist and under-nutrition as well as malnutrition would result.
Chapter 8

THE WOSERA

Throughout this thesis it has been shown repeatedly that the Wosera compares unfavourably in many ways with other regions occupied by the Abelam. The comparisons in previous chapters were made in order to add depth to the study by moving out of a single village environment; to make the thesis more synoptic and regional in character and to illustrate regional diversity within the Abelam area. In this chapter attention is focussed specifically on the Wosera. As very few data are available regionally, the only feasible approach was to make a detailed study of one village in the Wosera and to compare this with Yenigo. The Wosera village chosen was Stapikum. The first section of this chapter is a comparison between Yenigo and Stapikum; it is basically factual and describes the situation as it exists in the two villages and their surrounding areas today. As far as possible some of the factors reflecting or causing stresses are isolated and discussed under different headings.

In this section I am consciously assuming that Yenigo may be treated as a 'normal' village. Normality is very difficult to define. For the present purpose I am taking the word to apply to a village where there is alleged to be plenty of land, where society functions fairly smoothly, both from the traditional native and the Administration points of view, and where there are no excessive strains created by contacts of cultures; a 'normal' village has neither mal- nor under-nutrition and, if present trends continue, its society looks as though it will continue to function 'normally' for at least a few years.

1. Much of this chapter, especially the latter half, crystallized as a result of discussions in the field and subsequent correspondence with Forge. We have jointly drafted a paper on the Wosera and it is difficult to say exactly what contributions are wholly my own. All quantitative data, unless otherwise acknowledged, I collected myself. Where reference is made to the Wosera in this chapter, the term only applies to the North Wosera CSD. Problems of the South Wosera CSD are somewhat similar but trade with the Sepik River people supplements the diet, and there is a more plentiful supply of sago. To some extent these features compensate for land shortage.
Yenigo has problems, mainly social, which are also those of any village in New Guinea or of any group of people in contact with another culture whose emissaries are trying to change the indigenous way of life. On the whole these problems will be taken as constants so that they will not obscure the value of this comparison which will show that the people of Stapikum appear to be, and also feel themselves to be, under many stresses which do not appear to exist, nor are felt to exist, by the natives in Yenigo.

In the second section of this chapter I shall look at the Wosera in more general and qualitative terms. I shall attempt to seek the factors that have given rise to widespread social stresses, to describe the genre de vie, and to look briefly at the future of the Wosera and problems associated with it. The general observations made throughout the Wosera show that the detailed studies in Stapikum do reflect the general position of the region, although stresses there are more serious than in most other Wosera villages.

A COMPARISON OF YENIGO AND STAPIKUM

Undue repetition of factual data will be avoided as far as possible and page references will be made to any detailed discussions that precede this chapter. Some comparisons will be omitted altogether if they have no relevance to the theme of this chapter.

A Comparison of Environments

Stapikum is only twelve miles from Yenigo and is, broadly speaking, in a similar environment, though seasonality of rainfall is slightly more marked (see Figure 5) and the topography is a little lower and slightly more undulating: the main difference probably lies in the soils. No chemical analysis of soils or deep boring was possible, but the Stapikum soils are poorer by native classification (p.22) and seemed to be devoid of the fairly friable top soil often apparent in Yenigo. In general Stapikum soils are shallower and more poorly drained often making ditching necessary (p.98). The parent material in Stapikum is a hard sandstone, some of which is excellent for sharpening steel knives, and is visible on most of the ridges in that immediate area; in Yenigo and throughout the North Abelam, the parent material is mudstone or siltstone, and both are inherently richer than sandstone in plant nutrients.
The main difference in the physiognomy of the two villages lies in the plant cover, which, in Stapikum consists of low trees and grasses, and in Yenigo consists chiefly of well developed fallow trees, except for grasses which grow in newly abandoned gardens and along paths and roads (see pp. 28, 30). Yenigo has no river terraces that are used intensively, but Stapikum, like many other Wosera villages, does have access to productive terraces as its western boundary is the Nanu River. There are only 35 acres of fertile cultivable ground on the narrow and discontinuous terraces of this section of the river, but some other Wosera villages have access to much wider floodplain terraces on the Screw and Amuk Rivers (see Figure 4 and Plates 7, 33 & 34). Severe flooding of the lower terraces may occur every year but floods which inundate the higher terraces and cause extensive damage to the crops on the lower terraces, usually occur about once every eight years. These floods result in extreme shortage of food for those families which have most of their gardens on flooded land. After flooding, water is bailed from inspection holes dug beside many plants, and many of the leaves are individually cleaned when dry. Many plants become buried under deposits of silt and have to be excavated.

The garden land on the high terraces has a very short fallow of only three or four years. The lowest terraces which are often flooded and not used for gardens are planted with perennial tree crops such as bananas and 'tulip' trees.

Small localized floodplains and river terraces do occur outside the Wosera for example along the Parchee and Kalauri Rivers (see Figure 4), which are smaller than the three Wosera rivers and have narrower valleys and severe flash floods.

1. In 1961 and 1962 only eight whole gardens and part of two others were on the floodplain terraces (see Figure 18). These gardens almost exclusively contained varieties of asagwa which appears to be able to survive short inundations better than any other variety of ka. Because Stapikum had comparatively little floodplain land, many asagwa gardens were on hill slopes.

2. Forge (personal communication) reports that the natives in Kwanabandu washed each leaf of some yam plants after they had been covered with mud during a flood.
floodings are more frequent (p.20). In 1962, all but the highest river terraces along the Parchee River were covered three times by fast moving water. There are about 16 acres of Yenigo land on the floodplain terraces of the Parchee River (see Figure 17) but none of it was used for growing crops while I was in the village. Peanuts and rice had apparently been grown on this land before, but flooding was alleged to have caused some damage. Informants said that ka gardens had been made on the land before, but the risk of flooding and the difficulty of weeding coarse grasses, particularly S. spontaneum and Imperata, made it an unrewarding task. The highest alluvial terraces were sometimes used for gardens in Naramco, but they were only narrow strips and simply made up the lower parts of gardens on the hill slopes.

A Comparison of Populations

The Wosera is without doubt the densest lowland rural population on the mainland of New Guinea (cf. Brookfield 1960:235). The North Wosera CSD has a population according to the 1962 census returns, of 11,662; the area owned by the 43 censused village segments, or groups of village segments, is approximately 60 square miles of which about seven square miles consist of the virtually unusable Themeda-Ishaelmum grasslands.1 If the grasslands are excluded the overall population density within the Wosera is 220 people per square mile. Land however is not evenly distributed. Some villages, for example Umunoko which acquired territory as a result of fighting immediately before 1937, are sparsely occupied, while much higher densities are found in other areas, for example, the villages near the Nana River in the Central Wosera. Stapikum and Serakum which belong to this group, have a total population of 832 (1962) and own only 2.24 square miles of land, of which 0.24 square miles is under short grassland.2 Stapikum and Serakum thus have a

1. Several gardens were seen in the short grasslands but they were very rare. These gardens always appeared to be overgrown with weeds (see Plate 30) and the natives said that many plants died and that yields were not good.

2. Near a well called 'kanaul', Umunoko and Serakum share a common boundary which is almost a straight line. On the Serakum side of this line the fallow is mainly grass with a few low trees; on the Umunoko side there is tall timber which has obviously not been cut for about 25 years (Plate 35).
population density of over 400 people per square mile which compares very unfavourably with Yenigo where 234 people live in just under two square miles. Generally throughout the North Abelam region population densities vary from 80 to 180 people per square mile. Within the Wosera the population density is exceptionally high for the type of horticulture used, especially considering that the diet is poor and that there is very little cash cropping in the area and few other ways of earning cash.

Formerly warfare and expansion of frontiers by migration of groups to the west was the only means whereby the Woseras could cope with over-population (p.42); now the only means that might ease the demographic situation in the Wosera is migration. Emigration from the Wosera at the present time mainly takes the form of desertion by workers under agreement at Rabaul and other centres. There is no way of estimating how important this is, but every village has many men who have not been heard of for many years. In view of the fact that the majority of private employers in the Territory will not accept Woseras for labour now because they have a reputation for thieving and deserting, it seems likely that a substantial proportion of the 511 men listed as being 'at work outside the district' in the North Wosera census returns for 1962 would be deserters (cf. p.53. There is little desertion in other regions).

Intervillage migration is more marked in the Wosera than elsewhere among the Abelam and this is one of the few factors which lead towards a more even distribution of population. Emigration of males from Stapikum has already been mentioned (p.66). In this village there is also considerable emigration of females, caused according to many of the older men, by greedy men marrying their daughters to men in other villages in order to obtain high bride prices.

1. The population densities within the Wosera are comparable with some areas occupied by the Ibos and Yorubas of Southern Nigeria and the Lugbaras of Uganda where population densities are regarded as being too high in spite of better opportunities of earning cash (see Grove 1951, Morgan 1959a:144, Gourou 1959:86-90, Nye and Greenland 1960:132-33, Middleton and Greenland 1954:455).
If the wife migrates when she is married, the bride price is nearly always about 24 shell rings but if she remains in her own village the bride price may be as low as 12 rings. Many of the young men in the village complained that they could not marry because they were unable to obtain the necessary bride price to marry a girl from another village and there were few marriageable girls in their own village; further, even if they could raise the bride price, they wondered what girl would want to live in Stapikum. This shows very little pride in their own village and there may be some justification for their cynicism. Two newly married girls in 1962 were both cross-eyed; perhaps they could not get a husband in any other village. This means of acquiring wealth by exporting young girls as brides leads to great disparity in the sexes. In Stapikum there were only 69 females but 83 males in spite of a high rate of migration by the males.

I have already mentioned the high rate of annual increase in population throughout the Sub-district in spite of high child and maternal mortality rates (p.39). In the Wosera the overall rate of increase is 3.11 per cent but in parts it is as high as 4.04 per cent. In the villages of Stapikum, Serakum, Numamaka, Bapandu, Gulakim, Kwatmagum and Jambitanga the rate of increase is 3.61 per cent. Assuming that the rate of increase does not change, the population of the Wosera will be almost doubled within twenty years. With improving medical facilities, the breakdown of taboos and other factors (cf. pp.40-41) it seems probable that the rate will in fact rise.2

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1. These figures were obtained from Brewer as part of an intensive survey being made of the yields and populations within the Chimbu, Wabag and Maprik areas by the Bureau of Statistics (PNG) in co-operation with DASF and Dept. Census and Statistics, Canberra.

2. Moral restraint, war, starvation, pestilence and birth control must be eliminated as far as planning is concerned and the only practical method for decreasing population in the Wosera area seems to be by resettlement or large scale migration. When I left the field in July 1963 the Administration was considering buying some land in the Gawanga CSD and making it available to the Woseras, but the reaction of the Gawanga people is as yet unknown.
A Summary of Some Horticultural Comparisons

Access to land has been discussed in Chapter 5 and many comparisons in techniques, methods and yields have been made in Chapter 6. The main points which emerge from these two chapters are that the people of Stapikum are not as willing to lend land outside the sub-clan as are the people of Yenigo (p.72), and that in Stapikum yields of ka are generally lower (pp.104-107), the fallow period is shorter (p.108) and less land is cultivated per person per annum (p.77) than in Yenigo. On the whole the gardens of Stapikum are more untidy and poorly weeded compared with other Abelam gardens and the fences are feeble and often non-existent. The people of Stapikum say that they train the few pigs they have (p.126) not to enter the gardens, but any control achieved seems to be obtained by watching the gardens, sleeping in the garden houses at night and digging a few pig traps around the edges of the gardens (p.98). Such methods are not as effective as good fencing and many gardens plants were seen rooted up by pigs.

In contrast with Yenigo where the cultivation of the large ceremonial wabi is so important, the natives of Stapikum and many other Wosera villages, show little interest in the cultivation of large wabi and there are few or no special wabi gardens (pp.96 & 700). Traditional taboos are not carefully observed and much less care is taken with their cultivation. Although wabi are 'lined', the Woseras 'line' fewer and they are generally much smaller than the ones grown in the North Abelam region. To a large extent asagwa ka replaces wabi as the ceremonial crop.

Few crops have been successfully introduced into the Wosera. No peanuts were seen at all in Stapikum and sweet potatoes, beans, introduced cabbages and sweet bananas all seemed to be rather rare. In contrast coffee plantings

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1. cp. Pelzer (1945:14), 'The higher the density (of population), the greater the care bestowed upon the cultivation of the soil.'

2. One exceptionally long wabi in Stapikum was 7 feet 6 inches long but it was very thin and I estimated that it weighed just under 75 pounds.
Plate 29 - A typical Stapikum Garden without a fence.

The general low state of the fallow and the ubiquitous *Imperata* grass are evident.

Plate 30 - A garden in the short grasslands in the Wosera.

