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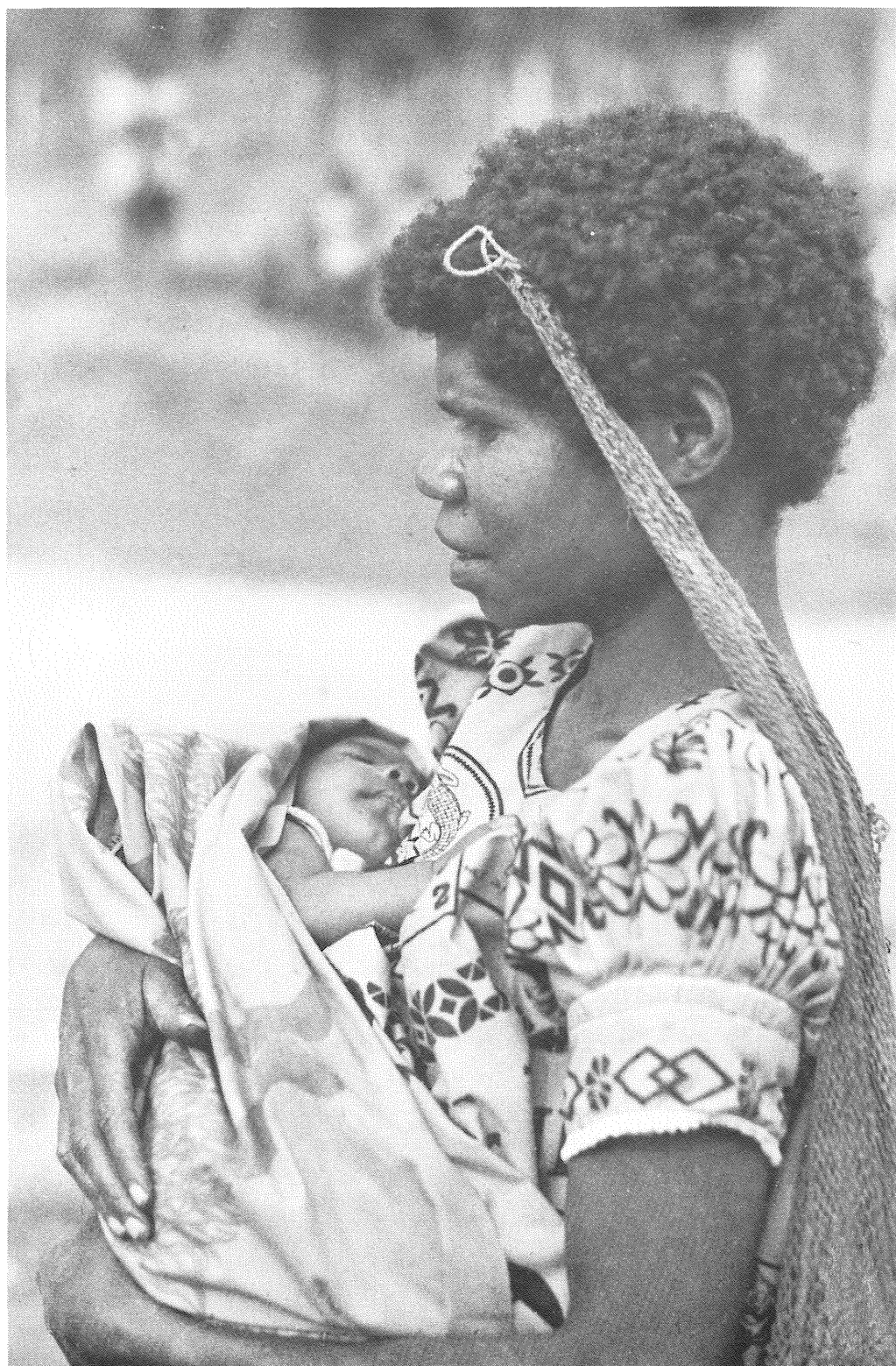
UNESCO/UNEP
Papua New Guinea Human Ecology Programme:
Lae and Its Hinterland

Report No. 1 From Kaukau to Coke:
A study of rural and urban
food habits in
Papua New Guinea

D.J. Jeffries

MAB

To the memory of the late
Eben Hipsley



FROM KAUKAU TO COKE

A STUDY OF RURAL AND URBAN FOOD HABITS
IN PAPUA NEW GUINEA

BY

DOUGAL JEFFRIES

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The Australian National University,
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PREFACE TO REPORT No. 1, Papua New Guinea Human Ecology Programme

This is the first in a series of reports to be published on the Papua New Guinea Human Ecology Programme (PNGHEP), 'Lae and its Hinterland'.¹ The Programme is being conducted by members of the Human Ecology Group of the Centre for Resource and Environmental Studies, Australian National University, in co-operation with national and local governmental and academic organizations in Papua New Guinea. The Programme itself is a contribution to the Man and the Biosphere Programme, Project 11: Integrated Ecological Studies on Human Settlements, which is jointly sponsored by Unesco and the United Nations Environmental Programme (UNEP).

The Papua New Guinea Human Ecology Programme has been designed in two stages which are equivalent to Phase 2 and Phase 3 activities in the guidelines for MAB Project 11 studies. The first stage consists of a series of demonstration projects, each involving an ecological evaluation of selected problems of development in the rapidly expanding industrial city of Lae and its hinterland. This preliminary study of twelve months duration is intended to demonstrate the value of ecological analysis in the perception and management of key problems. The second stage, to follow the evaluation of the success of the first stage, has been planned as a longer term more comprehensive ecological study, aimed at analysing the interrelationships between changes in the socio-cultural and physical environment and the health and well-being of the human population of Papua New Guinea.

While a full integrative ecological understanding of the dynamics and effects of change in Lae in relation to its hinterland is not possible without the second stage of the Papua New Guinea Human Ecology Programme, this stage is designed to make a useful contribution to the theory of human ecosystems and to the practical aspects of ecosystem management. Already it is clear that the findings in each research project have important implications for the analysis in others,

¹The report was also submitted in September 1978 as part of Dougal Jeffries' Ph.D. thesis at the Australian National University. The full thesis, entitled 'The Ecology of Food Habits in Contrasting Environments', includes some comparative material relating to food habits in Australia. Copies of the thesis will be lodged with libraries in the Australian National University and the University of Papua New Guinea.

and that the integration of the separate findings is enriching and assisting the policy-makers process.

There are four project areas, all dealing with problems at the heart of contemporary human ecology; food and nutrition, nutrient cycling and energy flows, cash flows and social change. In the area of food and nutrition, Dougal Jeffries has studied food habits and beliefs amongst the Fore people of the Eastern Highlands, in both their rural and their urban environments. The other three projects consist of a study of the ecology of consumer behaviour, focusing on cash flows stimulated by coffee-cropping in the Chimbu Province, and urban cash employment of Chimbu people in Lae; an analysis of the impact of urbanization on roles and social relationships amongst the Chimbu; and an examination of energy use and waste disposal with regard to alternative energy strategies, and nutrient cycling through intensive urban food production systems.

Unesco has made it a condition of contract that research be oriented to practical policy conclusions, and that the decision-makers and community representatives of the country concerned be informed about, and where possible involved in, the research programme. Indeed, in Papua New Guinea, interaction with local and national government in the process of research has been fruitful for both parties and implementation programmes arising from research are even proceeding in advance of the documentation of research findings.

Turning now to this project on food habits and beliefs, it must first be appreciated that the science of nutrition is facing many challenges. On the analytical level, there are such questions as the connections between nutritional status, growth rates, the effects of preventive and curative medicine, and morbidity and mortality (especially in children), which are complex and at present not clearly understood. This raises doubts as to the validity of comparing growth curves across populations as a measure of nutritional well-being.

On the practical level, there are difficulties relating to the crudity of twenty-four hour recall or even weighed food intake as a measure of diet. There are the expenses and hazards of fieldwork purporting to maintain an accurate measure of these parameters in a community over an adequate period. Surveys based on questionnaires

which are not followed up tend to be superficial and misleading, and clinical surveys are expensive and remain limited in scope.

Dougal Jeffries therefore decided that the most appropriate method to adopt would be an in-depth ecological study of a group of manageable size, yielding lengthy interview data verified by observation. Such a study can contribute a rich basis for understanding the nature of change and its implications for well-being in a volatile period of cultural transition. In this Report, the critical determinants of the diet of rural village dwellers, both agronomic and cultural, are defined, observed and described in terms of their response to the powerful influences of Western culture and the market economy - influences which become more significant as urbanization proceeds. This is the first study, to our knowledge, of the ecology of food habits and beliefs for members of the same group in both their rural and urban setting, and the study reveals the importance of such factors as perception and beliefs on diet and nutritional state. The changing status of foods from the rural to the urban environment, as well as attesting to the importance of socio-cultural factors in nutrition, points the way towards policies concerning food and nutrition which may be appropriate and beneficial in the dynamic circumstances of change from rural to urban living. The author draws conclusions which in many cases reinforce the directions of policy-making in Papua New Guinea, and this should prove heartening for the government policy-makers. Generally, however, the ecological approach described here provides a useful methodology for examining problems of nutrition caused by rapid economic developments in the Third World.

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Note

This is the first in a series of reports to be published on the Papua New Guinea Human Ecology Programme (PNGHEP), 'Lae and its Hinterland'.¹ The Programme is being conducted by members of the Human Ecology Group of the Centre for Resource and Environmental Studies, Australian National University, in co-operation with national and local governmental and academic organizations in Papua New Guinea. The Programme itself is a contribution to the Man and the Biosphere Programme, Project 11: Integrated Ecological Studies on Human Settlements, which is jointly sponsored by Unesco and the United Nations Environmental Programme (UNEP).

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The theme stated...

... by a middle-aged man from the village:

"Nambawan kaikai bilong yumi, olsem, nambawan kaikai bilong yumi tru, em kaukau. Em i nambawan kaikai bilong yumi tru. Kaikai i no ken pinis long yumi. Yumi no inap sotim, sot long kaukau. Yumi mas senisim, senisim. Sapos yumi no senisim kaukau hariap hariap, bai yumi stap nating."

"Our best food, it's like this, our very best food of all is sweet potato. It's truly our best food. We can't stop eating it. We mustn't go short of it, short of sweet potato. We must keep replanting it. If we don't replant it quickly, we'll be left with nothing."

... and by a young male migrant in Lae:

"Long taun, mi save baim olgeta kaikai, na mi kaikai. Tasol mi laikim mit pai na Coke, na samting bilong kukim: rais, pis wantaim, o sampela taim frisa mit. Em tasol. Na sips, wantaim pis. Mi laikim dispela kaikai."

"In town, I buy all kinds of food to eat. But I like meat pie and Coke, and things to cook: rice with fish, or sometimes meat from the freezer. That's all. And fish and chips. I like these foods."

Acknowledgements

My family and I owe our greatest debt to the Fore people among whom we lived and worked during our six months' fieldwork in Papua New Guinea. To all the villagers of Awande, and to the Fore residents of Lae, we extend warm gratitude, for their hospitality, tolerance, co-operation and kindness. Timothy Nigia, my full time field assistant, who cheerfully trudged many miles with us and shared many burdens (from sweet potatoes to our son), and Pilas, who ably assisted my wife with her interviews, were both good companions and helpful guides; to them we owe special thanks. As always, it is impossible to mention as many individuals as one would like, but from the village we must particularly thank Makis and all the inhabitants of Seve'agori hamlet, and from the town Emo, Wayama and Orame.

As a family, we also owe many thanks to Michael and Wendy Alpers and their children for continual encouragement, help and hospitality throughout our stay; and to Rudi Sakudh of the Awande Vocational School for his good neighbourliness and strawberries.

More formal acknowledgement is due to Michael Alpers in his role as Director of the Papua New Guinea Institute of Medical Research in Goroka, and to all the staff of the Institute, for their support and facilities; to Tony Chappelle and the University of Technology in Lae for help with duplicating; to Dr. John Conroy, of the Institute of Applied Social and Economic Research, for lending us a vehicle; and to Tau Manega, Field Manager of the A.N.U. Joint Research Schools, for arranging accommodation and transport on several occasions.

Among the many individuals who provided me with useful information and advice are Julian Lambert, now National Nutrition Planner; Sheila Hiles, Provincial Nutritionist in the Eastern Highlands; Marian Cast, Area Nutritionist in Morobe Province; Kimb Tai, Officer-in-Charge at Okapa Hospital, and his nursing staff; Trevor Busing, District Officer at Okapa; and in Australia, Colin Binns and Peter Sinnett. Steve Millar and Beverley Hewitt kindly collected some useful additional data for me, while they were working on a separate project in Awande in early 1978, under the auspices of the Institute of Medical Research. Acknowledgement is also made to Kumul Bakery (Lae) Pty. Ltd. for lending me copies of the advertisements reproduced in Plate 9.

The work described in this report was undertaken as part of my doctoral research during the tenure of an Australian National University Ph.D. Scholarship in the Centre for Resource and Environmental Studies (CRES). It also formed a demonstration project of the Papua New Guinea Human Ecology Programme, itself part of the Man and the Biosphere Programme sponsored by UNESCO/UNEP. Due acknowledgement is made to all these bodies for their financial support, and I should like to thank Hugh Littlewood, the Centre Secretary at CRES, for administering a rather complicated budget.

I am most grateful to my supervisor, Dr. Stephen Boyden, the Head of the Human Ecology Group within CRES, and to all my colleagues in the Group, for their encouragement, criticism and companionship. Ken Newcombe, as Director of the PNG Human Ecology Programme, provided valuable stimulation and leadership in its execution. For reading and commenting on various drafts of the entire manuscript I should like to thank Frances Barnes, Stephen Boyden, Frank Fenner, Bryan Furnass, Eluned Jeffries and Ken Newcombe; and for commenting on parts of it, Marion Christie and Cheryl Tychsen. Between them they managed to find a daunting number of errors, omissions and other inadequacies; those that remain are my own responsibility. For typing and retyping these pages, I should like to thank warmly Fay Goddard, upon whose efficiency and good humour I have been entirely and confidently reliant throughout.

My wife, Eluned, participated in the work from start to finish. Her concrete contributions are to be found in Chapter 6 of the report, and in some of the photographs, including the frontispiece; her less tangible contributions were still greater. To her and to Evan, my other companion, I offer due acknowledgement, thanks and love.

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Abbreviations used in the text

DPH	-	Department of Public Health
DPI	-	Department of Primary Industry
FAO	-	Food and Agriculture Organization
MCH	-	Maternal and Child Health
NPO	-	National Planning Office
NPU	-	Net Protein Utilization
PNG	-	Papua New Guinea
SDA	-	Seventh Day Adventist
WHO	-	World Health Organization

PART I

INTRODUCTION

CHAPTER 1

BACKGROUND, SCOPE AND METHODS OF STUDYNutrition in Papua New Guinea

Nutrition has long been recognised as an important factor in the national development of Papua New Guinea. This interest began with the first major nutrition survey in 1947 (Hipsley and Clements, 1950), and has recently been given extra emphasis by the appointment in October 1977 of a nutrition planner to the National Planning Office, and the subsequent preparation and implementation of a National Food and Nutrition Policy (NPO, 1978a). Reviews of the nutritional state of the population of Papua New Guinea (Hipsley, 1973; Wookey, 1973a) are bound to consider the rural and urban sectors separately, because of the great contrasts in environment, food supplies, population characteristics and life styles which exist between them.

a. Nutrition in rural areas. There have been numerous studies of various aspects of nutrition in different rural areas of the country. A comprehensive review of these is beyond the scope of the present report, but three overlapping foci of interest can be identified.

i) Studies of subsistence ecology and nutrition, reviewed by Oomen (1971), have clearly demonstrated the heavy reliance of most Papua New Guinea populations on a small number of starchy staples, or even a single staple crop. The main staples are sago and banana in the lowlands, and sweet potato, taro and yam in the highlands. These subsistence patterns have nutritional consequences which are locally variable, but three factors are critical. First is the protein content of the main staple, in relation to its energy content and physical bulk. Second is the availability of concentrated supplementary sources of energy, protein and other nutrients, and of sources of cash income for their purchase, if necessary. Third is the population factor: the age and sex structure and the growth rate of the population, in relation to potential food supplies and the labour requirements and land resources necessary for their production.

ii) Studies of nutrient and energy intakes in relation to requirements have produced some surprising results for energy and protein intakes. These have often been found to be exceptionally low

by international standards, but also to be accompanied by high levels of physical fitness, and low levels of overt malnutrition (e.g. Hipsley and Kirk, 1965; Norgan et al., 1974; Ferro-Luzzi et al., 1975). Notwithstanding the possibility of peculiar physiological adaptations to these low protein, low energy diets (Oomen and Corden, 1970; Hipsley, 1969), and the possibility that international standards are set too high for these populations, it is likely that in many parts of Papua New Guinea protein-energy malnutrition is a real risk for vulnerable groups such as preschool children, pregnant and lactating women, and the elderly. With the exception of anaemia, aggravated by intestinal parasites, and goitre and endemic cretinism in certain highland areas (a problem relatively easily treated by iodized oil injections), there seem to be few specific deficiencies of vitamins or minerals. This is not surprising, since most rural populations enjoy a diet largely made up of fresh, unprocessed, and conservatively cooked vegetable foods.

iii) Studies of infant and child growth and development in Papua New Guinea (e.g. Binns, 1976a; Malcolm, 1974) seem to agree on two general conclusions: that the growth rates of children in this country fall well below the widely used Harvard Standards, especially after the first six months of life; and that this shortfall is primarily due to the bulkiness of the normal diet which renders it deficient in energy. There is disagreement however on the implications of the slower growth rate and low weights-for-age for morbidity and mortality and for ultimate fitness and body size. Binns favours direct nutritional intervention as the best way of reducing mortality and morbidity rates, at least in sweet potato eating Enga children, while Malcolm argues that "simple and inexpensive health programmes" may in themselves be more effective than nutrition programmes. A combination of these approaches might be the best solution; in the meantime, the use of weight-for-age charts, using the 80 percent Harvard Standard as the criterion for defining malnutrition, continues to be the major diagnostic and monitoring tool used by the Department of Health in Maternal and Child Health (MCH) Clinics throughout the country.

Generally, studies in rural areas emphasise the continuing importance of subsistence production of foodstuffs, but the trend towards increased consumption of store foods, especially rice and

tinned fish, has been noted by several observers. Norgan et al. (op.cit.) report, for the survey population of Lufa in the Eastern Highlands:

"a shift away from almost complete reliance on the sweet potato towards other sources - notably, though still relatively small in importance, to foods bought from a local store."

Waddell, in an ecological study of the Raiapu Enga sweet potato cultivators, reports a similar change in food intake:

"The situation has been modified in recent years through the practice of 'making business' with pig meat, beef, and other foods, and as a result of the widespread availability of tinned foods in the stores." (Waddell, 1972, p.128).

In contrast, Lambert (1975a) found that less store food was being consumed in a Chimbu village in 1975 than had been the case in the same village twenty years before; he found a general decline in nutrition, and attributes it partly to increasing population, and partly to shortage of manpower because of migration of young men to the towns. Clearly, the dietary pattern in rural areas is changing under such influences, and the relationship between village and town, in terms of the movement of people, goods, and information is a critical factor in the process.

b. Nutrition in urban areas. Urban nutrition has so far received little attention in Papua New Guinea, and there have been few quantitative studies of food intake. In a study of the Rabia Camp migrant settlement in Port Moresby, Hitchcock reports intakes of energy which she describes as "the lowest yet recorded in Papua New Guinea" (Hitchcock and Oram, 1967, p.105). The energy intake was dominated by white rice, refined flour and its products, and refined sugar, with traditional starchy vegetables supplying only about 10% of the total. Protein intake was also dominated by refined cereal products, with tinned fish and tinned meat supplying about 25% and fresh meat and fish about 14% of the total. Fruits and leafy vegetables were consumed in very small quantities.

In his work on the economic and social welfare of Hanuabada in 1950-51, Belshaw used a semi-quantitative method to describe the food preferences of this urban community near Port Moresby (Belshaw, 1957). He found that bread, sweet tea, and rice were the main sources of energy,

while tinned meat and tinned fish contributed significantly to the protein intake; root vegetables and bananas were widely used, especially when the gardens were in their most productive season. Spinks (1963) compared food consumption and expenditure in Hanuabada and in Koke, a canoe settlement on another part of the Port Moresby coastline, near the major fruit and vegetable market. In both settlements, imported starches were consumed in larger quantities than local staples, and tinned fish and tinned meat in larger quantities than local fish and meat. These preferences were economically rational, in that the imported foods provided more energy and protein for the same amount of money than did the local foods.

More recently, Malcolm (1973) found that a sample of lower-paid public servants' households in Lae were consuming a diet in which 12% of calories came from protein (38% of this from animal sources), 77% from carbohydrates, and 11% from fats. He concluded that this diet, compared to the typical rural diet, improved prospects for physical growth and development, and increased resistance to most infectious diseases; however, it carried risks of more dental caries, hypertension, elevated serum cholesterol and obesity.

Wookey (1973b) gives a general account of nutrition in urban areas, but concentrates on Port Moresby. He emphasises the poor availability of cheap fresh fruit and vegetables, due to the climate and geographical location of the capital, and the high cost to the nation of importing foodstuffs, largely for expatriates. He also draws attention to the growing popularity of snack foods such as biscuits and aerated drinks.

No clear picture, then, emerges from these isolated studies. Most of them have been made in Port Moresby, but the nutritional situation may be more favourable in towns with more productive hinterlands, such as Lae and Rabaul. A further confusing factor, as Whiteman (1966) discovered in a study of beliefs and attitudes towards food in a low-cost housing settlement in Port Moresby, is the cultural heterogeneity of the urban population, which is largely made up of first generation migrants from a diversity of rural backgrounds.

With the urban population of Papua New Guinea currently increasing at over 5% per annum, most of this being due to in-migration from rural areas to the larger urban centres, the problem of feeding

this population is becoming ever more acute. There is a corresponding need for more information about how people's food habits are influenced by, and adapt to, new conditions, especially on moving from rural to urban environments, but also as food resources change in the rural environments themselves. My own research focusses on these questions, and the rest of this chapter summarises the scope and conceptual approach used in the study, and the sample populations chosen for investigation.

Scope and conceptual approach

The aims of the project described in this report can be summarised as follows:

- i) to make a comparative study of food habits and beliefs in culturally related urban and rural populations;
 - ii) to identify the main environmental factors which influence, and may be influenced by these habits and beliefs;
 - iii) to investigate in simple terms the implications of these habits and beliefs for the health and well-being of the populations;
- and iv) to relate the findings at the level of the two localised environments to factors at the national level, such as urbanisation, health and education policies.

The project was planned and executed as part of the Papua New Guinea Human Ecology Programme, which is concerned with the sociocultural and environmental effects of urbanisation, using Lae and its hinterland as a case study.

Human ecology is defined in barest terms as the study of man in relation to his environment. Among its essential features are its recognition of the importance of the interactions of biological, socio-cultural, and physical environmental variables; its emphasis on relationships existing within and between what might be termed a hierarchy of environmental levels, from the individual in his directly experienced local environment, through regional and national environments, to the level of the biosphere, or global environment; and finally, its insistence on human health and well-being as its ultimate

concern¹.

My approach to the study of food habits therefore focusses on interrelationships between certain aspects of human behaviour, and between this behaviour and the environments in which it takes place. This approach is summarised in the conceptual model shown in Figure 1. The basic assumption is that the food resources available to a particular population, and the food beliefs and preferences of that population, form two sets of interrelated variables, each set influenced by the other, and by factors in the local environment. The local environment is itself influenced by factors in the wider environment. In combination, the food resources, and food beliefs and preferences of a population largely determine its actual food consumption, although competing needs and values may intervene to prevent consumption of the ideally preferred diet. Food consumption is one factor among many influencing the total health and well-being of the population. The model exhibits the three essential features of human ecology as I have described it. The most important feature of the model itself is that it can be used in the study of populations in strongly contrasting environments, because the relationships which it displays are generally applicable ones. The model is not necessarily complete, in that it emphasises one-way causal relationships where reciprocal influences may exist, and it omits some significant factors, such as the nature of nutrient requirements, which would be included in a comprehensive account of the subject. Its usefulness lies in providing a logical structure for the collection, analysis and interpretation of data, rather than in expressing theoretical principles. This structure is reflected in the structure of this report, which will be outlined after the survey locations have been described².

¹I am here offering my own interpretation of the human ecological approach as it has been developed by the Human Ecology Group at the Australian National University, under the leadership of Dr. Stephen Boyden. In fact, human ecology has almost as many definitions as it has exponents (see Bayliss-Smith and Feachem, 1977, for a selection of Pacific studies in human ecology).

²Another conceptual model, aimed at identifying "the major determinants of nutritional status and their interactions in a self-contained subsistence community" is described by Sinnett (1977, pp.63-64); he states that, "It is only by establishing an appropriate conceptual model to serve as a basis for research and welfare programmes that specialist expertise can be co-ordinated into a unified plan of action." (ibid., p.85).

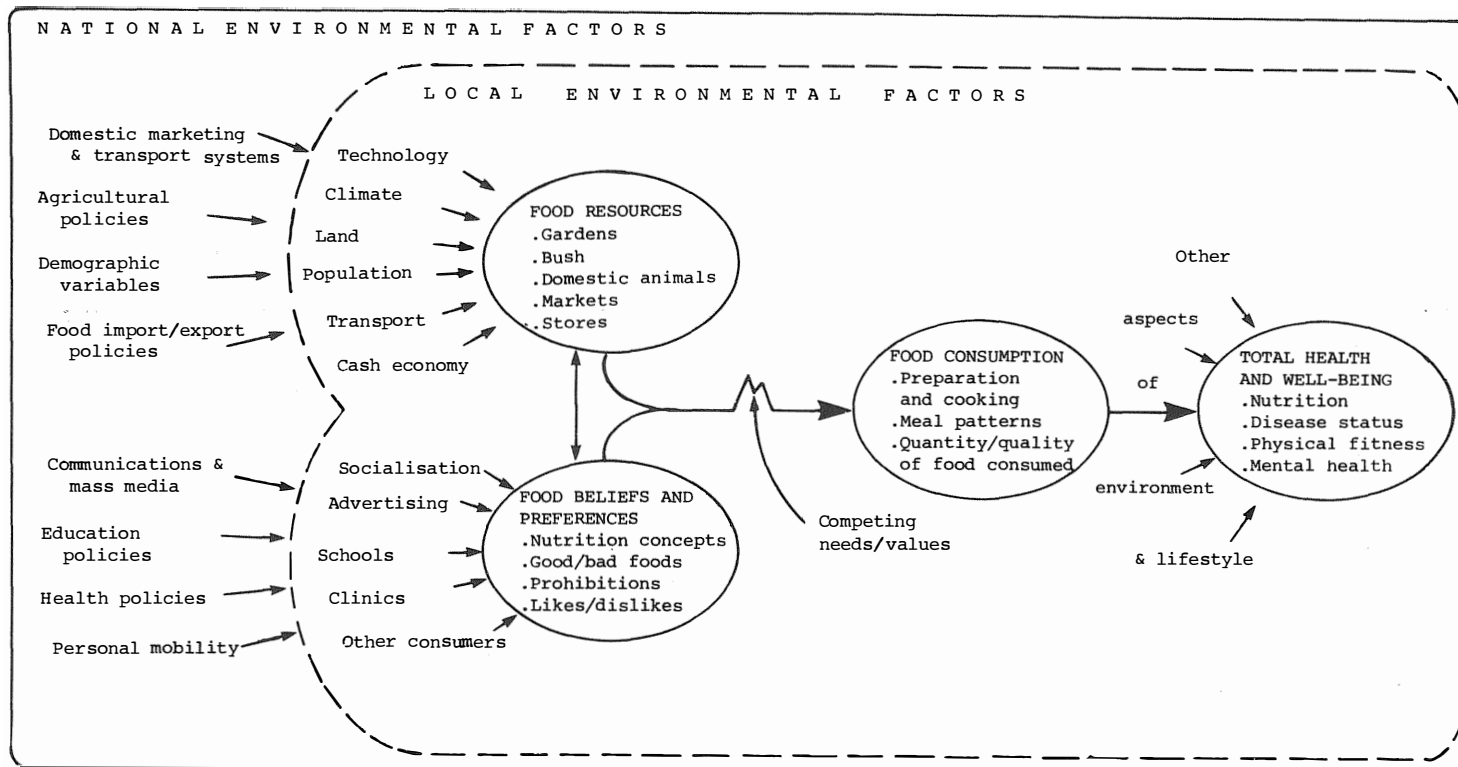
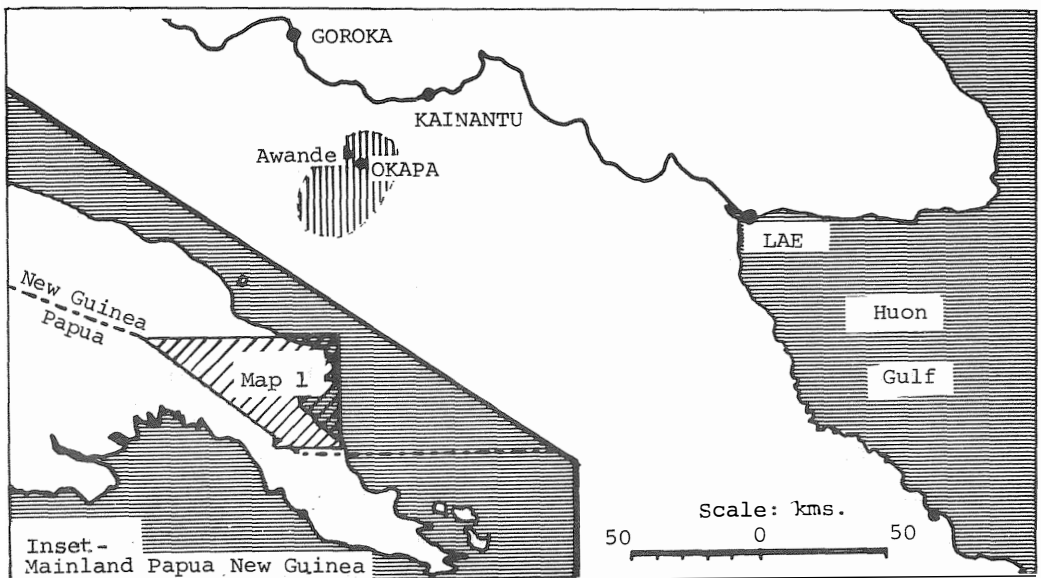


FIGURE 1 . A CONCEPTUAL MODEL FOR THE ANALYSIS OF THE FOOD HABITS OF A LOCALISED POPULATION
(Arrows indicate direction of main causal relationships)

Survey localities

The populations chosen for investigation belong to the Fore language group of the Eastern Highlands. The rural population was that of the village of Awande, five kilometres north-west of Okapa, in the Eastern Highlands Province (see Map 1). The urban population consisted of Fore migrants living in Lae, Morobe Province. The rural site was chosen for three reasons. First, considerable research had already been done amongst the Fore, mostly in relation to the neurological disease, *kuru*, but including some study of food habits and nutrition (Sorensen and Gajdusek, 1969; Reid and Gajdusek, 1969); secondly, personal contact and residence in the village was conveniently arranged through the Director of the PNG Medical Research Institute in Goroka, who was known to the population because of his participation in the *kuru* research; third, many Fore have found work and settled, semipermanently at least, in the rapidly expanding town of Lae, which is easily reached via the nearby Highlands Highway. Further description of the environments and survey populations will be found in the next chapter.

MAP 1. LOCATION OF THE FORE (SHADED AREA) IN RELATION TO LAE AND THE HIGHLANDS HIGHWAY



Fieldwork was carried out from April to October 1977: April 17th to April 26th was spent in Port Moresby, Lae, and Goroka, and included preliminary contacts with nutritionists and other authorities. April 27th to July 24th was spent in Awande; August 1st to September 30th in Lae; and a further three weeks, October 1st to October 21st, in a return visit to Awande. My wife was with me in the field for all but the last three weeks, and assisted with data collection and analysis throughout. Timoti Nigia, a young man from Awande, worked with us as a full-time field assistant in both the village and the town, and casual assistance was also given by a number of other Fore in each place. Most of the data analysis was done at the Australian National University in 1978. With the exception of most of Chapter 6 which was written by my wife and based on her own data, this report is entirely my responsibility.

The structure of the report

Following this introduction I describe, in Part II, the survey environments and populations, and their food resources. The rural and urban samples are described separately in Chapters 2 and 3 respectively, and in Chapter 4 comparisons are made between their food resources, in relation to differing environmental influences on these in the two localities.

Part III describes the food beliefs and preferences in each sample. Men's beliefs and preferences are dealt with in Chapter 5, and women's attitudes and beliefs regarding infant feeding in Chapter 6. Findings from the rural and urban samples are presented in turn in each chapter, and in Chapter 7 they are related to environmental influences; in addition, the importance of the relationship between the village and town populations is emphasised.

Actual food consumption is discussed in Part IV. A brief summary of meal patterns and cooking techniques is given in Chapter 8, and is followed by the key chapter of Part IV, describing dietary recall surveys in Awande and Lae. Chapters 10 and 11 provide some supplementary data on food consumption, based respectively on a short weighed intake survey in Awande, and a household expenditure survey in Lae. In Chapter 12 the food consumption patterns in the two populations are compared and related to other factors in their environments.

Part V turns to the implications of the observed food habits for health and well-being. Surveys of one quantitative measure of nutritional status, namely child weight for age, are described in Chapter 13, and their results are related to child morbidity and mortality patterns in the rural and urban environments. In Chapter 14, wider aspects of health and well-being are discussed, for adults as well as children, in relation not only to the food habits described earlier in the report, but also to other ecological and economic factors. Chapter 15 presents a summary of the overall findings, draws some conclusions of general relevance, and offers some suggestions relating to national and local nutrition policy.