This was one of the few gardens seen in the short grasslands. It was overrun by weeds and the crops were in poor condition.
are greater in the Wosera than anywhere else in the Sub-district (cf, Table 23). Many Woseras seem to think that coffee, and the income derived from it, offers the only means by which they can establish themselves in village society because traditional values are not highly regarded.

Although it is impossible without extensive trials over a long period to state categorically that the soils are rapidly deteriorating in the Wosera, all available evidence seems to point in this direction. Figure 18 shows large gaps in the middle of Stapikum village where no gardens were planted in either 1961 or 1962; these areas were mainly under tall grasses such as Imperata, Polytoca and Saccharum spontaneum. I was repeatedly told by informants that this land was now no good for gardens, although it had been cultivated by their forebearers. Soils may have been inherently poorer in the Wosera but if the fallow keeps getting shorter with increasing population the garden habitat will also become progressively poorer. It may even follow the pattern of what, in Robbins view (pp. 29, 41), occurred on the Middle Sepik Plains: the garden habitat may actually be destroyed.

This discussion may be summed up by presenting, without further comment, some statistical comparisons between the two villages (Table 26). However it is obvious that stresses other than ecological ones are operating in the area.
TABLE 26 - Some Statistical Comparisons between Yenigo and Stapikum.

<table>
<thead>
<tr>
<th></th>
<th>Yenigo</th>
<th>Stapikum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population - Males</td>
<td>117</td>
<td>83</td>
</tr>
<tr>
<td>Females</td>
<td>117</td>
<td>69</td>
</tr>
<tr>
<td>Total</td>
<td>234</td>
<td>152</td>
</tr>
<tr>
<td>Males per 100 females</td>
<td>100</td>
<td>120.3</td>
</tr>
<tr>
<td>Population growth by regions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(North Abelam and Wosera)⁺</td>
<td>2.58</td>
<td>3.11</td>
</tr>
<tr>
<td>Total Village Area (in acres)</td>
<td>1,158</td>
<td>349</td>
</tr>
<tr>
<td>Crude population density</td>
<td>129</td>
<td>275</td>
</tr>
<tr>
<td>Area of village land per person (in acres)</td>
<td>4.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Cultivable land per person (in acres)</td>
<td>3.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Area under coffee or shade trees (in acres)</td>
<td>8.6</td>
<td>5.3</td>
</tr>
<tr>
<td>Percentage of village land under coffee or shade trees</td>
<td>0.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Total cultivated area in 1961 (in acres)</td>
<td>40.13</td>
<td>17.08</td>
</tr>
<tr>
<td>Total cultivated area in 1962 (in acres)</td>
<td>32.22</td>
<td>16.89</td>
</tr>
<tr>
<td>Area cultivated per person per year 1961 (in acres)</td>
<td>0.17</td>
<td>0.11</td>
</tr>
<tr>
<td>Area cultivated per person per year 1962 (in acres)</td>
<td>0.14</td>
<td>0.11</td>
</tr>
<tr>
<td>Average size of ka garden (in acres)</td>
<td>0.69</td>
<td>0.41</td>
</tr>
<tr>
<td>Estimate yield of ka (tons per acre)</td>
<td>8.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Ka produced per person per day (pounds)</td>
<td>7.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Average length of fallow (in years)</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Total number of pigs and piglets 1961 1962</td>
<td>109</td>
<td>5</td>
</tr>
<tr>
<td>Percentage adult males at work</td>
<td>27</td>
<td>15*</td>
</tr>
<tr>
<td>Average weight of adult males (in pounds)</td>
<td>120</td>
<td>114</td>
</tr>
</tbody>
</table>

* Source: Bureau of Statistics, Papua. Only the Maprik, Mamblep and Wora CSDs were included in the North Abelam region and the North Wosera CSD, with Apambi village of the South Wosera CSD, were included in the Wosera region.

* Very few of these men were at work outside the Sub-district.
The Wosera before European Contact

The Wosera was densely populated before European contact and the inhabitants felt acute land shortage well before 1937. This led to the expansion of Wosera territory as land hungry villages, or remnants of partially exterminated villages, moved out into new regions, routing and exterminating the original inhabitants (pp. 42, 45). Mainly they went into the sparsely populated areas to the west, but also they expanded their northern frontier, pushing back the Arapesh who were comparatively well off for land. There was heavy and frequent fighting throughout Wosera territory particularly on the frontiers and each village was actively concerned with protecting what it had, and increasing its holdings at the expense of its neighbours. All the Abelam were prone to fight, but there was a remarkable difference between the fighting of the Woseras and the rest of the Abelam. The intensity of the fighting itself and the high casualty rate were features of the Wosera fights and the casualties involved were probably sufficient to reduce the rate of increase of the population. The result of fighting was a continual change of land boundaries and even village sites; land would change hands many times in a single lifetime and the boundaries between village groups were quite fluid. Amongst the North Abelam on the other hand, sorcery accusations were the main cause of fighting and, in the years before 1937, the village boundaries even in the frontier areas seem to have been fairly stable.

Land Disputes

The imposition of control by the Administration in 1937 called a halt to expansion and fighting, and although both were resumed during the period from the end of the war to the effective re-imposition of control in 1948, any changes that were made to the boundaries of villages were reversed after 1948 to uphold pre-war decisions.

1. There is good evidence that over 50 men were killed in one fight between Serakum and Jambitanga. Among the North Abelam fights usually stopped after one or two men had been killed.

2. This was made difficult because all records were destroyed during the war. Many villages disagreed on what decisions were made before the war.
With regard to land boundaries, the policy of the Administration as manifested by its officers patrolling the Wosera, has been to stop all fighting over land, and where disputes arise, to settle them usually by finding out who owned the land in 1937 and marking the boundary with a planted tree or shrub. The decision made by DNA officers is in theory only temporary pending an investigation by the Lands Titles Commission, but any men violating this decision are punished. This policy has worked well in other parts of the Abelam, but is difficult to apply to the Wosera. A creek of sago palms or a piece of land may well have changed hands a dozen times in the preceding generation, and before that may have belonged to some other village segment now miles away. Decisions have often been very arbitrary. Bapandu, for example, which had very little land in 1937, was granted at least three pieces of land that were held by other villages when contact was made. These three pieces of land are all isolated from the present village and are in the midst of land belonging to other villages. Where there has been no apparent agreement on who owns the land, the officer has made the best decision he can, which usually means dividing the land equally between the disputants. This has resulted in many villages making indiscriminate claims, knowing that they will not get all their claim, but hoping that they may at least get half of it.

Decisions made by the Administration have never been accepted by all concerned in the Wosera, and the disputes are brought up again and again in either the same or a different form on subsequent occasions, perhaps in disputes arising initially from adultery, assault or sorcery charges (cf. Brookfield and Brown 1963:137). A case in point would be the land called Marmulmal which is border territory between Stapikum and Bapandu. The Stapikum men press the claim most urgently because they claim that it the only good wabi growing soil in or near the village. Men in both villages said that the land did once belong to Stapikum (some said that it belonged to Moi, an Arapesh village, before then) and that in a fight just before 1937 Bapandu allied itself with Moi and won the land. Some of the sago growing in this area was alleged to have been planted in the period after the war by Stapikum men, a few of whom are

1. Bapandu used to be sited near Tuwaikum but was routed in the early 1930s and moved to its present site which was formerly Moi land.
Plate 31 - Rice gardens on the floodplains of the Amuk River between Tugaikim and Rubugum.

Plate 32 - Gardens on the edge of the Amuk River.

In the left foreground the lower part of a garden was severely damaged and many crops were swamped by deposition of alluvial sands. A considerable part of the garden was lost by the collapse of the banks of the river.
still living. This dispute, however, has never been settled to the satisfaction of the Stapikum men. The 'luluai' claimed to have been imprisoned three times over this one piece of ground and still does not consider that a settlement has been made, especially, he quite rightly points out, as Bapandu has been given ancestral land which it did not use or control in 1937. Despite unsuccessful litigation, the Woseras believe that if they put their case well and often enough they may ultimately get the land they genuinely need. This situation leads to continual uncertainty and worry about land boundaries and has become a main contributory cause of the demoralisation of the Woseras. Land disputes have become an obsession with the Woseras and have dominated their relationships with the Administration to the virtual exclusion of all other matters.

Land disputes have not been solely between village groups and village segments. There have been apparently insoluble disputes between clans and sub-clans within the village segments. Tensions attributable in whole or in part to land shortage have led to extremely hostile relationships between clan and other groups, and have resulted in many clans breaking away and forming new village segments. A comparison of aerial photographs taken in 1939 and 1958 show that there has been considerable dispersion of settlement in recent years. Before contact, warfare and the need for group security led to nucleated settlement; now the visitor to the Wosera who is familiar with other Abelam areas is always impressed by the way in which small hamlets are scattered throughout the village lands, and by the number of new hamlets with only a few very immature coconut and betel nut palms around them. In Stapikum there were four new hamlets isolated from the rest of the village with trees no taller than twelve feet in height. All these hamlets were founded as the result of intravillage disputes.

1. There are now no 'luluais' in the North Wosera since the Council elections early in 1963.

2. This is why many village names have the suffixes -kum, -kim or -gum.
Land disputes do occur in other Abelam areas but their occurrence is comparatively rare. Table 27 below shows the number of disputes heard in the Court of Native Affairs in which people from Wosera speaking areas were involved. The Tamaui CSD, which contains Yenigo village, only contains a few Wosera speakers in the gallery-like forests passing through the grasslands.

### TABLE 27 - Number of Land and Sago Disputes before DNA Courts. June 1960 - October 1962

<table>
<thead>
<tr>
<th></th>
<th>North</th>
<th>South</th>
<th>Tamaui</th>
<th>Rest of Sub-district</th>
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<tr>
<td>Number of Disputes</td>
<td>30</td>
<td>5</td>
<td>5</td>
<td>4</td>
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<tr>
<td>Population 1960-1961</td>
<td>11,192</td>
<td>3,618</td>
<td>5,310*</td>
<td>60,558</td>
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</tbody>
</table>


+ This figure includes 2,321 Northern Abelam speakers who are in the Tamaui Census District and also in the Maprik Local Government Council area.

#### The Yam and the Tambaran Cult

To my knowledge there are no tambaran houses in the Wosera and many of the manifestations of both the Yam and the Tambaran Cults have disappeared from sight (p.148). It would, however, be idle to suggest that the cults are altogether moribund for many of the basic beliefs, modified by cargo cult and mission beliefs, are still held and practiced in secret for many magical practices and

1. In Kalabu in 1939-40, Kaberry says that disputes over land were rare and that she was told of only one case 'within recent years' (Kaberry 1941:349).

2. In secret because they do not want to spoil their chances of getting the mission fathers to secure them a place in heaven. The natives fear hell but there seems to be an idea that you may escape hell as long as the fathers do not find out what is going on (Forge, personal communication). For this reason I was asked not to tell the fathers about the nauindu relationship (p.61) for they knew that father would not approve,
ceremonies are believed to be essential for food production and the maintenance of life. Apart from the decline in the sex taboos already mentioned (pp. 40-41), the decay of the cults has had some very important social effects. As I have already shown the social organization is highly permissive (p. 75) and men may change clans, residence and tshambere or may even belong to two clans at the same time. Many men are thus subject to rival and incompatible claims from various groups and clearly identifiable groupings do not normally emerge. This situation has both advantages and disadvantages, but it is one in which tensions and hostility flourish. One of the main sociological effects of the Tambaran Cult was periodically to crystallize the normally fluid structure of the village, for every few years the ceremonies forced a man to make a clear statement of his membership of one and only one group, with which he was identified for the months needed to prepare and perform the ceremonies. At the same time all disputes in the village, and to a lesser extent between villages and village groups, were brought into the open, debated, and as far as possible settled. This function of the Tambaran cult is clearly recognised as beneficial by the Abelam themselves. To perform a ceremony peace and order were needed within the village, and between villages, and individual desires and ambitions had to give way to secure the general good.

In the Wosera the mechanisms for settling even the most minor disputes within the village have almost lapsed, and quarrels go unsettled, festering into sorcery accusations and violence, and often eventually being brought before DNA courts where the original issue is frequently obscured by subsidiary matters and carefully prepared false evidence. Leadership was basically acquired through the Yam Cult but as the cult has degenerated, so few leaders or 'big men' have emerged from within the Wosera social structure. Native councillors and other natives appointed or elected to official positions in the villages are often mere 'satraps' of the Europeans: it is true to say that they have temporal power derived from their European overlords but they often have little authority in day-to-day matters within the village, especially over the older men.

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1. 'Satrap' is used here in the sense used by Brown (1963).
Plate 33 - Asagwa ka gardens on the floodplains of the Amuk River, with the asagwa vines lying roughly parallel to one another.

Plate 34 - Inside an asagwa garden on the floodplains of Kwanabandu village, with the asagwa vines laid out along the ground.

It should be noted that in the asagwa ka gardens there are few incidental crops. There is very little taro compared with the Yenigo gardens.
Finally an important feature of both cults was the fact that they provided outlets for artistic expression and productive skills, which gave the men justifiable pride and confidence in themselves and their society. The loss of self-fulfilment has been devastating to morale.

Contact with Europeans and its Effects

The European forces acting in the Wosera are not simple and have sometimes exercised divergent or contradictory influence. The missions were the first to make any effort to show any real interest in the people and, until 1963 when the Wosera Council was established, their influence has been considerably greater than that of the Administration. The Roman Catholic Mission has, at the present time, three occupied stations in the North Wosera (Kunjingini, Kaugia and Chigiangu), and two more in the west (Babmo and Kosengo) that are ready for occupation (Figure 15). During the last few years the Assemblies of God have established a station at Jamitanga, and have in addition a congregation in the Bobmagum - Kwanabandu area served from their Tamaui station. Although the Protestants have some local supporters, the Catholics remain the preponderant influence; tensions between adherents of the two missions have not yet attained any great importance although there are signs that these tensions are increasing.

In the Wosera the initial contact with the missions was traumatic. In the period immediately after the war, the father at Kunjingini, who took a very wide view of his duties, set the pattern for mission activity in the area by actively opposing the cults and encouraging wholesale destruction of cult objects and tambaran houses (p.62). He actually forbade many practices and customs and gave the natives the impression that all Europeans, and especially the Government, support and obey the precepts of the mission. I believe that the natives are now becoming aware of the distinction between Mission and Government and are beginning to resent what the missions made them do.

The Administration has never been able to offer any alternative to the missions. Cash-cropping, which has been the major Administration activity, has been singularly unsuccessful. Peanuts failed here as elsewhere in the Sub-district and rice is considered to give poor monetary returns from land which can hardly be spared for it. The fact that
Coffee is being enthusiastically planted (see Table 23) indicates that, although it is an untried crop and has a doubtful future, the Woseras are prepared to try anything that is suggested to them in an attempt to find an answer to their problems, even although cash crops have not proved successful in the past.

Communications in the Wosera are bad. The roads themselves are reasonable, but the crossings of the three rivers present the main difficulty, often being impassable (p.35). These barriers have tended to keep the Administration on the eastern side of the Screw. In the central and western part of the Wosera medical and educational services are poor and sparse. There are no hospitals and only a few aid posts run by aid posts orderlies. When a Government school was established to serve the Wosera, it was put at Serangwantu to the east of the Screw (see Figure 15), although only about 10 per cent of the Woseras live on that side. To most of the Woseras education means only religious instruction for an hour or so every week. They are genuinely unaware of any other sort of education.

The Wosera is not a particularly pleasant area to patrol; the water is often bad, and the people are obsessed with the land disputes and talk to Europeans of little else. DNA patrols are usually fully occupied with census, tax and land matters, and most other patrols tend to be few and rapid and, as a result, Europeans make even less contact with the natives here than they do in other areas.

The result of all this confusion and neglect has been to leave little alternative to the persistence of that

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1. 'The orderlies are of low educational standard, but have received two years special training in Wewak .... they are natives of the area and inevitably they believe in the local sorcery as firmly as anyone else. If he is conscientious and properly supervised, he can do a great deal of medical good for his fellow villagers, and also for those nearby villages which are traditionally friendly. However, about half of the surrounding villages will be hereditary enemies of the orderly's own village. Observations show that his therapeutic effects in enemy villages are practically nil at present' (Schofield and Parkinson 1963:7).
characteristic Melanesian phenomenon, the 'cargo cult', 1 Every part of the Wosera has had 'cargo cults' of some kind or other since the war with leaders of varying ability and congregations of all sizes. Recently there have been no large scale movements afoot but there is a persistent 'cargo cult mentality'. 2 Bühler (1957: 12) writes:

Without doubt these movements smoulder on even if we could only find vague signs of them ... We occasionally found tables in dwellings and tambaran houses which were adorned with flowers and these were set ready for the reception of the ancestors with their goods. As far as we could judge ... there are no tendencies of a positive build up from these movements. In the cargo cults and in many other events, disappointment and discontent are expressed. This disappointment is found, not only because the natives wish for but cannot obtain the material goods of the white man, but also it is an expression of a spiritual insecurity and of inferiority complexes, which result from contact with the white man. 3

Most of the Woseras are firmly convinced that the only way that their lot can be decisively improved is by supernatural means. Incipient 'cargo cult' thinking of this kind intensified the demoralisation that produced it, and is now so widespread and deep-rooted that much time and trouble will have to be spent, and many practical results achieved before it can be totally overcome.

The advent of the missions and the Administration inadvertently aggravated the causes of land shortage by

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1. For details on the 'cargo cults' see Worsley (1957), Burridge (1960) and Lawrence (1963).
2. There were some positive manifestation of the 'cargo cult' while I was in the field; for example in Bapandu in 1961 some shade trees planted for coffee were destroyed.
3. A rather free translation.
halting expansion and warfare and also by creating serious social stresses in the area. Certainly up to the time that the Wosera Council was established,¹ the Woseras, especially those west of the Screw River, believed that they were despised by Europeans, the native police and other Abelam natives,² and stories of insults and violence by native police and others, were frequently heard and widely believed; they knew that they were discriminated against by employers and they often felt that the Administration refused to recognise their just land rights making decisions that were irrational and arbitrary. There are few ways of obtaining traditional or European wealth in the Wosera and it is widely held that the best way is by gambling and 'lucky' is now one of the main interests of many of the younger men.

The Woseras are almost without self-respect, and are totally lacking in self-confidence. Their faith in traditional culture has been undermined, and their attempts to solve their problems through 'cargo cults' have been vigorously suppressed. They are ill-fed, bemused and demoralised, they do not understand the aims of the Administration, but are eager to have them explained and anxious to believe the explanation. So far they are only aware of the more negative aspects of the Governmental process and mission teaching, but they would undoubtedly be quick to appreciate genuine education and skilled medical care should these things be made available to them.

¹ During my brief field trip to the Wosera in July 1963 I felt that the establishment of the Wosera Council had created a beneficial outlet for the people and had given them a new self-respect.

² Some of the Yenigo natives often came with me into the Wosera and they would not hesitate to deride the small wabi. The normal reaction of a North Abelam to such insults would be to defend the smallness or categorically deny the accusation, even if the yams were obviously smaller. The Woseras, however, tamely accepted the rebukes and said that they were 'rubbish men'.
Plate 35 - An example of the maldistribution of land.

The high forest is on the Umonoko side of the boundary and the gardens, grassland and garden regrowth are on the Serakum side.

Plate 36 - A patch of short grassland in the Wosera, showing the gently undulating nature of the terrain.

The grass in the foreground has been recently cut.
DENOUEMENT

It seems clear that there is serious land shortage in the Wosera. I have never heard of a visitor to the area who doubted it, or of an inhabitant who was not acutely aware of it. Until land shortage is relieved all other efforts to develop or assist the Wosera can have no more than a weak palliative effect. Barring a revival of traditional cults there seems to be no feasible way of controlling the birth rate for at least the next few decades. Any increase in mortality would be speedily combated by PHD. There seems to be only one possible immediate solution and that is to increase the amount of land available,1 which should not be very difficult for there are surrounding areas that are only sparsely settled. The most obvious area for resettlement or expansion is to the west, thus continuing the movement halted by the Government in 1937.

Problems of land shortage are alleviated a little by the floodplains which are suitable for intensive land use, but all villages do not have access to them and those that do are under great nutritional stress when part of the harvest fails due to floods. Before European contact the Woseras responded to various stresses not only by fighting and migrating but also by draining poor soils and by developing techniques, and possibly even yam varieties, which made floodplain cultivation possible. It is almost certain that many other improvements could be made in native husbandry which would help overcome food shortages and also be the basis for more permanent land use, which is essential for any real economic and social progress (cf., Barraud 1958a:77). Some possibilities for the improvement of native horticulture and other associated activities are discussed briefly in Appendix E.

Doubtless population pressures should provide an impetus for new techniques, altering the environment or so changing existing practices that a new stage of development emerges (cf. East African Royal Commission 1955:35). However the situation in the Wosera is too critical and the indigenes too demoralised for local initiative to have much

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1. Redistribution of land within the Wosera should also be considered despite the local opposition which would inevitably arise.
effect, especially as the social stresses operative in
the Wosera are not conducive to the emergence of leaders.
I feel, however, that they would respond to energetic
leadership from someone who is interested in them and in
whose sympathy with their problems they have faith.
Obviously leadership in the present pass must come from
the Government but first the more positive aspects of
Government influence such as schools and hospitals
have to be established. All this would be very diffi-
cult unless bridges are built over the Screw and Nanu
rivers and the isolation of the Wosera ended.

Much research and bold experimental work still has
to be done and all likely or possible improvements must
be proved workable within the physical and social milieu
of the Wosera. The basic problem is not unique to the
Wosera or even New Guinea. Farmer sums up the situation
when writing of problems of land use in the dry zone of
Ceylon. He said that Ceylon was facing,

...the familiar dilemma of a country with a
traditional system of land use better suited
to local physical conditions than anything
yet devised to replace it, but which is
inadequate in a changed demographic context,
Care is excusable, haste is excusable; and
the only solution seems to speed up careful-
ness by speeding up research. Research is
needed... not only into the practical issues
of husbandry, but also into fundamental
conditions of climate, water supply and soil,
and into the factors behind traditional land
use with all its ancient wisdom' (Farmer
Chapter 9

CONCLUSION

In writing this thesis my aims have been threefold: to describe the human geography of the Abelam in terms consistent with modern geography but with some study of the native understanding and rationale of resource distribution and utilization (i.e., the ethnoscience); to enquire into the reactions to stresses derived from land shortage and external influence among a population of swidden cultivators; to seek to bring some measurement and exactitude into the study of production and consumption of food in a primitive society. The last demands some elaboration.

Few would now agree with Malinowski (1935:13) that it is in most cases not possible to substantiate statements about Melanesian resource use and production with quantitative data. A whole generation of anthropologists and human geographers have since been mapping, measuring and weighing their way through the agricultural economies of numerous societies in many parts of the tropics and some writers have attempted quite elaborate use of statistical methods in their ethnological and ecological interpretations. In New Guinea, it is now rare for a study of a native society to be made without at least some measurements of gardens. The fact that many of these data must remain suspect is not denied by the authors; what is significant is that it is now felt that the attempt to measure is thought worthwhile—sometimes, one suspects, even for its own sake. Groves, questioning this trend in a recent review article, has argued that empiricism, and we presume quantification, can lead to ridiculous circumlocution and detail in the statement of the patently obvious (Groves 1963:277). Groves continues with a more serious objection; he states 'it is seldom possible accurately to infer ideological norms regulating social decisions from the statistical frequency with which people make one kind of decision rather than another' (Groves 1963:285). Until analysis of the social process is carried out, we have no way of knowing whether the ideology is permissive or whether ideology and action are partially independent of each other or whether men make decisions because they are unable to assert their real preference, which of course could be a consequence of stress. Statistics may be suggestive, but study of the decision making process is
necessary before they can be given any real analytical value.

This is one of the main problems with which I have been faced in this exercise in research. This thesis is basically an analysis of the gardening systems of the Abelam. However, these systems are so integrated into the culture that discussion of many aspects of social and economic organization was inevitable. It will be very apparent that I have been thus drawn well beyond my range of competence into anthropological investigations and into the use of anthropological techniques; this had to be for otherwise my attempts to measure and compare could have had no meaning. Perhaps, however, I have merely come more sharply than most geographers into contact with a problem which besets the discipline as a whole. As Brookfield (1962b:15-16) has pointed out, geographers have been reluctant to involve themselves in comprehension of the social organization of production and consumption, yet it is questionable whether this omission can be wholly justified even in our own society (cf. Williams 1963).

Within the last decade, the move toward quantification in geographical enquiry has led to very extensive and increasingly sophisticated use of the abundant statistical data either available or readily obtainable from highly organized centralized agencies, but it has become very difficult to make use of these new techniques in the study of a very large part of the world, where it is the collection of the data and not the analysis of them that presents the real problem. As Gould has recently pointed out, 'in a very real sense our tools are outrunning our efforts to gather the necessary materials' (Gould 1963: 292). It might be added that there is some danger that the excessive elaboration of our analytical methods is leading us away still further from a full understanding of the processes leading to the making of decisions whose results we study.