PART II

ENVIRONMENTS, POPULATIONS AND
FOOD RESOURCES

CHAPTER 2

THE RURAL SAMPLEFore environment and societyThe Fore and *kuru*

The Fore people have been the subject of considerable medical, genetic and anthropological research since the identification in the mid-1950's of the neurological disease, *kuru*¹. The disease, which is invariably fatal, reached epidemic proportions at that time, and was restricted to the Fore and their closest neighbours. Elucidation of the aetiology of the disease took many years, but it is now known to be caused by a slow-acting virus, which leads to progressive degeneration of the central nervous system. Transmission of the disease was through the consumption of the flesh, viscera and, especially the brain, of deceased victims of the disease by their relatives. The attitudes and policies of missions and the Administration led to the disappearance of cannibalism through the 1950's, and since then deaths from *kuru* have gradually decreased. Because of the long incubation period of the virus, a few deaths are occurring even now, two decades after the last consumption of human flesh; indeed, a middle-aged man died of *kuru* in Awande a few days after our arrival in the village. The disease was contracted by about four times as many females as males, because the latter when adult rarely took part in mortuary feasts, and still more rarely did they consume brain tissue; it was mainly eaten by women and their dependent children. This sex differential led to severe distortions of the usual sex ratio at all ages, and this in turn had many ramifications in marriage patterns, sexual division of labour, and other aspects of social life (S. Glasse, 1962). Further information on the Fore region, Fore ethnography, and the epidemiology and aetiology of *kuru* can be

¹*Kuru* is a Fore word which refers to the type of sorcery thought to cause the disease; despite widespread missionary activity and apparent conversion to various sects of Christianity, sorcery beliefs are still strong in the area.

found in the collection of essays edited by Hornabrook (1976a). A comprehensive bibliography has been compiled by Alpers, Gajdusek and Ono (1975).

Fore environment and economy

A monograph on the subsistence economy and other facets of socioecological change in the Fore was recently published by Sorensen (1976). Much of the background information in this section is derived from Sorensen's account, and from papers in Hornabrook (op.cit.).

The Fore language group number some 16,000, dwelling in an area bounded roughly by the Lamari River to the East, and the Yani River to the West, occupying roughly 1000 sq.kms. Population density is lowest in the South, higher in the Central, and highest in the Northern region, these regions being distinguished by dialect differences (Scott, 1963). Altitude varies from about 1000m. to 3000m. above sea level, with most habitation and gardens below 2300m. The usual diurnal temperature variation is from about 7°C at dawn to 27°C at midday, with little change through the year. Rainfall averages 200mm. per month (at Okapa¹), the driest months being June to September. It is unusual for more than a week or two to pass without rain falling, and for most of the year some rain falls almost every day.

The Fore practise a form of shifting cultivation which is common to much of the Papua New Guinean highlands. Land is cleared from primary forest, or secondary bush grown up on old garden sites, fences are built to keep out the domestic pigs, and a succession of crops is planted and harvested until the overgrown garden is finally abandoned several years later. Most households will have several gardens in use at one time, and clear new sites each year, sometimes within already fenced but not fully used gardens. The sweet potato is the staple crop, but according to Sorensen it has succeeded taro in this respect only in the last century or so. There are still large stands of virgin rainforest throughout the Fore region, particularly in the south. In the more densely populated areas tracts of *kunai*² grassland are also found, the

¹Records for 1975, total 2490mm., and 1976, total 2292mm. Rainfall in other parts of the region is influenced by local topography.

²Some Melanesian Pidgin words will be used in the text; they are in italics, and are listed in a glossary appended to the report (p.225).

consequence of over-intensive cultivation of the tuberous staples. The forest is an additional source of food, in the form of birds, such as the cassowary and the bush turkey; marsupials, including possums, cuscus, and tree kangaroos; eels and fish in its larger rivers and streams; and a rich flora of fruiting trees, shrubs, herbs, and edible fungi. It is also a major source of fibres, medicinal plants, and timber for fencing, house building, implement making, and firewood; the latter is also provided by the ubiquitous *Casuarina* trees (*yar* in Pidgin), planted on old garden sites and in coffee gardens, where they provide shade and their nitrogen-fixing properties contribute to soil fertility.

Coffee was introduced to the Fore in the early 1960's, and is now by far the most important source of cash income to the area. As in much of the highlands, coffee-growing and road-building have been the two most important, and mutually reinforcing, factors in opening up the region to economic development and outside influences of all sorts. Other than coffee selling (and buying by a few individuals), sources of income for the Fore include employment on Government or Mission stations, sales of garden foods at local markets, and employment outside the area, in towns such as Lae and Moresby, on plantations, or in Government service throughout the country.

In the twenty-odd years since European contact, the Fore economy has changed from a purely subsistence one with negligible external trade relationships, to a mixed subsistence, cash cropping, and wage-earning economy, in which even most of the elderly, and certainly everyone of middle age and under is familiar with the use of money and with many of the goods and services which it can buy. Tradestores selling food, clothes and hardware are found in most villages, and journeys throughout the area are easily made by means of coffee-trucks and public motor vehicles (PMVs).

Fore social organisation

At the time of first European contact, in 1947, Fore society was greatly affected by warfare, and competition for status through physical strength and fighting prowess was a major preoccupation of males (Berndt, 1962). Sexual antagonism was reinforced by separate residence of men and women. However, the *Pax Australiana*, the influence

of missionaries, and the relative scarcity of women because of *kuru* all served to increase female status, and correspondingly to reduce the opportunities for males to achieve positions of great power (R.M. Glasse, 1962). Communal men's houses are no longer found, and husbands usually sleep with their wives and children. The 'Big Man' ideology which still prevails in Chimbu and the Western Highlands seems to be less dominant among the Fore. A few individuals have achieved local prominence in recent years through entrepreneurial and political activity, but they are exceptional; competition for prestige is not an obvious feature of day-to-day village life. Sorensen writes, of traditional Fore society:

"Instead of a formal hierarchy to govern social and political activity, the Fore had developed a system based on inter-personal compatibility and co-operation among close associates. Social cohesion was based on rapport, not principle." (op.cit., p. 135).

A patrilineal principle operates in the formation of small local lineages, and certain respect is accorded to the persons and opinions of their senior members; but there is great flexibility in the conventions governing residence, marriage, and adoption. The brother-sister bond is a strong one, and remains so after marriage. Marriage is commonly with a cross-cousin, but such a relationship may well be fictive, and according to R.M. Glasse, the

"So-called 'preference' is no more than the expectation of marriage arising in a reciprocal relationship entailing long-term property exchanges in both directions." (R.M. Glasse, 1969).

Those who behave to each other in a reciprocal, positive manner may be regarded as kin.

I have included these observations because they may have some bearing on the prevailing attitudes to rules governing food consumption, infant care and so on. We often found the answers to our questions about what is or should be done in a given circumstance included the Pidgin phrase "*em i laik bilongen*" ("it's up to him/her") or its variants. This imprecision probably results partly from the inadequacy of Pidgin as a medium of communication, but it may also be a function of the relatively easy-going, undogmatic set of beliefs and values common to the Fore. That beliefs in the power of sorcery, nature spirits and ancestral ghosts (Lindenbaum, 1976) apparently co-exist with beliefs derived from Christianity, is further evidence of considerable cultural flexibility.

The settlement pattern of the Fore has been stabilised since the Administration put an end to the endemic warfare and raiding which existed before European contact. Most people live in compact hamlets, which are fenced nowadays to keep out pigs rather than enemy warriors, and which contain up to a couple of dozen houses arranged sometimes lineally and sometimes more randomly. However, those who prefer to live in smaller groups are free to do so, and hamlets containing one or a few households are scattered between the larger units. Hamlets are linked together by lineage ties, and above this level into villages, whose identity has grown up under Government influence in the form of census-taking. Villages have no obvious spatial boundaries; Sorensen uses the term 'population clusters' to describe them, while Glasse and Lindenbaum refer to 'parishes'.

Awande: the setting

Location and environment (see Plate 1)

Awande is a village situated some 6 kms. north west of Okapa, just to the north of the boundary between the North and South Fore census districts, and sharing a boundary with Keiagana speakers to the West; Awande people speak the central Fore dialect but most understand some Keiagana too. I estimate the land owned by the various Awande lineages to cover an area of approximately 40 sq.kms; of this, the majority consists of secondary bush and currently worked gardens, but there are still large areas of forest on the hillsides bounding Awande to the north and south. The altitude varies from about 1500m. to 2000m., with most of the hamlets towards the upper end of this range. There are no large rivers in the area, but several permanent streams which provide water for drinking and washing.

Awande was the site of the Lutheran Kuru Hospital, built in the early 1960's for the study and treatment of *kuru* victims, and for the care of young children whose mothers had died of the disease. The hospital is now closed¹, and part of the building is used as a small Lutheran primary school with two classes and one teacher; my wife and

¹Okapa Hospital is 6kms. away; it has no fully-trained doctor but 8 orderlies and 3 nurses provide basic treatment and inpatient care, as well as running MCH clinics throughout the District.

I lived in another wing of the building during our fieldwork. The hospital residences were taken over by the Government several years ago, and are now used by the Awande Boys' Vocational Centre, which currently has one Australian and one Papua New Guinean member of staff and about thirty pupils. There is a small Lutheran church in the centre of the village, with a resident local pastor. An all-weather road goes through Awande, linking the District Headquarters at Okapa with the Gimi (another language group) to the south-west, and the Keiagana to the north-west.

Thus Awande is relatively accessible, more so than much of South Fore, and has had close contact with the Administration and with Missions for nearly two decades. Apart from the Lutherans, nearby Seventh Day Adventist churches have made some converts in the eastern, lower-lying hamlets of Awande. K2.00 will pay for a one-way PMV trip to Kainantu, about two hours away, and K5.00 for a trip to Lae, five hours away.

Population

In May 1977, I made a population count which gave the following approximate figures for those currently resident:

Adult males	115
Adult females	112
Children	330
Total	557

In addition, 47 young adult males were absent, mostly working in towns or on plantations, 11 of them with Awande wives. Five male youths were absent at boarding schools. Most of those absent were expected to return to the village to live at some time in the future. Taking absentees into account, the total adult sex ratio was about 1:3:1, which is unexpectedly high¹. The absence of the majority of young males from

¹According to the records of *kuru* deaths held by the Institute of Medical Research, Goroka, 49 people died of the disease in Awande from 1957 to 1977: 39 of these were female, and 10 male, the highest incidence being in women of child-bearing age. Although the figures I have given for current population show some imbalance of the adult sex ratio (165 males : 123 females), most of the imbalance is in younger age groups, rather than in the 40+ age group as would be expected from the age distribution of *kuru* deaths. I counted 9 widowers and 6 widows in the present population; furthermore, 7 men each had two wives. The explanation for this anomaly may lie in an influx of women from other areas; there were certainly several Keiagana wives, but I have no detailed data on this.

the village reduces the manpower available for heavy tasks such as fencing and clearing new garden sites, but I never heard this stated as a problem or complaint. It may be that the expectation of cash and goods from wage-earning male relatives offsets any resentment at the absence of their labour. (It is also quite likely that women at least would not readily have voiced such complaints to me.)

The resident population was distributed among twenty-five hamlets, ranging in size from a single household (in five hamlets) to fifteen households. A household usually consisted of a married couple with their dependent children; men sometimes slept alone in a nearby house, but communal men's houses are no longer found in Awande. Average household size was 4.5.

Dwellings

The typical house is round, about three metres across, with double walls of woven *pitpit* (a non-edible kind of wild grass, with bamboo-like stems) between heavy wooden stakes, and a roof of *kunai* grass. In the centre of the floor is the hearth, encircled by stones. A low sleeping platform of woven *pitpit* covers most of the remaining floorspace. A few houses in Awande were rectangular and raised on stilts, in the fashion introduced by the Europeans, but such houses were said to be too cold. The floor level of the usual house is slightly below that of the ground, and the houses are warm, but smoky.

In addition to the normal living houses, every hamlet had at least one menstrual hut (*haus blud* or *liklik haus* in Pidgin), where menstruating women had to remain with their infants, and where women gave birth. Most houses had their own pit latrine nearby, concealed by a small *pitpit* and *kunai* shelter. The use of latrines is traditional, a consequence of sorcery beliefs which regard bodily excretions as potent materials in working *poisin*.

Pigs, which used to be kept in the women's houses at night, and to have free run inside the hamlets, are nowadays usually excluded by a sturdy fence around the hamlet. Dogs, chickens and a few cats are kept and pick for scraps inside and outside the houses.

Economy

The local economy fits into the general outline given for the Fore as a whole. Subsistence gardening and pig husbandry are still the

mainstay of the economy. Most fencing is done by men, and most planting, weeding and harvesting by women. However, neither sex shows any shame in performing the tasks most often the responsibility of the other. This flexibility extends to other domestic activities, such as carrying infants, and cooking; it may be one consequence of the disruptions caused by *kuru*. But while women are expected to go to work in their gardens every day, excepting very wet weather, and Sundays, when they may go only to collect food for the evening and the next morning, men may do little productive work for days on end, preferring to play cards for small cash stakes, or sit, talk, and lie in the sun. Women rarely, if ever, play cards, unlike in some areas of the Eastern Highlands where their participation, as well as that of men, is held to pose a threat to the nutrition of young children, and to village life in general (PNG Post-Courier, 4 July, 1977).

Coffee is primarily a male responsibility, but women often help in picking, cleaning, drying and selling the beans. Most men have at least one coffee garden, with anything from 50 to 300 trees altogether. In a sample of twenty-four men questioned as to their total earnings from coffee in the 1977 season (which was practically over when the figures were collected in October), the range was from K15 to K130, with an average of K50¹. Most coffee is sold, at the parchment stage, to travelling coffee-buyers; sometimes it is sold, at slightly higher prices, direct to the local coffee-factory, an hour's walk away from the centre of Awande.

Income from wage-earning in the District was limited to eleven individuals at the time of our arrival: one hospital orderly and two council drivers, all usually resident at Okapa; two Public Works Department road men; one PMV driver; one carpenter; a part-time labourer in the Vocational School; the full-time storekeeper; the teacher; and the pastor. (The storekeeper was a Finschafen man, and the teacher was from Henganofi, an adjoining District to Okapa). A few households sold small quantities of food at the Okapa market, to government employees.

¹All monetary data in this report are in Kina. At the time of the research, the exchange rate was approximately K1.00 = Aust.\$1.15.

I have no data on the amount of cash which is brought into the village by wage-earners returning from further afield, but it must be quite substantial, as are the material goods, such as radios and sewing machines, which they bring home as gifts or for their own use.

Cash which enters the village is circulated or expended through three main channels. First, it may be used in ceremonial-type payments, such as brideprice, or gifts to *kandere* (members of the mother's brother's lineage) at funerals. Secondly, it may be reinvested in the form of goods to be sold to other villagers through small, individually-owned tradestores, or in the form of livestock such as cows (there was one cow in Awande when we were there, but two larger co-operative projects were planned), pigs and poultry. These animals may later be used in ceremonial payments, sold to other villagers, or used for home consumption. Finally, and most importantly, cash is used in the purchase of goods and services: mainly food, clothing, tools such as axes and bush knives, and travel. Major items include radios and tape recorders, sewing machines (themselves a form of investment when used for sewing clothes for sale to other villagers), and coffee-pulping machines. The latter are important labour saving devices, and there were six in the village. Each cost over K100, and was bought and owned jointly by a number of related households.

Through these three main channels, the cash economy includes the whole population of the village, though participation in it is unequal. Dissatisfaction is often expressed by the villagers at the lack of 'development', which is seen in terms of major projects, such as schools, water supply and businesses; but there are insufficient skills, leadership and communal initiative to realise these aims. The result is an economy where ceremonial payments tend to inflate, and expenditure is mostly on non-productive consumable goods.

Food resources (see Plates 2 and 3)

Sorensen and Gajdusek (1969) give a general description of gardening, food handling, and diet in the Fore, based on a much longer period of fieldwork than mine. My own account is restricted to what I was able to observe and record during three months in Awande, and on statements from informants regarding certain seasonal foods.

Gardens

Gardens are by far the most important source of food in Awande. They are planted in clearings in the primary forest, and on old garden sites where secondary bush has grown up after a period of fallow; some small plots are found inside most hamlet fences. Thus a garden may be anything from a few minutes' to an hour's walk away; the system of land rights leads to fragmented holdings by any one individual who usually has several gardens in varying stages of maturity at one time. The main garden crops, and a few wild plant foods, are listed in Table 1 (below). The table includes their botanical, English, and local names, with brief notes on their production, occurrence and use. Sweet potato is the paramount crop. It is fetched from the gardens daily and is planted throughout the year, while the other main starchy tubers - yam, taro, Chinese taro and wing bean root - are seasonal; bananas are sporadically available all the year. Pandanus nuts are another important seasonal resource, gathered from palms planted sometimes in gardens, and sometimes in the bush or forest. The three other major garden foods are sugarcane, the highland *pitpit* (*Setaria palmaefolia*), and a type of *kumu*, or leafy green, called *evi'a* in Fore. Each of these is gathered and eaten almost daily.

The range of garden foods now available is probably greater than it was before European contact; important introductions over the last generation or two include corn, peanut, Chinese taro, some varieties of bean, common and Chinese cabbages, and green onions. All these introduced crops, except Chinese taro, are grown partly for sale at the Okapa market, but they are also popular in Awande.

According to my informants, there is no regular seasonal shortage of food in Awande. Sometimes a household may go short of food because of inefficient planning, prolonged illness, or a pig spoiling a garden, but such a household can expect help in the form of food from a relative. Older men however say that fighting used to interfere with gardening:

"When we were fighting with our enemies, we wouldn't think of our gardens, and we'd go short of food... The women would be afraid of men from another *lain* arriving and shooting them, and they wouldn't think about the gardens - they'd just stay in the village."¹

Garden work was harder in the days before steel axes:

¹Quotations are from recorded interviews unless otherwise stated.

"We would keep on cutting trees - our bones would be all loose and painful. We'd go and sleep, toss and turn, sleep. Get up and get our stone axes, go back to work on the fences, keep working, cutting down trees, and making gardens... Now the young men don't think of working in the gardens; they sit around and play cards, that's all. We ourselves had hard work in the gardens."

In summary, gardens today provide a plentiful and varied source of food the year round. Their creation and maintenance is the focus of daily activity, involving constant work by the women, and seasonal exertions by the men when new fences and gardens are made¹.

TABLE 1 MAIN FOOD PLANTS USED AT AWANDE, WITH NOTES ON THEIR OCCURRENCE AND USE¹ (see footnotes at end of table)

Common name ²	Botanical name	Local name ³	Notes
Banana	<i>Musa</i>	<i>Yagi</i>	At least 8 named varieties, some cooking, some sweet. Cooking varieties may be cooked in skins on fire, boiled, or steamed in earth oven, whole or grated. Suckers planted near houses and in gardens.
Beans: Kidney & lima types	<i>Phaseolus</i> spp.	<i>Arikoko</i> <i>Yara</i> <i>Epamumeru</i>	Several dwarf and climbing varieties of bean widely planted, some available throughout year. Harvested at mature green stage; cooked in bamboo tubes or steamed in earth oven. Leaves also eaten. Named varieties said to be traditional, but 'arikoko' may be derived from 'haricot'.
Soya bean	<i>Glycine max</i>	<i>Soi</i> (P)	Introduced; planted in a few gardens. Eaten as other green beans.

¹Sorensen and Gajdusek (1969) emphasise the social and cultural importance of gardening in the following, rather fulsome, terms:

"During the day, hamlets are virtually deserted as the women and their husbands, together with the unmarried girls and young children, go to the gardens where they mingle their social, family and erotic pursuits with their garden work in a salutary and emotionally filled gestalt of garden life."

Table 1 (Ctd)

Common name	Botanical name	Local name	Notes
Wing bean (<i>Asbin</i>)	<i>Psophocarpus tetragonolobus</i>	<i>Piga</i>	Seed sown annually by every household. Flowers, leaves, green beans, and finally roots available in succession. Roots always steamed in bunches in earth oven, forming major item of many <i>munu</i> feasts.
Breadfruit, wild (<i>Kapiak</i>)	<i>Artocarpus</i> sp.	<i>Ta'ua</i>	Widespread on old garden sites, self-sown. Only young leaves eaten, especially with pig. Fruits and seeds inedible.
Cabbage, common	<i>Brassica oleracea</i>	)	Introduced; grown for sale at market, and for home consumption. Propagated from D.P.I. seeds, or replanted base of stem. Boiled in saucepan, or steamed whole in earth oven.
Cabbage, Chinese	<i>B. sinensis</i>	)	
		) <i>Kebis</i> (P)	
		)	
Cassava	<i>Manihot utilissima</i>	<i>Tapiok</i> (P)	Introduced; widely grown, but in small numbers. Boiled, cooked in fire, grated and cooked in bamboo tube, or steamed in earth oven. Not highly prized, but useful stand-by in times of shortage.
Chinese taro (<i>Taro kongkong</i>)	<i>Xanthosoma sagittifolium</i>	<i>Taro kongkong</i> (P)	Introduced; widely grown, but in smaller numbers than <i>taro tru</i> . Small auxiliary corms eaten boiled and steamed, main corm thrown away.
Corn	<i>Zea mays</i>	<i>Patari</i>	Probably introduced 2 or 3 generations ago. Popular seasonal crop; harvested at immature stage; cooked on embers, boiled in saucepan, or steamed in earth oven. Not stored, except for seed.
Cucumber	<i>Cucumis</i> spp.	<i>Kimi</i>	Several varieties, sown in new gardens; seasonal. Thirst quenching, eaten raw only.

Table 1 (Ctd)

Common name	Botanical name	Local name	Notes
Fungi (<i>Masrum</i>)	Many spp.	<i>Ugwa</i>	Many named types gathered in bush and forest, with various recognised cooking and eating qualities; some especially popular with children. May be cooked on fire, or in bamboo tube with <i>kumu</i> .
Ginger (<i>Kawawar</i>)	<i>Zingiber</i> sp.	<i>Kai</i>	Popular condiment, roots and stems eaten raw and cooked.
Irish potato	<i>Solanum tuberosum</i>	<i>Katope</i> (from german 'Katopen')	Introduced; grown by a few individuals, mainly for sale. Tubers small by European standards. Eaten boiled, cooked in ashes, or steamed in earth oven.
Leafy greens (<i>Kumu</i>)	Many spp. incl. <i>Ruellia</i> sp.	<i>Aninda</i> , incl. <i>Evi'a</i> <i>Ne'ne'</i> <i>Aibika</i> (P) <i>Avi'eni</i> <i>Aga'nu</i> <i>Naine</i> <i>Tarisarewa</i> <i>Osagi'a</i> etc.	Numerous types of leafy greens, cultivated and wild. <i>Evi'a</i> most popular, eaten almost daily, usually cooked in bamboo tube, often with <i>pitpit</i> hearts; propagated by stem cuttings. Other types propagated vegetatively, or by seed. Several wild herbs and ferns used, especially steamed with tubers in earth oven. Some tree leaves and shoots also used.
Onions, green	<i>Allium</i> spp.	<i>Anian</i> (P)	At least 4 introduced varieties, widely grown for sale and home consumption, usually boiled. Propagated by replanting base of stem.
Pandanus, nut (<i>Karuka</i>)	<i>Pandanus</i> sp.	<i>Ina</i> <i>Kabu'ina</i> <i>Pai'iani</i>	Wild and cultivated varieties. Latter planted in individually-owned groves, usually near streams in forest or bush. Seasonal. Nuts smoked and cooked in fire, consumed in large numbers; very popular. Fleshy inside of fruit also boiled and eaten.

Table 1 (Ctd)

Common name	Botanical name	Local name	Notes
Pandanus, red (<i>Marita</i>)	<i>Pandanus conoides</i>	<i>Mana</i>	Grows mostly at lower altitudes; otherwise obtained from S. Fore and Gimi areas. Seasonal. Drupes broken up and cooked in bamboo tube (traditionally) or boiled in saucepan (more common now). Red oil sucked off seeds, or may be used to <i>gris</i> vegetables. Traditionally, men ate it in seclusion from women, but not now.
Pea	<i>Pisum sativum</i>	<i>Raunpela bin</i> (P)	Introduced, not widespread. Eaten green, as beans.
Peanut	<i>Arachis hypogaea</i>	<i>Pinat</i> (P)	Introduced; apparently grown less now than a few years ago. At present only planted in hamlet at lower altitude. Grown for sale at market; also very popular among children; raw, boiled or fried.
Pineapple	<i>Ananas comusus</i>	<i>Painapu</i> (P)	Introduced; a few planted near houses in most hamlets. Sold in market, or eaten in hot weather.
<i>Pitpit</i> , highland ⁴	<i>Setaria palmaefolia</i>	<i>Pari</i>	Over 12 named varieties; most common cultivated plant after sweet potato, available throughout year. Heart of stem cooked with <i>kumu</i> in bamboo tubes; or, still with outer leaves, steamed in earth oven; more rarely cooked on fire. Important item at nearly all <i>mumu</i> feasts.
Pumpkin	<i>Cucurbita</i> spp.	<i>Igi</i>	Traditional varieties long, and high in moisture; introduced varieties round and more dense. Wild pumpkin vines found in forest. All cooked on embers, boiled, or steamed in earth oven. Tend to be fed to children at <i>mumu</i> .

Table 1 (Ctd)

Common name	Botanical name	Local name	Notes
Sugarcane	<i>Saccharum officinarum</i>	Yabu	Many named varieties varying in colour, size, taste and sweetness; grown in gardens and near houses. Propagated from tops of cut stems; grow to 12ft. or more, tied to stakes, mainly men's responsibility. Chewed as snacks throughout day, and with meals.
Sweet potato (Kaukau)	<i>Ipomea batatas</i>	Isa'a	Over twenty named varieties, varying in leaf shape, tuber skin colour, flesh colour and texture; corresponding variety in cooking and eating qualities. Universally planted; most important garden crop, available throughout year. Propagated from vine cuttings. Baked in ashes, boiled in saucepan, and steamed in earth oven. Leaves sometimes eaten.
Taro (Taro tru)	<i>Colocasia esculenta</i>	Îna	Several varieties. Universally planted, in separate small plots, often near homes. Seasonal. Cooked in ashes, boiled in saucepan (often with sweet potato), or steamed in earth oven. Propagated from top of old corm.
Yam	<i>Dioscorea</i> spp.	Ago Asage'a	Many varieties; universally planted, usually within sweet potato gardens. Seasonal. Propagated from old tubers, or vines. Cooked as sweet potato. <i>Asage'a</i> differs from others in longer growing period, much larger size, and denser texture.

¹This list is not exhaustive, and refers only to the immediate area of Awande; in particular, it omits some wild fruits, berries and nuts, whose occasional consumption is probably not of nutritional significance. Reid (1958), in addition to the common food crops lists over 250 dietary items, mostly herbs, which were traditionally used by the Fore.

²Names in parentheses are Melanesian Pidgin.

³North Fore names, unless indicated as Pidgin (P); my phonetic rendering, with assistance from Dr. Graham Scott, Dept. of Linguistics, Monash University.

⁴In some low-lying areas of South Fore, the lowland *pitpit*, *Saccharum edule* (Igu in Fore) is cultivated. The inflorescence is cooked on the fire and the outer sheaths removed before eating. This food is known to some, but not all, Awande inhabitants.

Forest and bush

A variety of leaves, shoots, nuts, berries and fungi are gathered in the forest and secondary bush, mostly by women and children. Some are included in Table 1. Often the collections are made on trips to and from gardens, but special trips are made for some purposes, as in the gathering of particularly valued ferns to accompany the tubers cooked at a *mumu*, or of breadfruit leaves to eat with pig.

Animal foods found in bush and forest include possum, cuscus, flying fox, and rats of various kinds. The larger types are hunted, mostly on moonlit nights, with bow and arrow, while small animals may be caught by hand, or in traps. Cassowaries, though sometimes seen, are now rare; if a young one were to be caught, it would be reared in a pen in the hamlet, and killed when mature. Small birds are shot at whenever they are seen, and hunting for them in small parties is a popular if unproductive pastime for men and boys. A few bush turkey nests are found annually, and the individual who finds one will repeatedly steal the eggs as they are laid; they can be sold at the market for 30t. each. Insects are another item caught in the bush, especially by children, who may either cook and eat them at once or take them back to the hamlet. Particularly appreciated is a large type of beetle larva, found in rotting tree trunks.

Wild foods do not contribute in large quantity to the diet, except for the semi-domesticated pandanus nut, in its season, but they provide a constant source of variety, and irregular but significant contributions of animal protein. As an old man put it:

"In the bush, there's not true food, but there's plenty of *abus*, like possum, cassowary, wild chickens, insects in trees. There's *kumu* too in the bush - we get that and eat it."

The recreational value of the forest is perhaps as significant as its role as a food resource. Hunting is undoubtedly engaged in for pleasure. A 16-year-old boy described one Sunday as follows:

"When I'd eaten, I got a towel and soap, went down to the stream and washed. I came and got dressed, and went down to church. After church, I went up to the house, changed my clothes, got my bow, and came on top. A man said, "Let's go and hunt rats". We hunted rats in this bush, down below. We lay in wait, holding our bows, we waited for the rats to come by. We lay in wait, and the girls chased the rats as we waited. We killed two, two rats. We kept on hunting for more, but there weren't any, we gave up. I left the others, came back to the house, cooked food, and went to sleep. We gave the rats to the husband of this woman here..."

Hunting was always described to me as an enjoyable pursuit; likewise, the discovery of a treetrunk covered in an edible fungus, of a wild pumpkin, or of a clump of special ferns was always greeted with delight (Plate 3.3).

Domesticated animals

Every household in Awande, excepting one or two Seventh Day Adventist ones, owned pigs. A pig count in May 1977 gave a figure of 472 pigs, an average of nearly four pigs per household. Pigs are cared for by both men or women. They may be owned by individual men and women, or jointly by a married couple, depending on the origin of the pig. They are fed regularly twice a day, and at *mumu* feasts, on inferior sweet potatoes and scraps. The rest of the time they find what they can in the bush. Most pigs are penned at night, sleeping in small shelters. They may also be penned for a period before slaughtering if they are being fattened for a special occasion.

Pig husbandry is not based on maximising biological productivity, but is closely related to the complex system of gift exchange and ceremonial payments. Thus, two halves of pig can be bought for K32.00 from the Okapa freezer, while a village pig of equivalent whole carcase size might be valued for exchange purposes at K200 or so¹.

When pigs break into a garden, it is usually held to be the fault of the pig's owner, for not feeding it properly. If there is disagreement, the matter may be settled by the village court, as happened in this unusual case:

A man found a large pig had broken into his old, but still yielding, sweet potato garden. He shot and wounded the pig, and he and the pig's owner went to court. The pig's owner argued that the garden fence was old, and that his pig had been specially put aside for the forthcoming *singsing*. The man who shot the pig was fined K10, and had to return the pig to its owner. He then killed it, butchered it and cooked it in an earth oven, and sold it piece by piece to other villagers, for a total of K106. He gave K8 to the man who shot the pig.

¹In Salisbury's terms (Salisbury, 1962), the village pig would be classed as a "valuable", but the freezer pig would be a "luxury"; the latter would rarely be used in ceremonial payments.

The actual consumption of pig will be discussed in more detail in Chapter 8.

Chickens were found in nearly all hamlets, especially since the start of a chicken project at the Vocational School. This project buys one-day-old cockerels, and sells them at 2 or 3 weeks old, for 50 toea each, to villagers. There is a heavy loss from hawks, dogs, and other causes, and this, combined with the lack of quality feed makes chicken-rearing a highly inefficient process. There were also some hens in a few hamlets, but their eggs were either never found, or were left to hatch. Chickens are rarely eaten until several years old.

One Seventh Day Adventist had a number of ducks, bought as ducklings from Lae; these were intended to be sold eventually, but probably many will die before then. Another man had a cow, which ranged freely and was not milked, and was greatly feared by the villagers whenever it appeared. Its owner will slaughter it on a suitable occasion:

"When the time comes when I want to kill it, my brothers, sisters, children, we'll get together, get some *kumu*, heat some stones, and everyone can come. We'll cook it in the *mumu*, we'll take it out, cut it up, and give it to all my friends - or someone who's given me cow to eat before, I'll pay him back - it's up to me, I can give it to whom I like. *Wantoks*, friends, sisters.... if I don't give it to them, they'll be angry with me: they won't give me any food... it's the same with killing pig."

Two groups of kin within the village were each planning co-operative cattle projects, for which they will seek help from the Department of Primary Industry. However, livestock husbandry in Awande is, as I have described, poorly developed in terms of efficiency of management and production. The potential and apparently the desire, for improvement is great, but is likely to be realised only slowly, and with many disappointments and setbacks along the way.

Markets

The market at Okapa was held twice weekly, from about 6.30 to 8.30am on Wednesdays and Saturdays. There was a smaller market at Ke'afu, a Keiagana village some 2 kms. from the centre of Awande; and larger ones were held weekly at Tarabo and Anumpa, both about 15 kms. distant. Some families sold food regularly at Okapa, but the other markets were not often visited because of the lack of convenient transport.

People from Awande rarely go to a market in order to buy food. Sometimes, after making a sale, they may buy something, such as a cabbage, some peanuts, or another item they do not grow for themselves, but usually the money will be spent on store foods, or saved for later use. Thus, markets provide a potential food resource for Awande which rarely needs to be used.

Stores

Awande is the site of a relatively large trade store, run by a private company which has branches throughout Papua New Guinea. The Awande store has no freezer, but has a range of tinned and dried foods: rice, tinned meat and fish, dried milk, sugar, salt, dripping, biscuits, tinned cake, aerated drinks, tea, coffee, milo, cheesepops¹, and chewing gum. Other tradestores in Awande include a small one run by the Vocational School, and (in July 1977) six individually-owned *kentin*, four of them situated on the roadside and two others in less accessible hamlets. All these stores carried a smaller range of goods than the main store. Store prices and sales are described in more detail in Appendix A.

There is a store in Okapa with a freezer, from which frozen brisket, and sometimes chicken and halves of pig can be obtained. In Kainantu, frozen mutton and various cuts of beef and pork are usually available, and may be bought for special occasions. Still further away is the cattle ranch at Dumpu in the Markham Valley, where a whole fresh cow can be bought for about K300, and its carcass brought back to the village by truck.