In this thesis, I have tried to keep before me the central, chorographical objectives of a geographical enquiry. My major questions have been: how is the land used? what groups work together and for what purposes? what evidence is there to support or deny the hypothesis that stresses exist which affect the pattern of production
and consumption? What are the differences between the two chosen villages, and how am I to explain them? For these purposes measurement has been essential, and I have spent much time and effort on the collection of numerical data to assist in answering my questions. But in the last analysis an understanding of the social process is a pre-requisite of any satisfactory interpretation, and at the end of the task I am left with a feeling of dissatisfaction for, to me, the nature of this understanding has been rather elusive. Perhaps, however, the lessons learnt from this attempt to measure and compare in such a setting as the Abelam may provide the basis, both in findings and in method, on which a more rational discussion of land shortage and swidden cultivation might in future be built.
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<th>K (%)</th>
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<th>Tapsoil 0.9 0.14 8 1.6</th>
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<td>25 % H2O</td>
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<td>10 25</td>
<td>29 10 26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 0.5 0.06 7</td>
<td>0 164 6.9</td>
<td>74 15.4 16.9</td>
<td>0.5 0.2</td>
<td>0.5 38 56</td>
<td>3 18</td>
<td>24 22 33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic Heavy Clay Alluvial Soils</td>
<td>Topsoil 0.9 0.31 4 64</td>
<td>390 6.6</td>
<td>55 10.8 10.9</td>
<td>0.5 0.5</td>
<td>1.1 16 56</td>
<td>1 5</td>
<td>18 41 35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 0.8 0.07</td>
<td>100 560 7.0</td>
<td>55 12.8 12.8</td>
<td>0.6 0.3</td>
<td>0.7 16 56</td>
<td>1 4</td>
<td>14 45 35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Texture Alluvial Soils</td>
<td>Topsoil 0.7 0.23 5</td>
<td>150 1560 6.5</td>
<td>59 16.2 5.0</td>
<td>0.8 0.6</td>
<td>1.2 36 66</td>
<td>5 25</td>
<td>25 39 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsoil 0.4 0.07</td>
<td>114 1000 6.8</td>
<td>66 11.9 4.2</td>
<td>0.7 0.2</td>
<td>1.1 25 68</td>
<td>6 26</td>
<td>25 32 15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
I collected a number of soil samples in July 1963. These are being analysed in New Guinea but at the time of submission analysis was not completed. On Table 28 opposite I have shown the average results of soil analyses carried out by the Division of Land Research and Regional Survey (CSIRO 1961).
APPENDIX B.

STATISTICAL ANALYSIS OF YIELD DATA

Statistical analysis may be divided into three main parts:

(a) Analysis of Yenigo data to examine possible differences in yield of different varieties of ka by an Analysis of Variance Test, single classification (Snedecor 1948:214 - 26).

(b) Analysis of Stapikum data to examine possible differences in yields of different varieties of ka by the same method.

(c) Comparison of yields of ka grown in both villages to examine possible village differences by a more complicated Analysis of Variance Test (Snedecor 1948:291 - 92).

(a) Analysis of Yield from Yenigo.

First it had to be established whether a significant variation existed in yields from the different varieties grown in Yenigo.

Analysis of Variance Table.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between varieties</td>
<td>28</td>
<td>27,336.26</td>
<td>976.30</td>
<td>7.63</td>
</tr>
<tr>
<td>Within varieties</td>
<td>826*</td>
<td>105,709.62</td>
<td>127.98</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>854</td>
<td>132,045.88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* This excludes 48 male ka where individual readings were not made. They were all weighed together (total 626 pounds).

The F value of (7.63) is significant at the 0.1% level and this means that there is overwhelming evidence for a between variety difference in yield. The next task was to look at the data further to find where the main differences lay. It was only possible to do this successfully for varieties 1 - 11 where there were more than 32 readings.
When the possible 55 "t" tests between the 11 varieties are performed the following groupings are obtained.

Group 1. Mar'ka, male'ka, nyimbikwaruka.
Group 2. Wolimile, wamatsikwus, walewasaka, kawaka.
Group 3. Asagwa, Apa'ka.
Group 4. Tuma, mbiat.

Varieties in group 1 are significantly lower than all other varieties.
Varieties in group 2 are significantly lower than those in group 4.
Varieties in group 3 are not significantly lower than those in group 2.

(b) Analysis of Yield from Stapikum.

As for Yenigo it has to be established whether there is significant variation in yield from the various varieties of ka grown in Stapikum.

Analysis of Variance Table

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between varieties</td>
<td>15</td>
<td>23,769.01</td>
<td>1,584.60</td>
<td>23.29</td>
</tr>
<tr>
<td>Within varieties</td>
<td>834</td>
<td>56,738.19</td>
<td>68.03</td>
<td>68.03</td>
</tr>
<tr>
<td>Total</td>
<td>849</td>
<td>80,507.20</td>
<td></td>
<td>68.03</td>
</tr>
</tbody>
</table>

This value of F (23.29), is also highly significant at the 0.1% level and indicates a very highly significant difference in yield of the various varieties in Stapikum.

By applying individual "t" tests as in Yenigo it is possible to place all varieties with a large number of observations (viz. more than eighteen) into two groups.

Group 1. Wolimile, mbiat, kawaka, nyimbikwaruka.
Group 2. Asagwa, wamatsikwus.
All varieties in Group 2 are significantly higher than those in Group 1.
(c) **Comparison of Yenigo and Stapikum.**

To make this comparison only those varieties are used where a large number of observations have been made in both villages. The varieties used are: Asagwa, wolimile, wamatsikwus, mbiat and nyimbikwaruka.

**Analysis of Variance Table.**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of freedom</th>
<th>Sum of squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between villages</td>
<td>1</td>
<td>2,120.93</td>
<td>2,120.93</td>
<td>24.75</td>
</tr>
<tr>
<td>Between varieties</td>
<td>4</td>
<td>5,229.32</td>
<td>1,307.33</td>
<td></td>
</tr>
<tr>
<td>Interaction;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Villages and varieties</td>
<td>4</td>
<td>3,183.56</td>
<td>795.89</td>
<td>9.25</td>
</tr>
<tr>
<td>Error</td>
<td>1,048</td>
<td>90,167.86</td>
<td>86.04</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,075</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* No need to do this test for it has already been done in more detail in parts (a) and (b) above.

The F value of 24.75 for 'between villages' indicates a highly significant difference of yield between villages and clearly Yenigo has higher yields than Stapikum.

The F value of 9.25 for interaction is also significantly high, and indicates that although the Yenigo yield may be generally better than that of Stapikum there is evidence that this is not necessary true for all varieties and that there may be some varieties for which the Yenigo and Stapikum yields do not differ significantly.

When "t" tests were applied to compare the five varieties separately in the two villages, it was found that asagwa, wamatsikwus, and nyimbikwaruka did not differ significantly in yields (accepting probability of 0.05) from village to village whereas wolimile and mbiat did.

Thus there is evidence that Yenigo gives significantly higher yields than Stapikum although there may be some varieties for which this is not true.
TABLE 29 - A Summary of Yield Data Collected in Yenigo Village 1962

<table>
<thead>
<tr>
<th>Number</th>
<th>Variety</th>
<th>Sub-species</th>
<th>Weight Counted</th>
<th>Variety</th>
<th>Weight Counted</th>
<th>Weight Counted</th>
<th>Weight Counted</th>
<th>Weight Counted</th>
<th>Sum of Squares</th>
<th>Sum of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mar'ka</td>
<td>Mar'ka</td>
<td>163</td>
<td>2,313</td>
<td>14.19</td>
<td>18.05</td>
<td>47,107</td>
<td>32,821.90</td>
<td>14,285.10</td>
<td>1,007.52</td>
</tr>
<tr>
<td>2.</td>
<td>Apa'ka</td>
<td>Apa'ka</td>
<td>123</td>
<td>2,673</td>
<td>21.73</td>
<td>13.62</td>
<td>74,388</td>
<td>58,088.85</td>
<td>16,299.15</td>
<td>1,007.52</td>
</tr>
<tr>
<td>3.</td>
<td>Wolimile</td>
<td>Apa'ka</td>
<td>99</td>
<td>2,055</td>
<td>20.76</td>
<td>10.96</td>
<td>57,933</td>
<td>42,966.82</td>
<td>15,036.18</td>
<td>1,007.52</td>
</tr>
<tr>
<td>4.</td>
<td>Tuma</td>
<td>Apa'ka</td>
<td>70</td>
<td>1,871</td>
<td>23.87</td>
<td>7.75</td>
<td>49,399</td>
<td>39,889.16</td>
<td>9,509.84</td>
<td>1,007.52</td>
</tr>
<tr>
<td>5.</td>
<td>Male'ka</td>
<td>Male'ka</td>
<td>63</td>
<td>1,344</td>
<td>24.51</td>
<td>6.98</td>
<td>45,756</td>
<td>37,840.25</td>
<td>7,915.75</td>
<td>1,007.52</td>
</tr>
<tr>
<td>6.</td>
<td>Mbiat</td>
<td>Apa'ka</td>
<td>61</td>
<td>1,274</td>
<td>24.51</td>
<td>6.98</td>
<td>45,756</td>
<td>37,840.25</td>
<td>7,915.75</td>
<td>1,007.52</td>
</tr>
<tr>
<td>7.</td>
<td>Wamatsikwu</td>
<td>Apa'ka</td>
<td>41</td>
<td>820</td>
<td>20.00</td>
<td>4.54</td>
<td>23,044</td>
<td>16,400.00</td>
<td>6,644.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>8.</td>
<td>Asagwa</td>
<td>Asagwa</td>
<td>74</td>
<td>756</td>
<td>22.23</td>
<td>3.77</td>
<td>20,704</td>
<td>16,809.88</td>
<td>3,894.12</td>
<td>1,007.52</td>
</tr>
<tr>
<td>9.</td>
<td>Walewasaka</td>
<td>Mar'ka</td>
<td>32</td>
<td>658</td>
<td>20.56</td>
<td>3.54</td>
<td>22,578</td>
<td>13,530.13</td>
<td>9,047.87</td>
<td>1,007.52</td>
</tr>
<tr>
<td>10.</td>
<td>Kawaka</td>
<td>Apa'ka</td>
<td>35</td>
<td>656</td>
<td>18.74</td>
<td>3.88</td>
<td>18,432</td>
<td>12,295.31</td>
<td>6,136.69</td>
<td>1,007.52</td>
</tr>
<tr>
<td>11.</td>
<td>Nyimkwaruka</td>
<td>Apa'ka</td>
<td>33</td>
<td>433</td>
<td>13.12</td>
<td>3.65</td>
<td>6,689</td>
<td>5,681.48</td>
<td>1,007.52</td>
<td>1,007.52</td>
</tr>
<tr>
<td>12.</td>
<td>Legeto'ka</td>
<td>Apa'ka</td>
<td>20</td>
<td>399</td>
<td>19.75</td>
<td>2.21</td>
<td>6,599</td>
<td>5,746.05</td>
<td>852.95</td>
<td>1,007.52</td>
</tr>
<tr>
<td>13.</td>
<td>Gilewoba</td>
<td>Mar'ka</td>
<td>8</td>
<td>284</td>
<td>35.50</td>
<td>0.89</td>
<td>11,690</td>
<td>10,082.00</td>
<td>1,608.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>14.</td>
<td>Ta'li'ka</td>
<td>Mar'ka</td>
<td>4</td>
<td>88</td>
<td>22.00</td>
<td>0.44</td>
<td>2,032</td>
<td>1,936.00</td>
<td>96.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>15.</td>
<td>Mbiyniyka</td>
<td>Mar'ka</td>
<td>9</td>
<td>127</td>
<td>14.11</td>
<td>0.99</td>
<td>1,963</td>
<td>1,792.11</td>
<td>170.89</td>
<td>1,007.52</td>
</tr>
<tr>
<td>16.</td>
<td>Kwaika</td>
<td>Mar'ka</td>
<td>13</td>
<td>232</td>
<td>17.84</td>
<td>1.44</td>
<td>4,692</td>
<td>4,140.31</td>
<td>551.69</td>
<td>1,007.52</td>
</tr>
<tr>
<td>17.</td>
<td>Wamabieng</td>
<td>Apa'ka</td>
<td>7</td>
<td>262</td>
<td>27.43</td>
<td>0.77</td>
<td>10,440</td>
<td>9,806.29</td>
<td>633.71</td>
<td>1,007.52</td>
</tr>
<tr>
<td>18.</td>
<td>Nambingile</td>
<td>Apa'ka</td>
<td>9</td>
<td>384</td>
<td>32.67</td>
<td>0.99</td>
<td>17,076</td>
<td>16,384.00</td>
<td>692.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>19.</td>
<td>Kttnangkwi</td>
<td>Mar'ka</td>
<td>5</td>
<td>157</td>
<td>20.14</td>
<td>0.55</td>
<td>5,219</td>
<td>4,929.80</td>
<td>289.20</td>
<td>1,007.52</td>
</tr>
<tr>
<td>20.</td>
<td>Yipalupa</td>
<td>Mar'ka</td>
<td>9</td>
<td>399</td>
<td>44.33</td>
<td>0.99</td>
<td>18,217</td>
<td>17,689.00</td>
<td>528.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>21.</td>
<td>Maninget</td>
<td>Mar'ka</td>
<td>14</td>
<td>157</td>
<td>10.79</td>
<td>1.55</td>
<td>1,745</td>
<td>1,628.64</td>
<td>116.36</td>
<td>1,007.52</td>
</tr>
<tr>
<td>22.</td>
<td>Apikoka</td>
<td>Mar'ka</td>
<td>3</td>
<td>46</td>
<td>15.33</td>
<td>0.33</td>
<td>8,826</td>
<td>6,523.33</td>
<td>2,292.67</td>
<td>1,007.52</td>
</tr>
<tr>
<td>23.</td>
<td>Kwarika</td>
<td>Apa'ka</td>
<td>12</td>
<td>280</td>
<td>23.53</td>
<td>1.33</td>
<td>8,826</td>
<td>6,523.33</td>
<td>2,292.67</td>
<td>1,007.52</td>
</tr>
<tr>
<td>24.</td>
<td>Mogvia</td>
<td>Mar'ka</td>
<td>3</td>
<td>25</td>
<td>8.33</td>
<td>0.33</td>
<td>225</td>
<td>208.33</td>
<td>16.67</td>
<td>1,007.52</td>
</tr>
<tr>
<td>25.</td>
<td>Waledjambika</td>
<td>?</td>
<td>1</td>
<td>9</td>
<td>9.00</td>
<td>0.11</td>
<td>81</td>
<td>81.00</td>
<td>0.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>26.</td>
<td>Tsimbi'ka</td>
<td>Mar'ka</td>
<td>19</td>
<td>390</td>
<td>20.53</td>
<td>2.10</td>
<td>12,328</td>
<td>8,005.26</td>
<td>4,322.74</td>
<td>1,007.52</td>
</tr>
<tr>
<td>27.</td>
<td>Kwalika</td>
<td>Apa'ka</td>
<td>7</td>
<td>114</td>
<td>16.29</td>
<td>0.77</td>
<td>2,332</td>
<td>1,856.57</td>
<td>475.43</td>
<td>1,007.52</td>
</tr>
<tr>
<td>28.</td>
<td>Nyamioka</td>
<td>Apa'ka</td>
<td>4</td>
<td>76</td>
<td>13.00</td>
<td>0.44</td>
<td>1,670</td>
<td>1,444.00</td>
<td>266.00</td>
<td>1,007.52</td>
</tr>
<tr>
<td>29.</td>
<td>Pa'lkka</td>
<td>Male'ka</td>
<td>2</td>
<td>31</td>
<td>15.50</td>
<td>0.22</td>
<td>481</td>
<td>485.50</td>
<td>0.50</td>
<td>1,007.52</td>
</tr>
</tbody>
</table>

903   17,847  19.76  99.95  105,709.62
<table>
<thead>
<tr>
<th>Number</th>
<th>Variety</th>
<th>Sub-species</th>
<th>Number Weighed</th>
<th>Total Weight in lbs.</th>
<th>Mean Weight in lbs.</th>
<th>% of Total Number Counted</th>
<th>$\sum^2$</th>
<th>$\frac{t^2}{n}$</th>
<th>Sum of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.</td>
<td>Asagwa</td>
<td>Asagwa</td>
<td>480</td>
<td>10,645</td>
<td>22.18</td>
<td>56.47</td>
<td>279,762</td>
<td>236,075.00</td>
<td>43,687.00</td>
</tr>
<tr>
<td>31.</td>
<td>Wolimile</td>
<td>APA'ka</td>
<td>231</td>
<td>2,683</td>
<td>11.61</td>
<td>27.18</td>
<td>37,396</td>
<td>31,162.29</td>
<td>6,233.71</td>
</tr>
<tr>
<td>32.</td>
<td>Amatsikwus</td>
<td>APA'ka</td>
<td>38</td>
<td>784</td>
<td>20.63</td>
<td>4.47</td>
<td>21,184</td>
<td>16,175.16</td>
<td>5,008.84</td>
</tr>
<tr>
<td>33.</td>
<td>Mbiat</td>
<td>APA'ka</td>
<td>18</td>
<td>213</td>
<td>11.83</td>
<td>2.12</td>
<td>2,981</td>
<td>2,520.50</td>
<td>460.50</td>
</tr>
<tr>
<td>34.</td>
<td>Tsimbi'ka</td>
<td>MAR'ka</td>
<td>8</td>
<td>85</td>
<td>10.62</td>
<td>0.94</td>
<td>983</td>
<td>903.13</td>
<td>79.87</td>
</tr>
<tr>
<td>35.</td>
<td>Angeileka</td>
<td>MALE'ka</td>
<td>5</td>
<td>41</td>
<td>8.20</td>
<td>0.59</td>
<td>471</td>
<td>336.20</td>
<td>134.80</td>
</tr>
<tr>
<td>36.</td>
<td>Kawaka</td>
<td>APA'ka</td>
<td>23</td>
<td>230</td>
<td>10.00</td>
<td>2.70</td>
<td>2,720</td>
<td>2,300.00</td>
<td>450.00</td>
</tr>
<tr>
<td>37.</td>
<td>Kwiaka</td>
<td>MAR'ka</td>
<td>3</td>
<td>42</td>
<td>14.00</td>
<td>0.35</td>
<td>650</td>
<td>588.00</td>
<td>62.00</td>
</tr>
<tr>
<td>38.</td>
<td>Nyimbikwaruka</td>
<td>APA'ka</td>
<td>21</td>
<td>242</td>
<td>11.52</td>
<td>2.47</td>
<td>3,069</td>
<td>2,788.76</td>
<td>280.24</td>
</tr>
<tr>
<td>39.</td>
<td>Legeto'ka</td>
<td>APA'ka</td>
<td>4</td>
<td>90</td>
<td>22.50</td>
<td>0.47</td>
<td>2,042</td>
<td>2,025.00</td>
<td>17.00</td>
</tr>
<tr>
<td>40.</td>
<td>Tserangget</td>
<td>MAR'ka</td>
<td>5</td>
<td>36</td>
<td>7.20</td>
<td>0.59</td>
<td>278</td>
<td>259.20</td>
<td>16.80</td>
</tr>
<tr>
<td>41.</td>
<td>Malamogwia</td>
<td>MAR'ka</td>
<td>7</td>
<td>34</td>
<td>7.71</td>
<td>0.82</td>
<td>428</td>
<td>416.57</td>
<td>11.43</td>
</tr>
<tr>
<td>42.</td>
<td>Minyambil</td>
<td>?</td>
<td>1</td>
<td>8</td>
<td>8.00</td>
<td>0.12</td>
<td>64</td>
<td>64.00</td>
<td>1.00</td>
</tr>
<tr>
<td>43.</td>
<td>Mogwia</td>
<td>MAR'ka</td>
<td>1</td>
<td>10</td>
<td>10.00</td>
<td>0.12</td>
<td>100</td>
<td>100.00</td>
<td>1.00</td>
</tr>
<tr>
<td>44.</td>
<td>Mar'ka</td>
<td>MAR'ka</td>
<td>4</td>
<td>88</td>
<td>22.00</td>
<td>0.47</td>
<td>2,232</td>
<td>1,936.00</td>
<td>296.00</td>
</tr>
<tr>
<td>45.</td>
<td>Djimungka</td>
<td>?</td>
<td>1</td>
<td>9</td>
<td>9.00</td>
<td>0.12</td>
<td>81</td>
<td>81.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

| Total  | 850          | 15,260      | 17.95          | 100.00              | 297,730.81            | 56,738.19          |

TABLE 30
A Summary of Yield Data Collected in Stapikum Village 1962
APPENDIX C

PROTEIN ANALYSIS OF THE EDIBLE PORTION OF SOME YAMS FROM THE MAPRIK AREA

(Analysis done by Division of Plant Industry, DASF, Konedobu, Papua.)

<table>
<thead>
<tr>
<th>Yenigo Name</th>
<th>Botanical Name</th>
<th>Protein as % dry weight</th>
<th>Estimate protein as % wet weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ka</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wolimile</td>
<td>D. esculenta</td>
<td>10.2</td>
<td>2.55</td>
</tr>
<tr>
<td>Kawaka</td>
<td>&quot;</td>
<td>6.3</td>
<td>1.57</td>
</tr>
<tr>
<td>Asagwa</td>
<td>&quot;</td>
<td>10.0</td>
<td>2.50</td>
</tr>
<tr>
<td>Mbiat</td>
<td>&quot;</td>
<td>8.8</td>
<td>2.20</td>
</tr>
<tr>
<td>Tuma</td>
<td>&quot;</td>
<td>8.8</td>
<td>2.20</td>
</tr>
<tr>
<td>Wamatsikwus</td>
<td>&quot;</td>
<td>6.9</td>
<td>1.72</td>
</tr>
<tr>
<td>Nar'ka</td>
<td>&quot;</td>
<td>6.3</td>
<td>1.57</td>
</tr>
<tr>
<td>Apa'ka</td>
<td>&quot;</td>
<td>6.3</td>
<td>1.57</td>
</tr>
<tr>
<td>Nyimbikwaruka</td>
<td>&quot;</td>
<td>6.9</td>
<td>2.02</td>
</tr>
<tr>
<td>Maleka</td>
<td>&quot;</td>
<td>5.8</td>
<td>1.45</td>
</tr>
<tr>
<td>Average</td>
<td>&quot;</td>
<td>7.8</td>
<td>1.94</td>
</tr>
<tr>
<td>Wabi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landji</td>
<td>D. alata</td>
<td>9.4</td>
<td>2.35</td>
</tr>
<tr>
<td>Mbandwan</td>
<td>&quot;</td>
<td>11.9</td>
<td>2.97</td>
</tr>
<tr>
<td>Wundunggul</td>
<td>&quot;</td>
<td>15.6</td>
<td>3.90</td>
</tr>
<tr>
<td>Yamewabi</td>
<td>&quot;</td>
<td>6.9</td>
<td>1.75</td>
</tr>
<tr>
<td>Kwandjel</td>
<td>&quot;</td>
<td>6.9</td>
<td>1.75</td>
</tr>
<tr>
<td>Wurawabi</td>
<td>&quot;</td>
<td>10.6</td>
<td>2.65</td>
</tr>
<tr>
<td>Mambetap</td>
<td>&quot;</td>
<td>8.1</td>
<td>2.02</td>
</tr>
<tr>
<td>Nggwokurpi</td>
<td>&quot;</td>
<td>13.1</td>
<td>3.27</td>
</tr>
<tr>
<td>Yepmane</td>
<td>&quot;</td>
<td>12.4</td>
<td>3.10</td>
</tr>
<tr>
<td>Yaimbu</td>
<td>&quot;</td>
<td>14.5</td>
<td>3.62</td>
</tr>
<tr>
<td>Average</td>
<td>&quot;</td>
<td>10.2</td>
<td>2.74</td>
</tr>
<tr>
<td>Lipma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Djambwi (tuber)</td>
<td>D. bulbifera</td>
<td>11.2</td>
<td>2.80</td>
</tr>
<tr>
<td>Djambwi (bulbil)</td>
<td>&quot;</td>
<td>10.6</td>
<td>2.65</td>
</tr>
</tbody>
</table>

Some comparative figures and their sources are given below:

<table>
<thead>
<tr>
<th>Source</th>
<th>Botanical Name</th>
<th>No. of Samples</th>
<th>Protein as % wet weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hipsley and Clements 1950:</td>
<td>Dioscorea spp.</td>
<td>4</td>
<td>1.9</td>
</tr>
<tr>
<td>Oomen &amp; Malcolm 1958:140</td>
<td>D. alata</td>
<td>?</td>
<td>1.2</td>
</tr>
<tr>
<td>Brown 1951:388 D. alata</td>
<td>7</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>FAO 1953:24 Dioscorea spp.</td>
<td>?</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Webster 1924:220-21 D. esculenta</td>
<td>7</td>
<td>2.64</td>
<td></td>
</tr>
<tr>
<td>&quot; &quot; D. alata</td>
<td>6</td>
<td>2.23</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D

PERCENTAGE COMPOSITION OF OVERALL DIET
(Basis for Figure 16)

<table>
<thead>
<tr>
<th>TABLE 32</th>
<th>August</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YENIGO</td>
<td>STAPIKUM</td>
</tr>
<tr>
<td></td>
<td>% Calorie % Protein</td>
<td>% Calorie % Protein</td>
</tr>
<tr>
<td>Yams</td>
<td>34.0</td>
<td>38.9</td>
</tr>
<tr>
<td>Taro</td>
<td>19.8</td>
<td>20.8</td>
</tr>
<tr>
<td>Sago</td>
<td>24.5</td>
<td>-</td>
</tr>
<tr>
<td>Bananas</td>
<td>9.4</td>
<td>4.9</td>
</tr>
<tr>
<td>Greens</td>
<td>4.8</td>
<td>22.1</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>2.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Meat</td>
<td>2.8</td>
<td>9.3</td>
</tr>
<tr>
<td>Other</td>
<td>1.9</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Notes on the above:

1. These figures are based on the following weighings:
   In Yenigo from the 21st. to the 28th. August (inclusive) 1962 and includes all the food eaten by a man, a woman and a child aged four and from 17th. to the 30th. March for the same family with another man.
   In Stapikum from the 8th. to the 15th August (inclusive) and includes all the food eaten by a man, a woman and a child aged five.