Summary

With the coming of the Australians in the mid-1940's, the Fore entered a period of rapid social, cultural and economic change which continues to the present day. The *kuru* epidemic, which at its height seemed to threaten the very survival of the culture, is now in its last phase, but its demographic and social effects are still felt. The cessation of warfare, the introduction of coffee as a cash-crop, and

¹Throughout this report, I use "cheesepops" to include all brands of cheese-flavoured, plastic-packed snacks.

the departure of young men for wage-earning jobs in other parts of the country have radically altered the traditional way of life.

Subsistence gardening still constitutes by far the most important source of food, with sweet potato the dominant crop, complemented by a wide range of other vegetables. Garden food supplies are abundant throughout the year. Animal protein is available in the form of domesticated pigs, chickens and a few cattle but efficiency of production is very low. Food from the bush and forest is of minor and probably declining significance in nutritional terms, as more land is continuously being cleared for gardening and cash-cropping. Production of coffee and vegetables for cash sale does not yet appear to threaten subsistence food supplies, through diversion of labour or land, but might do so in the future as population expands, or if many more young men leave the villages to seek work elsewhere. Tradestore foods are readily available throughout the region, but cash income is generally too low to allow households to replace a large proportion of their traditional diet with purchased foods. Some of the main environmental factors influencing food resources in the rural area will be considered further in Chapter 4, after the Fore population in Lae has been described.

CHAPTER 3

THE URBAN SAMPLELae: the settingLocation and environment

Lae is Papua New Guinea's second largest urban centre, and its foremost industrial town. In October 1977, its population was estimated at 45,100, of whom 4,100 were non-citizens; the annual growth rate of the citizen population from 1971 to 1977 was approximately 5.0% (Bureau of Statistics, 1978a). These figures for population and growth rate were both much lower than had been predicted from earlier figures (see Conroy, 1977), suggesting that the rate of in-migration has slowed down, though the total number of migrants in the town must still be high. A large proportion of the migrant population is housed in self-help settlements on the fringes of the town.

Situated on the Huon Gulf at the mouth of the Markham River, Lae has a hot and humid climate with little seasonal variation. Mean monthly temperatures vary from 24.8°C to 27.4°C, with an overall mean of 26.3°C, and a diurnal range of about 5.5°C. Annual rainfall averages 456cm., with a peak in July and August. Relative humidity is usually around 80%¹.

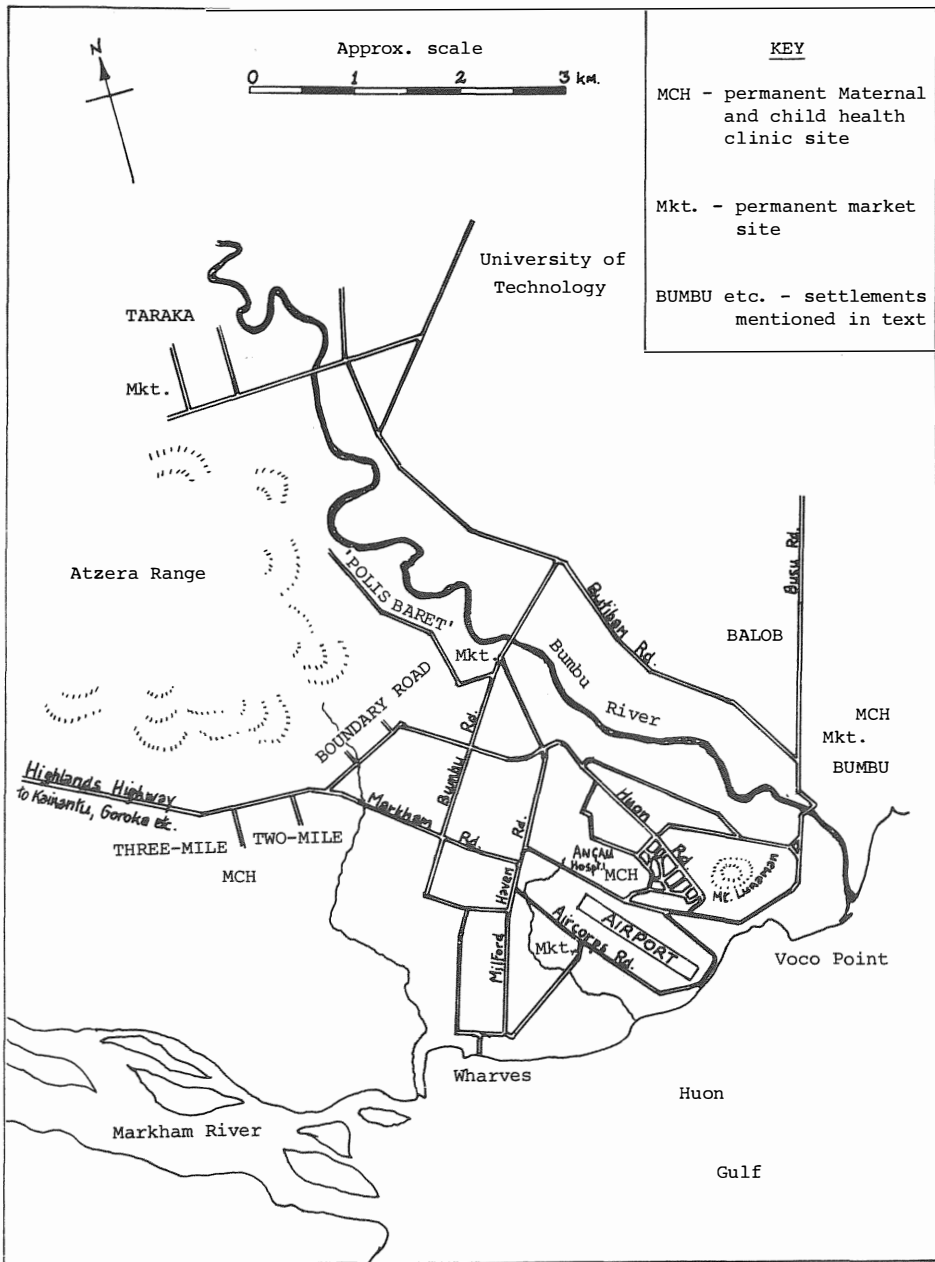
Most residential and commercial development in Lae is on level terrain between the Markham and Bumbu Rivers, out along the Markham Road to the north-west, and to the north of the Bumbu, towards Taraka (see Map 2). There is an extensive self-help settlement on the lower slopes of the Atzera Range which lies to the north-west of the town, but the danger of erosion due to heavy rainfall and intensive clearing of the forest cover for gardens and firewood makes the higher slopes of the range unsuitable for permanent settlement.

The Fore population in Lae

By first contacting the six Awande men then living in Lae, and

¹Data from long-term records of Commonwealth Bureau of Meteorology, 1970.

MAP 2. LAE, SHOWING MAIN ROADS, SETTLEMENTS, AND PERMANENT CLINIC AND MARKET SITES MENTIONED IN TEXT



thereafter using the *wantok* system to build up further contacts, I was able to find over fifty households with Fore heads in Lae. These 'households' varied in size from single male employees' quarters, to self-help dwellings where three or four married couples and several single relatives shared their meals together. Excluding transient visitors, the population was made up as follows:

Adult males, Fore	80
Adult females, Fore	32
Adult females, other highland groups	12
Adult females, Markham District	13
Children	87
TOTAL	224

There were other Fore households in Lae which I failed to contact, but judging from my informants' comments, they were few in number.

The people I contacted came from all over the Fore area, from Paiti in the far south, to Kagu in the north. Most of the adult men had been in Lae for less than ten years (with a median of six years), and most of the adult women for less than five (with a median of three years). All the adult women were married, most of them a few years after their husbands had first migrated to the town. Most of the children were born in Lae, and nearly all were under ten years old.

The sample population was distributed throughout the town, including the following settlements: Boundary Road, Two-mile (in *Haikost*), Taraka, Bumbu, Balob, and *Polis baret*¹; some people were living in hostel accommodation, and others in quarters provided by their employers in the central area of town.

Different sub-samples of the total were used in studies of food beliefs and preferences, food consumption and child weights for age; further details of the composition of these populations will be found in the relevant sections.

¹A name given by its inhabitants to the settlement near the Police Barracks; presumably it is a mistaken Pidgin rendering of the latter.

Housing conditions (see Plate 6)

Forty-one of the households contacted were living in self-help settlements, in dwellings either erected by themselves, or purchased from earlier migrants. These houses were constructed mostly of scrap materials such as timber, corrugated iron and asbestos sheeting, and were raised on posts above the often muddy ground. Generally they provided adequate shelter from the rain; often with one family per room, they were crowded by European urban standards, but no more so than the usual village house. Cooking in these self-help dwellings was usually done in small shelters adjoining the house, on an open fire or, more rarely, on kerosene stoves. Firewood could usually be obtained free, or at low cost, from various sources of scrap in the town, but it is not plentiful. Water supplies have been put into most of the settlements by the local authority, which charges a small annual fee (e.g. K6 per plot in the Two-mile settlement) for this and other services such as road maintenance. The water supply usually consisted of one tap in the yard, or a communal tank shared by a number of dwellings. Some people had erected tin drums as rainwater tanks. Pit latrines were constructed in most house plots, but the high rainfall and resulting heavy soils make them less satisfactory than their village equivalents.

Only four households occupied Housing Commission dwellings, rented for between K7 and K10 per fortnight. These houses are generally better than self-built homes, with regard to strength and durability of materials, internal division into rooms, and outside toilet and washing facilities. Electricity is provided, and used mostly for lighting. The other households lived in a variety of hostel and employee accommodation, often of a poor standard. As an example, one young married couple occupied a single room approximately 2m. by 2m. in a block of such units; one electric light was provided, and the couple used their own primus stove. Water was from a tap shared by several dozen households. For this accommodation the husband, a barman in one of the biggest and plushest hotels in Lae, was charged K4 per fortnight.

Economy and social life

The great majority of Fore men in Lae are in full-time employment. For those from whom I obtained details, the breakdown by type of employment was as follows:

Hotel and restaurant workers	17
Factory hands	17
Drivers, mechanics	8
Retail store assistants	5
Road and wharf labourers	3
Other	9
Unemployed	11
TOTAL	70

The concentration of employed men in hotels and restaurants, and in a small number of factories, is probably a result of new arrivals seeking jobs through an already established *wantok*. The unemployed Fore in Lae, I believe, mostly fall into the category which Ross Garnaut (1972) calls "the hopeful... who prefer continued urban life without a job, and anticipating that formal employment would become available, to returning to village life". Most of them are young, and financially dependent on the older male relatives with whom they live in Lae. Those wishing to return to their village would have no difficulty in borrowing the K5-K10 necessary for the one-way journey.

I found no Fore in 'white collar' jobs; only a few of those contacted had any secondary schooling, and Form 2 was the highest educational level reached. Gross wages for full-time jobs were typically between K50 and K60 per fortnight, with a tax of K3 or less¹. A taxi driver and a Highlands Highway truck driver each earned over K100 per fortnight. Two women in the sample were employed, both as part-time domestics in expatriate homes, for wages of K32 and K20 per fortnight. A few households supplemented their income by selling garden produce at the market, but the proceeds would not have reached K10 per week.

In Chapter 11 I describe a small household expenditure survey which provides detailed information on how money is spent. For the time being, it is sufficient to note that all the households I contacted had a relatively secure cash income through at least one full-time male

¹The minimum urban wage rate at the time was K56.16 per fortnight for adult general labourers and K42.72 for unmarried juniors.

wage-earner. The economy is basically a cash economy, supplemented by some gardening for home consumption (discussed in the section of food resources, below).

In addition to their relatively long-term unemployed *wantok*, usually young men who are as happy to look around as to look for a job, many households are visited quite frequently by other village relatives, including parents and unmarried sisters. Many families make return visits to the village during the husband's annual leave, and on special occasions such as funerals; for people from North Fore, even weekend trips are practicable. These two-way visits maintain social and emotional links between the urban migrants and their home villages. Gifts are also exchanged at such times, the town-dwellers giving clothes and other store goods, and coastal products such as coconuts and betel nuts, and receiving in return valued village foods such as sugarcane and sweet potato. Thus the town and village household economies are closely interrelated, as I have already pointed out in the case of Awande.

I did not attempt to study Fore social life in Lae, and the comments which I now make are based on casual observation and conversation. In comparison with the village, the opportunities for social interactions with other Fore are more limited in number, frequency and variety, especially for women. The residential pattern of concentrated enclaves of Fore scattered among the various settlements means that daily contacts with other Fore are mostly made within the household, with people in a few nearby houses, or, for the men, with colleagues at work. During the week it is common for unemployed men and childless women to visit *wantok* in other parts of Lae; at the weekend there are often gatherings of people from the same village of origin at the house of one of them. On weekdays, there is little movement outside the settlements after dark; at weekends, recreational activities include watching sports but rarely participating in them, going to the cinema, playing cards, occasionally beer-drinking, and simply 'going around'¹ town with family and friends: sitting, talking, watching the world go by, and visiting snack bars. Contacts with non-Fore seem to be minimal

¹'going around' is my translation of the Pidgin verb '*raun*'; Marilyn Strathern (1975) translates it even more directly as "to 'round'", and explains it as follows: "to wander 'around', to go astray, to travel with no other purpose than to sightsee."

except at work and, as is quite common, when relationships with families in the Lae area have been established through marriage¹.

Lae: food resources (see Plate 7)

Gardens

Migrants in Lae who wish to produce food from their own gardens face four sets of problems. First, available land is in short supply in most settlement areas. Only near Taraka and the *Haikost* settlements is there plenty of garden land. On the lower slopes of the Atzera Range above the Boundary Road settlements the land is subject to severe erosion, mainly because of haphazard and over-intensive tree-felling and cultivation, which is extending ever further into the bush. In most areas inside the town, garden land is owned and used by the original inhabitants of the villages around which Lae was established, and is rarely available to migrant settlers.

Second, because of the informal system of land use by settlers from different backgrounds, who have little if any communal ties with each other, gardens are not secure from theft and damage. This is in contrast to the village, where numerous sanctions and customary rules operate to protect people's gardens from interference by others.

Third, unfamiliarity with the soil, climate, and crops of the coastal region makes gardening more difficult for the highland migrants. Frequently they complain about the effects of the heat, the softness of the soil (caused by heavy rain in poorly-drained flat ground), and the prevalence of insect pests.

Finally, women are likely to feel particularly insecure in the town, with their men away at work for most of the day, and their older relatives still in the village. They are therefore not keen to walk long distances to gardens in unfamiliar bush, where dangers may exist in the form of both human strangers, and unfriendly local 'spirits' or

¹Compare Lucas (1972), writing about Lae in 1971: "For most of the indigenous population of the town, social horizons are likely to be bounded by the settlement in which they live, and more specifically by their own "wantoks"... They will probably extend to "wantoks" in other settlements around the town and will almost certainly include kinsmen from the home area who visit them from time to time".

'devils'.

Despite these problems, nineteen households in my sample did have gardens in the bush, mostly near the Taraka and Boundary Road settlements. Also, twenty-three households had small gardens inside, or adjacent to their house plots. The most commonly grown crops, in decreasing order of occurrence, were banana (mostly cooking types), sugarcane, taro, sweet potato, green leaves of several kinds, predominantly *aibika*, and cassava. Less common crops included yard-long beans, yam, pawpaw, lowland and highland *pitpit*, pineapple, pumpkin, peanut, coconut, and corn. Only at Taraka, where many Chimbu migrants make a reasonable living out of growing garden produce for sale at the markets, were gardens spoken of with much pride or enthusiasm. On the whole, my impression was that gardening provided a useful supplementary source of fresh vegetable foods, but could not be depended on as a steady or sufficient source of staples.

The rapid decline in soil fertility, expressed in Pidgin as the loss of *gris*, which is bound to accompany the present gardening techniques in Lae, was a widely recognised problem. Sustainable gardens will only be made possible through composting and other fertilising techniques, combined with a systematic pattern of land management and crop rotation, and the establishment of secure land tenure. A series of experimental composting and gardening projects has recently been started by the Lae City Council in conjunction with the Department of Primary Industry, the Morobe Province Research Centre, and local settlement leaders¹. The hope is that these experimental projects will eventually lead to increased and more stable garden production in Lae's settlement areas.

Bush

For most of the Fore in Lae, the surrounding bush is insignificant as a food resource. One man who contracted to clear bush under electric power lines told me he had caught and eaten a *mumut*, or bandicoot, as well as picking leaves of wild *tulip*, but this was

¹This work is also part of the PNG Human Ecology Programme.

exceptional. Sometimes people will pick fruit from wild breadfruit trees, and from unowned coconut palms and pawpaw trees in the town.

Fishing is another source of 'wild' food. It tends to be a weekend activity, and may constitute a family outing. I have no data on its frequency, and only two or three people mentioned it. A hook and line can be used in the Bumbu River, and in the permanent pool which lies to the north of the airstrip. Small shellfish and prawns can be gathered at certain sites on the seashore, but no one told me they did this, nor did any Fore fish from boats.

Domesticated animals

Pigs cannot be kept within the town boundaries; a few men who had married Morobe women claimed part-ownership of pigs in their wives' villages.

Chickens were kept by seven households, only one of which collected eggs regularly. Properly husbanded, poultry might prove a valuable food resource in the urban environment, but at present, as in Awande, chickens are left to fend for themselves, and losses through predators and theft are heavy.

Markets

The two main markets in Lae are the City Council market near the centre of town, and the Butibam market, near the Bumbu settlement. Both are open 5½ days a week, and sell a wide range of fresh fruit, vegetables, and fish. The council market attracts sellers from all over the Province, and even some from the highlands¹; it also has meat and fish stalls, and snack bars. There are smaller markets at Taraka, Kumkum, Chinatown and Two-mile; they attract local sellers, offering a smaller range of fruit, vegetables, coconuts, and betel.

Most of the accustomed Fore foods can be found at the main market, with the notable exceptions of the green leafy vegetable, *evi'a*, and highland *pitpit*, which is rarely available. However, as we shall see in Chapter 5, the quality and prices of these foods are not always

¹Its sweet potato hinterland extends as far as Bulolo, 70kms. to the south-west, and Kiapit, 110kms. up the Highlands Highway (McKay and Smith, 1974).

acceptable. In addition to the familiar foods, there are many more varieties of banana and yam, and there is sago; coastal fruits include pawpaw, guavas, avocados, watermelons, several types of citrus, and mangoes; vegetables include the yard-long bean, *aipika*, pumpkin and choko leaves and shoots, *tulip*, and European introductions such as Chinese and common cabbages, tomatoes, capsicums, aubergines, corn and lettuces. Coconuts are sold when mature (*drai* in Pidgin) or when still green (*kulau* in pidgin). Other nuts include peanuts grown in the Markham Valley, and, in season, *galip* and pandanus. Animal products include hen and bush turkey eggs; live crabs and lizards; cooked and uncooked prawns; fresh and smoked fish of many kinds; an occasional turtle; live chickens; and cooked and raw pork and beef.

Many Fore households use the main market only once or twice a fortnight, coinciding with payday. In Taraka, the local market is used more frequently, both by women, and by men on their way home from work. The Lae markets, while perhaps not as well-provided as Rabaul's, are better than those of Port Moresby; thanks to Lae's productive hinterland there is no serious shortage of fresh vegetables and fruits at any time of the year, and the prices are well within the means of employed town-dwellers. More information on prices at the market, and expenditure on market items, will be found in Appendix B and Chapter 11 respectively.

Stores

The retail food outlets in Lae can be divided into four categories: supermarkets, medium-size stores, small tradestores, and snack bars.

The half-dozen supermarkets in Lae are essentially identical to their Australian counterparts. They provide a wide range of canned, dried, frozen and fresh products at prices which tend to be lower than those of their smaller competitors. Since they cater largely to the expatriate population, their emphasis is on European-type foods; they do not, for example, stock indigenous staples such as taro or sweet potato. A few Fore expressed some misgivings at using these supermarkets, whose methods of operation and range of goods were unfamiliar to them, but most used them regularly, especially for 'freezer meat' (i.e. chilled or frozen meat).

The medium-size stores are often owned and run by Chinese, and these *Saina stua* are popular with some Fore, maybe because their

atmosphere is less intimidating than that of the supermarkets. They are widely dispersed through the town, but there is none at Taraka. Their stock is smaller in range than the supermarkets, especially as regards frozen and cooled foods such as meat and dairy products.

The small tradestores are similar to their rural equivalents; they are usually owned by Papua New Guinean individuals or groups and are found inside all the settlements. They are thus convenient for buying smaller quantities of food required at short notice; like the local markets, they are often used on the way home from work, or in the evenings. They vary in size from tiny structures selling across a window counter, to quite large establishments rivalling the smaller Chinese stores; their range of stock is correspondingly variable, an important factor being the presence or absence of a freezer.

Snack bars, by which I mean milk bars, food bars, fish and chip shops and so on, are found in all the main shopping centres; as well, the supermarkets and larger stores often include a snack bar. Every type of 'snack' is available: hot meals such as fish and chips, chicken, and Chinese dishes; meat pies, meat balls, sausages, and hamburgers; ice-creams, milk shakes, and soft drinks of all kinds. Many Fore men use snack bars for lunch; they are also popular with the whole family when going around town at weekends.

Shopping for food, then, is part of the daily round for most Fore migrants in Lae. It is done by men and their wives, together or separately: there is no clear sexual division of labour in this respect, except when a woman is newly arrived in the town, and therefore unfamiliar both with the goods and operation of the larger stores, and with the relatively large sums of money involved.

Summary

The Fore living in Lae do not form a single coherent community, but belong to a number of overlapping social networks spread throughout the town. They cannot be regarded as fully urbanised, since most of them have been in the town for six years or less, occupy housing of a relatively temporary nature, and intend to return to their villages in later life. Whether the growing numbers of Fore children now being

brought up in the town will want to return to their fathers' villages is an open question; it is possible that many will remain in town to form a more truly urbanised generation.

Most Fore men in Lae have some primary education at least, and most of them have jobs which, by rural standards, make them relatively wealthy in terms of cash income. Few of them pay a substantial rent, so that there is generally sufficient money in the household to buy enough food for its members, as well as to support a number of short and long term visitors, and to send some money, or its equivalent in goods, back to the village from time to time. Obviously some individuals and their households are better off than others, and priorities in cash expenditure vary; these matters are explored in more detail in Chapter 11.

As for food resources themselves, Lae is well situated in this respect. The markets are well supplied throughout the year with vegetables, fruits and fresh animal products, many of which the Fore are already familiar with. Stores of varying sizes sell a great variety of fresh and processed foods, the latter mostly imported. However, rural migrants, when they arrive in Lae, are faced with a shortage of good gardening land, and this has social, economic and nutritional consequences which warrant further examination. Enthusiasm for gardening and its food products is variable, even where land is available. The gardening and composting projects recently initiated by the Lae City Council in conjunction with the PNG Human Ecology Programme may, if properly monitored, give some insight into the scale and nature of demand for gardening opportunities in the town.

Factors influencing the nature of the food resources in both village and town, and the general nutritional implications of these food resources, will be discussed in the next chapter, before turning to the beliefs and preferences which underlie the process of food selection itself.

CHAPTER 4

FOOD RESOURCES IN THEIR ECOLOGICAL SETTING

In comparing the influence of various environmental factors on the availability and use made of food resources in village and town, it is useful to divide the food resources themselves into those acquired through subsistence production including hunting and gathering, and those acquired through purchase. These two categories are affected by different sets of external variables, and are of differing relative importance in rural and urban settings. In the discussion which follows, reference is made to some of the environmental factors shown in the conceptual model (Figure 1, p.8), and brief mention is made of the nutritional implications of the food resources in village and town, in relation to food beliefs and preferences, and food consumption.

Subsistence food resources

Subsistence food resources include garden products, domestic animals, and food gathered or hunted in bush, forest or water, for home consumption. The nature and availability of these resources are influenced by physical environmental factors including climate, soil quality and topography; by biotic factors including natural flora and fauna, and human population density in relation to available land; and by cultural factors including technology in its widest sense, meaning not only techniques and tools, but the skills, knowledge and customs which influence their use. While these factors can all be seen to operate within the local environment of a single human settlement, such as Awande or Lae, they are in turn influenced by factors in the wider environment. Of particular interest in this context are the agricultural policies developed at the national level, which are intended to modify subsistence systems in certain directions.

a. The rural environment. In a rural Fore village, such as Awande, gardens are the most significant source of subsistence food, followed by domestic pigs and 'wild' foods from the bush. The climate and physical environment are suitable for the production of sweet potato and a number of supplementary vegetable foods, and for domestic pig husbandry.

Population density is still relatively low in relation to land resources compared to some other areas of the highlands such as Chimbu, and extensive stands of forest, in addition to secondary bush which grows up on old garden sites, still provide a useful source of wild foods. The technology used in subsistence gardening is relatively simple, using no tools more advanced than steel axes and spades, whose introduction several decades ago greatly reduced the labour and time necessary for most gardening tasks.

National agricultural policy has had very little direct impact on subsistence activities at the village level, since the efforts of the Department of Primary Industry have been mainly directed, until recently at least, towards increasing the production of cash crops. Some European vegetables have been introduced, partly through informal channels and partly through deliberate action by the D.P.I., but most of these, and particularly peanuts and common cabbages, are grown primarily for sale. Extension workers do not go on 'patrol' into hamlets off the main roads, and their assistance is most likely to be sought for cattle projects, such as the two which were in preparation at Awande in 1977. Cattle projects seem to offer rewards in the form of cash, prestige, meat and perhaps excitement. Judging by experience in other parts of Papua New Guinea, reality is unlikely to live up to expectations but, unfortunately, 'development' has tended to be promoted and thought of in terms of spectacular projects for immediate economic reward rather than gradual improvements to the traditional subsistence system. Attempts to upgrade the nutritional quality of the staple foods, to diversify vegetable crops, and to increase the survival and productivity of domestic pigs and fowls deserve more attention, although their potential benefits might be less easily perceived by the villagers.

b. The urban environment. In Lae, most Fore households grow small quantities of foods for their own consumption, but population pressure on available land severely limits the opportunities for sustained subsistence horticulture; in addition, the climate and soils of Lae are different from those of the highlands and require modified techniques. For many households, a steady cash income reduces the need and the motivation for gardening, but there are others in which economic factors or personal preferences act in the other direction.

One of the recommendations of the National Food and Nutrition Policy (NPO, 1978a) is that urban subsistence production should be increased, and the experimental composting and gardening projects started in Lae in 1977 are in accordance with this recommendation (see p.40 above). Pig husbandry is prohibited within the town boundaries, but many settlement dwellers, including a few Fore, attempt to rear chickens for their own consumption; assistance from extension officers might make this a more rewarding task than it is at present, with its high losses through disease, theft and other causes.

Purchased food resources

Foods can be purchased either from markets, which sell fresh foods produced within the local hinterland, or from stores, which sell a few locally produced fresh foods, a few items which have been processed within Papua New Guinea, and a large variety of processed foods imported from overseas. The availability of each type of food resource is influenced by a number of environmental factors. The scale and nature of foods available in a local market are influenced by the transport system, and by the level of consumer demand, as well as by the physical and technological factors which affect local food production itself. Domestic marketing and transport systems are the subject of national policy, which is particularly concerned with promoting markets in urban centres (NPO, *ibid.*). Foods which are processed in significant quantities within the country from locally produced raw materials include salted peanuts and peanut butter, dehydrated sweet potato chips, dried and frozen fish, frozen meat and small goods, and palm oil; foods which are processed locally from mainly imported raw materials include flour products such as bread and biscuits, beverages including beer and soft drinks, and a variety of snack foods including cheesepops, meat pies, and ice-cream (Hepworth, 1976). Among the most important foods which are imported in their fully-processed state are tinned meat and tinned fish, frozen meat, sugar and rice; some fresh fruit and vegetables are also imported. Dependence on imported foods and foodstuffs not only constitutes a drain on scarce foreign currency, but also increases the vulnerability of the economy, and of the nutritional state of the population, to external factors. This issue will be discussed at greater length in Chapter 14 (pp.206-208).

a. The rural environment. In Awande and other rural villages in the Fore region, local markets are rarely used for the purchase of food by local people with gardens of their own; the markets have developed primarily in response to the demand from full-time wage earners, mostly in government or mission employment. Tradestores are found throughout the region, varying in size from one-room thatched huts situated in remote hamlets, to the major retail outlet in Okapa, which has a large freezer and a wide range of stock. The stocks of the smaller stores are limited by the lack of freezing or cooling equipment, and fluctuate with the demand from the local population. The level of demand is largely determined by cash income from coffee sales. This, in turn, is influenced by factors as remote from the local environment as frosts in Brazil, and the machinations of international commodity markets.

b. The urban environment. In Lae, the fresh food markets are currently able to meet the demand within the town, thanks mainly to the initiative of local producers within a hinterland which is adequately served by road transport. More market sites, and improvements to the road system are planned for the future. Retail stores are supplied by a sophisticated import and marketing system, which is dependent upon the functioning of the nationaleconomy. The largest supermarkets cater mainly for a wealthy expatriate clientele, but are also used by the local population in increasing numbers. Future developments in this sector will therefore be influenced by economic factors at the national level, including import policies and income and price levels, and by the changing nature of the demand for processed foods in the urban population, including its expatriate component.

The balance between subsistence and purchased food resources

a. The rural environment. For the rural Fore, subsistence production is by far the most important source of food throughout the year. The purchasing of food from tradestores is a supplementary source which is used when cash is available, mainly in the coffee season. As a class, store foods are not a necessity, but neither are they any longer an unusual luxury as they were twenty years ago; they occupy an intermediate status as desirable items which are commonplace at certain times of year,

rarer at others, but which could be done without entirely, if necessary. For the time being, the amount of land and labour diverted from subsistence gardening to cash-cropping does not seem to threaten the village food supply. The unstable nature of coffee sale prices, however, and the risk of disease, make major expansion of coffee-gardens an unwise policy, but this is not appreciated at the village level, where most individual owners are keen to increase the number of trees each year. Subsistence food production is more efficient, in terms of returns of food for an equivalent amount of labour, than is cash-cropping with the use of profits for food purchase. However, cash is used for items other than food, so that this argument cannot be used to convince rural villagers of the need to limit their coffee plantings. If the risk of severe disruption of village society and economy in the future is to be minimised, it may be necessary to introduce some form of quota control of coffee growing. Such a risk is at present more acute in the more densely populated areas of the region, and will increase throughout the region as population expands, and as expectations rise with further economic development.

b. The urban environment. For the urban Fore, the purchasing of store foods is accepted as a normal cost of living in town, and indeed the nature of some of these foods is one of the attractions of town life, as we shall see later. However, most people enjoy eating fresh vegetables, and do not easily accept that these too must often be purchased rather than home-produced; they therefore maintain small vegetable plots if suitable land is available, and some maintain larger gardens in outlying areas of bush. In the future, rising prices for imported foods, combined with increasing population and hence demand for foods of all kinds, will make subsistence production more attractive. The potential for expanding subsistence production within the town is being explored in a series of projects, but population pressure is such that it could never provide more than a small proportion of the urban population's total needs. Most of the population will continue to purchase the bulk of their foods, with home production providing a supplementary source. It will become more difficult for the formally unemployed to find land to grow all their food, and some migrants will probably choose to return to their villages, where most still have traditional rights to garden land.

The relationship between village and town

The links between the rural and urban economies in which the Fore participate were mentioned in the two previous chapters. Gifts of food are carried in both directions, while durable goods and cash tend to flow from the town to the villages. Earlier familiarity with processed foods sold in the village tradestore makes the adaptation to an urban diet easier for migrants, since the rural tradestore foods constitute a small selection of the wider range to be found in the town. Conversely, on their return to the village, urban migrants will tend to stimulate the demand for foods which they used habitually in town. Thus there is a self-reinforcing tendency towards similarity in the kinds of processed foods sold in each environment, subject of course to constraints imposed by transport costs and facilities for storage and preservation in the village.

Even in the case of subsistence production, there are some significant links between village and town. Migrants often experiment with new crops, taking coastal varieties to the village gardens, and traditional village varieties to their urban gardens; such attempts meet with varying degrees of success, but indicate a strong interest in subsistence food production. Livestock, including piglets, chickens and ducklings are sometimes purchased in or near Lae for raising in the village.

The close relationship which exists between village and town will be stressed throughout this report. The scale and frequency of visiting between them has widespread social, cultural and economic consequences for both the rural and the urban populations, and it would be misleading to consider each in isolation from the other.

Nutritional implications of rural and urban food resources

Actual food consumption by the Fore population in Awande and Lae will be considered in detail in Part IV, but a few preliminary observations on the nutritional quality of the available food resources are appropriate here. In neither environment does there appear to be any absolute shortage of food; more significant are the choices made among the various foods which are available.

Subsistence production in the village is dominated by the sweet potato, which has a low protein content, and is high in bulk. Both

factors make the crop nutritionally unsuitable as a staple food, especially for small children who may have difficulty in consuming enough of it to satisfy their energy requirements, let alone their protein requirements. However, many other vegetables are grown, and a fairly well balanced diet including peanuts, green leaves, corn, banana, pumpkin and beans in addition to sweet potato could easily be obtained from these. Furthermore, regular consumption of pork, tinned fish and tinned meat could provide useful supplements of protein and fat. Nutritionally disadvantageous trends in rural food resources include the promotion by the D.P.I. of certain green vegetables, especially cabbages, which are poorer in protein, vitamin and mineral content than the indigenous leafy greens (a fact noted in Hamilton, 1955), and the sale of such items as aerated drinks and cheesepops in the village tradestores. The critical factor, then, is the set of food beliefs and preferences that governs the relative amounts of each crop which are grown and the patterns of consumption of these and other available foods.