2. Taro was being harvested and eaten by other families in August in Stapikum; that it was not eaten by the family selected in August was an error due to sampling. Sweet potato, birds, pig and tinned meat are also occasionally eaten in Stapikum but they are insignificant in terms of overall diet.
TABLE 33 - Values Assumed for Nutrient Content of Whole Product (Including Waste) as Weighed in Field Trials.¹ (per 100 gms.)

<table>
<thead>
<tr>
<th>Product</th>
<th>Calories</th>
<th>Protein (gms.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yam</td>
<td>96</td>
<td>2.0</td>
</tr>
<tr>
<td>Taro</td>
<td>95</td>
<td>1.8</td>
</tr>
<tr>
<td>Sago</td>
<td>350</td>
<td>0.0</td>
</tr>
<tr>
<td>Bananas</td>
<td>80</td>
<td>0.8</td>
</tr>
<tr>
<td>Greens</td>
<td>35</td>
<td>3.2</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>116</td>
<td>1.0</td>
</tr>
<tr>
<td>Meat</td>
<td>200</td>
<td>12.0</td>
</tr>
<tr>
<td>Other</td>
<td>100</td>
<td>2.0</td>
</tr>
</tbody>
</table>

¹ With reference to Hipsley and Clements (1950:273), Oomen and Malcolm (1958:140), F.A.O. Food Composition Tables (FAO 1953), and my own estimates based on diet tables, methods of preparing food, the advice of Dr. K. V. Bailey and the protein analyses shown in Appendix C.
APPENDIX E

SOME SUGGESTIONS ON THE IMPROVEMENT OF NATIVE HORTICULTURE IN THE ABELAM AREA

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

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

In this appendix I set out in note form some thoughts on possible improvements and suggest some lines for future research and experimental work. I make no attempt to elaborate or to suggest how improvements could be implemented.

1. The Upgrading of Staple Foods.

It is well known that most species of important food crops throughout the Pacific Islands have many different varieties in small localities. There is no doubt that some varieties have a consistently higher yield or higher protein content than other varieties. Recently it has been found that in the Highlands of New Guinea the Okinawa variety of sweet potato has a higher protein content than any other variety (Bailey, personal communication). My own results (see Appendix C) also suggest that there are some varieties of yam with higher protein content than others. There is also no doubt that the yields of some varieties are consistently higher than other varieties. Trials could certainly be
carried out to determine which are the best varieties and they should be followed by extension work to encourage wider planting. Taste preferences and prejudices would probably never be overcome with adults so extension work should concentrate on encouraging children to eat them; this could well be linked with education. As Williams noted 'We should aim at improving the culture of native products before we begin the scattering of unknown seeds' (Williams 1933:7).

2. The Introduction of New Food Plants.

This topic has been discussed extensively elsewhere (Williams 1933, Barrau 1958a:100-102, Barrau 1960) but among the Abelam those food crops which are rich in protein and capable of being stored such as nuts, cereals and pulses are the most essential. To encourage the adoption of these crops the methods of cultivation must be easier and the returns higher than crops which are grown now or there will be no incentive to plant them.

3. Improved Hand Implements and Mechanization.

Even although labour is very cheap in the area some form of mechanization is necessary to show that the Administration is concerned with improving the native way of life and also to give some incentive to the introduction of new crops. Some possibilities that immediately spring to mind are scythes instead of grass-slaying 'sarap'; the sago rasper of Malaysia instead of the laborious methods now practiced (cf. Morris 1953, Burkill 1935:1463); hoes for weeding and grinders for peanuts (which keep almost indefinitely when ground to a paste). If rice could be easily grown and milled in the villages, it is reasonable to suppose that unpolished rice might be eaten and that rice itself would be more widely grown.


The planting of legumes as green manures is probably not feasible because the necessary cultivation technique results in the soil lying exposed whilst the legumes become established. Nye and Greenland (1960: 136) state that 'the nitrogen status maintained beneath a forest fallow is good, and there is no reason to think that short-term leguminous fallows would offer any advantage'. Probably the best use that could be
made of legumes would be to encourage more intercropping during the productive life of the garden in order to offset leaching by symbiotic fixation of nitrogen.

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

5. Soil Conservation.

Soil conservation is closely connected with mulching. If ground is to be used for several years before it reverts to fallow, the practice of exposing the soil for long periods and sweeping it clean before planting would have to cease. Cover crops would have to be planted as soon as possible and vegetable waste from the fallow and the garden could be used as a protective cloak over the soil. It would certainly be better to plant yams much closer together in order to get higher yields per given area as well as providing cover for the soil, even though this may result in individual plants having smaller tubers. This would be difficult to encourage because large yams are so ritually important and are a status symbol (cf. Simoons 1960:214). As far as yams are concerned the Abelam are megalomaniacs and one's gardening ability is judged by the size of each tuber rather than by the total yields from each garden or even from each hole.

Some form of terracing is also possible, even if it is only the very simple form at present practiced by the West Woseras.

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

It is difficult to imagine a more effective method of storing whole yam tubers than that used by the Abelam for the large *wabi* (see Plate 18). The tubers are well supported, off the ground, safe from vermin, well shaded and surrounded by circulating air. Tubers stored in this way keep well for periods up to nine months. The smaller *wabi* and *ka* tubers, although they keep well in the yam houses, do lie at least in part on the ground. Probably storage would be better if the tubers were lifted off the ground or stored on a raised cane floor permitting a better circulation of air around them.

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


Many trees and palms and their products are securely integrated into the Abelam economy. However, there is still plenty of scope for more intensive planting of nut, leaf and fruit bearing trees, and timber trees could be more intensively planted around hamlets and along ridgertops to provide shelter and to control runoff. Research should also be done to see whether it is worth leaving corridors of trees between gardens to aid reseeding and to act as firebreaks and into the merits of planted fallows\(^1\) and of the possibility of the 'taungya' system (Allsop 1953).


Pigs and fowls are the only productive animals used by the Abelam. Better use could be made of the products from both these animals and the quality could be vastly

\(^1\) Some examples of planted fallows are *Casuarina* in the Central Highlands of New Guinea (Brookfield and Brown 1963:50-1) and *Acioa barteri* in West Africa (Nye and Greenland 1961:136-7).
improved by better breeding and selection. On the Sepik grasslands and along paths and roads there are considerable areas of grass. If stock, particularly cattle (Zebu crosses) and goats, could be put onto these areas they could provide work, manure and protein-rich foods and they would only occupy, what are at present waste areas. Goats are a problem with their destructive eating habits but with peg and chain they could be easily controlled.

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

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

1. Irrigation is not unknown in New Guinea (cf. Williams 1933:33).
APPENDIX F

SOME PLANTS IDENTIFIED IN THE MAPRIK AREA SHOWING BOTANICAL NAMES AND THE ABELAM, ENGLISH AND PIDGIN ENGLISH EQUIVALENTS

In the right hand column the Abelam name, as spoken in Yenigo, is shown italicized, the English name follows in ordinary type and the Pidgin English name follows in inverted commas.

I have grouped all plants identified in alphabetical order under the following headings: Garden Plants, Some Trees of the Forest, Some Trees of the Fallow, Some food producing Trees and Plants, Some Other Trees and Shrubs, Some Weed Grasses and Canes, Some Palms and finally a few Miscellaneous Plants.

Garden Plants

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Abelam Name</th>
<th>English Name</th>
<th>Pidgin English Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abelmoschus manihot (L.) Med.</td>
<td>tsagne (many variety names), 'apika',</td>
<td>onion, 'anien'.</td>
<td></td>
</tr>
<tr>
<td>Allium sp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranthus hybridus L.</td>
<td>kumbur'ie aliagwus (Wosera)</td>
<td>'aupa'.</td>
<td></td>
</tr>
<tr>
<td>Amaranthus tricolor L.</td>
<td>bare, 'aupa'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranthus sp.</td>
<td>wuraman, leaves eaten. A coarse wild variety fed to pigs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ananas comosus (L.) Merr.</td>
<td>tuan na djwia, pineapple, 'ananas'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arachis hypogaea L.</td>
<td>peanut, 'kasang'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassica chinensis L.</td>
<td>Chinese cabbage, 'kabis'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassica c.f. juncea</td>
<td>mil, 'kabis'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capsicum sp.</td>
<td>chillie.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capsicum frutescens</td>
<td>capsicum, 'lambau'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carica papaya L.</td>
<td>mbale-minya, paw-paw, 'popo'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closus cristata L.</td>
<td>kumburie (leaf eaten).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citrullus vulgaris Schrad.</td>
<td>water melon, 'melen'.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coffea canephora Pre,</td>
<td>Robusta coffee.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colacasia esculenta (L.) Schott and Endl.</td>
<td>Mai and waula (many varieties), taro, 'taro'. Leaves eaten of four varieties.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. I am indebted to Mr. J. Womersley of the Division of Botany, DASF, Lae, for identifying many of the plants listed here.

2. I am also indebted to Mr. Forge for checking much of the orthography.
Cucumis sativus L.
Cucurbita maximima Duchesne
Cucurbita pepo DC
Deeringia amaranthoides (Lmk.) Merr.
Dioscorea bulbifera L.
Dioscorea alata L.
Dioscorea esculenta Bkl.
Ficus wassa Roxb.
Ipomoea batatas (L.) Lam.
Lycopersicum esculentum Mill.
Manihot esculenta Crantz.
Musa spp.

Nicotiana tabacum L.
Dryza sativa L.
Psophocarpus tetragolobus (L.) DC.
Saccharum edule Hassk.
Saccharum officinarum L.
Vigna sinensis (L.) Savi.
Xanthosoma sp.
Zea Mays L.

am ange: cucumber, 'Kukamba'.
squash.
pumpkin. (shoots eaten), 'pamken'
winba, 'kumul'.
lipma, aerial yam, 'patata'.
wa bi, yam, 'yam'.
ka, yam, 'mami'.
kwandje, 'kumul'.
kiwik, sweet potato, 'kau kau'.
tomato, 'tomato'.
tsagopi, cassava, 'tapiok'.
lapu, (many varieties), bananas, 'banana'.
nyingg wu, tobacco, 'brus'.
rice, 'rais'.

Some Trees of the Forest (mainly strong building timbers)

Aglia sp.
Casearia sp.

Celtis grewoioides Warbg.
Casuarina sp.
Celtis sp.

Diospyros sp.
Eugenia c.f. F. mutans.
Gmelina sp.
Homa lium sp.
Intsia bijuga
Moraceae

Pometia pinnata For.
Tiliaceae ??

Vitex cofassus
Zizyphus sp.

kaman,
man gge (used for carving and
mandatory for the ridgepoles
of tambaran houses.
ang gi (strong timber).
tsige, kwara, 'yi at'.

yaunggu (sap used for glazing
black paint).
kalau, (fruit eaten).
le puk (used for posts).

miat.

nyingg gri p.
ang gi??
kwa tmu, 'kwila'.
gunek (used for making cloth
bark).

wa, 'taun'.
djawmara (bark pounded in
water and stuns fish).
miambe, 'garamut'. (No. 2
Kwila), also used for carving.
djimangge.
Some Trees of the Fallow

**Althoffia pleiostigma**  
(F. Muell) Warbg.  
**Callicarpa sp.**  
**Commersonia bartramii** (L.) Merr.  
**Debregeasia sp.**  
**Ficus wassa** Roxb.  
**Ficus septica** Burm. f.  
**Garcinia sp.**  
**Gironniera sp.**  
**Glochidion sp.**  
**Kleinhovia hospita** L.  
**Macraranga quadriglandulosa**  
**Mallotus sp.**  
**Melanolepis multiglandulosa**  
**Pipturus sp.**  
**Prema corymbosa** L.  
**Timonius sp.**  
**Trema cannabina** L.  

*ndatbalang*, brother to 'kwila',  
tagwanyingga (used for carving),  
ranggwul (used for carving).  
*ku'lavi* (used for posts and drums).  