In the town, a much wider range of foods is available, and again it is obvious that a well balanced diet could be obtained in a number of ways by choosing wisely from these. However, the ready availability of highly processed foods and sweet snack foods of all kinds, and their promotion through advertisements and display make an informed, nutritionally rational choice more difficult. The cheapest starchy staples in the urban environment are rice, and wheat flour and its products; cooked rice is marginally richer in protein than sweet potato, and wheat flour markedly so, but refining of both cereals reduces their vitamin and mineral contents. Promotion of brown rice and wholemeal flour would be a valuable measure in this respect¹. Fresh vegetables and fruits of good quality can be obtained relatively cheaply, and animal protein is available in many forms, including fresh, frozen and canned meat and fish, eggs, and milk products. As in the village, then, the food beliefs and preferences of town dwellers are critical in determining the quality

¹Brown rice has recently become more readily available in Papua New Guinea, and is sold at a slightly lower price than white rice. Also, the opening of a flour mill at Lae in 1977 may make the manufacture of wholemeal flour products more practicable than hitherto.

of their diet; the latter is not constrained by inadequacies in the quantity or quality of the foods which are available.

Food beliefs and preferences are the subject of Part III of this report, in which they are discussed in relation both to the food resources described in this and the previous chapters, and to other environmental factors which directly influence them.

PART III

FOOD BELIEFS AND PREFERENCES

CHAPTER 5

MEN'S FOOD BELIEFS AND PREFERENCES IN AWANDE AND LAEIntroduction

Most nutrition surveys make passing reference to people's food beliefs, likes and dislikes, but very few studies in Papua New Guinea have sought detailed information of this kind. The most relevant to the present account are those by Whiteman (1965, 1966). She reports on two studies : one of customs and beliefs relating to food, nutrition and health in the Chimbu area, the other on food beliefs and attitudes in a low-cost housing settlement in Port Moresby. In the former study beliefs about particular foods were listed, and the general conclusion drawn that,

"Whilst the Chimbus do believe that there are one or two foods which have the property of making strong blood, the general concept that the food they eat may affect their health is not held. Food taboos are not an important feature of Chimbu life."

In the urban study, Whiteman adopted a more formal technique, using local interviewers to administer a 24-item questionnaire to an unspecified number of subjects. The validity of their replies was variable, because of differing conceptions of the meaning of terms like "good food"; in the summary it is concluded that,

"The results showed that great variations in beliefs and practices relating to food still existed, probably due to the different tribal origins and educational levels of the people living in Hohola, although the results of consistent health education on one or two points could be seen in the answers to some questions. In general, food was taken for granted, and its relationship to good health was not recognised by the inhabitants of Hohola."

It was partly because of the problems of interpretation caused by cultural diversity in the urban environment that I decided to study an urban group which was culturally homogeneous, and to compare it with a related rural group. To this extent, at least, the present study of urban and rural food beliefs and preferences should provide comparisons which are more valid than those which can be made on the basis of Whiteman's two papers.

To obtain a general picture of the main food beliefs and preferences in Awande and Lae, I interviewed a number of adult males in each place. At the same time, my wife concentrated on women's beliefs and

attitudes relating to infant feeding in the two populations. In each location, the interviews, which were tape-recorded, followed a more or less consistent pattern, but this was freely modified whenever a respondent showed interest in talking further on any topic. There were some differences in the approach and the questions asked in Awande and in Lae, and these are mentioned in the following sections.

The validity and reliability of the findings are subject to two main qualifications. The first relates to our lack of familiarity with the Fore language and culture, and our consequent use of Melanesian Pidgin as a medium of communication throughout. As a result, the conclusions can only be expressed in terms of relatively general concepts, whose interpretation is made more difficult by the ambiguities in which Pidgin abounds. A deeper understanding of the content and origins of food beliefs would require a thorough knowledge of Fore concepts relating to bodily processes and the nature of disease, as well as of the magico-religious mode of thought which underlies such beliefs. Some information on these matters is contained in S. Glasse (1963), Lindenbaum (1976), Hornabrook (1976b) and Sorensen (1976); a few references to these sources will be made in footnotes.

The second qualification relates to the use which we make of the responses of a relatively small number of informants. There is a danger, first, that the sample may be unrepresentative, and second, that one may pay too much attention to the responses of a particularly forceful or voluble individual. Where we use direct quotations, they will tend to come from the more talkative subjects, but we try to use them to illustrate common beliefs or attitudes which others share but express less fluently. The general conclusions are based less on a counting up of responses of one kind or another (a technique inapplicable to the open-ended nature of the questioning), than on our subjective assessments of the consensus, or of differences of opinion where they clearly existed. The intention in using people's own words is to present a picture in which the lively and dynamic nature of beliefs and attitudes is not concealed under a gloss of static generalisations.

In the remainder of the chapter, I report on food beliefs and preferences in Awande and Lae, as expressed by male subjects. The subsequent chapter, written by my wife, deals with women's beliefs and attitudes regarding infant feeding. The last chapter in Part III comprises

a discussion of the findings, mostly in terms of the influence of interacting variables in each environment.

Awande: methods and subjects

In Awande I interviewed twenty-five men, eighteen of them over 40 years old, one a youth of 16, and six between 20 and 40¹. Seven of the interviews were conducted wholly in Pidgin without the use of an interpreter; the others depended on translation into and from Fore by my 25-year-old assistant from the village, who spoke no English but was fluent in Pidgin. All the taped interviews were transcribed soon after their completion, mostly directly into English; in six interviews I made notes only. Nearly all the men were married with children; a very few had been to school.

The form and coverage of the questions asked evolved with my growing knowledge of the food habits and tastes in Awande, and as new topics emerged from one interview to the next. The main topics covered were these: foods which are good for the body in some way; foods good for children; the causes and treatment of emaciation or *bun nating* in children; the treatment of diarrhoea; food taboos; and beliefs and preferences relating to particular foods, and especially to store foods as a separate category. Interviews lasted from a quarter of an hour to an hour or more. They were often done in the presence of bystanders, and thus sample a wider range of opinion than the figures given above might suggest. I have incorporated bystanders' comments, as well as information from casual conversations, into my findings.

Awande: Findings

Nutritional concepts and foods good for the body

Two adjectives were used by all subjects to describe foods. These were *strong*, and *swit*, both Pidgin words whose meanings differ from their English originals in some respects. *Strong* or *strongpela* can mean hard, tough, firm etc; but it can also mean sustaining, filling,

¹Ages are approximations only.

energy-giving; *strong* foods are spoken of as strengthening the body, the stomach, the skin, and the bones; they are foods which enable one to do physical work. When it has this meaning, I write the adjective as *strong*; otherwise I translate it into its nearest English equivalent. *Swit* can mean sweet, as in sugar; but more generally it refers to any food which tastes good; to avoid confusion, I leave it in the Pidgin form, *swit*.

Some foods are *strong* and *swit*: sweet potato, taro and wing bean root are examples, while rice is *swit* but not as *strong* as the root crops; a few foods are *strong* but not really *swit*, such as cassava; many are *swit* but not *strong*: green vegetables and most forms of *abus* (meat, eggs, tinned fish etc.) are so regarded.

Beyond the universal belief that the body needs *strong* foods, and above all sweet potato, to enable it both to grow and to do work, there was no unanimity about what foods were good for it. One or two younger people said that *kumu*, beans, pumpkin and the like were good for the blood, and to make the skin 'smart'. One spoke of such foods as having *gris*, not in the sense of oil or fat, but as the term is used when referring to fertile soil, that is to say containing what might be called 'goodness'. *Strong* foods then, are foods good for the body, and vice-versa; all other foods are generally thought of as adding different tastes and variety to the diet, but not as being essential. Only under the influence of school and clinic teaching are more specific nutritional concepts being introduced.

Good foods for children

When asked specifically what foods were good for children, most people replied that children eat the same as adults, although when they are very small the food must be soft. A 40-year-old man with three children summarised as follows:

"First he drinks his mother's milk. He keeps drinking it, then he gets one or two teeth, we cook sweet potato in the fire. The mother puts it in her mouth, then gives it to the child... *Kumu*, and sweet potato, that's all we give a little child. When he grows up, he can eat these hard foods, like taro and yam."

Another man, about 50 years old, with five children stated:

"When they are very small babies, the mother gives milk; when it's had milk, a little later it cries, give it milk again...so it goes until it grows a bit bigger. Then it can sit by itself. Now we give it food - sweet potato. Just

sweet potato. It goes on like this until it can walk by itself, then we give it sweet potato, yam, taro, *kumu*, *pitpit* - this kind of food."¹

Child feeding is permissive rather than prescriptive, in that children are given food when and if they cry for it, but their feeding is not a matter of great interest except in the case of illness, which is discussed later. A few younger men have learnt, from school, from clinics, and from observation of Europeans in towns, of the idea that children need special foods and attention to their diets. *Kumu* and other vegetables such as pumpkin and tomatoes, especially chopped up and served with rice as 'soup' are said to be good for children. Tinned fish and meat are also good. The European fashion for giving their babies tinned baby food, and dried milk in bottles, had been noted by two or three of the young men in the village. The 28-year-old carpenter, educated to Standard VI, had used a bottle:

"Milk is good to help children - Sunshine milk. Before, I used to give it to my son, in a bottle, when my wife was pregnant."

A man of the same age, educated to Standard III, had heard it discussed by the '*Radio Dokta*':

"They said this Sunshine milk isn't very good. Mother's milk is all right, it's *namba wan*. You can't use this (dried) milk much. If a mother knows enough about giving this milk, she must wash the bottle, and wash the rubber quickly in hot water and cover it up."

A 30-year-old man on leave from his job in Port Moresby asked me about baby foods:

He used to give his nephew tinned banana custard, on which he grew fat and big. But a Chinese woman told him one day that they put *poisin* in baby food, and he noticed some Europeans bought it, while others didn't. What was true? He also said that when children live at the *stesin*² they are fed ice-cream and baby foods, and their skin becomes fat. When they come

¹Compare with this account in S. Glasse (1963): "An infant feeds solely on breast milk for the first few months and then begins to eat tiny pieces of pig fat (not meat). It continues on this diet until the two bottom teeth appear, when it may have sweet potato, taro and other vegetables and premasticated sugar. Until it has teeth, no hard food must be given, or the child will choke and die. By the time it walks the child will eat all kinds of food, even banana. Banana is withheld until then because it prevents teeth from growing well." We heard no mention of the latter belief, nor of the early feeding of pig fat, which, if it does occur, is probably of negligible nutritional benefit since pork is consumed only once every few weeks.

²*Stesin*, originally referring to Government Stations, is now used as a general term for the town or city.

back to the village, their skin becomes slack, on the diet of sweet potato and garden foods.

Opinions such as these are bound to have an increasing influence on the customary beliefs and attitudes to child feeding, although at the moment they are confined to a small minority.

Bun nating children¹

Frank kwashiorkor and marasmus are rare in the area, but a degree of emaciation, accompanied by slack skin, is recognised as a fairly common condition, often following a gastrointestinal illness. Some also say it is the result of adultery by one of the parents, while the child is small². The carpenter quoted above blamed *bun nating* on hookworm.

Many people say that the condition can be treated by the use of traditional medicines - a special herb, or bark of a certain tree - whose identities and methods of use are known to only a few. A 45-year-old father of six had sought the help of such a specialist:

"One of my children got like this, and Awaki looked at him and said he had sickness in his belly. He looked at him first, came back from his house and brought some of this medicine up on top (i.e. to the man's hamlet). He got some *kumu* and pig too, cooked it in a bamboo, and gave it to the boy... His skin was slack, he was *bun nating*; he cooked this and gave it to him, and now he's all right."

Awaki, himself about the same age as the man just quoted and with five children of his own, described the treatment from his point of view:

"When a child is *bun nating*, with slack skin, they bring it here and I give it some medicine. Before, my mother showed me this kind of medicine; then she died. I get this small *gras* from the bush, and get some *kumu*, and pig, and cut it up; cook it and give it to them. Only once, for one child. It

¹In Pidgin, "*bun nating na skin i slek*"; hence the adjective 'slack'. Sometimes the skin is described as '*lus*' (loose).

²Lindenbaum (1976, p.29) summarises traditional Fore beliefs about the aetiology of illness as follows: "Illnesses fall into two broad categories, each defined by beliefs about causation. Firstly, there are maladies resulting from the malicious actions of men against men; these diseases are the consequences of acts of sorcery. Secondly, there are diseases not attributable to the evil machinations of men, but to native spirits inhabiting the spirit places associated with one's parish of residence, to ghosts of the recently dead, or to violations of social rules and expectations among co-residents. Calamities ascribed to sorcery involve dangerous diseases that usually cause death, diseases such as *kuru*, tuberculosis and yaws... Non-sorcery-caused ailments, however, involve minor afflictions and temporary illness among adults, and sickness and death among children."

recovers, its skin becomes fat. I do this, and they pay me." Other people did not mention any form of medicine, but said simply that the child should be given plenty of food, including *kumu*, sugarcane, and store foods. A 30-year-old father with one child, who had worked in various towns but was now living in the village again said:

"If a child has slack skin and he is *bun nating*, we get *kumu*, and some *abus*: pig or possum. Now we cook this and give it to him. And good food like sugarcane, *kumu*, store foods; rice, fish, meat; buy dripping, and mix it with *kumu* and give it him. And if a man has money, he'll buy milk, and sugar, mix them, and give it to the child to drink."

Finally, there are again those who have learnt explicit lessons, usually from the MCH clinic or the hospital. A 30-year-old man who had worked in Moresby is an example. Talking about *bun nating* children he said:

"The nurse will show the paper (i.e. the weight chart) to the mother, she will say 'Look, the child was growing well, then his weight went down; you didn't give him the right food. Go and give him pineapple, banana, soy beans or some kind of beans from the garden. And store foods too'. Old men who have just stayed in the village don't know this, and just give sweet potato. They haven't heard of foods for babies."

Diarrhoea

This complaint, expressed in Pidgin as *pekpek wara*, is well-known to everyone. The equally well known cure, for children and adults, is to eat baked taro. A few men say that the taro is 'talked to' first, but such *toktok* is known only to older men. Awaki explained as follows:

"When a child has diarrhoea, they get taro, and talk to it about a kind of tree that has sap like milk. When you cut it, this sap comes out and when it's dry it becomes strong, like *PK* (chewing gum). They talk about this thing to the taro, then give it to the child."

An old man of 60 or 70 said:

"Before, when there was no hospital, when a child had diarrhoea, they would get ash from the fire, and rub it on the child's stomach. If this didn't work, get some taro, give it *toktok*, and give it to the child... Adults too, we'd do the same thing."

Several men recommended sago as a treatment for diarrhoea; it could be obtained intermittently from the Purosa direction, beyond South Fore over the Papuan border. One man had himself discovered a 'medicine' prepared from the bark of a tree, and given with salt in cold water; it caused constipation for two days, after which the stools were firm again.

People from other hamlets came to him to learn the medicine and to receive treatment.

The influence of hospital, clinic and school is once again reflected in the statements of some younger men. Their recommended treatment for diarrhoea in children was to feed them 'sugar water'.

The man who listened to '*Radio Dokta*' explained:

"If my child has diarrhoea, I follow the doctors' idea; they say you must put salt in hot water - you can't put coffee in - put sugar and a little salt. I give him this and he drinks it, and he becomes all right. When he's a bit better I buy rice. I don't put too much fish in, just a little. I give him *strong* rice and he eats it, he grows strong."

Three men described this 'sugar water' treatment, which is recommended at health clinics, accurately; another claimed that nurses had told him that sugary milk was good, but also pointed out, as did several others, the availability of hospital treatment:

"Now there's good medicine for children and adults with diarrhoea, at the hospital. If we've got money, we'll buy milk and sugar, and if that's no good, we'll go to the hospital."

Food taboos

Some pregnant women are subject to a number of food taboos, while others eat normally; it seems to be a matter for the woman to decide, with or without pressure from her husband and other relatives. The restrictions are relaxed in pregnancies subsequent to the first successful one. The most common taboos mentioned were tinned meat and tinned fish, sugarcane cut with a knife (it can be broken by hand instead), and *kumu* from the ends of a bamboo cooking tube (kumu from the middle of the tube can be eaten). These three taboos are intended to ensure a safe and easy delivery, through avoiding the consumption of foods which might close the mouth of the womb, just as they are themselves 'closed' in some way; a middle-aged man explained thus:

"Older women, who are having their fifth or sixth child, they can eat anything; tinned meat, fish and suchlike. But a young woman pregnant with her first child, they are taboo for her; she can't give birth well; she'll be pregnant for a long time; she won't have the child quickly... This tinned meat and fish is closed at both ends. They think about this, and taboo it... Tinned meat and fish hadn't arrived when my father died; but they used to taboo sugar cut with a knife."

Other taboos mentioned included large tubers, pig bones, possum, and food brought from other villages. As I have suggested, the taboo on tinned fish and tinned meat is based on the same reasoning as that underlying the taboos on *kumu* from the ends of a bamboo; however, this rather arbitrary advice does not convince most of the younger villagers, and they are less likely to worry about the new foods¹.

Customarily, young boys were initiated in a series of rituals including nose-bleeding, and confinement in a sweat-house for many days. A large number of foods were taboo from initiation until manhood: red varieties of tubers and *pitpit*, red being a ritually dangerous colour; game of all kinds, wing bean root, some varieties of sugar, and foods cooked at large *mumu* feasts. Also, the initiates could not eat foods prepared by young women. These initiation ceremonies, and the taboos which accompany them, are now observed in a weakened form, if at all². Instead of bleeding their noses, the boys' faces may be ritually washed. The father of two boys initiated while we were in the village said:

"These taboos on foods for children, they were something our *tumbuna* (grandparents, ancestors) did. Now, you people (i.e. Europeans) arrived, and we think it's just something to eat, they were deceiving us when they taboo'd things... Now when we bleed their noses we give them any food and they eat it."

The boys themselves, however, told me that they were forbidden to eat corn, game, and some red foods. Whatever the truth in this particular case, it is probable that such taboos will disappear even before the initiation rites with which they are associated.

One or two households in Awande contain Seventh Day Adventists,

¹Again, compare with this account of traditional South Fore practices (S. Glasse, op.cit.): "A first pregnancy is hedged around with myriad food taboos to ensure successful termination. The mother will not eat rats, possums or birds shot with bow and arrow or caught in a trap, nor sugar cut with a knife or tomahawk, though sugar broken by hand will not harm her. She avoids foods of great size such as large yams or taro or big possums or tree kangaroos. She keeps to small varieties of sugarcane, and refuses water which flows through a Spirit Place or is carried to her in wild bamboo. These 'imitative' restrictions avert the danger of a difficult labour which might cause the child to die in the uterus. Most restrictions apply to first pregnancies only. Some husbands too keep to the diet." This last observation was not corroborated by any of my informants.

²Berndt (1962) described the customary forms of initiation in the Fore and related people. Initiation is probably more common now in the more remote areas of South Fore than in the Central and Northern regions.

whose religion places a taboo on pig, and game animals; these animals are said to have 'sin' inside them. They are also forbidden all 'stimulants', including alcohol, tea, coffee, and betel nut. Such beliefs are treated with good-natured tolerance by the majority.

Beliefs and preferences regarding particular foods

a. Root crops and bananas. The root crops are the most important *strong* foods. Sweet potato is the most important of all and apart from a 2-year-old girl, who was expected to grow to like it soon, I could discover no one who did not enjoy it, and eat it more or less daily throughout the year.

Taro is as *strong* as sweet potato, and is very popular in its season. Yam, wing bean root, and cooking banana are the other three customary starchy crops which are enjoyed by everyone. Ripe banana is not as *strong* as cooking banana, and is especially popular with children.

Cassava is another *strong* crop, but its taste is less widely appreciated. The Irish potato is an occasional item in the diet, but it is not classed as a *strong* food, nor is it very *swit*.

b. Nuts. Pandanus nuts are a highly valued seasonal crop. The '*mit*' or '*kumu bilongen*', (the flesh in which the nuts are embedded), is a *strong* food which may displace even sweet potato for a few meals. The nuts are *swit* but not *strong*.

Red pandanus is not liked by everyone. The red fat extracted from the seeds by boiling can be eaten alone, or with *kumu*. One man said that this *gris* made the skin fat. The redness of this food has associations with blood, which traditionally made it dangerous for men to eat it in the presence of women; this restriction no longer exists.

Peanuts are a very *swit* food which people buy in town, but few people grow them. Children are especially keen on them, and one reason given for not growing them is that they will be stolen by young boys. Two men had heard from nurses that peanuts are good for children.

c. Other vegetables and fruits. Sugarcane is another fairly *strong* food, and universally enjoyed. As well as being a *swit* snack, it allows one to continue working in the garden all day long, only coming home in the evening to eat. It is good for helping a lactating mother's milk supply.

Corn, which is eaten on the cob and never stored, is quite *strong*, but it could never suffice as the main item in a meal. Too much of it can cause diarrhoea.

Pumpkins are of two kinds. The traditional ones are long and watery, and are not *strong*; the introduced ones are round and more solid, and are *strong* food when eaten with sweet potato.

Beans are *strong* too, and might alone be enough to satisfy a child's appetite. They are very *swit* cooked together with *kumu* in a bamboo tube.

Kumu and *pitpit* are both popular *swit* foods, neither of them *strong*. The many types of *kumu* have different tastes; some may be eaten raw, especially as an accompaniment to meat. Tinned fish and dripping are both popular with *kumu*. Mushrooms are another tasty accompaniment to *kumu*.

Pineapples, passion fruit, and rather sour oranges are cultivated by a few people, and are appreciated in hot weather.

d. Fresh meat and eggs. Pig meat is a *swit* but not a *strong* food. Too much of it causes sickness and diarrhoea¹. Most children, and some adults, prefer the fat to the lean; one or two men said it made the skin fat. Organs and intestines are also eaten, and the blood mixed with green leaves, but no one voiced any extra enthusiasm for, or suggested any specific nutritional properties of, these.

Beef is generally preferred to pork for its taste. It has less fat, or its fat is not so tough, and it does not cause diarrhoea so frequently. Mutton has a lot of fat, which some like and others do not. It is less familiar than pork and beef. Chicken is very *swit*; chickens reared in the village have very little fat, but ones from the freezer have plenty.

Game such as possum, wild birds, and flying fox are all traditional *abus*; not *strong*, but eaten with great enjoyment when available.

Eggs of domesticated chickens or wild birds are the same. Usually, if they are not sold, they are cooked in bamboo tubes between layers of

¹No one explicitly mentioned *pig bel*, an often fatal form of food poisoning caused by *Clostridium welchii*. This and other types of food poisoning are encouraged by the consumption of pork which is often undercooked, and often eaten some days after its original cooking; susceptibility to infection is probably increased by the low protein intake typical of the highlands.

kumu. A few people say that they are good for children, others only that children like them.

e. Store foods. As a class, these are luxuries or at least desirable 'extras' eaten for taste, more than for sustenance. Rice is quite *strong*, especially with tinned meat or fish added, but is not a substitute for sweet potato. It is popular with all age groups and both sexes.

Flour can be bought in Okapa as a deep-fried batter *skon*; in the village, it is mixed with water and fried with dripping; these products are *strong*, more so than rice, but again not substitutes for sweet potato.

Biscuits are fairly *strong*, especially when eaten with fizzy soft drinks (*loli wara*) or tea. Several people said biscuits, particularly sweet biscuits, were bad for the teeth. Tinned cake is another fairly *strong* store food, but is too expensive and not to everyone's taste. Bread is not a *strong* food, but is good with butter or tinned meat.

Cheesepops are popular with children, who cry for them when taken into the store. Adults eat them less often. Three people said they were bad for the teeth; others denied this when asked.

Tinned fish is the *namba wan* store food, with rice. Tinned meat is slightly less popular, being twice the price, and its taste is disliked by some. Both are eaten mixed with rice or with *kumu*. Children are very keen on the oily fish, and are given the empty tins to lick. Dripping is a popular addition to *kumu*, after the latter is cooked.

Tea, coffee and milo, together referred to as *ti*, are quite *strong* when sweetened with white sugar; the latter is often said to be the same as sugarcane, in its sustaining qualities. Milk, usually tinned, may be added to *ti* if money is available. *Loli wara* too is sustaining. Any sweetened drink together with biscuits, bread or cake, makes a suitable snack if one has a long walk ahead.

Salt is widely used, on tubers and with rice. Native salt is no longer made.¹

¹See Sorensen and Gajdusek (op.cit.) for a description of traditional salt making. Traditional salt would have contained a high percentage of potassium salts, and the changeover to sodium chloride may have significant physiological implications.

Awande: Summary and conclusions

Like the food resources themselves, the food beliefs and preferences of men in Awande are a mixture of traditional ones, long established in Fore culture, and modern ones, resulting from European contact.

According to traditional beliefs, the body requires *strong* foods, mostly starchy roots and pre-eminently sweet potato, in order to grow and to do work; other foods are *swit* but serve no particular function in the body; taboos are imposed on certain age and sex categories because of the ritual and magical associations of certain foods; illnesses such as *bun nating* can be caused by ritual transgressions, and cured by herbal medicines, sometimes in association with magical recitations.

Modern food beliefs, transmitted mainly through schools and clinics, recognise the importance of vegetables and *abus* in the growth of children and the maintenance of health; the relationship of *bun nating* to poor feeding; and the value of hospital treatment in curing illness. Other beliefs share aspects of the traditional and the modern: for example, some tinned foods have been incorporated into the traditional food taboos for pregnant women, and Seventh Day Adventist teaching has added a set of taboos based on religious dogma to the traditional taboos based on sympathetic magic.

Each individual has his own set of beliefs, a blend of the old and the new. The young, the educated, and the travelled (three characteristics which tend to be associated) are likely to have adopted more modern beliefs; the old, the uneducated, and those who have never left the village are likely to retain more traditional beliefs. The same applies to some extent to food preferences: store foods tend to be more popular with younger people and with those who have lived in town, than with older village men who are less familiar with the new foods.

Food beliefs and preferences in Awande will continue to change under the influence of many factors: changing food resources in stores and gardens; the teaching of schools and clinics; information and advertising on the radio and in the press; and the ideas and behaviour of migrants returning from town. Assuming that the latter factor is significant, future food beliefs and preferences in the village are likely to be foreshadowed in some of their aspects by those current among

Fore town-dwellers; it is to these that we now turn. The influential environmental factors which have just been mentioned will be discussed in Chapter 7.

Lae: Methods and subjects

Basically the same interviewing method was used in Lae as in Awande, with the differences that all the interviews were tape recorded, and all were conducted in Pidgin without the use of an interpreter. Nearly all were done at the homes of the interviewees, in settlements all round the town.

I interviewed twenty-five individuals; their ages ranged from 17 to 35, and most were in their twenties. Ten had no formal education, fourteen had some primary schooling, and one had two years of secondary schooling. The longest residence in town was eleven years, the median six years. Four were unemployed, two had part-time jobs; the rest had full-time jobs with gross wages (excluding overtime) ranging from K52 to K102, with a median of K56. Twenty-one of the men were married, five of them to women from the Markham region; sixteen had children, with a maximum of three, and mostly only one or two. I also held two 'group interviews'. One was with half a dozen young men from Iwaki, in South Fore, now living in the Bumbu settlement. The other was with two related households, whose three male members came from Kasoru in North Fore; two of the men were married to coastal women, the other, a youth of sixteen, was at high school in Lae. To sum up, the Fore subjects in Lae differed from those in Awande in three important respects: they were younger, better educated, and mostly had much higher incomes.

As in Awande, the content of the interviews tended to change gradually as I grew more familiar with the situation. In general, the topics covered were these: foods good for the body; foods good for children; foods which can harm the teeth; the causes of fatness; the causes and treatment of children who are *bun nating*; attitudes to bottle-feeding; treatment of diarrhoea; taboos to pregnant women; attitudes to coastal foods in general; and beliefs and preferences regarding particular foods.

Lae: Findings

Nutritional concepts and foods good for the body

The range of nutritional concepts expressed was more diverse than in Awande¹. The basic adjectives *strong*, applied to sustaining foods, and *swit*, applied to good-tasting foods, were still used. *Strong* foods included the root crops, as in Awande, but in the town rice, which has become a staple at least as important as these root crops, also tended to be regarded as *strong*. Two men spoke of sweet potato as having *bun* (bone), which has similar connotations to *strong*.

Many people said that vegetables were good for the body; more specifically, two said that they were good for the skin, to make it 'smart', and two that they were good for the blood. A 16-year-old boy in his second year at high school summarised his views thus:

"I think this: *aibika*, green leaves and things are to make the body strong, and the blood. Things like taro, cassava, and sweet potato are to strengthen the bones (*strongim bun*) - and banana. Eggs and *kumu* make new blood."

A man with two children recalled what he had been taught at primary school (which he attended to Standard V) as follows:

"When we were at school, they told us this: 'When you've peeled sweet potato, cook it first, and leave the water - you mustn't throw it out. Drink it with the sweet potato, your skin will become fat... When you've cooked sweet potato, and it's done, go and get onion (i.e. green onion) and ripe tomato - get them and cut them up into the sweet potato. The tomato and onion are only half cooked; when you eat them, your skin will be good.' That's what they told us."

One man had heard of vitamins at school; he had been told that they were good for the skin, but too much of them would make one grow old quickly. He knew they could be bought at the pharmacy, but did not think of them as constituents of foods.

¹Part of this extra diversity may have been due to idiosyncracies in my respondents' use of Pidgin, as compared to the village where most of the responses were translated by one individual (my interpreter), into his personal Pidgin style and vocabulary. Furthermore, my own Pidgin improved throughout my fieldwork.

Good foods for children

The idea that certain foods are particularly good for children is widespread in the urban group. The most commonly mentioned foods were *kumu* or green vegetables (several people used the term '*grin vejtebels*' in their Pidgin vocabulary), ripe banana, milk, sweet potato, eggs, pawpaw, tinned baby food, pumpkin, peanuts, rice and chicken. A man in his early twenties, with two children and no formal education, was not certain about what foods were good to make children grow, but had his own ideas:

"I don't know - I don't buy him strong (hard, solid?) foods. I buy pawpaw, and *kumu*; cook soup and mix it with meat, give him that... I buy chicken, take out its bones, cut it up and cook it with soup. He eats that."

Men are often directly involved in feeding their children. A 30-year-old road worker, speaking of tinned baby food for his third child, a boy of 6 months, said:

"I buy it - 18 toea for a tin. I've bought it four times for this child. I buy it, cook pumpkin first, then mix this... Myself, I taught my wife and she makes it and gives it to him. I buy it on pay day."

Some fathers said that their children simply ate the same as themselves and their wives, but in smaller quantities. This attitude is similar to that which prevails in the village, but the diet to which it refers is likely to be less bulky, and therefore more satisfactory for a child.

Foods which harm the teeth

Of those who were asked what foods harm the teeth, half mentioned biscuits, and half of those blamed sweet biscuits especially; nearly all said they had learned this at school, and said that *binatang* (a general term for tiny animals) get into the teeth and make holes. Other foods said by one or two people to harm the teeth included: sugar from the store, sugarcane, salt, betel nut, soft drinks, ice blocks, soft foods in general, including sweet potato, and very hot sweet potato. The latter was a lesson told to one man by his *tumbuna*. Four people did not know of any foods which might be bad for the teeth; two others said only that one should clean the teeth.

Causes of fatness

Questioning on why many men grew fat in the town produced a remarkable uniformity of response, with nearly everyone blaming beer;

a 25-year-old father of two put it like this:

"Beer, that's all. I've seen them, they drink beer every day, every week. They drink too much, and get fat bellies and fat arses. We don't drink much beer, we don't get too fat."

Incidentally, his last two statements seem to be generally true of the Fore in Lae.

Three people also blamed fatness on too much food in general, one on too much *abus*, and one on too much bread and cake.

Bun nating children

Bun nating was recognised to occur at least as often in the town as in the village, and four men said it was more prevalent in the town, though not among their own *wantok*. Sixteen people said it was the fault of parents for not looking after their children well, either through not giving the right food, or through letting dirt get into food or onto the mother's breasts. For example, the roadworker who gives his own child tinned baby food, said:

"I think their parents don't give them good food, they just give them solid foods: sweet potato, and hard bananas, and taro - things which don't have *gris*. They give them only this food, and they don't add meat, or fish, or freezer meat, or *kumu*. They give this food and they eat it and their skin becomes slack and they become all bone - this is what we think."

A driver, with one small child of his own, blamed poor hygiene:

"Their parents don't cover up the child's food, so dirt gets in the food and he eats it. This is what I think. I've heard doctors say, if you don't cover up the food and the child eats it, his belly will swell up."

Other causes of *bun nating* are adultery by one of the child's parents (also mentioned in Awande), and the child eating food prepared by his mother while she was menstruating. A self-employed contract labourer of about 30 explained:

"In the village, we think about this; when the stomach is painful, we say menstruating women have given food to the children. They've eaten this food, and their bellies swell and become painful, they become *bun nating*, with taut bellies. We see this sickness, and women must not give food to us, or to the children... In the town too. This is what our *tumbuna* say."

In the town, when a woman is menstruating she will still sleep in the house, but another woman in the household, or her husband, will do the cooking .

Only four people offered no opinion on the cause of *bun nating*. There was less confidence in suggesting cures, however. Six people said good foods would cure the condition, specifying *kumu*, *abus*, rice, sweet potato, banana, and foods with *gris*. A 24-year-old storeman, with Standard VI schooling, who rents a Housing Commission house and has three children, consistently doubted the value of many store foods; regarding the treatment of *bun nating* he said:

"If the doctors told me about this I'd be clear about it, but myself, I would try to give food from the market and the garden, food which has *gris*... taro, and corn, some *aibika*, and pumpkin, pawpaw, banana."

Cures using traditional medicines were mentioned by only two people. For the sickness resulting from food polluted through contact with a menstruating woman one man said the sap of a certain tree would be used as an emetic. A radio electrician with two years' education quoted a European¹ he had known in his village:

"One whiteman told me that when they get sick like this they have hookworm or something inside, and it eats the good *gris* from the food, so they get *bun nating*. He said, 'If a child of yours gets like this, you give him pumpkin seeds to eat. They will go inside and kill the hookworm'."

Bottle-feeding²

Of twenty-one individual opinions regarding bottle-feeding with dried milk, seven were undecided or thought it was a good method of feeding, eleven thought it was bad, and three had mixed views having themselves used it for various reasons: one had bottle-fed a motherless child at the Awande Kuru Hospital³, one a premature child on nurses' advice, and one a normal child on his own initiative. The latter, an uneducated laundry attendant married to a woman from Mumeng, in the

¹A Ph.D. research student from the Australian National University - but not me!

²Bottle-feeding is strongly discouraged in P.N.G. by the health authorities, and the availability of feeding bottles and teats has recently been curtailed by the passage of the Baby Feed Supply (Control) Act 1977.

³One of the many social effects of *kuru* was to make it necessary, and therefore culturally acceptable, for men to take a major role in rearing small children whose mothers had died of the disease (See S. Glasse, 1962).

Morobe Province, had mixed motives:

"I thought, my wife isn't from the same place as me. I thought she might leave me or something - suppose she left me, I would look after him myself, with milk and food. We carried on like this, until this year; he stopped drinking milk, and he eats sweet potato (The child is now 3½). My wife too, she said, 'I can't be bothered to look after him (i.e. with breast milk); sometimes I wash my breasts, sometimes I don't - he might drink when they are dirty'." Their second child, now fourteen months, is breast-fed, because the doctors disapproved of the bottle: "They said, 'All the children looked after like this are *bagarap* (harmed, damaged).' When I used to take him to the hospital they were angry with me."

Approval of bottle-feeding was usually based on casual observation of *taun-meri*, and Europeans. Disapproval, however, was often the result of hearing explicit warnings of the dangers involved, and several people had given up the use of a bottle and teat for this reason. The lessons of the hospital nurses are sometimes absorbed in detail. A young driver with a 9-month-old son who sometimes drinks powdered milk from a cup, had this to say:

"The nurses say, 'Before, you used to bring up children on (mother's) milk and they grew well, and you mustn't do this (bottle-feeding). Whites have fridges and things in their houses, they make up the milk and put it in there, it's all right. But you native (sic) women, when you buy it you don't look after it properly, you throw it around and dirt gets in; you mustn't use these *gumi plastik* (teats). You leave it. Give the child milk from a cup, pour it out and wash it.' When the child is a bit sick or something, my wife takes it to the hospital and the nurses talk like this."

The same storeman I quoted earlier as preferring market and garden to store foods had had the lesson passed on by a *wantok* training to be a teacher:

"They don't get much protein (sic) from this store milk. I don't know, but mother's milk has all sorts of foods in it, and they get it direct from the mother, and get plenty of good protein... He said, 'We studied this, and mother's milk is better for children.' He told me this, and from the beginning we just gave our children mother's milk."

One man heard warnings against bottle-feeding on the radio news: one from his European employer; and one read it in the Pidgin weekly, '*Wantok*'. Two said they had learned about it from doctors or nurses; others did not specify their sources of information.

Diarrhoea

Two courses of action are equally popular for the treatment of diarrhoea; one is to eat taro, or sago, or both; the other, particularly

for children, is to go to the hospital. The recital of *toktok*, and rubbing ashes on the belly, both methods used by the *tumbuna*, were mentioned a few times, as in the group discussion I held with South Fore men; one said:

"There are two kinds of men. Some will talk, and spit on the child's belly, and it will finish. Some will get some food, sago and taro, and give it to them, and the diarrhoea will finish... In town, we just go to the hospital."

The growing reliance on hospital treatment is nicely summarised by the high school student quoted earlier:

"They would just get ash from the fire, and give this *toktok*. This way was the custom (sic).. I think the old men still do it this way, and us, we're looking for a new way of life (*painim nupela laip*): we just go to the hospital and get medicine."

Only three people described the 'sugar water' treatment. Hard biscuit was suggested as a cure by four people, and *aibika* by two.

Food taboos

Food taboos for pregnant women were less common in Lae than in Awande. Eight of the sixteen men with children said that their wives had not followed any food taboos in any of their pregnancies. Five had avoided tinned meat and tinned fish; one husband had forbidden his wife to eat freezer meat; one had forbidden tea and coffee; and one Coca-Cola. The latter was the idea of the storeman, a Seventh Day Adventist, (SDA) who was unusually interested in the quality of foods:

"I thought it (Coca-Cola) was a bit strong, like beer. I think it is a bit sharp (*pait liklik*), perhaps when they make it they put in some alcohol or something. I just thought so myself, no one told me, so I said, 'You don't drink this'. I gave her orange to drink."

The apparent relaxation of taboos may in some cases be a consequence of marriage to coastal women, who, as far as I could gather, were not accustomed to taboos during pregnancy.

There were ten SDA's in the sample, nine of them from two neighbouring villages in North Fore. They were all subject to the SDA taboos listed earlier: pork, game, alcohol, tea, coffee and betel; several of them ignored the taboo on coffee.

Fear of coastal foods

An unexpected finding which emerged in the course of the first few interviews was that many Fore migrants to Lae were afraid of certain

coastal foods, which they believed caused sickness especially when they returned to the highlands. These fears seemed to be of three kinds, with some overlap between each.

First, many people believed that malaria could be transmitted through overripe fruit, in particular pawpaw and banana; coastal *pitpit* was also mentioned by two people; these foods were often avoided for this reason, and if eaten, were selected carefully. The taxi-driver from Awande, educated to Standard VI, had heard of this theory from other men, and had given up eating pawpaw:

"I'm afraid of getting malaria. They say this mosquito lays eggs in the pawpaw - sometimes the pawpaw is soft. So I don't eat it any more."

Another man was also afraid of coastal *pitpit*, for similar reasons:

"We're afraid of getting malaria from this, because mosquitoes go inside when the *pitpit* is bearing, and leave urine (*pispis*) inside, and we go back to our village and get sick... Because it's a cold place and afterwards we'll get very sick, we don't buy this, or pawpaws... We're afraid of ripe bananas too, but the nurses say it's good food for children, so we buy them and give them to the children, but not too often because of this sickness."

Not everyone agreed about this, and most people said that after a few years at the coast you can eat what you like. A 30-year-old man who had been in Lae for seven and a half years said:

"Some people say, 'You'll get malaria, you mustn't eat those things.' Some people say, 'It's as you like, if you want to eat, you can.' That's what they say... When I was staying at Bulolo, I got malaria. When I went back to my village, I stayed there and the malaria finished. So now, I'm living here, I don't get malaria anymore. It's completely finished. So I eat whatever foods I want."

The few people I asked were not familiar with malarial prophylactics such as chloroquine, with the exception of a young mother from Salamaua who said she gave tablets to her two children daily. Several people, on the other hand, said that they had received anti-malarial injections at the Angau Hospital in Lae.

The second kind of fear related to some coastal foods which resemble their village equivalents, but are in some way different; yams of all kinds, and red pandanus (*marita*) were the commonest foods mentioned. The sickness caused by these foods was described variously as malaria and shivering (*sik malaria na skin guria*), *bun nating*, "just sickness" (*sik tasol*), and, in the case of yams, boils on the skin. Here is one account

collected during my group discussion with men from Iwaki (South Fore); comparing red pandanus from Lae with that from their own area, they said:

"It's the same thing, but it's different. Our place is cold, at the coast it's hot, so we don't eat it... If we eat it here, then go back to the village and eat it there, at that time we'll get sick, *bun nating*, we often get this kind of sickness."

A 35-year-old man, three years in Lae, said:

"We're afraid of yams from the coast.... No good we should eat it and our legs or our skin should swell up or something.. In the village, too, the old men can make some *stori* (to the yams) and then they'll plant them, and do all kinds of sorcery to make them big. Then if we eat them, we get big boils (*buk*), on the face, skin, legs. Then we go to the owner of the garden who planted the yams. He'll spit on the boils and they'll be finished. So we're afraid of these yams here - we're not clear about their owners."

The recurrence of the theme, 'This is a hot place, we come from a cold place; if we eat foods here and then go home, we get sick', may be based on the observation of visitors to the town who contract malaria there, but exhibit the symptoms only when they have gone home.

The third kind of fear is simply fear of the unfamiliar, and in particular of the more exotic foods such as turtle, crab, large fish, and lizards; a few people were afraid of eating sago. A 17-year-old's fear of eating turtle was expressed thus:

"I'm afraid. I don't want to eat that kind of thing. I don't want to get sick. Myself, I think it's no good my skin should grow short (hunching his arms and shoulders in illustration). Myself, I feel this, so I don't like to eat it."

Fear of coastal foods, then, ranges from specific fears based on quite logical, if mistaken beliefs (e.g. mosquito eggs-fruit-malaria), through an amorphous set of beliefs which to the European observer seem less rational and coherent, to a general fear of peculiar and unfamiliar foods. Two or three people expressed no fears whatsoever of coastal foods.

Beliefs and preferences regarding particular foods

a. Root crops, bananas, sago, breadfruit. Sweet potato is still popular in the town, but is not the indispensable staple which it is in the village. One third of the respondents said that they ate it rarely or not at all while in Lae. Several added that they find it difficult to

eat for several weeks after they return to the village, because it 'sticks in the throat', and their 'stomachs are too small'.

Taro, both *taro tru* and *taro kongkong*, are as popular as sweet potato, being readily available at the market and easy to grow. There is no fear of coastal taro.

Cassava and cooking banana are both used regularly; yam is less popular, some people fearing it, and some claiming its taste is inferior to village yam.

Sago is a *strong* food, but one which only a few people use regularly. It is already familiar to migrants from the extreme south of the Fore region, where it is grown. Several men were introduced to it by their coastal wives and enjoy it from time to time. About half the sample had tried it and disliked it, or had never tried it.

Breadfruit seeds are *strong* food, liked by some but not by others. The flesh of the varieties available at Lae is apparently not good to eat; one man compared it unfavourably with the breadfruit he had eaten at school on Karkar Island, near Madang.

b. Nuts. Red pandanus and pandanus nuts are eaten only if they have been brought down from the Eastern Highlands. Local red pandanus is widely feared, while local pandanus nuts are too tough to eat.

Peanuts are a popular snack, usually eaten raw. The *galip* nut is a seasonal delicacy which only a few people know.

Coconuts are universally liked, both in the *drai* form to 'grease' food, and as *kulau*, drunk to quench thirst. Eating the meat of *drai* coconuts can cause diarrhoea.

c. Other vegetables and fruits. Sugarcane is much less *swit* in Lae than in the village; it grows thinner and shorter, and is tougher to chew. Nevertheless, it is quite a popular item.

Corn is similarly tougher in town than in the village, because of the heat. Too much can cause diarrhoea.

Of the green leaves, pumpkin and choko shoots are the best liked; *aibika*, and Chinese and common cabbages are also popular. *Tulip* leaves are an acquired taste; many find them too bitter. Green onions are popular, but some prefer the round onions which can be bought in the supermarkets.

Coastal *pitpit* is feared by some people, but eaten by others, especially the South Fore to whom it is already familiar from the village.

Pumpkins are generally liked, as are the local 'yard-long' beans; haricot beans are not often available. Tomatoes are not often bought or grown.

Of the fruits, pawpaw, pineapple, ripe banana, guava, mango and *mulu* (oranges, lemons, grapefruits etc.) are liked, though there is said to be some danger from overripe fruit, as discussed above. Some people buy expensive imported apples and oranges from the supermarkets.

d. Fresh meat and eggs. Pork is not much liked in town; it is taboo to Seventh Day Adventists in any case, and other people tend to prefer the other meats; there is some mistrust of local pork, and some men had heard a story about someone recently being imprisoned for butchering and cooking their own child, and selling it in the market as pig meat.

'Freezer meat' is mostly beef and chicken; the latter is the most popular meat, though rather expensive. One household regularly bought fresh chickens at the market, to cook in *mumu*-style.

Fresh and smoked fish taste good, but many people find their preparation too much bother.

Shellfish and prawns are liked by a few people, but feared by many. Two men had acquired a liking for prawns while working in a Chinese restaurant.

e. Common store foods. Rice is an urban staple equal in importance to all the root crops combined; it tends to be thought of as *strong*, but is quite often eaten together with sweet potato or taro.

Bread is a regular breakfast food; spreads include butter, peanut butter, spaghetti, tinned meat, baked beans, tomato sauce and jam - but all these are expensive, so it is often eaten alone.

Hard biscuits often substitute for bread; with sweetened *ti* they make a *strong* breakfast.

Flour is *strong*, whether bought as ready-made *skon*, or fried at home.

f. Beverages and snack foods. *Ti* (tea, coffee and milo) is always sweetened with white sugar, and often tinned evaporated milk is added.

It makes a good breakfast with bread or biscuits, is a popular item during work breaks, and is drunk by all the family at night. Milo is good for Seventh Day Adventists, who are supposed to take neither tea nor coffee, but tend to ignore the latter taboo. Tea itself is disliked by many people, who find it bitter.

Aerated soft drinks are extremely popular, Coca-cola most of all. They are drunk at the lunch break, and when going round town at weekends. They are not really *strong*, but 'deceive the stomach' into feeling full for a while.

Beer is taboo to all SDAs, and of the rest only seven men admitted to drinking it often or even occasionally. Many spoke of its bad effects, and of the problem of drunkenness among other migrant groups.

Of the hot snack foods, fish and chips and chicken and chips are much liked, though chips at 35 toea a portion are too expensive. Such foods are not *strong*; they are eaten for pleasure especially when going around town with no special aim in mind. Meat pies, meat balls and hot sausages are regarded as lunchtime snacks which fill the stomach for a time, but are not *strong*. "*Mit pai na Coke*" is the commonest idea of lunch for working men.

Ice-cream, ice blocks and cheesepops are popular snacks for children; the first two are good when the sun is hot.

Lae: Summary and conclusions

Among Fore men in Lae, the distinction between traditional and modern food beliefs exists as it does in Awande, but in Lae modern beliefs are more prevalent than in the village. The category of good foods for the body has expanded to include many vegetables, and *abus* such as freezer meat; awareness of the dangers of bottle-feeding and of unhygienic food preparation is more widespread; clinics and hospitals are looked to for advice as well as treatment. However, a new set of beliefs has emerged in relation to particular coastal foods: these beliefs rest partly on traditional fears of sorcery and magic, and partly on fragments of received scientific knowledge, such as that relating to mosquitoes and malaria.

In the town the range of readily available foods is wider than in the village, and tastes and preferences are correspondingly more varied. Rice ranks with sweet potato and taro as one of the most

popular staple foods, and many urban Fore have come to prefer its taste and texture to that of their traditional staple. Fresh meat, and snack foods of all sorts are universally popular; certain store items like spaghetti, fresh eggs, and jam are liked by some individuals, and ignored by or unknown to others. Some people develop a strong liking for a number of coastal foods, such as coconut and fresh fish, while other people dislike or mistrust them and maintain their accustomed preferences.

All the Fore adults now living in Lae were brought up in the village environment, and many of them will probably return to it for the latter part of their lives, taking some of their urban habits and attitudes with them. However, those who remain in the town will give rise to a new generation of Fore and part-Fore children born and raised in Lae. The food habits and preferences of this new generation will probably be influenced less by traditional Fore culture than by factors which affect all cultural groups in the urban environment: the nature of the diverse food resources, both natural and processed; the visible example of thousands of other urban consumers from varying socio-economic and cultural backgrounds; the pressures of commercial advertising and sales techniques; and the nutritional advice relayed via schools, clinics and the media. These factors will be considered in more detail in the discussion following the next chapter, which deals with women's attitudes and beliefs regarding infant feeding, in Awande and Lae.

CHAPTER 6¹WOMEN'S ATTITUDES AND BELIEFS REGARDING INFANT FEEDING IN AWANDE AND LAEIntroduction

Cultural variation in infant feeding practices in Papua New Guinea has been quite widely reported, most comprehensively in a study by Oomen and Malcolm (1958) which dealt with six contrasting rural locations throughout the island of New Guinea. Becroft (1967 a and b) studied child-rearing practices among highlanders at Baiyer River, giving particular attention to breast-feeding. In general, more information is available on practices than on underlying attitudes and beliefs, and there is little data on the urban situation.

Rawlinson (1977) undertook a study "to assess the reception of Child Health Record Booklets by New Guinea Highlands women and to investigate their understanding of Key Nutrition and Health concepts which underpin the effective use of the booklets". She also investigated the understanding of the booklets by a group of health workers. On the basis of standardised interviews with forty-six uneducated Highland mothers attending the Family Health Clinic at Goroka Hospital, she states:

"Many uneducated mothers do not see themselves in an active role as a promoter of child development. Although most had received nutrition education, child feeding still appears to be controlled by demand concepts rather than by need concepts which education attempts to instil."

In one of the few published studies of nutrition in an urban population in Papua New Guinea (Hitchcock and Oram, 1967), Hitchcock includes an appendix on infant feeding, and another on the means of improving nutrition, among the inhabitants of the Rabia Camp migrant settlement in Port Moresby. She found that food intake appeared to be insufficient in total quantity, and suggests that:

"A rise in real income is probably the most important pre-requisite for the success of any nutrition improvement program... It is difficult to find, among the usual agencies, one through which such a program could operate for the camp... Any program must be aimed towards the adult women responsible for the cooking and for making many of the food purchases but

¹Most of this chapter was written by Eluned R. Jeffries, who collected all the data on which it is based.

it is equally important that the men be included and persuaded to give their support to the program." (ibid., p.117).

Hitchcock does not make any direct comparisons between rural and urban conditions, and, as already stated, it is in this respect that the current study has its particular value.

Awande: methods and subjects

Twenty interviews were carried out with women in Awande, all but one of these through an interpreter, a teenage village girl who had learned to speak Pidgin during a stay at the coast. The interviews were all tape recorded. In some cases, men were present for part of the interview and often made comments, which largely agreed with the women's. On the whole looking after small children is considered the woman's responsibility, and children do not spend much time with their fathers until after they are weaned; 4- and 5-year-olds are often seen to spend more time with their fathers than with their mothers.

The sample was not selected in a strictly random fashion, but an attempt was made to include as many of the different hamlets as possible, and to cover a wide range of ages and conditions. Although seven of the women were grandmothers, most of these still had young children of their own; there were very few women in the village over fifty, this being the generation which was most severely affected by *kuru*.

All the women were happy to be interviewed, and most spoke readily, though one or two of the younger women were rather shy. The format of the interview was flexible to allow topics to be covered if the informant raised them, but it tended to follow a general pattern. The topics covered were: suitable foods for small children, the introduction of solid foods, the treatment of diarrhoea and *bun nating*, taboos and special foods in pregnancy and lactation, weaning practices, and attitudes to the Maternal and Child Health Clinic.

Awande: findings

Good foods for children

The main finding was that there is no special theory or practice of infant feeding. Children are not perceived to have needs that differ from those of adults, nor are they considered particularly vulnerable.

When asked what was good food for young children, a mother would typically reply:

"When the child is young, it just drinks milk. It goes on doing this, gets bigger and bigger, then it eats sweet potato."

The best foods for small children were said to be sweet potato, *kumu*, sugarcane and banana, with four mothers mentioning rice and fish, one mentioning pig, and one mentioning biscuits and cheesepops. There was no differentiation made between what children eat, and what they should eat. Nor were any foods mentioned that children should not eat, except in the case of pig, where opinions were very mixed as to whether the lean meat, the fat, both, or neither should be given to small children. A few women spontaneously said that pig made the body strong, or the skin fat.

Introduction of foods into the diet

Coupled with the lack of strong beliefs about what a child should eat is the absence of any firm beliefs about when the child should start eating solid foods. If pressed on the subject, some mothers would mention an age of three or six months, or the eruption of one or two teeth, but most would say that the child is given a peeled sweet potato or a piece of sugarcane when it can hold it in its own hand. Soft food is not specially cooked for a baby, nor will it be spoon-fed, but pre-mastication is quite common.

Similarly, there is no idea of the child needing a certain number of meals a day - though on the back of MCH clinic books it states, in Pidgin, "A child must eat three times in one day" - but rather that the child will make its own wishes known. The mother of a 10-month-old child was typical when she said,

"In the morning he drinks milk and eats sweet potato. We go to the garden, and cook sweet potato, take it with us, then if he wants milk or sweet potato, he can have it. Midday or afternoon, he can eat."

When the women were walking some distance to a garden they tended to take only those children, up to 6 or 8 months old, who were still small enough to be carried in a *bilum* (net bag) hung from the head. Thus a slightly older child who was still dependent on breast milk for most of his energy intake might be left in the care of older children or another woman for perhaps six hours at a time.

Diarrhoea and *bun nating*

In order to see how mothers linked their ideas of feeding and health, they were asked what they would do for a child with diarrhoea, and for a child who had some sickness and then became *bun nating*.

For diarrhoea, the universal remedy is taro roasted in the fire, and then peeled; only three mothers said they would take the child to hospital. If specifically questioned about store foods as cures, most mentioned either hard biscuit or 'sugar water' with or without salt. The latter treatment has been learnt by many mothers, but some claim it as their own idea rather than something advocated by the clinic nurses. This self-reliant attitude is very widespread in Awande; one is not taught, either by other women or by outside sources, how to look after children: each mother claims to follow her own way, and knows how to cope.

To cure *bun nating*, many mothers mentioned *kumu* as being useful, and recourse to traditional remedies was quite common:

"We've got plenty of medicines here. We can get them, put them with pig, the child will eat and his skin will grow fat."

Though most agreed that such medicines prepared from tree barks were helpful, plenty of food was thought to be the best cure. The oldest informant, who was probably 75 years old, echoed the view of many mothers when she said,

"Now there's rice and fish, we get these and cook them with sweet potato, and give them to the child and he eats and becomes fat. Before, it used to be a lot of hard work, but now good food has come and we can buy it and give it to them."

Few women made any reference to cleanliness in food preparation or in the home generally, and it was not surprising to discover that scabies was very prevalent in the village. A striking exception was the mother of two of the fattest and healthiest-looking young children in Awande. She was aware of the need for good food and for regular feeding, and often included rice and fish in the household's diet, but she attributed the superior growth of her children mainly to her insistence on cleanliness:

"I always wash my hands before I give food to the children. And I wash my children's hands, and then they eat. All the time I do this, and wash my breasts, and so on."

Foods in pregnancy and lactation

There did not seem to be any connection made between eating good foods in pregnancy and bearing a healthy baby. A taboo on tinned fish was mentioned by all mothers, although some said they did not follow the taboo themselves, particularly in later pregnancies. This appears to be equivalent to the old taboo mentioned by a couple of women against eating *kumu* or drinking water from a narrow bamboo. The tin or bamboo was likened to the woman's womb, in being 'closed' or 'fastened'. Eating tinned food would, by a kind of imitative process, lead to a hard labour (see pp.61-63 above).

No special food is required at the time of birth, though the other women will bring plenty of food to the new mother while she remains in the *liklik haus*, and after a couple of days a *mumu* will be held to mark the birth.

No worries were expressed about the milk supply, but it was said to be good to chew plenty of sugarcane and to drink tea with sugar from the store. Breastmilk was considered a drink rather than a food: it was important for the mother to have "*planti wara i stap insait long susu*" ("plenty of 'water' in the milk").

Babies are entirely breastfed for the first few months, and while most of these babies look chubby and healthy, they do not seem to receive much immunity from the ubiquitous *kus* (cough and runny nose). The mothers worry about this in their young babies, and sometimes those only a couple of weeks old are taken to hospital for treatment.

Weaning practices

Breastmilk is seen as the natural food for small children, and in theory is available as often as the child wants it, until he decides to wean himself. This '*laik bilong pikinini*' however, may be abruptly terminated when the mother becomes pregnant again. Traditionally, there was a taboo on intercourse for three to four years after the birth of a child. Although a child will still be breastfed for this long if the mother does not become pregnant, permanent cohabitation of man and wife has reduced the usual birth interval to two or three years. When a woman is pregnant, she may wean her previous child by going away for a while, but more often she will continually try to push it away from the breast when it tries to drink. Mothers often said this was difficult,

and sometimes the birth of the new baby is the terminating incident:

"A child eats sweet potato, drinks milk, and then when another baby comes, he will leave the milk. He likes to drink, but the mother says, 'You go!', and pushes him away. When his mother is pregnant, he fights to go on drinking, but when the new baby comes, then the big one is pushed away."

On one occasion, we observed an older child breastfeeding while its 3-month-old sister was asleep, but this practice was said to be unusual. However, lactating mothers enjoy breastfeeding the small babies of other mothers, and we observed this quite often.

It is not considered harmful to breastfeed while pregnant. If a child has to be weaned abruptly on the birth of a sibling, there is no concern that the displaced child will suffer, so long as it is eating plenty of sweet potato.¹

Attitudes to the MCH clinic

Several of the mothers regularly attended the Maternal and Child Health Clinic which visits Awande monthly, but said they were not told anything by the nurses, who just weighed the children. One husband interposed as follows:

"Do you have this in your country, people who come and weigh the children?... They come here, and sometimes they *bikmausim* (boss, shout at) the women, and tell them what food to give. But we know how to look after the children, to give them food so they grow well. Taro is a good food, and we give it to the children, and they eat it, but they (the nurses) say the children are feeling hungry now. They say sweet potato, water, is not enough, you must give them lots of different kinds of food or they will become *bun nating*."

The advice of the clinic nurses does not seem to be taken seriously by many of the mothers, for two main reasons. One, as we have seen, is that women tend to adopt a self-reliant attitude to infant feeding, and do not generally welcome the advice of outsiders. A second reason is probably the tone in which the advice is given: it tends to take the

¹No one mentioned the application of repellent substances to the breasts as a method of weaning. S. Glasse (1963) implies that this was normal practice among the South Fore, but Sorensen (1976) claims that it occurred only under special circumstances such as the impending birth of a sibling, and even in this case a mother might prefer feeding both children to forcibly weaning the elder.

form of a sharp, short lecture, rather than a discussion; furthermore, it is always given in Pidgin, which many of the women do not understand well.¹

Summary and conclusions

The findings show that there is considerable variety in women's attitudes, beliefs, and practices in infant feeding. Some are more responsive than others to new ideas and outside advice, and some more ready to experiment with new foods or feeding techniques. Bearing in mind the existence of these individual differences, the following generalisations can be made.

In spite of the attempts by clinic nurses to convince mothers of the need for frequent feeding and a more varied diet, traditional attitudes to infant feeding still prevail. They are based on the assumption that, after a period of breastfeeding, children can develop quite satisfactorily on a diet consisting mainly of sweet potato, supplemented by greens, sugarcane, and an occasional serving of *abus*. As far as diet is concerned, the child, once weaned, is treated as a small adult.

In practice, certain popular and nutritious store foods such as rice and fish, and traditional foods such as pumpkin, insect grubs, and pieces of pig are often given to small children in response to their vocal demands. This is in line with the attitude that children should be given what they ask for, rather than because of any awareness of the nutritional value of these foods to the children. Cheese-pops and sweet biscuits may be given to children for the same reason.²

¹Some women are more attentive than others. In the course of an interview with her husband, one middle-aged mother of five explained not only what foods the clinic nurses had recommended for young children (tinned fish, onion, *kumu*, tomato), but also the use of the weight chart in the *Helt Buk* (see Plate 10):

"When we go to weigh the child, they say, 'Your child is growing like this - it goes down, it goes up' (indicating growth line)... This mark, they say, 'If this goes up, your child is growing big; if it goes down, the child's skin is a bit loose.' They tell us this kind of thing."

²It seems likely that those children who can best make their demands heard and felt (not infrequently by displays of temper) will receive more food than those who are more placid. Thus the child who is congenitally weak, or suffering from a debilitating infection, is at a double disadvantage and his or her chances of survival are much reduced.

As for the treatment of nutrition-related conditions such as diarrhoea or *bun nating*, most women in Awande are very willing to use the MCH clinic or the Okapa Hospital, at the same time as trying the traditional remedies. The clinic is not generally seen as a source of advice, though regular attenders presumably gain some sense of reassurance from the monthly weighing of their children.

Clearly, traditional attitudes and practices are changing in Awande, under the influences of new ideas and new foods. The process can be expected to continue as education, health services, and other contacts with the outside world expand.

Lae: methods and subjects

In Lae, seventeen interviews involving twenty-three women were carried out. Two of the women were from Kainantu, and one from Henganofi (both districts in the Eastern Highlands); the others were from all over North and South Fore. All were married to Fore men. Of the Fore women living in Lae whom we had located, all but one were interviewed.

The interviews were carried out in Pidgin directly with the women concerned, except for two women whose husbands interpreted. The women were mostly much more responsive and interested in the subject than those in Awande had been, though none of them had any formal education. Most of them were in their twenties, and the oldest was in her late thirties. The number of children varied from one to five, and all but one mother had a child breastfeeding. All except one family had some land, either by the house or in the bush, where they grew vegetables, and all the husbands were employed. In these respects they were more privileged than many town-dwellers.

The order in which the questions were asked was flexible, as in Awande, but the content was fairly uniform. The topics covered were: good food for small children; the introduction of food; clinic and hospital attendance; treatment of diarrhoea and *bun nating*; attitudes to bottle-feeding; pregnancy, lactation and weaning; store and snack foods; and attitudes to coastal foods. Since the content of the interviews was not quite the same as in Awande, the findings are reported under slightly different headings.

Lae: findings

Good foods and feeding practices for young children

Good food for small children meant a mixed diet, with soft foods first, then a progression to an adult-type diet. Children received their portions on their own plates, and most also had their own cup and spoon.

Ripe banana was mentioned sixteen times as a good food for small children, sweet potato ten times, and *kumu* nine times; rice, pawpaw and pumpkin each five times; eggs three times; and tinned baby food and tinned fish twice.

Several mothers said you should start solid food at four months, others at five or six months; occasionally the answer mentioned the eruption of teeth. Most mothers said their children wanted to eat three times a day, morning, midday and afternoon; a few expressed concern that their children did not want to eat this often and were becoming thin.

Some mothers gave detailed descriptions of how they prepared food for their small children. They had learnt how to do this from nurses, and other sources; for example:

"We get pumpkin and banana, and mix it up with milk - milk like mother's milk. We get it and pour it in, mix it up with banana, pumpkin, eggs, give it to the children... I used to work for a European woman with four children, and she taught me how to make the food."

Clinics and hospital

Nine mothers said they were going regularly to an MCH clinic, and two others were taking a child regularly to the hospital. Others said that they used to go, but had stopped when their children were a year or two old. A few said that the nurses just weighed the babies, but most said that they received nutritional advice, which put the emphasis on a mixture of local vegetables and fruit, and tinned fish. Asked whether the nurses said anything about food, one mother answered as follows:

"Yes. They say, 'What is he eating?' and I tell them. When he was eating sweet potato, they said, 'Give him pawpaw, and ripe banana, get tinned fish, and pour the *wara* (fish oil?) into his food', and I did as they said."

One woman had recently attended a mobile cooking demonstration

by some nurses, near her home in the Taraka Settlement. Her account is worth quoting at length, because it illustrates how successful such education can be if it reaches those who are keen to learn:

"The nurses talked to us the day before yesterday. They came here, by the church, all we women gathered together and they taught us about cooking food for children... The nurses told us women to fetch food, the children's plates and spoons. One woman fetched sweet potato, one taro, one banana, one *kumu*, *aibika*, Chinese taro. Then we went to the home of one woman. They washed their hands, then the nurses showed us: they peeled the sweet potato, put water with it, cooked it. We stayed watching. When it had finished boiling, they shared it out. (Later) I came back and saw them getting onions, *kumu*, *aibika*. There weren't all that many women. The food was cooking in a saucepan. Some meat and fish was mixed in with the sweet potato, taro and banana. It was all mixed till it was very soft. They said, 'Now you must give it to the children.' That's how they taught us... They say 'Don't give just one kind of food. Get *kumu*, sweet potato, taro, banana - if you give just sweet potato, they won't get good bodies, they'll get sick. Pumpkin too. Get them all, cook them, eat them together.' When a woman knows how to look after her children, their weight goes up. Some women's children are *bun nating*, their weight goes down."

This degree of interest was exceptional, but there was plenty of evidence of the influence of nutrition education through the clinics. The hospital, which for some mothers meant quite a long journey, was also regarded as a ready source of help and advice.

Diarrhoea and *bun nating*

Most mothers said they would take a child with diarrhoea to the hospital. Nearly everyone mentioned the importance of giving plenty of water to drink, and many described how to boil the water and mix in salt and sugar before giving it to the child. One mother, recently arrived from the village, recommended Fanta for a child with diarrhoea.

Opinions on underweight children were in marked contrast to those in the village. Several women insisted that it was the parents' fault, for not caring for the children properly, and giving them the wrong food; one mother put it like this:

"They don't know what food to give them or how to look after them. They give them taro or sweet potato or banana, just that. We know how to look after our children, and give them all kinds of food from the store and the market."

Bottle-feeding

Four mothers attributed *bun nating* directly to bottle-feeding, and very few people thought bottle-feeding was good. Many understood the problem of cleanliness in its preparation, like the woman quoted earlier, who had herself worked for a European:

"For European women, who have everything for mixing it and giving it, it's all right. For us *kanaka*¹, we can't get things clean. If a woman can get out all the dirt before mixing up the milk, it's all right."

A couple of women who had tried bottle-feeding had abandoned the practice after being severely scolded by the clinic nurses. One had been bottle-feeding a toddler with T.B.:

"I used to do this, but the nurses were cross with me so I left it. They said, 'You've got your own milk, you mustn't do this.' He was weaned, but the baby was drinking. Now the two drink together; he (the older child) doesn't drink in the day, just at night."

One woman in the sample was currently bottle-feeding her 10-month-old infant; the mother had gone into hospital to have her spleen removed after an accident, when the child was only five months, and her milk supply had dried up. The child was now seriously underweight, despite the mother's efforts to feed him four times a day, and he frequently had diarrhoea. Another woman had partially bottle-fed her fifth child because her own milk supply was inadequate. The child was put onto solids early, and at the time of the interview, at 18 months, had left the bottle but still sucked at the breast occasionally.

Pregnancy, lactation and weaning

When pregnant, few women followed any taboos, which were thought of as something for the village and the older generation. One woman was asked about the taboo on tinned fish; she herself had been pregnant in the village, but said:

"That's a custom of the *tumbuna*; you can't believe their talk. I ate it, and I didn't listen to their talk. It (tinned fish) is *abus* for me, that's what I said to them. They are just fooling."

¹*Kanaka*: a term often used derogatorily by urban-dwellers to describe unsophisticated rural people; here presumably being used to refer to 'us village women in town'.