*ma'am* (used for making net bags).  
*vi'argwu*.  
*manangwu* or *sargwe* (Wosera make net bags with this).  
*kwi'amabat* (used for frames in house building).  
*kwandjel*, 'kumul'.  
malinge.  
mirek.  
*nyarmacwun* (used for making net bags. Also planted in villages).  
*ullipat* (used for house posts).  
*mbet'gwu* (sometimes planted in the villages. Used for making net bags).  
*weireman* and *tsambian* (leaves eaten).  
*mbau*.  
dzungwule (medicine for runny noses).  
kwalambe and *wamake* (fruit eaten by cockatoos).  
a'lain. (bark scrapings used as dressing for sores).  
nongrup.  
*nimbi*.  
*mandambu*.  
*lepa* (used for making man killing throwing spears).  
*kjak'apwei*.  
kolimbo  
*mmbu'gara*.  
*mbe'gwu*.  
tsarbma.  
walambe.  
wamatagwu.
Some Food Producing Trees and Plants

<table>
<thead>
<tr>
<th>Tree/Plant Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annona muricata L.</td>
<td>mi-wal, soursop, 'kapiok'.</td>
</tr>
<tr>
<td>Areca catechu L.</td>
<td>masa, betel nut palm, 'bwoi',</td>
</tr>
<tr>
<td>Artocarpus atilis Fosberg</td>
<td>talumba and kam nuts only</td>
</tr>
<tr>
<td>Artocarpus atilis Fosberg</td>
<td>eaten, breadfruit, 'kapiok'.</td>
</tr>
<tr>
<td>Bambusa sp.</td>
<td>wal (flesh and nuts eaten),</td>
</tr>
<tr>
<td>Canarium sp.</td>
<td>breadfruit, 'kapiok'.</td>
</tr>
<tr>
<td>Carica papaya L.</td>
<td>danggwu, bamboo with edible</td>
</tr>
<tr>
<td>Citrus sp.</td>
<td>shoots.</td>
</tr>
<tr>
<td>Cocos nucifera L.</td>
<td>mainggio, 'galip'.</td>
</tr>
<tr>
<td>Diospyros sp.</td>
<td>mbale-minya, paw-paw.</td>
</tr>
<tr>
<td>Ficus aff. F. cyanaroides Corner</td>
<td>lemons, limes etc.</td>
</tr>
<tr>
<td>Ficus copiosa Steud.</td>
<td>tipma, coconut, 'kokonas'.</td>
</tr>
<tr>
<td>Ficus wassa Roxb.</td>
<td>kelau (inside kernels of</td>
</tr>
<tr>
<td>Graptophyllum sp.</td>
<td>fruit - eaten).</td>
</tr>
<tr>
<td>Gretum gnemon</td>
<td>mar'ru (shoot &amp; fruit eaten).</td>
</tr>
<tr>
<td>Kleinhovia hospita L.</td>
<td>kwarmbi (nut kombasik),</td>
</tr>
<tr>
<td>Mangifera indica L.</td>
<td>'kumul'.</td>
</tr>
<tr>
<td>Mangifera minor</td>
<td>kwandjel, 'kumul'.</td>
</tr>
<tr>
<td>Medusanthera papuana Becc.</td>
<td>mbar'gl (leaf eaten often</td>
</tr>
<tr>
<td>Metroxylon sagu Rottb.</td>
<td>planted in hamlets).</td>
</tr>
<tr>
<td>Morinda citrifolia L.</td>
<td>yuit, 'tulip'. Leaf and</td>
</tr>
<tr>
<td>Pandanus conoideus?</td>
<td>fruit eaten.</td>
</tr>
<tr>
<td>Phaseolus lunatus L.</td>
<td>weireman, leaves eaten - also</td>
</tr>
<tr>
<td>Piper betle L.</td>
<td>tree of the fallow.</td>
</tr>
<tr>
<td>Pometia pinnata For</td>
<td>tsake, introduced mango,</td>
</tr>
<tr>
<td>Syzygium malaccanse L.,Merr.</td>
<td>tsake, native mango,</td>
</tr>
<tr>
<td>&amp; Perr.</td>
<td>mi-tip. Leaves eaten. Also</td>
</tr>
<tr>
<td>Leguminosae</td>
<td>fallow tree.</td>
</tr>
<tr>
<td></td>
<td>nang, sago, 'sak sak'.</td>
</tr>
<tr>
<td></td>
<td>tsimbia (the red-hot fruit).</td>
</tr>
<tr>
<td></td>
<td>dkwia, 'arang' or 'garoka'.</td>
</tr>
<tr>
<td></td>
<td>dungumene. A pea like plant</td>
</tr>
<tr>
<td></td>
<td>of the early fallow -</td>
</tr>
<tr>
<td></td>
<td>immature white seed eaten.</td>
</tr>
<tr>
<td></td>
<td>kwarsi, 'daka'.</td>
</tr>
<tr>
<td></td>
<td>wa (many varieties), 'taun'.</td>
</tr>
<tr>
<td></td>
<td>nggwanggwale, Malay apple,</td>
</tr>
<tr>
<td></td>
<td>'lor lor'.</td>
</tr>
<tr>
<td></td>
<td>kwarandungu (leaf eaten,</td>
</tr>
<tr>
<td></td>
<td>Often planted to mark</td>
</tr>
<tr>
<td></td>
<td>boundaries).</td>
</tr>
</tbody>
</table>
Note:

1. The following garden plants are also grown outside the gardens:
   Abelmoschus manihot, Amaranthus spp., Ananas comosus,
   Arachis hypogaea, Brassica spp., Capsicum spp.,
   Cucumis sativus, Cucurbita spp., Manihot spp., Musa
   spp., Nicotiana tabacum, Lycopersicum esculentum, and
   Celosia cristata.

2. Fronds from the following ferns are also eaten:
   mbandjip, mbumi, wangguk, tserai. See also some
   edible shoots under palms. Also many wild
   Cucurbitaceae eaten: tsargelen, kwarmbut
   (Trichosanthes sp.??) marte-kinjo (Luffa sp.)
   arsel, yamekinjo (leaf also eaten), katabi.

Some Other Trees and Shrubs

Abroma augusta L.
Amomum sp.

Bixa orellana L.
Cassia alata

Ceiba pentandra (L.) Gaertn.
Cordyline sp.
Curcuma longa L.
Leucaena glauca
Leucosyke sp.
Mussaenda frondosa Gaertn.
Pandanus sp.

Note:

The inner bark of the following trees, usually specially
planted near the village, is used for making net bags;
nyamum, yipa, yuit, kam, ma'am and tsa'kwi.
Some Weeds, Grasses and Canes. (Wara is the general term for weeds and grasses, and vi for grass).

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageratum conyzoides L.</td>
<td>Coelorhachis rottboellioidees (R.Br) A.Camus</td>
</tr>
<tr>
<td>Bambusa sp.</td>
<td>Eleusine indica Gaerin.</td>
</tr>
<tr>
<td>Bambusa sp.</td>
<td>Eriocaulon longifolium</td>
</tr>
<tr>
<td>Coelorhachis rottboellioidees</td>
<td>Imperata cycindrica (L.) Beauv.</td>
</tr>
<tr>
<td></td>
<td>Paspalum conjugatum Berg.</td>
</tr>
<tr>
<td></td>
<td>Polytopa macrophylla Bth.</td>
</tr>
<tr>
<td></td>
<td>Saccharum spontaneun</td>
</tr>
<tr>
<td></td>
<td>Sorghum sp.</td>
</tr>
<tr>
<td></td>
<td>Areca catechu L.</td>
</tr>
<tr>
<td></td>
<td>Borassus sp.</td>
</tr>
<tr>
<td></td>
<td>Calamus sp.</td>
</tr>
<tr>
<td></td>
<td>Caroyta sp.</td>
</tr>
<tr>
<td></td>
<td>Cocos nucifera L.</td>
</tr>
<tr>
<td></td>
<td>Cyrtostachys sp.</td>
</tr>
<tr>
<td></td>
<td>Metroxylon sagu Rottb.</td>
</tr>
</tbody>
</table>

Weeds, Grasses and Canes:

- begningi
- kama, bamboo, 'mambu'
- dangu (shoot eaten), bamboo
- tsike and tsikewara
- tipmandugo
- yugwia (salt grass)
- nunggwai, 'kunai'
- bulmunga
- mbura
- tsua, wild 'pit-pit'
- vi-kapuk

Palms (* indicates that the shoot can be eaten):

- masa, betel nut palm, 'bwoi'
- waletipma (bark used in yam magic)
- mbal, climbing palm, 'kanda'.
- yaman, black 'limbom'.
- tipma, coconut.
- tapu, 'limbom'.
- nang (many varieties, sago palm, 'sak sak'.
- alo (used for flooring)
- mbandin (light coloured wood used for spears).
- mbambo (black wood used by Arapesh for making bows.
- tsapumasa (a wild betel nut. Very thin and tall).
- tsawwil (used for flooring).
- vindu (a substitute for betel).
- wangge (small ragged leaf. Used for spear points. Dark coloured).
- *mbandin (flooring, fencing, spears, bows).
- *wambinan.
Some Miscellaneous Plants

Alocasia sp. and/or Colocasia sp.
Ipomoea sp.
Ipomoea sp.

Lygodium sp.
Pandanus sp.
Pandanus sp.
Parsonia sp.
Passiflora foetida L.
Piper betle L.
Selaginella sp.
Vigna lutea (Sw.) A. Gray

miambé, 'wail taro', a wild taro.
au'gut (a vine).
kiv'vi (a vine. The stem is mashed and mixed with coconut water. Makes the consumer vomit).
nunnggwa (a vine from which armbands and yam masks are made).
bingna (rope for lashing).
tsige (small pandanus. Common in alluvium forests).
yeibowi (a vine).
mbausei (an introduced vine with edible fruit).
kwarsi, 'daka'.
tsike (a ground fern).
'bin', grows plentifully in new fallow.

pinu (large creeper. Pounded bark said to make people violently vomit. Death results if patients do not vomit).
APPENDIX G

MAPS AVAILABLE ON THE MAPRIK AREA, SEPIK DISTRICT, NEW GUINEA.

There are a number of sketch maps showing approximate village locations and locations of rivers, roads and paths etc. in patrol reports (available in Sub-district Office, Maprik). The Terrain Studies (AGS 1943, 1944) also contain a number of sketch maps, plans of outstations, and a survey of the Bainiyik - Pagwi road. There are no pre-war maps of the area to my knowledge although the Australian Petroleum Co. had aerial photographs flown by Adastra Airways for most of the Wosera and Wora areas. Also Trimetric aerial photographs were flown by the R.A.A.F. in 1947. The following is an annotated list of all maps available and they are listed in the order of the dates released.

1944 -Compiled by the Corps of Engineers, U.S. Army from aerial photography flown by Aust. Petroleum Co. in 1939 and by U.S.A.F. in 1944. Scale 1:63,360. Coloured and has form lines with interval of 100 feet. Village location and form lines very approximate. Sheets of the East Nanu, East Moi, Maprik West and Wihama West cover the whole Abelam area.

1944 -Compiled by 2/1 Aust. Army Topo. Survey Coy. from the same sources as above. Scale 1:253,440. Coloured but relief shown by oblique shading only. Many errors in village location and on the whole rather rough. Wewak sheet covers whole area.

1950 -Produced by the Division of Regional Development, Canberra. A booklet form of maps on 'The Resources of Papua and New Guinea'. Scale 1:4,561,920. It is in colour. Very generalized and out of date.

1951 -'District of Sepik', Sheet A,b. Compiled by the National Mapping Section, Department of the Interior, Canberra. Scale 1:600,000. Shows rivers and some village location but is very approximate. Relief shown with hachures.

1955 -'Sepik District' compiled by the Dept. of Lands, Port Moresby. Scale 1:506,880. A plan showing approximate river and village location.

1956 -'Wewak', compiled by the Dept. of Lands, Survey and Mines, Port Moresby. Scale 253,440. Somewhat more detailed and more accurate than the above.
1956 - 'Aitape' (974C IV)G. Published by the Aeronautical Chart and Information Centre, U.S.A.F. Scale 1:250,000. In colour and shows the approximate 500 foot contour interval. The best topographical map available. Does not show village location.

1959 - Sheets entitled 'Maprik', 'Wihama' and 'Korogo' produced by the Division of National Mapping and compiled from aerial photos flown by Adastra Airways, August 1958. Scale 1:40,000. These maps are only for the area east of 143° E. They show accurate location of nearly all hamlets (unnamed), all rivers and most of the smaller streams, roads and areas under grass.

1960 - Photomosaics of the aerial photos mentioned above. These photos were flown at 25,000 feet and these mosaics have a scale of 1:50,000. They are produced by the Division of National Mapping. These mosaics are available for those sheets mentioned above and likewise do not occur west of longitude 143° E.

1960 - 'Wewak - Lower Sepik Area' drawn by the Division of National Mapping, Canberra, for the CSIRO. Scale 1:126,720. Compiled from the same sources as the above mentioned map and shows the same features as the 1959 map with a scale of 1:40,000 though hamlet location is rather generalized and some small streams are not shown. This map was used by the CSIRO for plotting Land Systems (see CSIRO 1961) and Forest Resources.