A few women were Seventh Day Adventists, and were never allowed to use tea or coffee, tobacco, betel, pork or game. One woman when pregnant had avoided tinned fish, yam and sago. Yam and sago are two of the coastal foods that are widely suspected of causing sickness - either malaria or non-specific 'swelling up' - if eaten too soon after coming to Lae. Familiar foods such as sweet potato, banana and taro are readily eaten, and most people soon become very fond of coconut, using it to 'grease' food in the coastal fashion.

In pregnancy, many people had individual dislikes, such as sweet potato or rice, and most said they quickly felt full up. Several people said they ate plenty of *abus*, *kumu* and tinned fish; but the only person who clearly linked this to the size and health of the baby was a Kainantu woman, married to a coastal man, who joined in an interview:

"If we just eat sweet potato, the baby doesn't get *gris*.
We eat *abus*, *kumu*, ripe banana: this sort of food gives
gris to the baby."

Many mothers recommended plenty of fluids, especially milk-based drinks, to encourage lactation; but as in the village, there was little obvious anxiety over this. There was no apparent trend towards earlier weaning¹, which in theory is still "*laik bilong pikinini*". A couple of mothers said that the milk is no longer good once the mother becomes pregnant.

Store and snack foods

These are accepted as a normal part of the diet, and are not the luxuries that they are in the village. Children are given all kinds of snacks when the family goes around town at weekends, including ice blocks, ice-cream, fish and chips, meat pies, soft drinks, cheesepops, and biscuits. One mother said the nurses had told her not to give cheesepops and biscuits because they rot the teeth, so she had stopped. Few mothers were questioned directly about this, and only one said she had heard of it. Snack foods in general are enjoyed as a part of the outing, and are not thought of in terms of good or bad food.

Tinned baby food, on the other hand, is considered good food. Only four mothers had never tried it, and ten said they used it

¹But see Chapter 13; there is some evidence of a slight tendency towards earlier weaning in the town as compared to the village.

regularly. Some mothers said one child liked it, another did not. Most people did not know exactly what was in the tins - one mother suggested sweet potato, *kumu* and pig fat - and the absence of pictures on the tins must have made choosing a haphazard process.

Lae: Summary and conclusions

The Fore women in Lae represent a transitional stage between rural and full urban life. Few have been in the town for longer than five years, and nearly all go home to the village from time to time. In town they receive visits from *wantok* who bring eagerly accepted gifts of village food. While many of the women appreciate the advantages of town-dwelling, and a regular cash income, most of them long for the plentiful 'free' village food, and what they see as the healthier climate of the highlands.

Overall, there is a strikingly higher level of awareness of the nutritional needs of young children than in Awande. For example, the use of tinned baby food, while neither an economical practice, nor one encouraged by clinics, does suggest that urban parents are at least aware of the need for deliberate attention to their young children's diets. It was often stated that if children did not grow well they were not being properly cared for, or had some sickness which needed treating at the hospital. The self-sufficient attitude typical of Awande mothers has in most women been replaced by a readiness to absorb the teaching of nurses and doctors, whose advice was often repeated in some detail.

A more varied diet for children is encouraged not only by nutrition education, but also by the wide range of foods available in Lae. Sweet potato and *kumu* are still considered the most important foods, but rice, tinned fish, tinned and fresh meat, eggs, and milk are all popular. However, the indulgent attitude towards children's requests, which was noted in the village as well, leads to frequent consumption of relatively expensive snack foods, whose poor nutritional value is not generally recognised by the mothers. As women grow more accustomed to urban life, their attitudes to foods and child feeding practices will continue to change. There is still plenty of scope for further education and advice.

CHAPTER 7

FOOD BELIEFS AND PREFERENCES IN THEIR ECOLOGICAL SETTING

Two general trends are apparent in the findings reported above, for both village and town, and for women as well as men. The first trend is towards an increasing consciousness of the significance of food to health; the second trend is towards an increasing range and diversity of food preferences. To conclude Part III, these trends will be discussed in terms of the relationship between village and town, the relationship between the sexes, the influence of schools and clinics, the role of advertising and the media, the nutritional implications of the observations, and the relationship of food beliefs and preferences to food consumption and food resources. This discussion is implicitly based on the conceptual model shown in Figure 1 (p.8), reference to which may clarify the main points.

The relationship between village and town

That Fore food beliefs and preferences should be exhibiting similar trends in both village and town is a result of several factors common to both environments. First, the adult Fore now living in Lae were themselves brought up in the village environment, and thus underwent the same process of socialisation in their early years as did those who now remain in the village. The basic set of beliefs and preferences is therefore common to both groups. Secondly, the new foods available in the village through tradestores are a sub-set of the many store foods available in the town. Thirdly, of those men with some school education, most went to Mission schools in the Fore area, and even those few who went to Government schools elsewhere were taught according to a similar syllabus. Fourthly, the type of nutrition education given at MCH clinics is basically the same throughout the country, with minor modifications relevant to local conditions; this reflects the relatively centralised system of nurses' training. Finally, and perhaps most important, the constant movement of *wantok* between village and town ensures a continuing exchange of ideas, attitudes and beliefs.

The degree to which beliefs and preferences will in future diverge in rural and urban environments will therefore depend on the various factors influencing the food resources available in each

environment, on the extent to which government health and education policies differentiate between them, and on the opportunities for personal mobility, in the form of migration to and from the town. Curtailment of these opportunities, for instance through the introduction of official controls as has been advocated in some quarters, would reduce the exchange of information between village and town, and loosen the sociocultural bonds between urban migrants and their *wantok*.

The relationship between the sexes

As would be expected, where members of both sexes were questioned on a particular topic, their answers tended to agree. This agreement is due not only to the obvious factor of their common cultural background, but also to exchanges between the sexes of information derived from outside sources. For example, several men in Lae quoted nutritional lessons which their wives had received from the clinic nurses. In the other direction, men pass on to their wives facts which they have learned at school, and, when women come to join them in town, opinions and beliefs derived from their longer experience of the urban environment.

This readiness in men and women to pool their knowledge, especially as regards infant feeding, may in part be a reflection of the relatively loose sexual division of labour among the Fore, itself partly a result of the *kuru* experience (see footnote p.71). With school education and hence adult literacy still so much the prerogative of males, the exchange of ideas between the sexes is a particularly significant cultural factor in encouraging the spread of new ideas and information.

The influence of schools

It is of interest to examine briefly the resemblance between what was taught in school, and what is recalled later. Two years of village 'Bible School', in which teaching is done either in Pidgin or in the local language, would be representative of the school education of many Fore men. In the Awande Lutheran Bible School, the second year of the '*Haisin*' (Hygiene) course includes two or three lessons on nutrition, based on the idea of three food groups¹. '*Kaikai bilong kisim strong*'

¹The summary presented here is derived from a 1970 Teachers' Text prepared at a Lutheran teachers' training college, as used in Awande.

('Foods for strength') include starchy staples, sugar and fats; '*Kaikai bilong mekim yumi kamap bikpela*' ('Foods to make us grow') include meat, fish, eggs, peanuts and dried beans; and '*Kaikai bilong paitim sik*' ('Foods to fight sickness') include green vegetables, tomatoes, carrots, pawpaw and pineapple. In addition, the lessons cover the importance of cleanliness in food preparation, nutrient-conserving cooking methods, how to prepare soft food for babies, and dental care in relation to food.

The official Government syllabus for Health Education in primary schools is also based on the three food groups; by Standard VI the groups are described in terms of energy, protein, and vitamins and minerals respectively. Other lessons deal with the causes of malnutrition, the use of MCH clinics, and the selection of foods giving nutritional value for money.

None of the interviewees referred to the three food groups as such; many spoke of foods for growth, and foods to make the body strong, without always distinguishing the two; no one mentioned foods to 'fight sickness'. The lessons recalled from school present an assortment of more or less accurate snippets of knowledge, with specific advice, such as to give children chopped up vegetables in soup, remembered better than instruction in the general principles underlying good nutrition.

The current official syllabus emphasises that nutrition education in schools should be made relevant to local conditions, and that children should carry out practical projects, involving mothers and other people in the community. Such recommendations seem wholly worthwhile, but whether they are acted upon will depend largely on the enthusiasm of individual teachers. At the moment, there are too few Fore children of school age in Lae to make any comparisons between what they have learnt, and what their rural counterparts have learnt about nutrition. In Awande, nutrition education in schools does not appear to have diffused through the local community.

The influence of clinics and hospitals

MCH clinics and hospitals were often quoted, by men and women, as sources of nutritional knowledge. The advice given in these settings is usually related to specific problems, especially those of underweight and other malnourished children, and is delivered in the form of clearcut instructions rather than theoretical explanations.

In Awande, and presumably in most other Fore villages, nutrition education for mothers is limited to advice given at the monthly visits of the MCH clinic. Our observations of the clinic in Awande suggest that the nurses' advice, which is always well-meant but often ignored, would meet with more response if it was delivered more sympathetically.¹ The nurses' job would also be made easier if a reliable interpreter could be secured at each clinic site.

In Lae, there are permanent MCH clinics at the Angau Hospital, at Butibam, and at the Haikost Community Centre; a mobile clinic visits Taraka. In addition, there are occasional mobile cooking demonstrations by student nurses, at which nutrition is also discussed. There is a Nutrition Ward at the hospital, where mothers admitted with their malnourished children are given nutrition education by the Sister-in-charge. However, no Fore women mentioned this source of information, and probably none had been admitted to the ward.

Nutrition education by hospital, clinic and Aid Post personnel is based on the Department of Health Publication, 'Nutrition for Papua New Guinea' (DPH, 1975). The value of this excellent manual will be further enhanced when a Pidgin version is available; it might then be used by less educated but influential people such as primary school teachers, Village Committee representatives, and Aid Post Orderlies. The Department of Public Health also produces two booklets in Pidgin, '*Kaikai Bilong Skul*', (Food for School), and '*Gutpela Kaikai Bilong Bebi Bilong Yu*' (Good food for your baby), as well as several posters; none of these publications was seen in Awande, or in any Fore households in Lae.

We did not attempt any systematic enquiry into mothers' understanding of the weight chart found in their children's *Helt Buk* (Health books), but our impressions agreed with the findings reported in the study by Rawlinson which was cited earlier. She concluded that:

"In the case of uneducated Highland women, the Health Record Booklet as a significant motivator towards better nutrition appears to be limited in its role, firstly by insufficient

¹The officer-in-charge at Okapa Hospital came to the same conclusion after a series of meetings with village women in the district: one of their chief complaints about the clinics was the way in which mothers were sometimes shamed and embarrassed in front of others when reprimanded by the nurses for not feeding their children properly. (Personal communication July 20th, 1977).

understanding of relatively sophisticated concepts contained in the "green road to health"; secondly by mothers' attitudes to the booklet resulting from attenuated understanding; and thirdly by incomplete instruction from Health Extension Workers." (Rawlinson, 1977).

To sum up, it seems that nutrition education through clinics and hospitals will continue to influence attitudes and beliefs, but more slowly than might be desirable. For the education to be more rapidly effective, at least three conditions are necessary: a higher literacy rate, especially among young mothers; a greater degree of motivation among mothers, which can only come from changing perceptions of the nutritional needs of their children; and a greater sensitivity in the attitudes and behaviour of health extension workers towards local circumstances.

The influence of advertising and the media

Commercial advertising of food and drinks is probably not yet a very significant influence on food preferences among the Fore, either in the village or in the town. Few people read newspapers or magazines even in Lae, and novel snack foods have quickly become popular in rural areas in the virtual absence of advertising. A strip cartoon advertising a brand of meat pies is one of the few printed advertisements in Pidgin, but it is published in the English-language national newspaper (see Plate 9). Its message, that meat pies provide strength for heavy work, is not, as we have seen, reflected in the opinions of most Fore men in Lae, despite their regular consumption of the pies concerned. Commercial advertising on national radio may come to exert a more pervasive influence in the future, but its introduction in 1977 was still too recent for its effects to be judged while we were in the field. The National Broadcasting Commission has formed a Health Advisory Committee to advise them on the desirability of advertisements, but this committee has no direct powers. From the outset of commercial broadcasting, the Commission prohibited the advertisement of infant formula and special baby foods, and in 1978 it agreed to stop the advertising of "rubbish foods" of the cheesepops variety; against the wishes of the Department of Health Nutrition Section, it still allows the advertising of aerated drinks or *loli wara* (J. Lambert, personal communication, 1978).¹

¹Cinemas may provide a more effective channel for commercial advertising than the other media, but I have no information on the content or form of cinema advertising. Cinema-going is a popular pastime among many urban dwellers.

Several male informants mentioned the media, both press and radio, as sources of particular items of nutritional knowledge, especially in relation to the dangers of bottle-feeding. Given the small size of the sample, this suggests that information carried in the media is quite widely received, and that more material of this kind might usefully be produced. However, none of our informants in Lae spontaneously mentioned the series of programmes on Nutrition and Health being broadcast, in Pidgin, on Radio Morobe (Lae's local, non-commercial station) while we were in Lae.

Nutritional implications of current food beliefs and preferences

Assuming for the moment that stated food beliefs and preferences do in fact coincide with actual behaviour, it is possible to summarise the main nutritional implications of these beliefs and preferences in the rural and urban settings.

Among the rural Fore, connections between diet and physical health are perceived in only the most general of terms, the dominant notion being that the body needs *strong* foods, of which sweet potato is the foremost. Small children are neither believed to require particular foods, nor to need more frequent feeding than adults. These beliefs, coupled with the low protein content and high bulk of the dominant staple, can be expected to lead to sub-optimal intakes of both energy and protein in small children, and possibly in vulnerable adult groups such as pregnant and lactating mothers, the sick and the elderly. Hipsley (1964a) and Malcolm (1974) stress the importance of frequency of feeding for the development of the child. Malcolm believes that in most Papua New Guinean cultures, as in the Fore, the mother responds to the child's demands, rather than perceiving its needs; in any nutrition programme,

"An awareness of the child's needs must be implanted in the mother before she will show any concern for either the quantitative or qualitative introduction of supplementary food." (ibid., p. 194).

The indulgent attitude shown towards children can have beneficial effects when the food demanded is a nutritious one such as tinned fish, or pork, but permissiveness in relation to snacks such as cheesepops is of less nutritional benefit. The replacement in tradestores stock of cheesepops and *loli wara* by salted peanuts and real fruit juice would improve the nutritional effects without interfering with the underlying cultural attitude in any way.

In the urban setting, the evidence suggests that children should receive a diet which is richer in protein, less bulky, and more varied than the rural one. This is partly a result of the nature of the available food resources themselves, but is also encouraged by a more positive, directive attitude towards child feeding, which includes an emphasis on more frequent feeding. However, children are also likely to be given nutritionally undesirable snack foods and drinks which may be sweet, sticky or both, and low in vitamins; most adults too express a liking for such items, which carry risks of obesity and dental caries. Education about the low nutritional value of many snack foods, and the relative costs of different foods in terms of their nutritional value, should receive priority in the urban environment.

Food resources, beliefs and preferences, and consumption

In the foregoing sections, several sources of influence on specific food beliefs have been identified and discussed. However, there remains a wide range of beliefs and, especially, preferences, whose origins are much more difficult to demonstrate. For example, the overriding popularity of rice and tinned fish in the village, and the widespread preference in Lae for chicken over beef, are not easily explained.

People's likes and dislikes are influenced by their cultural conditioning (or socialisation in the term used in the conceptual model), but also by individual psychological, and even physiological factors which cannot be considered here. What is quite clear is that foods are often adopted or rejected on grounds which have nothing whatsoever to do with beliefs regarding their value or otherwise to health; indeed such beliefs may emerge later as rationalisations of food preferences formed on other criteria.¹ This is true of all societies, except perhaps

¹In discussions of our findings with other people, the significance of prestige as a factor in determining food consumption has been raised several times. For example Standish (personal communication) states that rice is a highly prestigious food among the rural Chimbu. In a relatively short period of fieldwork it is difficult to gain a clear picture of the ways in which people compete for, and express positions of prestige or status. Among the Fore, the ownership of pigs is certainly related to status, but pork consumption is less obviously so. Also, at *mmu* feasts large presentations of food may take place, and the status of the donor group is enhanced by exceptional generosity in such gifts, especially if they are accompanied by cash. However, and contrary to our expectations, we saw little evidence to suggest that particular foods conferred status on their purchasers or consumers.

the most fanatically health and nutrition-conscious of subcultures, and it should not be lost sight of in any consideration of the potential value of nutrition education. The latter should be made as relevant as possible to the food beliefs and preferences which already exist; hence the importance of studying these.

As indicated in the conceptual model, the interaction between the available food resources, and the food beliefs and preferences, of a population or an individual will largely determine what food is actually consumed. There are, however, certain intervening factors which may prevent the ideally preferred diet from being consumed, even when the food is available; in the conceptual model these are referred to as 'competing needs and values'. For example, in the town people may prefer to spend money on a visit to the cinema rather than on a meal; in the village, people may decide to stay at home in rainy weather and eat leftovers, rather than make the long and uncomfortable trip to the gardens to fetch fresh food. Many similar circumstances can be envisaged, so that it should be no surprise to discover that people do not always eat what their stated beliefs and preferences might lead one to expect. This should become clearer in Part IV of this report, when I look at actual food consumption by the Fore in Awande and Lae.



1.1



1.2



1.3



1.4

PLATE 1. AWANDE: THE SETTING

1.1: General view of part of Awande. Small hamlet left foreground, Old Kuru Hospital (now primary school) mid-left background. Secondary forest on right. 1.2: Large hamlet near centre of village, surrounded by Casuarina trees and small coffee gardens. Traditional and new-style houses. 1.3: Hamlet built on ridge. *Kunal* grass in foreground. Large area of primary forest in background. 1.4: Woman and child returning to hamlet with food for *mumu*, and leaves for wrapping it. Sweet potato inside hamlet fence on left.



2.1



2.2



2.3



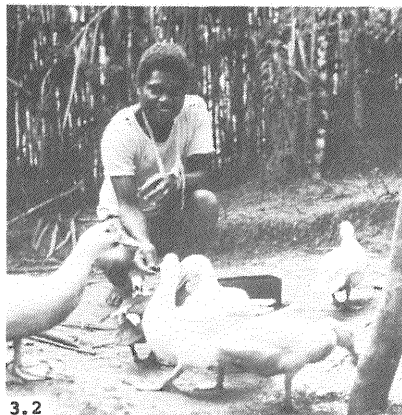
2.4

PLATE 2. AWANDE FOOD RESOURCES: GARDENS

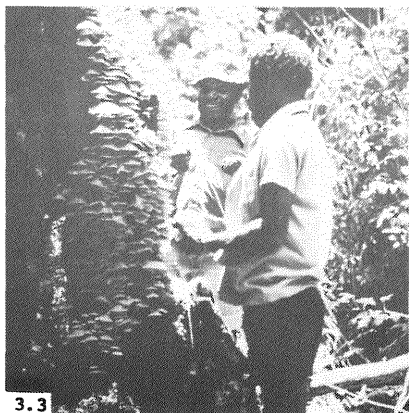
2.1: Large garden near forest, subdivided into several plots in various stages of development. Dead trees have been ringbarked. Pandanus nut palms left foreground. 2.2: Chinese taro, highland pitpit, climbing yams and young sugarcane in part of same garden. Note small children in mid-right, for scale. 2.3: Man harvesting sweet potato with digging-stick, another part of the garden. 2.4: Woman planting sweet potato, *kumu*, and highland pitpit in another garden, October. Drainage channels running downhill.



3.1



3.2



3.3



3.4

3.1: Pig being butchered in *haus singeing* prior to cooking in earth oven; pit for hot stones on left. Pig was shot after spoiling another man's garden. Cooked meat will be sold to other villagers.

3.2: Ducks, bought in Lae as ducklings, being fed inside enclosure of wild *pitpit* stems.

3.3: Harvesting wild fungi from tree trunk in forest. They will be taken back to the hamlet and shared with other households.

3.4: The main tradestore in Awande, showing most of the food stocks. Rice, carbonated drinks, chewing gum, biscuits and cheese puffs out of picture.



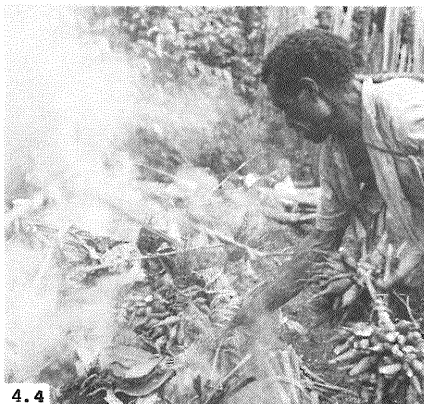
4.1



4.2



4.3



4.4



4.5



4.6

PLATE 4. A *MUMU* IN AN AWANDE HAMLET

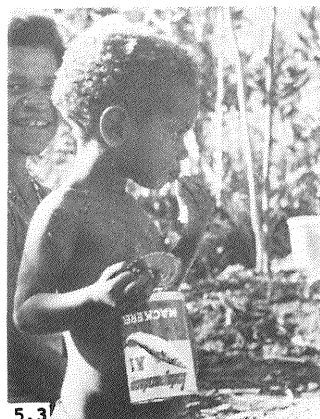
4.1: Parcels of pitpit, sweet potato and wing bean root prepared for cooking. 4.2: Men push hot stones into first *mumu* pit, while stones for second *mumu* are being heated. Left foreground, senior male cuts up half pig bought from Okapa freezer. 4.3: Bundles of pitpit placed on banana leaves over first pit. 4.4: Bundles of wing bean root placed on top of pitpit. Only pitpit and wing bean root cooked in first *mumu*; pig and sweet potato cooked in second one. 4.5: Fern fronds and leaves cover first pile of food, earth thrown on top to seal the oven. 4.6: Water poured in to generate steam for cooking. Wing bean roots cook for 2½ hours.



5.1



5.2



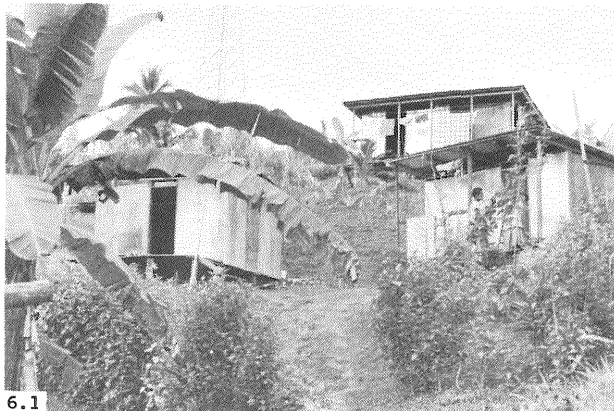
5.3



5.4

PLATE 5. FOOD CONSUMPTION IN AWANDE

5.1: Food being distributed by the senior males at the *mumu* feast shown in Plate 4. Centre saucepan contains rice and tinned fish. 5.2: Corn cobs, and bamboo tubes containing *kumu*, cooking over embers of a fire used for preparing stones for a *mumu* on another occasion. Wire grid behind is used for cooking food in saucepans inside houses. 5.3: Tinned fish is relished by young children; nearly empty tins are often given to them to finish off. 5.4: Tinned fish mixed in with boiled rice, while *mumu* cooks in background.



6.1



6.2

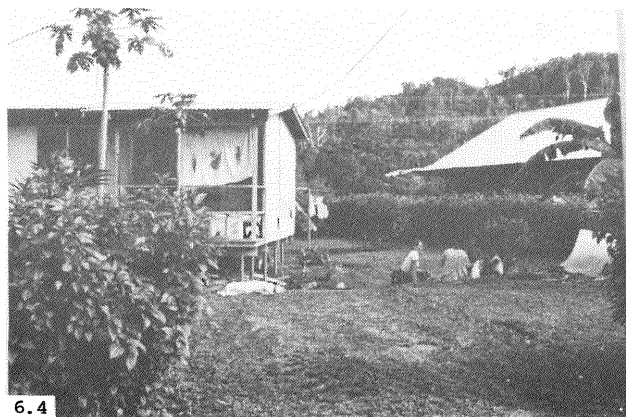
6.1: Self-help homes in the Boundary Rd. settlement; married men from Awande live in the lower two houses. Beans climbing stakes in front of right-hand house; banana and coconut palms nearby.

6.2: Large self-help dwelling in Two-Mile settlement, occupied by five married couples and five single men, all South Fore.

6.3: Water supply for house shown in Plate 6.2; some water also collected in drums from roof.



6.3



6.4

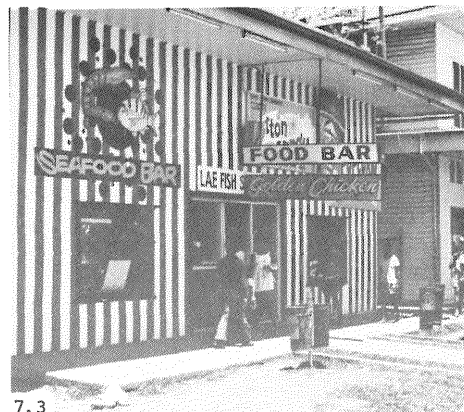
6.4: Housing Commission house in Taraka, occupied by North Fore couple with one child, and several *wantok*. Bananas and pawpaws in garden. Atzera range in background.



7.1



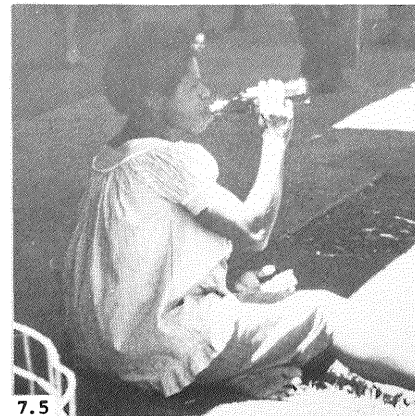
7.2



7.3



7.4



7.5

PLATE 7. FOOD RESOURCES IN LAE

7.1: Fish caught in Bumbu River by young Fore boy from Taraka. 7.2: Produce in Lae Council Market. L. to r.: betel, sweet potato, taro, cucumber, choko, wild ferns, pumpkin shoots, yam, red pandanus, sugarcane. 7.3: One of many snack bars in town. 7.4: Another view of market, on quiet day. Coconuts in centre, water melons on right. Fish sold in shed in background. 7.5: "*Mit pai na Coke*" - a typical midday snack for urban dwellers.



8.1



8.2

8.1: Weighing a child at the Awande MCH clinic, using coffee scales.

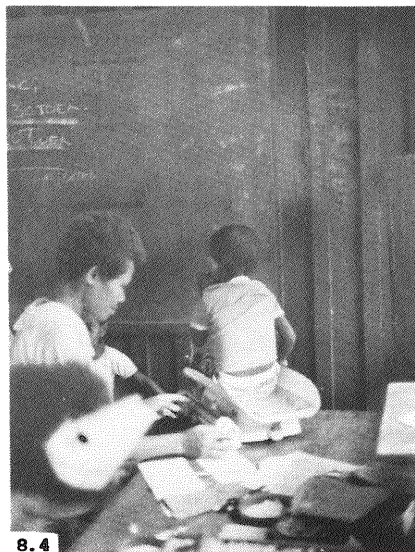
8.2: General view of Awande clinic. Basic medical supplies in tin patrol box. Clinic staff and equipment are brought out by car from Okapa.

8.3: The MCH clinic at Three-Mile Community Centre, Lae.

8.4: Weighing a child at the Three-Mile clinic, which is permanent.



8.3



8.4


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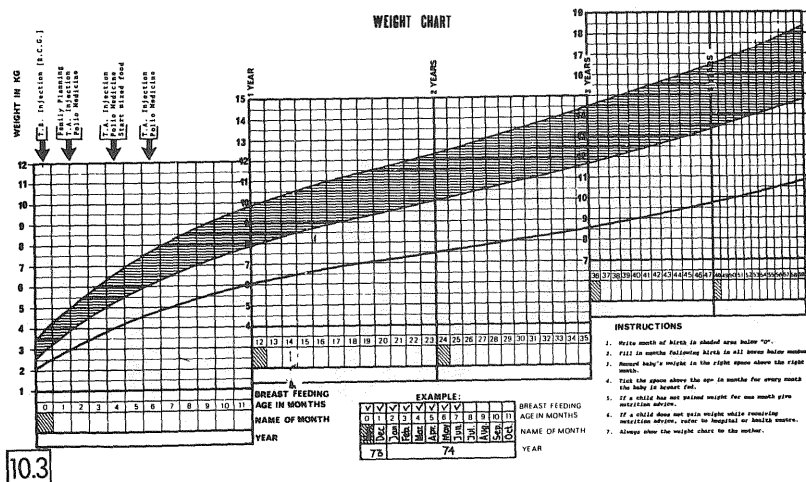


KARIM DISPELA BUK WANTAIM YU OLGETA
TAIM, TAIM YU LAIK KAM LONG HAUSIK,
HELT SENTA, ED-POS O KLINIK

WEIGHT CHART

Date	Height kg	History and Examination	Diagnosis	Treatment or Referrals
10/2				

Monthly gains of well fed children:		
0 - 6 Months	6 - 12 months	Older children 0 2 Kg every month
0.6 Kg every month	0.4 Kg every month	



10.1 Cover of book. Name and register number on front, nutrition advice on back. 10.2 Inside page for weight and treatment record. 10.3 The weight chart . key tool for monitoring progress. Shaded area between 100 & 80 percent weight-for-age lines called the 'Road to health'. Lower line is 60 percent weight-for-age, diagnostic of severe malnutrition or disease.

PLATE 10. THE 'HEALTH BOOK' ISSUED TO UNDER-FIVES AT MCH CLINICS

PART IV

FOOD CONSUMPTION

CHAPTER 8

GENERAL OBSERVATIONS ON FOOD CONSUMPTION IN AWANDE AND LAEIntroduction

Many studies have been made of food consumption in various parts of Papua New Guinea, and most of them have involved quantitative measures of food intake, later converted to figures for energy and nutrient intakes. Their aim has usually been to establish the adequacy or otherwise of dietary intake, through direct means, involving physical and biochemical examination of the population, or indirectly, by reference to theoretical requirements. Outstanding among early studies of nutrition in Papua New Guinea were the pioneering studies included in the 1947 New Guinea Nutrition Survey Expedition (Hipsley and Clements, 1950), and the intensive study of a Chimbu population by Verkatachalam (1962). A more recent project, distinguished by its technical sophistication and its general theoretical implications, involved the study of dietary intake and energy expenditure in contrasting highland and coastal environments (Norgan et al., 1974; Ferro-Luzzi et al., 1975). A wide-ranging study of the nutrition, disease and health status of a small Enga population in the Western Highlands was carried out by Sinnett in the late 1960's and early 1970's, and is summarised in Sinnett (1977). Among the Fore themselves, only one nutrition survey has previously been reported (Reid and Gajdusek, 1969). This study will be considered further in Chapter 10. Briefly, it can be noted here that the study revealed energy and protein intakes which were higher than those reported for most highlanders.

These and other studies vary in their assessment of what constitutes a satisfactory dietary intake. However, it is generally acknowledged that the heavy dependence on the sweet potato, common to most highland areas, leads to energy and protein intakes which, at best, leave little margin for safety; toddlers, and pregnant and lactating women, are particularly vulnerable. Vitamin and mineral intakes are generally satisfactory in highland areas, where large amounts of fresh green vegetables are always available.

The lack of detailed nutrition surveys in urban areas was mentioned in Part I of this report, and the main findings of the few studies which

have been published were summarised on pp.4-5. As is the case with food beliefs and preferences, no studies have been made which directly compare the food consumption of culturally related populations in rural and urban environments. Before one can draw any firm conclusions about the nutritional implications of urbanisation, such comparison is necessary; this was the aim and justification of my own study of Fore food consumption.

In comparing the food consumption of rural and urban Fore, my main concern was to obtain a general picture of the frequency of consumption of different items in each environment, rather than to make detailed measurements of energy and nutrient intakes. The latter can only be valid if they are made on large populations over an extended period, and with accurate and reliable techniques and equipment. Given the limitations on the time and resources available, it seemed more sensible for me to concentrate on the general consumption patterns of a large number of individuals over a short period, obtaining data from which nutritional implications might be indirectly derived. This work is described in Chapter 9, where direct comparisons, based on dietary recall surveys, are made between food consumption in Awande and Lae.

The possibility of doing a small weighed intake survey in Awande was at first rejected, because of lack of time, and doubts as to its usefulness. However, the existence of the earlier report by Reid and Gajdusek (ibid) made such a survey seem worthwhile, and a short return visit to Awande in October provided the opportunity. This survey is described in Chapter 10. Unfortunately the time spent in Lae was too short to allow a comparable survey to be made there.

In the urban environment, one of the primary points of interest to the nutritionist is the cost of foods, and their importance, relative to each other and to non-food items, in the household budget. For this reason, I made a survey of expenditure over one fortnight in a small number of Fore households in Lae. These data, analysed in Chapter 11, provide some basis for assessing the budgetary constraints on food consumption in a group of urban migrants. The final chapter in Part IV returns to the ecological context of my work, and draws out some of the interrelationships already mentioned between environmental variables and aspects of behaviour involved in food consumption.

The remainder of the present chapter consists of a general

description of meal patterns and cooking methods of the Fore in Awande and Lae.

Awande¹

The meal pattern

The typical day in Awande begins at about 6 a.m., when the fire, still containing embers from the previous evening, is built up to prepare the morning meal. This usually consists of sweet potato, either cooked in the hot ashes, or, less often, boiled in a large saucepan; in the latter case, salt² is often added, and the cooking water is drunk after the sweet potatoes are removed. If any is available in the house, sweetened *ti* (tea, coffee, milo or even hot water alone with white sugar) may accompany the meal. Otherwise cold water may be drunk; it is collected from nearby streams in long bamboo tubes or in metal or plastic containers. The meal is a leisurely affair, and people often move from house to house within the hamlet, sometimes being offered food, and sometimes carrying their own with them. Leftover cooked tubers will be eaten during the day; schoolchildren carry them to school (but sometimes eat them on the way), and mothers often take them to the gardens for their young children to eat.

Usually the hamlet is more or less deserted during the day, and the houses are padlocked. However, there are many circumstances in which people choose to stay at home, or to return there in the middle of the day after performing some task in the morning. When this is the case, a simple midday meal, usually a sweet potato or two, is likely to be prepared. *Mumu* feasts are generally eaten in the early afternoon, but sometimes earlier (see below).

When men and women are working in the gardens, they commonly cut a length of sugarcane in the middle of the day to drink its juice. They may also eat raw *kumu*, or *pitpit* hearts, picked from the garden. Sometimes

¹This account may be compared with that by Sorensen and Gajdusek (1969) who describe food habits in the South Fore in the early 1960's. Income from coffee in the Fore region has greatly increased since that time, and tradestore goods, including cooking utensils as well as food, are consequently much more common today.

²Only salt from the tradestore is used; traditional salt-making as described by Sorensen and Gajdusek (*ibid.*) is no longer practised.

they will prepare a fire, or even a *mumu*, in the garden and cook a small meal of sweet potato and leafy vegetables. Children spend as much time in the bush and forest as in the gardens, and often find small items of food such as wild ferns, insects, berries, or mushrooms; if such items require cooking, a fire may be made using a glowing ember from a nearby hamlet, or they may be taken home and cooked later. The tradestore is another source of daytime snacks popular with adults and children alike, and if cash is to hand, for instance after a roadside coffee sale, people will drop in to buy biscuits, chewing gum, cheese-pops, soft drinks and so on. However, it is quite common for people to have nothing to eat from when they leave the hamlet in the morning, till when they return towards dusk.

The main meal is usually eaten between 6 p.m. and 8 p.m. predominantly in family groups, although there is again a good deal of movement between houses, especially by children; they often stay on to sleep with the household whose meal they have shared. Sweet potato is still the main item, but may be accompanied by *kumu*, *pitpit* hearts or both, and by other vegetable items such as corn, beans, pumpkin or mushrooms. Leafy vegetables are either boiled in a saucepan, or steamed in bamboo tubes, tightly stuffed and placed on the embers. Pig and other fresh meat may also be cooked in this way. These bamboo tubes last for two or three meals before they become too charred for further use, when new ones will be cut. Despite the effort involved in their preparation, they are used several times a week; this method of cooking, which requires no addition of water, is highly conservative of both nutrients and flavours.

If money is available, a family may buy rice and tinned fish or tinned meat for their evening meal, boiling the rice in a large saucepan until the cooking water is absorbed, and then adding the meat or fish and perhaps *kumu*, green onions, or another vegetable; friends within the hamlet will often be given portions of the food. Even when rice is cooked in quite large quantities, it is normal for sweet potato to accompany the meal. Quite often the evening meal includes leftovers from a nearby *mumu* feast held in the early afternoon, or from a more formal *mumu* feast held in another village, where pig meat may have been distributed.

The *mumu* (see Plate 4)

The *mumu* is an integral feature of rural Fore society, with respect both to day to day social interaction within the hamlet and the village, and social relationships with groupings in other villages. It is therefore pertinent to describe briefly its main material and social aspects. This method of cooking is found throughout the Papua New Guinea highlands, with variations from place to place. The following description applies to what I observed in Awande.

The *mumu* itself consists of a pit, up to a metre deep, dug into the ground and filled with rounded stones which have been heated on a large platform of firewood; banana leaves are placed over the hot stones, and bundles of food are piled on top of these¹. When the pile is complete, another layer of large leaves is wrapped around it, and the whole heap is covered over with earth, dug from the surrounding ground. Water from bamboo tubes, or metal drums, is poured into holes left in the top or sides, generating clouds of steam. The *mumu* is finally sealed with more earth, and left to cook for anything from one to four hours, depending on its size and contents. In effect, this earth oven acts as a giant pressure cooker, and is another method of cooking which conserves nutrients. When the food is thought to be ready, the layers of earth and leaves are removed, and the bundles of food distributed to their owners. Generally the *mumu* is opened in mid-afternoon, but sometimes it will be as early as midday or as late as 5 p.m. In the period of feasting which follows, there is a good deal of sharing and exchange of foods: usually some cooked food is taken away and eaten later.

The foods most commonly cooked in the *mumu* are sweet potato and *pitpit*, and the more seasonal root crops, such as wing bean roots, yam, and taro. Cooking banana is often grated, mixed with herbs, and wrapped in breadfruit leaves before being placed in the *mumu*. Other vegetable foods which can be cooked in the *mumu* include corn, beans (still in their pods), whole cabbages of the European variety, and pumpkin. When pig or other fresh meat is cooked in the *mumu* it is placed in pieces on top of the vegetables; in the case of pig, the whole skin may be placed over the

¹Sometimes the food is placed in a wooden cylinder made from a hollowed out treetrunk. There were several of these drums in Awande, but they are no longer made; young men say they would not know how to make one.

top of the pile, under the outer covering of leaves and earth.

There is a clear sexual division of labour in the preparation and conduct of the *mumu*. Men are responsible for heating the stones, and loading, sealing, and opening up the oven. Women are responsible for collecting food, and gathering leaves for tying it up into bundles. Men cut up meat, and may also prepare grated taro or cooking banana for the *mumu*. Rice and tinned fish are often prepared while the *mumu* is cooking, and are primarily a male responsibility. Women may cook *kumu* and *pitpit* hearts in bamboo tubes, on the embers of the fire which was used to heat the stones. Throughout, men and women sit apart.

The majority of feasts are shared by a small number of related households in a hamlet, the decision to hold a *mumu* being a communal one prompted by such factors as good weather, or the availability of a particular valued garden crop. These small *mumu* are held several times a week in most hamlets. Large feasts, attracting up to several hundred people, are held to mark such events as funerals, initiations, marriages, and settlements of disputes. At the large gatherings, pigs are often killed by the hosts, and given to the visitors in ceremonial payments. Between the small, informal feasts, and the very large ceremonial occasions lies a range of gatherings of intermediate size. The following list of occasions on which pigs were cooked at *mumu* feasts over a two-month period while we were in Awande gives an idea of the variety involved; all the hamlets mentioned are in Awande:

- May 15th : at Karomarari hamlet, 1 pig, following the death of a relative at the N. Fore village of Anumpa 10 miles away.
- May 22nd : at Karomarari, 3 pigs, killed while marauding in a nearby garden.
- May 24th : at Umanti, $\frac{1}{2}$ freezer pig, celebrating return of young man from prison.
- June 12th : at Seve'agori, 2 pigs received as gifts at funeral feast in another village on previous day re-cooked and distributed among lineage.
- June 20th : at Aibamuti, 2 pigs and 1 cow (from Dumpu ranch in Markham Valley), to celebrate initiation of 3 boys.
- June 23rd : at Seve'i, small pig 'marketed' to other villagers for about K20.
- June 23rd : at Agaramanti, 2 pigs and 1 cow, at a party for an old woman (? to pre-empt large funeral feast later).
- June 29th : at Toborobeti, 5 village pigs and 1 freezer pig cooked in 4 earth ovens, for funeral of 4-year-old boy who died of dysentery on 27/6/77. Over 200 people present; mother's brother's line given meat to take back to their village. Feasting continued for next 3 days.

- July 3rd : at Akongai'ari, 1 pig, killed in a garden, cooked and 'marketed' to other villagers for K106.
- July 6th : at Kumeri, 2 pigs, piece of mutton, and piece of cow; party for an old woman.
- July 9th : at Porototi, $\frac{1}{2}$ freezer pig, party for relatives from S. Fore village of Kume, in connection with earlier funeral feast at Kume.
- July 10th : at Aibamuti, 1 pig marketed to other villagers.
- July 13th : at Aibamuti, $\frac{1}{2}$ freezer pig, $\frac{1}{2}$ freezer sheep, to celebrate girl's first menstruation.

This list may not be complete. It should also be noted that individuals and groups from Awande were invited to feasts at other villages, probably at least once a month.

The sharing of food is a universal way of expressing social relationships between human individuals and groups. The essential feature of the *mumu* is that it enables large amounts of food to be cooked at one time. At small feasts the enjoyment of the participants is evident, not only in the consumption of food, but in the preparation of the *mumu* and in the conversation which continues throughout the proceedings. At large feasts, the nature of the social relationships between those present may make the atmosphere less relaxed, but this only underlines the significance of the occasion. From the nutritional point of view, the *mumu* is a beneficial feature of Fore food habits; from the sociological point of view, the *mumu* is a central institution in hamlet, village, and wider social life.

The *singsing*

The large ceremonial pig feasts common to most areas of the New Guinea highlands are, according to Sorensen and Gajdusek (op.cit.), held at 5- to 15-year intervals in the Fore area; they are smaller than among the Enga, and even the Chimbu. One was held in Awande in 1972, but no one could say when another was due. Much more common than the *singsing bilong pik*, is the new form of *singsing* which has developed in the area only over the last four or five years, consequent on the inflow of cash from coffee sales.

The *singsing* consists of a night of dancing, singing, eating, and drinking, inside a large circular enclosure, the *haus singsing*. The perimeter of the *haus singsing* is made up of a ring of partitioned low-roofed, cane-and-thatch booths, each with a small counter from which food is sold to the visitors to the *singsing*. Each booth is used by a separate group of people from the host village, or *lain* within the

village, while the visitors come from villages all around. They pay an entry fee, normally of 30 toea per adult, which goes to the *papa bilong singsing*, the man who initiated the construction of the *haus singsing* and organises the event itself; he also collects K2.00 from each of the stallholders, except his closest relatives; finally, as part of a complex economic network which I do not fully understand, cash payments are made to him by groups from other villages, apparently in settlement of debts incurred by them in the course of organising previous *singsing* of their own.

These *singsing* are held throughout the coffee season, but especially in the drier months of August and September. Most villages contain at least one *haus singsing*, which needs to be largely rebuilt each year.

In Awande in 1977 there were two completed *haus singsing*, and two more under construction, each the property of a particular *lain* within the village. One *singsing* was held in each of the completed *haus*. One of these, which I attended, was held on August 12th:

Five pigs were killed, and three cows bought from Dumpu at K245 each, to be cooked and sold to stallholders. The other items sold included flour *skon*; cooked sweet potato, taro, yam and bananas; plates of rice, vegetables and tinned meat or fish; cigarettes and tobacco; tea and coffee with white sugar; sugarcane; bread sandwiches; peanuts, coconuts and betel brought up from Lae; cheesepops and bubble gum; and beer. The latter is one of the main attractions of the *singsing*, and being illegal without a licence, was sold 'under the counter' at the high price of 60t. a bottle.

The *singsing*, attended by several hundred people from Awande and surrounding villages, continued from early afternoon to dawn of the following day, a large central fire lighting the scene through much of the night. The man who organised the *singsing* reported net takings of K960, including gate money, stall hire charges, and debt payments. He said the money would be used by his *lain* when they thought of a purpose for it; they did not want to waste it on consumption, but were uncertain as to how to invest it productively.

The new form of *singsing* has both economic and social significance at the local level, as another channel for cash exchange and social intercourse between Fore villages and groups. It is regarded by stallholders as a way of making money, and by visitors as an enjoyable form of recreation. Nutritionally, it makes a minor contribution to varying the normal diet, mainly in the forms of fresh meat, flour products, and beer. From the wider point of view, the non-productive nature of the activities

involved in the *singsing*, and the economic and social implications of high cash expenditure on large amounts of beer must be regarded with some misgivings.

Lae¹

In Lae, where most Fore men are in full-time employment, the meal patterns of men and women are different, at least during the working week. Men tend to rise at dawn, and drink a cup of sweet *ti*, often accompanied by bread or plain biscuits, before leaving for work. At work tea and biscuits may be supplied in the morning, and at lunchtime working men may use either the work canteen, or a snack bar nearby; many, however, have nothing at midday. Women tend to eat later in the morning, with their young children; whether, and what they eat in the middle of the day depends on their activities, whether they remain at home, go to a garden, or go visiting elsewhere in town.

In the evening the family generally eats together, and often with other families sharing the house. Cooking is usually done in a make-shift shelter separate from the main dwelling, or in the open yard if the weather is fine. Some people have kerosene stoves, but these frequently break down and are not very efficient; cooking on an open fire is more common. The evening meal is variable, but generally includes rice, a starchy vegetable staple such as taro or cooking banana, or both; *abus* in the form of fresh meat or tinned fish or meat; and some green vegetable. Tea, milo, or coffee is drunk after the meal.

At weekends, the morning meal is likely to be more substantial than on working days; and the common activity of going around town as a family or with friends means snack foods are more frequently consumed then.

The *mumu* is a rare occurrence in the town. It is difficult to obtain suitable stones and sufficient firewood, and expensive to buy large quantities of fresh food. One family I met cooked chicken and vegetables regularly at weekends in an improvised *mumu*, consisting of a

¹I had less opportunity to observe meals and cooking practices in Lae than in Awande, so this section can only offer a general summary, based on informants' comments and my own impressions.

metal drum containing a little water, over which the food was placed on a rack and sealed in with leaves and earth; the whole drum was heated over a wood fire, and the contents thus steam-cooked. Although small *mumu* feasts are occasionally held, they do not constitute a regular feature of Fore social life in the town¹. At weekends, small informal gatherings of Fore from particular villages are quite common, and on such occasions food, and sometimes beer, will be shared. It seems unlikely that such gatherings can provide people with a sense of communal involvement as successfully as the village *mumu* appears to do, and this may constitute a significant cultural loss associated with urbanisation.

¹I was not aware of any institutionalised formal '*Pati*' among the urban Fore, such as M. Strathern (1975) describes for Hagen migrants in Port Moresby. It may be that the Fore place less importance on ceremonial exchanges than do the Hageners, with their *Moka* background; however, my period of fieldwork was too short to allow investigation of such matters.

CHAPTER 9

DIETARY RECALL SURVEYS IN AWANDE AND LAEIntroduction and methodsThe dietary recall technique

Dietary intake in Awande and Lae was assessed by means of a simple recall technique. Each subject was directly questioned as to what he or she had had to eat and drink on the previous day. The responses were recorded in a notebook, as items consumed in the morning, at midday (*belo* in Pidgin), and in the afternoon: this categorisation into three distinct meal times is somewhat misleading, because some snacks, and some larger meals as well, may be consumed in mid-morning, mid-afternoon, and late at night. However, provided that this qualification is borne in mind, the convenience and ease of interpretation of the threefold categorisation outweigh its disadvantages.

There are other disadvantages of the recall method. The most obvious is that people will tend to forget the details of their previous day's consumption, and in particular the consumption of small snack items between the main meals¹. A related problem is the possibility that people will deliberately give a false report, by omitting items of which they think the investigator may disapprove, or adding items of which they suppose him to approve. Although it is impossible to be certain, I believe that the latter problem was much less significant than the former in my surveys. A limited amount of prompting was used when it seemed likely that the respondent might have forgotten something.

The third disadvantage of the recall method is that it provides no data on quantities of food consumed, and hence cannot be used in assessing nutrient intake. For example, the quantities of pig consumed by individuals in Awande were frequently of the order of 100g. or less, and sometimes consisted entirely of fat, at other times of lean; in Lae, much smaller quantities of green leaves were cooked for a meal

¹Water was excluded from the recall data, since it seemed one of the most likely items to be forgotten or misreported. Salt was excluded for the same reason.

than was the case in Awande. Such variability in size and composition of portions of the same food is not reflected in the recall data, which record merely whether or not a particular item was consumed.

The advantages of the recall technique are several. It is quick and straightforward, so that the diets of a relatively large number of people can be recorded in a short time. Because it is retrospective, it does not in itself distort eating behaviour in the way that weighed intake surveys may do. Finally, use of the technique in culturally-related populations, as were the Fore groups surveyed in Awande and Lae, should yield data between which comparisons are quite valid; this might be less true where the populations to be compared are culturally unrelated, because of the possibility of their having differing attitudes to the survey approach.

In both Awande and Lae, the dietary recall survey met with universal co-operation, and a good deal of interest. People were keen to jog each other's memories where necessary, most of the recalls being collected while all the members of a household were together.

Records were only accepted directly from the individuals concerned, and from adults speaking on behalf of children too young to reply for themselves. Slight differences of approach in Awande and Lae will be dealt with below.

Methods of analysis

Data collected in the field were immediately transferred onto coding sheets, where the sex, approximate age and marital status of each respondent were recorded along with his or her consumption of food and drink items in each part of the day, as described above. Sixty-five items were listed, some less specific than others (for example, all forms of green leaves, including traditional *kumu*, common and Chinese cabbage, pumpkin shoots and choko shoots were recorded as one item).

The data were later punched onto computer tape at the Australian National University, and analysed on a UNIVAC 1100/42 computer, using the Statistical Package for the Social Sciences (SPSS). The analysis consisted mostly of straightforward crosstabulations of consumption rates for each item by age groups; at a later stage, most items were amalgamated into more inclusive categories, such as starchy staples,

green/yellow vegetables etc., to give a more general picture of dietary patterns. These categories are fully described in the results section, below.

Methods and subjects in the two survey locations

a. Awande. In Awande, three separate surveys were carried out, in May, July and October 1977, in order to sample the diets at different times of the year¹. In each survey the same representative series of hamlets was visited, the survey lasting one week and covering one, or sometimes two hamlets per day, but never the same hamlet twice in the week. Many individuals were therefore included in all three surveys but some were omitted on one or two occasions. The total number of households covered, and a breakdown of the survey samples by sex and age, are shown in Table 2, which also shows the corresponding figures for Lae.

TABLE 2

HOUSEHOLDS AND INDIVIDUALS BY SEX AND AGE GROUP
IN DIETARY RECALL SURVEYS, AWANDE AND LAE 1977

	AWANDE						LAE	
	May 16-22		July 8-14		Oct. 2-8		Aug. 28-Sept. 21	
No. of households ¹	70		77		76		84	
Individuals, by sex	M	F	M	F	M	F	M	F
15 years and over	63	65	81	81	78	74	102	81
5-14 years	59	43	57	47	56	46	16	6
0- 4 years	31	29	42	34	43	24	39	26
Total	153	137	180	162	177	144	157	113
Total, sexes combined	290		342		321		270	

¹'Household' defined as commensal unit, usually larger in Awande than in Lae, where the families are younger; figure for Lae includes 23 single males counted as independent households, though they may sometimes eat in company.

¹A fourth survey was carried out from January 26 to February 2, 1978, by Steve Millar from the Papua New Guinea Institute of Medical Research, Goroka. These results have not been analysed in detail, but they reveal no major divergences from the pattern common to the other three surveys.

Hamlets were visited early in the morning, while nearly everyone was still at home. If people had left exceptionally early, for their gardens or on other business, they were excluded from the sample unless they could be located later in the day. People were usually quite clear about the division of their food consumption into morning, *belo*, and afternoon, except sometimes in the case of *mumu* meals. Most *mumu* were reported as afternoon meals, except in October, when they were split almost equally between midday and afternoon; the division must be recognised as being somewhat arbitrary. When food was eaten at a *mumu*, this fact was recorded, giving data on the frequency of *mumu* meals.

b. Lae. In Lae, diet recalls were collected over a period of about three weeks, in settlements all over the town. The Lae sample was comparable in size to the Awande samples, but its age and sex structure were different in several respects as shown in Table 2. It contained many fewer children in the 5-14 years age group, a larger number of single men, and fewer single women, than the Awande samples; nearly all the adults in the Lae sample were under 40. The survey sample was larger than the contacted Fore population whose characteristics were described in Chapter 3 (pp.33-37) because it included a number of individuals whose household and economic circumstances I did not investigate.

The urban recall survey was done in the late afternoon, and at weekends, when working men were more likely to be present. Remembering the previous day's food intake did not seem to pose any problems, once it was clear that 'yesterday' really meant yesterday and not today.

Results

In Tables 3 to 8, and Figures 2 and 3, the results are expressed in terms of the frequency of consumption of different items of food and drink; the 'consumption rate' of a particular item is defined as the percentage of respondents who reported consuming that item during the specified period on the previous day. The percentage of respondents who had no food or drink is also reported for each period of the day. The results will be described separately for the age groups 5 years and over, 1-4 years, and infants under 1 year. There was little qualitative difference in the composition of the diets of 5- to 14-year-olds and

those of adults in Awande; in Lae there were too few children over five years to make any valid comparison.

Results for the two sexes have been combined, since the only significant sex difference revealed on analysis was in the consumption of meat pies and aerated drinks at midday in Lae; men were more likely to consume these items than were women.

Age group 5 years and over

a. Morning (see Table 3). In Awande, the overriding importance of sweet potato at the morning meal is obvious, with over 90% of individuals consuming it in each survey period; no other item had a consumption rate of over 10%, except for green leaves in the July survey (10.9%). A number of other items were consumed by a small percentage of people, but sweet potato alone was the most common morning meal.

In Lae, hot sweet beverages were consumed by 60% of the sample; they were frequently accompanied by bread (17.6%), plain biscuits (15.6%), sweet potato (14.1%) or rice (12.2%). Unlike those in Awande, a substantial number of people (22.4%) in Lae went without food or drink in the morning. The range of items consumed in Lae was greater than in Awande; this was true for all meals.

b. Midday (see Table 4). Nearly half of each Awande sample had no food or drink (except perhaps water, which was not recorded) at midday. Of those who did eat, the majority had sweet potato, with sugarcane, *pitpit* and green leaves the next most common items. In the October sample, 9.1% ate pork at midday, all of it cooked at *mumu* gatherings; a higher percentage of people (18.1%) reported attending midday *mumu* meals¹ in October than in May (2.2%) or July (9.0%). Of the less common items at midday, some (root crops, cooking banana, meat, rice, tinned fish etc.) were consumed at *mumu* meals, while others (biscuits, tea, coffee, berries, orange juice etc.) were in the nature of snacks.

¹Figures for percentage of sample eating at *mumu* are not shown in the tables; distinction between midday and afternoon *mumu* was not always easily made. Combining figures for midday and afternoon *mumu* shows that, in all three Awande surveys, over one third of the sample attended a *mumu* on the previous day. In other words, people in Awande, on average, attend a *mumu* approximately every third day.

TABLE 3 CONSUMPTION RATES OF MAIN FOOD ITEMS BY INDIVIDUALS 5 YRS AND OVER, MORNING. AWANDE AND LAE[†]

AWANDE MAY 16-22		AWANDE JULY 8-14		AWANDE OCT. 2-8		LAE AUG. 28-SEPT. 21	
N = 230	%	N = 266	%	N = 254	%	N = 205	
Sweet potato	94.3	Sweet potato	91.4	Sweet potato	94.1	Tea/coffee/milo, + sugar	60.0
Tea/coffee/milo, + sugar (with milk, 3.9%)	5.2	Green leaves	10.9	Tea/coffee/milo, + sugar (with milk 0.8%)	7.9	(with milk, 27.3%)	
		Pork	6.0	Taro	7.5	Bread (with butter 15.1%)	17.6
						Plain biscuit	15.6
						Sweet potato	14.1
No food or drink	4.3	No food or drink	3.4	No food or drink	3.5	Rice	12.2
						Green leaves	8.8
						Cooking banana	6.8
						No food or drink	22.4

Under 5%: sugarcane, green leaves, rice, tinned fish, taro, *pitpit*, wing bean root, ripe banana, pork, tinned meat.

Under 5%: rice, coffee, tinned meat, yam, taro, corn, green beans, beef, sugarcane, tinned fish.

Under 5%: green leaves, pork, sugarcane, rice, tinned fish, *pitpit*, pumpkin, ripe banana, corn, tinned meat, beef, plain biscuit.

Under 5%: *skon**, tinned meat, tinned fish, taro, aerated drink, cucumber, sweet biscuit, green beans, ripe banana, pork, eggs, bandicoot, meat pie, buns, ice cream, peanuts.

**Skon*: flour and water fried in dripping.

[†]Consumption rates are given as percentages of individuals questioned who reported consuming specified items in the morning of the previous day. See text for further details.

TABLE 4 CONSUMPTION RATES OF MAIN FOOD ITEMS BY INDIVIDUALS 5 YRS AND OVER, MIDDAY. AWANDE AND LAE[†]

AWANDE MAY 16-22		AWANDE JULY 8-14		AWANDE OCT. 2-8		LA E AUG.28-SEPT.21	
N = 230	%	N = 266	%	N = 254	%	N = 205	%
Sweet potato	34.8	Sweet potato	39.8	Sweet potato	39.8	Rice	18.0
Sugarcane	13.9	Sugarcane	10.2	Sugarcane	20.1	Aerated drink	17.1
Green leaves	7.8	Green leaves	6.4	<i>Pitpit</i>	17.3	Tea/coffee/milo,+ sugar (with milk 4.9%)	13.7
				Green leaves	14.2	Green leaves	11.7
No food or drink	49.6	No food or drink	46.6	Taro	9.4	Tinned meat	8.8
				Pork	9.1	Sugarcane	7.8
				No food or drink	42.9	Meat pie	5.9
						Sweet potato	5.4
						No food or drink	42.4
Under 5%: tinned fish, rice, tinned meat, plain biscuit, tea, coffee, yam, taro, wing bean root, cooking banana, potato, <i>pitpit</i> , pumpkin, mushroom, ripe banana, insect larvae, orange, orange juice, flying fox.		Under 5%: <i>pitpit</i> , pork, plain biscuit, corn, milo, coffee, yam, taro, cooking banana, mushroom, green beans, ginger, berries, beef, mutton, rice, tinned fish, <i>skon</i> .		Under 5%: corn, yam, plain biscuit, pumpkin, cooking banana, cassava, green beans, beef, mutton, possum, rice, tinned fish, <i>skon</i> , bread, sweet biscuit, ice cream*, peanuts, aerated drink*, tea, coffee.		Under 5%: tinned fish, cooked chips, cooked fish, buns, cake, bread, sweet biscuit, cucumber, beef, ripe banana, cooking banana, guava, apple, <i>kulau</i> *, coconut milk, eggs, cooked chicken, meat ball, <i>skon</i> , plain biscuit, ice cream, baked beans, spaghetti.	
				*On visit to <i>wantok</i> in Goroka.		* <i>Kulau</i> : young green coconut.	

[†]Consumption rates are given as percentages of individuals questioned who reported consuming specified items at around the middle of the previous day ('belo' in Pidgin). See text for further details.

TABLE 5 CONSUMPTION RATES OF MAIN FOOD ITEMS BY INDIVIDUALS 5 YRS AND OVER, EVENING. AWANDE AND LAE[†]

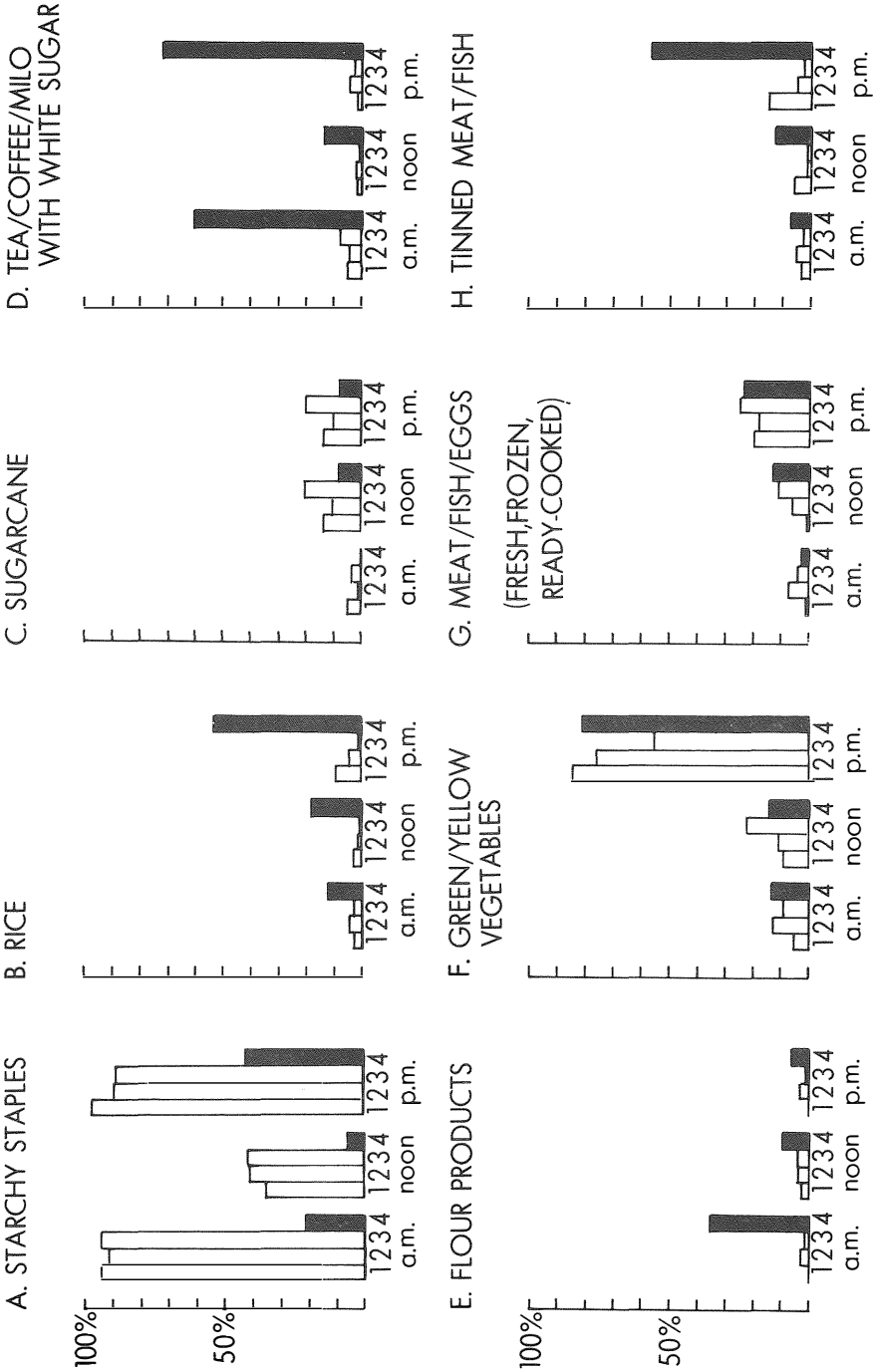
AWANDE MAY 16-22		AWANDE JULY 8-14		AWANDE OCT. 2-8		LA E AUG.28-SEPT.21	
N = 230	%	N = 266	%	N = 254	%	N = 205	%
Sweet potato	97.0	Sweet potato	89.1	Sweet potato	84.3	Green leaves	75.6
<i>Pitpit</i>	70.0	Green leaves	63.9	Green leaves	46.9	Tea/coffee/milo	66.8
Green leaves	65.2	<i>Pitpit</i>	53.0	<i>Pitpit</i>	38.2	(with milk 32.2%)	
Wing bean root	20.0	Pork	16.5	Taro	23.2	Rice	63.4
Sugarcane	17.4	Taro	15.0	Sugarcane	20.9	Tinned fish	36.1
Mushroom	14.8	Sugarcane	14.7	Pork	15.7	Sweet potato	33.7
Pork	12.6	Corn	14.3	Beef	15.7	Tinned meat	23.9
Tinned fish	12.2	Green beans	9.4	Corn	9.1	Beef	12.2
Rice	9.1	Mushroom	9.0	Dripping (with	7.1	Cooking banana	10.7
Taro	9.1	Tea/coffee/milo	8.0	green leaves)		Taro	10.2
Cooking banana	6.5	(with milk 1.2%)		Green beans	5.5	Freezer chicken	8.8
Green beans	6.5	Dripping (with	6.8	Cooking banana	5.5	Coconut milk (with rice	5.4
Yam	5.2	green leaves)				etc.)	
		Yam	5.3				
No food or drink	0.9	No food or drink	3.4	No food or drink	6.7	No food or drink	0.5
Under 5%: dripping (with green leaves), insect larvae, beef, ripe banana, tinned meat, corn, potato, pineapple, flying fox, cheese pops, tea.		Under 5%: tinned meat, plain biscuit, rice, tinned fish, potato, ginger, cheese pops, mutton.		Under 5%: tea, coffee, ginger, yam, pumpkin, mushroom, cucumber, ripe banana, coconut, possum, rice, tinned fish, tinned meat, plain biscuit, peanut.		Under 5%: sugarcane, green beans, <i>skon</i> , cooked chicken, aerated drink, <i>kulau</i> , cassava, pumpkin, carrot, ripe banana, bread, butter, chips, plain and sweet biscuit, ice cream, dripping, packet soup, beer.	

[†]Consumption rates are given as percentages of individuals questioned who reported consuming specified items in the afternoon or evening of the previous day. See text for further details.

FIGURE 2

CONSUMPTION RATES OF MAJOR FOOD CATEGORIES BY INDIVIDUALS 5 YRS. AND OVER, ALL MEALS. AWANDE AND LAE

KEY: 1 = Awande, May 2 = Awande, July 3 = Awande, Oct. 4 = Lae, Aug./Sept.



In Lae, as in Awande, over 40% of the sample had no food or drink at midday. For those who did have something, no single item was outstanding; rice (18.0%) was usually accompanied by green leaves (11.7%), with tinned meat (8.8%) or tinned fish; only 5.4% ate sweet potato. Many snack items were reported, including aerated drinks (17.1%), hot sweet beverages (13.7%), sugarcane (7.8%), meat pies (5.9%), and a variety of other pre-cooked hot foods, cakes and buns, and fresh fruits.

c. Evening (see Table 5). The evening or afternoon meal in both Awande and Lae typically included a wider range of items than did meals earlier in the day. In Awande, sweet potato, green leaves and *pitpit* were the main items; the figures are not shown in the table, but these three items eaten together and with no accompaniments constituted the commonest single combination at the evening meal, being consumed by over 10% in each survey period. Pork was quite a common item, mostly eaten at afternoon *mumu* feasts, which were attended by 32.6%, 20.3%, and 16.1% of people in the May, July and October surveys respectively (see footnote, previous page). In October, fresh beef was eaten by 15.7% of the sample, some of them at a *mumu*, and some buying it at a nearby *singsing*. Of the root crops, wing bean roots were still in season in May, while taro was more common in July and October; corn also came into season after the May survey.