1962 - 'Wora and North Wosera CSD's'. Drawn by D.A.M. Lea and compiled from aerial photos flown by Adastra Airways in 1958. Shows same features as 1959 map with scale of 1:40,000. Some village names were incorrect on original map but have since been corrected. Scale of this map 1:48,210.

Maps are also available in the District Office, Wewak of the Wosera and Proposed Amuk Native Local Government Councils. These are virtually copies of Lea's map but in addition show proposed electorates and alienated land.
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The approximate boundary of the Abelam as shown on this map is according to Glasgow and Loving (1960). The southern boundary of the Abelam is however not clear for there is a gradual merging with the Sepik River people. Whether the people south of about Yambi Agricultural Station are Abelam or Sawos (Sepik Plains speakers) is therefore open to question. Figure 7 shows the Abelam boundary as accurately as I believe it can be drawn.
Figure 2 - Linguistic boundaries and dialect boundaries within the Abelam. The Boikin linguistic group (not shown) is immediately east of the Wingei dialect group. Many villages are bi-lingual (e.g., Tatumba, Imbia, Ulupu and Balmo).

This map is based on the work of Glasgow and Loving (1960) who made a list of villages within the Maprik Sub-district divided according to language breaks. The few changes made, have been based on my own observations and native classification of dialects. Umonoko and Wabin-dumakag have been included with the West Wosera speakers instead of the Woseras; Seragakim has been included with the Maprik speakers instead of the Woseras and I have moved the western boundary of the Wingei speakers about three miles to the west.

On the whole Glasgow and Loving's five dialects (cp. Laycock 1962:29) bring out the main dialect groups although according to native classification, there are many different 'kinds of talk' in Abelam territory. The one major exception is that most informants in all areas agreed that the people of Kalabu, Malba, Yenigo and Naramco speak a different dialect (mamu kundi) from the people further west (shamu kundi). For the non-specialist, dialect boundaries are very difficult to determine. The natives have different dialect names for groups living close to them but further away groups become much larger. The people of Yenigo (mamu kundi) say that the people of Waiknakum (wa kundi) speak a dialect different from their own and from the people of Yangisagu (i'ye kundi), but the people of Stapikum (kamu kundi) say that the same dialect is spoken in Waiknakum, Yenigo and Yangisagu.

According to Laycock (1962:8) there are 29,188 Abelam speakers, 17,332 Boikin speakers, 1,804 Sawos (Sepik Plains) speakers and 17,791 Arapesh speakers based on the returns of the 1958/59 census. Within the Maprik Sub-district alone Glasgow and Loving give the following figures:

<table>
<thead>
<tr>
<th>Language</th>
<th>Number of Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abelam (Maprik)</td>
<td>30,180</td>
</tr>
<tr>
<td>Boikin</td>
<td>11,265</td>
</tr>
<tr>
<td>Gawangha</td>
<td>7,515</td>
</tr>
<tr>
<td>Sepik Plains</td>
<td>1,850</td>
</tr>
<tr>
<td>Mountain Arapesh</td>
<td>3,647</td>
</tr>
<tr>
<td>Southern Arapesh</td>
<td>8,070</td>
</tr>
</tbody>
</table>
Each District is divided into Sub-districts, and within each Sub-district certain villages have been grouped into CSDs.

Composition of CSDs is determined either on the basis of tribal or linguistic groups, or for convenience of patrolling, or in a quite arbitrary manner.

An officer making a census patrol is expected to patrol a complete CSD.

The following CSDs are patrolled from Maprik: Mamblep, Albiges, Wora, Yamil, Tamaui, North Wosera, South Wosera, Sepik Plains and Maprik.

Wingei, Nindepoyle, Kaboibus and Sepik are patrolled from Yangoru and all other CSDs are patrolled from Dreikikir.
Figure 4 - Physiographic Regions.

East of Longitude 143°E this map is largely based on the Land Systems of the Division of Land Research and Regional Survey (CSIRO 1961).
Figure 5. - Average monthly rainfall of seven stations between the Sepik River and the north coast of New Guinea.

On each rainfall graph January is on the left and December on the right.

Average annual rainfall for the stations shown on this map are:

- Dagua -- -- 95.90 inches
- Wewak -- -- 85.76 "
- Maprik -- -- 66.65 "
- Bainyik -- -- 65.93 "
- Yambi -- -- 81.83 "
- Ambunti -- -- 97.58 "
- Angoram -- -- 85.36 "

(Source, Commonwealth Bureau of Meteorology, Melbourne)

Variability of annual rainfall expressed as a mean deviation from the mean is only 8.4 per cent at Bainyik which is low compared with most tropical stations.

The Physical Regions shown on this map are generalized and taken from the CSIRO Report (1961:38).
AVERAGE MONTHLY RAINFALL & GENERALIZED PHYSICAL REGIONS

- COASTAL PLAIN
- MOUNTAINS
- FOOTHILLS & ANGORAM HILLS
- WOSERA HILLS
- LOW HILLS
- WASHKUK HILLS
- UPPER PLAIN
- FLOODPLAIN

Legend:
- Data on rainfall and physical regions of the area.
- Coasts, mountains, foothills, and plains are indicated.
- Specific locations such as Kairiu Is., Mushu Is., Maprik, Bainyik, Wevax, Yambi, and Ambunti are marked.
- Miles scale on the right side of the diagram.
Figure 6 - Daily rainfall in Maprik between September 1960 and August 1961.

Gaps occur during the Easter and Christmas holidays.

Total for each month are as follows:

<table>
<thead>
<tr>
<th>Month</th>
<th>September 1960</th>
<th>October</th>
<th>November</th>
<th>December (incomplete)</th>
<th>January 1961</th>
<th>February</th>
<th>March</th>
<th>April (incomplete)</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.65 inches</td>
<td>7.16</td>
<td>4.04</td>
<td>5.87</td>
<td>7.79</td>
<td>7.50</td>
<td>9.79</td>
<td>4.94</td>
<td>3.39</td>
<td>7.14</td>
<td>2.06</td>
<td>4.54</td>
</tr>
</tbody>
</table>

|               | 66.87           |

(Source, Malaria Control Pilot Project, Maprik).
DAILY RAINFALL AT MAPRIK

RAINFALL IN POINTS (TO NEAREST 5 POINTS)

- = TRACE (LESS THAN 5 POINTS)
Figure 7 - Abelam regions and population distribution.

The boundaries between the various Abelam regions cannot be defined with any more accuracy than shown on this map. The continuous line shown as the boundary between the North Abelam and the Wosera and the North Abelam and the East Abelam is fairly clear because of a noticeable change in dialect. Elsewhere changes are more gradual. The Sepik Plains is basically a physiographic region; the people of Nala have close ties with the Wosera and the people of Kwimbu with the North Abelam.
ABELAM REGIONS
POPULATION DISTRIBUTION

[Map of Abelam regions with population distribution marked with dots, representing population density. Key points such as Maprik, New Guinea, and Sepik Plains are labeled. Approximate boundary of Abelam is shown with a dashed line. Mile scale is also included.]
In 1962 there were 154 non-indigenous adults in the Maprik Sub-district. About 35 of these were in Maprik or Bainyik and another 45 were on mission stations and schools in the Abelam area.
ABELAM LAND
GOVERNMENT AND MISSION STATIONS

MAP

BELAM LAND GOVERNMENT AND MISSION STATIONS

APPROX. BOUNDARY OF ABELAM — ROAD
GRASS LAND — MISSION STATION (UNOCCUPIED) — AIRSTRIP
GOVT PRIMARY SCHOOL — RC ROMAN CATHOLIC — AOG ASSEMBLIES OF GOD
SSEM SOUTH SEAS EVANGELICAL MISSION — SDA SEVENTH-DAY ADVENTISTS
Figure 9 - Age and sex structure of the people in Yenigo and Stapikum No. 1 in 1962. This figure shows the structure of the population in five year cohorts of the 386 people who were included in my censuses of the two village segments. All birth dates before 1948 are estimated but are checked against genealogies and by my acquaintance of all concerned.

There was no difference in the numbers of each sex in Yenigo village but in Stapikum there were 83 males and only 69 females.

Low birth rates after the war are probably due to heavy recruiting of labour for post-war reconstruction around the coast and outbreaks of dysentery and influenza in the villages, which are mentioned in patrol reports of 1948.
POPULATION STRUCTURE OF YENIGO & STAPIKUM
1962

MALES

FEMALES

NUMBER OF PEOPLE

AGE

200

186

30

20

10

0

30

20

10

0
Figure 10 - The pattern of residence in Yenigo Village October 1961 to September 1962.

Erratum: amei not amie.
PATTERN OF RESIDENCE
YENIGO  OCT. 1961- SEPT. 1962

LEGEND
- Residence of Adult Male
- Separate Residence of Wife
- Residence of Widow
- Disused Residence
- House Tombaran
- Amie
- Road
- Old Hamlet Site
- Movement Ex-Hamlet 1961-62
- Movement Into-Hamlet 1961-62
- Sub-Clan Membership

<table>
<thead>
<tr>
<th>HAMLET</th>
<th>SUB-CLANS</th>
<th>ADULT MALES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>El</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>II</td>
<td>Cl, D1</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>III</td>
<td>D1, El</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>IV</td>
<td>D1</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>V</td>
<td>A1, A3, D1</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>VI</td>
<td>A3, C1, C3, D1</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td>VII</td>
<td>C1</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>VIII</td>
<td>C3</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>IX</td>
<td>A4, D2</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>X</td>
<td>C2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>XI</td>
<td>B1, D2</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>XII</td>
<td>A2, B1, C2</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>XIII</td>
<td>A2, B1, C2</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>XIV</td>
<td>B1, D2</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>XV</td>
<td>B2, D2</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>XVI</td>
<td>A1, B1</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>XVII</td>
<td>B1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>XVIII</td>
<td>A2, B1</td>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>

TOTAL: 63 ADULT MALES (63 CLANS, INCLUDING 15 NO LAND IN THAT HAMLET = 234)

FEET 100

KUMUNDJI

KWIENDJI
Figure 11 - Example of land and tree ownership on a south eastern ridge of Yenigo.
EXAMPLE OF LAND & TREE OWNERSHIP
A SOUTH-EASTERN RIDGE OF YENIGO
Figure 12 - Examples of typical Abelam gardens.

The two *wabi* gardens contained 52 *wabi* mounds and the *ka* garden contained 635 *ka*, 59 small *wabi*, 2 *lipma* mounds and 1,979 taro plants.
TYPICAL ABELAM GARDENS

TWO WABI GARDENS
TOTAL AREA 0.20 ACRES

ONE KA GARDEN
AREA 0.81 ACRES

GARDEN HOUSE
PIG PROOF FENCE

FALLOW
PATH

GATE WITH STILE
BLOCK DIVISION

ROUGH DOOR OF SAGO THATCH
ROUGH BARRICADE

LOWEST PART OF GARDEN
FORM LINES (CONTOUR INTERVAL 10 FEET)
Figure 13 - Cross section of a large wabi hole.
CROSS SECTION OF WABI HOLE

HOLLOWED SEED TUBER

CENTRAL HOLE LEFT BY CANE

REPLACED FINELY BROKEN TOP SOIL

REPLACED BROKEN SUB-SOIL

FORMER GROUND SURFACE

LIMIT OF HOLE

FEET
0 1 2 3 4
Figure 14 - Cross section of a large wabi hole on a hill slope showing the form of the trellis. If the wabi hole is on level ground the trellis is the same but there is no retaining wall, and the inspection hole is a long trench similar to the trench dug when the tuber is harvested except that only part of the tuber is exposed.
CROSS SECTION OF WABI HOLE ON HILL SLOPE

HORIZONTAL BARS

YAM VINE

GUIDING TRELIS

SEED

CANE RETAINING WALL

INSPECTION HOLE

TURER

REPLACED SOIL
Figure 15 - The North Wosera.

The limits of this map are shown on the inset in Figure 1.
Figure 16 - Percentage calorie and protein contribution from various foods in Yenigo and Stapikum in August and March.

For numerical data on which this figure is based, and some further comment see Appendix D.
PERCENTAGE CALORIE AND PROTEIN CONTRIBUTION FROM VARIOUS FOODS

YENIGO

AUGUST

MARCH

STAPIKUM

AUGUST

MARCH (ESTIMATE)

YAMS

GREEN LEAVES

TARO

SWEET POTATO

SAGO

MEAT

BANANAS

OTHER


LEGEND

KA GARDENS 1961
KA GARDENS 1962
WABI GARDENS 1961
WABI GARDENS 1962
COFFEE GARDENS
TREE GROVES & VILLAGE AREA
DISPUTED LAND
SLEEPING HOUSE
JEPP ROAD
VILLAGE BOUNDARY
BOUNDARY OF FLOODPLAINS & RIVER
TERRACES WITHIN VILLAGE BOUNDARY