The evening meal in Lae was dominated by rice (63.4%), with the starchy vegetable staples (sweet potato, cooking banana and taro) less commonly consumed. The starch, whether rice, vegetable or both, was sometimes cooked with coconut milk (5.4%), and usually eaten with green leaves of some sort (75.6%), and tinned fish (36.1%) or tinned meat (23.9%); freezer or fresh meat (beef, 12.2%, and chicken, 8.8%) was less common. The other main item consumed with or after the evening meal was a sweet hot beverage (66.8%, with 32.2% having milk with it), milo and coffee being more popular than tea. Consumption of beer was reported by only two men.

d. Major food categories (see Figure 2). To allow general comparisons to be more easily made, the main food items were amalgamated into certain categories, as shown in the figure. The items included under each heading are listed below, with comments on the consumption rates of each category.

- A. Starchy staples¹ (sweet potato, yam, taro, wing bean root, cooking banana, cassava, Irish potato). The consumption rates of these were very high at the morning and evening meals in all three Awande surveys; at midday they were consumed by most of the minority who had anything at all to eat. In Lae the starchy staples were quite important at the evening meal, but their consumption rate was half that in Awande; at other meal times they were even less important.
- B. Rice. This was consumed by very few people in the Awande samples. In Lae it was a major item in the evening, but less common in the morning and at midday.
- C. Sugarcane. A popular item in Awande at midday and in the evening, sugarcane was less commonly consumed in Lae.
- D. Tea/coffee/milo with white sugar. The contrast between Awande and Lae is particularly striking in this case: rarely consumed in Awande at any time, hot sweet beverages were a normal component of both the morning and the evening meal in Lae.
- E. Flour products (bread, biscuits, buns, cake and *skon*). These were common breakfast items in Lae, where they were also quite often eaten as midday snacks. In Awande they were consumed by few people, and mostly as biscuits during the day.
- F. Green/yellow vegetables (*kumu*, including a wide variety of green leaves, local and European; *pitpit*, pumpkin, young corn, green beans, cucumber, green onions). These were predominantly consumed at the main, evening meal, and the consumption rates were similar in both Awande and Lae². However, the nature of the vegetables eaten in each place was different. In Awande, the category was largely made up of the main local variety of *kumu*, (*ebi'a* in Fore), and of highland *pitpit*; while in Lae, pumpkin and choko shoots, and cabbages were most important, with no *ebi'a* or highland *pitpit* being consumed.
- G. Meat/fish/eggs (pork, beef, mutton, poultry, game, eggs, insect larvae, cooked fish, cooked chicken, meat pie, meat balls etc.). The consumption rates were similar in Awande and Lae, being highest in the afternoon or evening, but again the items within the category differed. In Awande, pork predominated, most of it coming from village pigs but some bought from the Okapa freezer; next in importance came beef, purchased from Okapa or further afield. In Lae, snack foods like meat pies were more common at midday, and frozen or fresh beef and chicken in the evening; pork was not eaten at all in the sample period.
- H. Tinned meat/fish. In Awande, these were consumed by a few people, sometimes accompanying a *mumu*, and sometimes as part of an ordinary meal. In Lae, they were the main form of *abus* used in the evening

¹Strictly speaking, this term could include rice, which is a staple in Lae at least; as used here, the term refers to starchy root crops and bananas.

²The low rate shown for Awande in the evening period in October may be partly accounted for by the slightly higher rate for midday than in the other two surveys, related to the higher incidence of midday *mumu* meals in October.

meal, usually mixed with rice and vegetables; they were also used by significant numbers at the midday meal.

- I. Other categories. Fresh fruit was eaten more often in Lae than in Awande, but in neither place was it a major item in the diet. Aerated soft drinks were a common midday item in Lae, but very infrequent in the Awande samples. Milk, most of it tinned evaporated milk, was added to about half the hot beverages drunk in Lae, but was little used in Awande. Other items consumed occasionally in Lae but not at all in Awande included butter, peanut butter, coconut, ice-cream, and cooked chips. Items consumed only in Awande included mushrooms, and fresh ginger.

Age group 1-4 years (see Tables 6, 7, 8, and Figure 3)

The sample sizes of the 1-4 year age group ranged from 44 in Lae, to 62 in the Awande July sample; the small numbers provide a poorer basis for comparison than was the case for the older age group. However, a few points emerge clearly from comparisons within the younger age group, and between it and the age group 5 years and above. In most respects, the diets of the two age groups were very similar in kind, if not in quantity. This is most clearly seen by comparing Figures 3 and 4. The differences which are of some significance were as follows.

- a. Breastmilk. This was an important item in the diets of this age group in both rural and urban samples, with no obvious differences between them in consumption rates. Between a third and a half of this age group breastfed at each period of the day in every sample; many fed repeatedly throughout the day, but the details were not recorded.

- b. Hot sweetened beverages. These were drunk by over 40% of the young children in Lae, in the morning and in the evening; this is a lower figure than for older children and adults in Lae, but still very much higher than the corresponding figure for Awande.

- c. Meal patterns. Comparing the consumption rates of the different meals between the younger and older age groups, it appears at first glance that a much higher percentage of the young children fed at midday in both Awande and Lae. This difference, however, is almost entirely accounted for by the consumption of breastmilk; the proportions of the older and younger age groups eating solid foods at midday are very similar. In Lae, very few young children went without food in the morning; their consumption rates of rice, vegetables, and tinned meat or fish were over twice those of the older age group at this meal.

TABLE 6 CONSUMPTION RATES OF MAIN FOOD ITEMS BY 1-4 YEAR-OLDS, MORNING. AWANDE AND LAE[†]

AWANDE MAY 16-22		AWANDE JULY 8-14		AWANDE OCT. 2-8		LAE AUG.28-SEPT.21	
N = 50	%	N = 62	%	N = 52	%	N = 44	%
Sweet potato	100.0	Sweet potato	88.7	Sweet potato	92.3	Tea/coffee/milo, + sugar (with milk 20.5%)	40.9
Breastmilk	40.0	Breastmilk	46.8	Breastmilk	38.5	Breastmilk	36.4
Green leaves	10.0	Green leaves	9.7	Taro	7.7	Rice	29.5
Sugarcane	8.0	Pork	6.5	Green leaves	3.8	Sweet potato	20.5
Tea, with milk	4.0	Rice	6.5	Sugarcane	3.8	Green leaves	18.2
Taro	4.0	<i>Pitpit</i>	3.2			Bread (with butter)	18.2
		Corn	3.2	No food or drink	3.8	Cooking banana	13.6
<u>Consumed once only:</u> wing bean root.		<u>Consumed once only:</u> yam, sugarcane, black coffee.		<u>Consumed once only:</u> <i>pitpit</i> , pumpkin, pork, rice, tinned fish, plain biscuit, milo with milk*. *On visit to <i>Wantok</i> in Goroka.		Tinned fish	11.4
						Plain biscuit	11.4
						Green beans	9.1
						Tinned meat	9.1
						Ripe banana	4.5
						<i>Skon</i>	4.5
						Dried milk	4.5
						No food or drink	6.8
						<u>Consumed once only:</u> taro, tinned babyfood, bun, aerated drink.	

[†] Comparisons of percentage consumption rates should be interpreted with caution, because of small numbers in samples.

TABLE 7 CONSUMPTION RATES OF MAIN FOOD ITEMS BY 1-4 YEAR-OLDS, MIDDAY. AWANDE AND LAE[†]

AWANDE MAY 16-22		AWANDE JULY 8-14		AWANDE OCT. 2-8			
N = 50	%	N = 62	%	N = 52	%		
Sweet potato	42.0	Breastmilk	46.8	Sweet potato	48.1	Breastmilk	34.1
Breastmilk	38.0	Sweet potato	41.9	Breastmilk	34.6	Rice	18.2
Sugarcane	8.0	Sugarcane	11.3	<i>Pitpit</i>	19.2	Ripe banana	9.1
Green leaves	8.0	Corn	4.8	Green leaves	15.4	Tea/coffee/milo (milk 4.5%)	9.1
<i>Pitpit</i>	4.0	Pork	4.8	Sugarcane	15.4	Green leaves	6.8
Dripping (with green leaves)	4.0	Green leaves	3.6	Taro	5.8	Sugarcane	6.8
Tea/coffee (with milk 1.0%)	4.0	<i>Pitpit</i>	3.6	Pork	5.8	Sweet biscuit	6.8
				Pumpkin	3.8	Aerated drink	6.8
No food or drink	36.0	No food or drink	25.8	No food or drink	25.0	Sweet potato	4.5
						Tinned fish	4.5
						Tinned meat	4.5
						<i>Skon</i>	4.5
						No food or drink	22.7

Consumed once only: rice,
tinned fish.

Consumed once only:
cooking banana,
mushroom, green
beans, mutton, plain
biscuit, cheese pops,
black coffee.

Consumed once only:
cassaca, beef, mutton,
bread*, plain biscuit,
peanuts, black tea.

Consumed once only: guava,
kulau, tinned babyfood, meat
pie, plain biscuit, ice
cream, dried milk.

*On visit to *wantok* in
Goroka

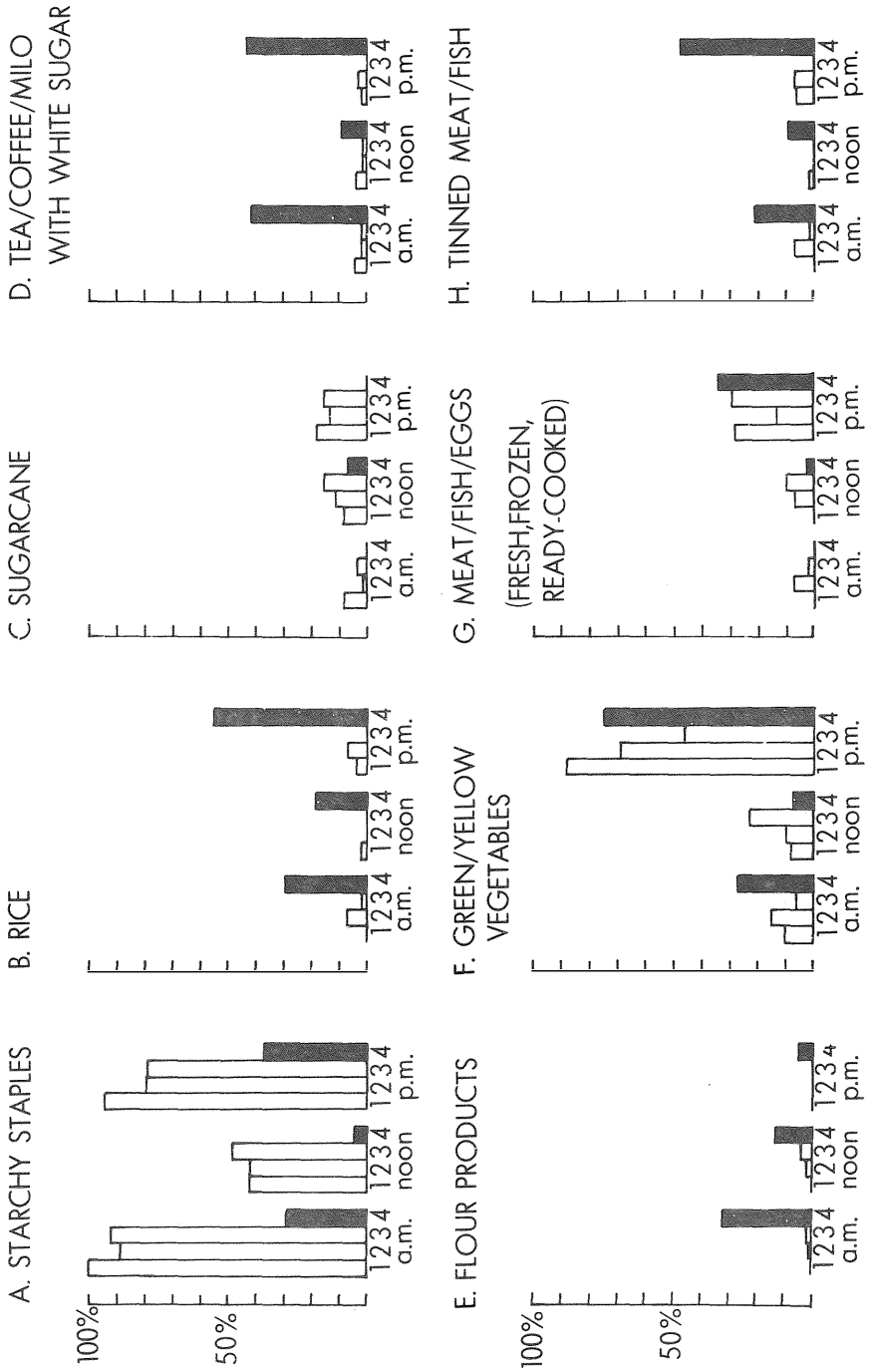
[†] Comparisons of percentage consumption rates should be interpreted with caution, because of small numbers in samples.

TABLE 8 CONSUMPTION RATES OF MAIN FOOD ITEMS BY 1-4 YEAR-OLDS, EVENING. AWANDE AND LAE[†]

AWANDE MAY 16-22		AWANDE JULY 8-14		AWANDE OCT. 2-8		LA E AUG. 28-SEPT.21	
N = 50	%	N = 62	%	N = 52	%	N = 44	%
Sweet potato	94.0	Sweet potato	77.4	Sweet potato	75.0	Green leaves	72.7
Green leaves	72.0	Green leaves	54.8	Green leaves	40.4	Rice	54.5
<i>Pitpit</i>	64.0	Breastmilk	46.8	Breastmilk	40.4	Tea/coffee/milo (with milk 20.5%)	43.2
Breastmilk	38.0	<i>Pitpit</i>	45.2	<i>Pitpit</i>	32.7	Breastmilk	38.6
Pork	24.0	Corn	16.1	Beef	19.2	Tinned fish	31.8
Sugarcane	18.0	Taro	16.1	Taro	17.3	Sweet potato	29.5
Wing bean root	16.0	Sugarcane	12.9	Pork	15.4	Beef	29.5
Mushroom	12.0	Green beans	11.3	Sugarcane	15.4	Tinned meat	15.9
Green beans	12.0	Mushroom	9.7	Dripping	7.7	Taro	6.8
Corn	6.0	Pork	9.7	Green beans	5.8	Cooking Banana	6.8
Cooking banana	6.0	Rice	6.5			Coconut milk (with rice etc)	4.5
Rice	4.0	Dripping (with green leaves)	6.5			Dried milk	4.5
Tinned fish	4.0	Yam	4.8				
Taro	4.0	Mutton	3.2				
		Tea/coffee (black)	3.2				
		No food or drink	3.2				
<u>Consumed once only:</u> ripe banana, pineapple, beef, larvae, tinned meat, tea with milk.		<u>Consumed once only:</u> tinned meat.		<u>Consumed once only:</u> cooking banana, mushroom, ginger, ripe banana.		<u>Consumed once only:</u> green beans, chicken, eggs, 'skon', cooked chicken, bread with butter, plain biscuit.	

[†] Comparisons of percentage consumption rates should be interpreted with caution, because of small numbers in samples.

FIGURE 3 CONSUMPTION RATES OF MAJOR FOOD CATEGORIES BY 1-4 YEAR-OLDS, ALL MEALS. AWANDE AND LAE.
 KEY: 1 = Awande, May. 2 = Awande, July. 3 = Awande, Oct. 4 = Lae, Aug./Sept.



Age group under 1 year : infants

Because of the very small numbers involved (10, 13 and 15 in the Awande May, July, and October surveys respectively, and 20 in the Lae survey) the results for this age group are reported in a form different from that used for the older age groups. The results for the three Awande samples have been amalgamated, and they are shown in Table 9, together with those for the single Lae sample. This form of presentation gives some indication of the order in which different foods are introduced into the diet, and at what ages this occurs.

TABLE 9

NUMBER OF INFANTS CONSUMING VARIOUS ITEMS OF
FOOD AND DRINK ON PREVIOUS DAY, AWANDE AND LAE

	Age in months			
	0-2	3-5	6-8	9-11
A. Awande				
No. of observations ¹	15	10	7	6
Breastmilk	15	10	7	6
Sweet potato	-	2	7	6
Ripe banana	-	1	-	-
Cheesepops	-	1	-	-
Green leaves	-	-	1	4
Sugarcane	-	-	1	2
<i>Pitpit</i>	-	-	-	3
Taro	-	-	-	1
Wing bean root	-	-	-	1
B. Lae				
No. of children	7	4	3	6
Breastmilk	7	4	3	5
Tinned baby food	1	-	-	1
Fanta orange drink ²	1	-	-	2
Ripe banana	-	1	1	2
Sweet potato	-	-	1	3
Green leaves	-	-	-	4
Dried milk (bottle fed) ³	-	-	-	1
Rice	-	-	-	1
Tinned fish	-	-	-	1
Cooking banana	-	-	-	1
Bread	-	-	-	1
Plain biscuit	-	-	-	1
Eggs	-	-	-	1
Chicken	-	-	-	1
Taro	-	-	-	1
Irish potato	-	-	-	1

Notes. 1. Aggregate data from May, July and October surveys.

2. Fed from bottle at 2 months, by mother recently arrived in town.

3. Infant weaned from breast at 5 months because of mother's prolonged stay in hospital at that time.

In Awande, all infants observed were breastfeeding regularly; in Lae, one infant of ten months was being bottle-fed with dried milk, owing to its mother's prolonged stay in hospital after a severe accident when it was aged five months. Another infant in Lae, two months old, was being given Fanta orange drink from a bottle, as well as breast milk.

The range of early foods was wider in Lae than in Awande, and included a number of store items not easily obtained in the village, such as tinned baby food, bread and eggs. Sweet potato, ripe banana, and green leaves were common items in the infant diet in both places. The data are too few to draw any conclusions about the average age at which solid foods are introduced into the diet.

General observations

a. Seasonal variation in garden crops in Awande¹. The results from Awande show marked seasonality in consumption of wing bean root, which was high in May (towards the end of the season for this crop), but nil in the other two survey periods. Taro was consumed by more people in October and July than in May. Consumption rates for corn and green beans were highest in the July survey. Seasonal variation in these and other crops would be better revealed by a more continuous survey².

b. Store foods in Awande. The highest consumption rate for a single item of purchased food in Awande was for fresh beef in the October survey, (consumed by 19.2% of the age group 1-4 years, and 15.7% of the age group 5 years and over). Tinned fish was consumed by 12.2% of the older age group in the May survey; other significant items were dripping, with green leaves; hot beverages; tinned meat; rice; and plain biscuits. All of these had consumption rates of below 10%. There were no obvious differences between the three survey periods, despite their falling near the beginning, at the peak, and towards the end of the coffee season³.

¹Seasonality in agricultural production in the Lae hinterland is presumably reflected in prices at the local markets, and therefore some seasonal variation in consumption rates of the various fresh garden crops would be expected.

²Preliminary analysis of the Jan/Feb 1978 recall survey in Awande (see footnote, p.114) shows that wing bean root was again in season at that time, as were pandanus nuts (*karuka*) and red pandanus fruits (*marita*); taro was still being consumed at rates comparable to those of July and October.

³Surprisingly, the Jan/Feb 1978 survey, carried out when coffee was not being sold at all, also shows similar results.

Again, a more continuous survey would be more sensitive to trends in store food consumption and might be expected to reveal some relationship between it, and trends in coffee sales and other forms of cash income.

c. Possible errors and omissions. In Awande, the number of people who reported consuming snack items, such as cheesepops and aerated drinks, was very small indeed. Casual observation suggests the likelihood of some under-reporting of these items, perhaps because they were simply not considered as proper food and were therefore easily forgotten; it is unlikely that people would have been reluctant to admit to their consumption, since there was little if any awareness of their nutritional quality. However, such items do not form a substantial part of the diet in the village, and although the absolute figures for consumption rates given here may be inaccurate, their relative importance is very low.

Similar arguments hold for many of the snack foods consumed in Lae, which include hot snacks and ice-creams, as well as the *sispop na loli wara* common to both environments. Beer is another obvious candidate for under-reporting, but because its consumption is concentrated at weekends, and because it is certainly avoided by many Fore households in Lae, the error may not be great.

The deliberate omission of water and salt from the recall data is in some ways unfortunate, but consumption rates alone for these items would have been of limited interest. It was my impression that salt was a commonly used item in both rural and urban households, while plain cold water was much more often drunk in Awande than in Lae, where it was replaced by hot beverages and aerated drinks.

Discussion

The dietary recall surveys in Awande and Lae reveal major differences in food consumption patterns in the two environments. In Awande, the pattern is one of heavy dependence on garden foods, especially sweet potato, supplemented by much less frequent consumption of domestic pigs, foods from the bush, and a narrow range of store items. In Lae, the Fore migrants are dependent largely on store foods, many of which are imported; these are supplemented by vegetables from the market and from small gardens.

Differences in consumption between young children on the one hand, and older children and adults on the other, are not very marked in either

environment, with the obvious exception of breastmilk¹. Infants are introduced to a wider range of foods in Lae than in Awande, but there are insufficient data to identify any significant difference which might exist in the time of introduction of solid foods.

Composition of rural and urban diets

Based as they are on a simple counting of the frequency of consumption of different items, the recall surveys cannot provide any reliable basis for the comparison of nutrient and energy intakes in the rural and urban environments. However, they can give some indication of the composition of the diets in terms of different nutritional components. To conclude this chapter, these will be tentatively described so far as is possible given the nature of the data.

a. Energy content. In Awande, by far the greatest percentage of energy intake is provided by starchy tuberous staples, sweet potato foremost among them, with taro, yam, and, in its season, wing bean root as other major contributors. Sugarcane is a secondary energy source, and the balance is made up of green vegetables, small quantities of pork, and purchased foods including fresh meat, dripping, tinned meat and fish, sugar (in hot drinks), and biscuits.

In Lae, rice is the main energy source, with flour products (bread and biscuits) and tuberous staples of secondary importance. Energy is also provided by white sugar used in hot drinks, by fresh and tinned meat and fish, and by a variety of snack foods and drinks, all of them sweet, starchy, or fatty. Energy is provided mainly by carbohydrates in both village and town, with fat intake extremely low in the former, and low by Australian standards even in the latter.

b. Protein content. In Awande, the predominance of the sweet potato in terms of frequency of consumption means that it must also provide the bulk of the protein intake, despite its low protein content. The high

¹This finding is not consistent with the stated attitudes of urban mothers towards frequency of child feeding, which suggested that urban children would be fed more frequently than their rural counterparts (p.88 above). However, the number of 1- to 4-year-olds in the Lae sample was only 44, of whom 10 had no food or drink in the middle of the day; a larger sample might have revealed a significant difference from the rural pattern.

consumption rate of green leaves, most of them dark green and immature, and hence relatively rich in protein, must also contribute significantly to the protein intake. In season, wing bean roots, which have a protein content of up to 11% wet weight (Claydon, 1976), pandanus nuts, and several kinds of semi-mature green beans add to the vegetable protein intake. Animal protein comes mostly from the domestic pig, which is eaten quite frequently (approximately every fortnight on average, according to the results given above), but in small individual portions; purchased pork, beef, and mutton, small game, and tinned fish and meat are other significant contributors to the animal protein intake.

In Lae, protein is obtained from the rice and wheat flour products which provide most of the energy intake, and also, in much greater quantities than in Awande, from animal sources. Tinned meat and fish, and frozen and fresh beef and chicken are the main items concerned, with eggs and milk of little significance. In contrast to Awande, most Fore in Lae eat some animal protein at least once each day.

c. Other components. The vegetables in Lae, while consumed as often as in Awande, are generally consumed in much smaller quantities, are not as fresh, and probably consist mainly of less nutritious varieties than in the village. For these reasons, and because of the lower intake of sweet potato, vitamins A and C are probably in shorter supply in the town. The white rice consumed throughout Papua New Guinea is fortified with vitamin B₁, by law, so that this should not be a problem.

The diet in Lae is much higher in refined carbohydrates, in the form of white rice, white flour products, and white sugar, than in Awande; consequently, the intake of fibre must be lower.

In summary, the dietary recall data suggest that the diet in Lae is less bulky, sweeter, more refined, and higher in protein than is the diet in Awande. Before describing the implications of these dietary differences for individual and communal health and well-being, I shall present some further quantitative data, relating to weighed dietary intake in Awande, and household expenditure on food and other items in Lae.

CHAPTER 10

A WEIGHED INTAKE SURVEY IN AWANDEIntroduction

Any weighed intake diet survey faces a number of problems of both execution, and interpretation¹. First, measurements of actual food intake must be accurate, and possible omissions and the need for estimations minimised. Second, the sample selected for study must be representative of the group as a whole, and their intake during the survey period must in turn be representative of their normal diet. Third, once the data on food intake have been collected, they must be converted to figures for nutrient and energy intakes, if possible through laboratory analysis of aliquots of the foods consumed. If chemical analysis is not practicable, a set of food composition tables must be used, introducing a potentially serious source of error except where the tables have been prepared specifically for the locality under study. Finally, if the intention is to assess the adequacy of the measured dietary intakes in the absence of biomedical examinations, reference must be made to theoretical recommended standards, whose relevance to the specific population being studied may well be doubtful. It was with such problems as these in mind that I decided to base my dietary investigations mainly on the recall techniques described in the previous chapter, to which the survey described in this chapter should be regarded as supplementary.

Reid and Gajdusek (1969) report on a weighed intake survey carried out in Moke village, some six kilometres from Awande, in 1957. The survey was planned as part of the extensive research then beginning into the aetiology of *kuru*, but its findings stand independently as a useful summary of the nutritional composition of the traditional Fore diet. The survey covered only three households, measuring the daily intake by each household over a one week period, with one further day

¹McArthur (1977) discusses these problems in the Melanesian context in some detail. Her criticisms of the nutritional work of a cultural anthropologist (Rappaport, 1968) are almost enough to frighten off the non-specialist altogether; luckily I did not read the paper until my fieldwork was completed!

spent weighing the intake of each individual in one of the households. Food composition and recommended daily allowances were calculated from tables published in Hipsley and Clements (1950). Comparison was made between the Fore diet, as assessed from the three households in the sample, and the diets of five other New Guinean areas where the same techniques and allowances were used; the following conclusions were drawn:

"The Fore consumed significantly more calories and obtained more calcium than any of the other groups, and only in the Trobriand Islands, with a diet rich in fish, did the protein intake exceed that of the Fore."

In my own survey, I followed closely the methods used by Reid and Gajdusek, except in my use of more recent food composition tables and theoretical requirements¹. Direct comparisons between the methods and results used in the present survey and in the earlier one are made at the end of the results section of this chapter.

Methods and Subjects

Household composition and recommended allowances

Three neighbouring households in one hamlet were selected for the survey which took place from October 10th-16th, 1977. Their composition, and their theoretical requirements of energy and protein are shown in Table 10. Household 1 consisted of a middle-aged man and two of his children, with occasional visitors; his wife and three other children were away visiting *wantok* in Goroka throughout the week of the survey. Most of the garden food for this household was collected by the 12-year-old daughter, but she was sometimes assisted by her father. Household 2 contained a young married couple and their small child; the husband's adult brother, who was unmarried; and their sister (separated from her husband) and her child. A woman and her three young children came to join the evening meal on one day of the survey. Household 3 contained a married couple and their five children; the husband was absent from the hamlet overnight on one occasion, and his older daughter once stayed overnight in Household 1; one of the boys from Household 2 came to stay for one night.

¹I did not replicate their one-day survey of food intake by individuals in a single household, nor calculate vitamin or mineral intakes.

TABLE 10 HOUSEHOLD COMPOSITION AND THEORETICAL ENERGY AND PROTEIN
REQUIREMENTS OF HOUSEHOLDS IN WEIGHED DIETARY INTAKE SURVEY, AWANDE

No.	Age	Sex	Weight (kgs)	Relationship to household head	Days eating in household	Theoretical requirements* daily (1) & for week (2)			
						MJ		Protein (g.)	
						(1)	(2)	(1)	(2)
Household No.1.									
(wife & 3 children absent)									
1.	45	M	53.2	Head	6½	10.6	68.9	43	279.5
2.	13	F	33.2	Daughter	7	10.3	72.1	45	315.0
3.	2	M	12.7	Son	7	5.7	39.9	23	161.0
4.	35	M	(60 est)	Visitor	1	11.5	11.5	49	49.0
5.	8	F	n.k.†	Visitor	1	8.8	8.8	35	35.0
6.	10	M	n.k.	Visitor	1	10.5	10.5	43	43.0
7.	8	F	17.7	Visitor	½	8.8	4.4	35	17.5
Total theoretical requirement over week						216.1		900.0	
Household No.2.									
1.	35	M	49.5	Head	7	9.6	67.2	37	259.0
2.	25	F	43.2	Wife	7	7.5	52.5	32	224.0
3.	4	M	11.8	Son	7	7.2	50.4	29	203.0
4.	30	F	55.0	Sister	6½	9.2	59.8	41	266.5
5.	5	M	14.1	Sister's son	4½	7.2	32.4	29	130.5
6.	25	M	63.6	Brother	5	12.5	62.5	52	260.0
7.	25	F	(55 est)	Visitor (lactating)	½	11.5	5.7	65	32.5
8.	5	M	n.k.	Visitor	½	7.8	3.9	29	14.5
9.	3	F	n.k.	Visitor	½	6.4	3.2	23	11.5
10.	5½	F	n.k.	Visitor (wholly breastfed)	½	included in mother's requirements			
Total theoretical requirement over week						337.6		1401.5	
Household No.3.									
1.	35	M	51.8	Head	5½	9.6	52.8	42	231.0
2.	30	F	35.0	Wife (lactating)	7	9.0	63.0	50	350.0
3.	12	M	25.9	Son	7	11.3	79.1	43	301.0
4.	10	M	19.5	Son	7	10.5	73.5	43	301.0
5.	8	F	17.7	Daughter	6	8.8	52.8	35	210.0
6.	4	F	10.5	Daughter	7	7.0	49.0	29	203.0
7.	1	M	7.3	Son (breastfeeding)	7	4.9	34.3	23	161.0
8.	5	M	14.1	Visitor	1	7.2	7.2	29	29.0
Total theoretical requirement over week						411.7		1786.0	

*Calculated from WHO (1973), Tables 3, 4, 7, 25. Requirements for children not adjusted for body weight. Protein requirements assume protein score of 70%

†n.k. = not known.

The theoretical requirements for energy and protein¹ were calculated from those listed in the FAO/WHO publication, 'Energy and Protein Requirements' (WHO, 1973); requirements for adults were adjusted for body weight, while those for children were not, on the grounds that their growth might have been retarded as a result of insufficient food intake. Requirements for protein are based on an assumed net protein utilisation value of 70%, as suggested by the PNG Department of Health, (1975). Requirements were summed for each individual over the period he or she was eating in the household, a single morning or evening meal counting one half the daily requirements towards the total. Requirements for each member of the household were then summed over the week, giving a total theoretical requirement for the week which could be compared with actual intake by that household.

Measurement of food intake

Daily food intake was measured with the help of my village field assistant. Each day, food brought into each household from the gardens was divided into its constituents and weighed, before being prepared for cooking. The main foods were sweet potato, sugarcane, *pitpit*, and leafy greens; the latter consisted almost entirely of *ebi'a*, the most important of the Fore green leafy vegetables. Most food was brought home in the late afternoon; any sweet potato intended for the household's pigs was set aside, as was normal practice, before the remainder was weighed. The households were again visited early in the morning, and if any surplus sweet potato from the previous night was to be given to the pigs, it was weighed and subtracted from the earlier measurement. Coffee scales weighing up to 25 kg. were used for weighing quantities over 1 kg.; a set of kitchen scales accurate to 25 g. was used for smaller quantities. Water intake was not recorded.

Store foods, and portions of meat brought from other hamlets or villages were also weighed whenever possible, and estimates made of any small items consumed away from the hamlet; major meals consumed

¹I use the term 'theoretical requirements' throughout this chapter, following the terminology of the FAO/WHO expert committee. It should be noted that the theoretical energy 'requirements' listed by the latter are average figures, while the protein 'requirements' are the average plus 2 standard deviations, giving what the committee refers to as figures for 'safe levels' of protein intake, theoretically adequate for 98% of people. (See McArthur, op.cit. pp.105-6 for comments on this approach).

elsewhere were ignored, and a corresponding deduction made from the recommended allowances, as explained above.

Several *mumu* were attended by the households in the sample, and these were carefully observed so as to minimise the errors which might have resulted from undetected exchanges of food; it was not possible to weigh every exchange made, but overall, goods given and received seemed to be in approximate balance.

Before energy and protein intakes could be derived from tables of food composition, the weights of raw unprepared foods had to be converted to weights of raw edible portions, and this necessitated calculation of appropriate conversion factors. These were obtained by several repeated measurements for each item, and those used were as follows: sweet potato, whole to peeled, 86%; taro, whole to peeled, 78%; ripe banana, whole to peeled, 71%; *pitpit* hearts as picked, to edible portion, 36%; *pitpit*, whole stems to edible portion from *mumu*, 20%; sugarcane, whole to edible portion (i.e. juice), 50%. The conversion factor for green beans was taken from Reid and Gajdusek (op.cit.), who used a factor of 60% to convert the weight of whole pods as harvested to the weight of the edible portion of beans.

Calculation of energy and protein intakes

Weights of edible portions of foods were used to calculate figures for energy intake (in megajoules) and protein intake (in grams), using the food composition tables produced by the Western Pacific Regional Office of the World Health Organisation (WHO, 1972) and reprinted in the '*Iiklik Buk*' rural development handbook for Papua New Guinea (Melanesian Council of Churches, 1977). These food tables are themselves a composite of many previously published sources, and contain figures for most of the items consumed during the survey.

The use made of the food tables in the case of the following items should be noted: per 100 g. edible portion, sweet potato was taken to contain 117 kcals., and 1.3 g. protein; taro, 104 kcals. and 1.9 g. protein; leafy greens (using figures for 'dark green leaves'), 41 kcals. and 5.0 g. protein. Pumpkin was taken to be equivalent to yellow squash; green beans (following Reid and Gajdusek) as containing half the energy and protein content of dried beans of *Phaseolus vulgaris*; pig as being medium fat; insect larvae as equivalent to sago grubs; tinned meat as tinned corned beef; and beer as containing 3.0% alcohol.

Most other items were exactly as listed in the WHO Tables. Figures for beef, mutton, and dripping were taken from Platt (1962), and figures for roasted packeted peanuts from Corden and Thomas (1971). A factor of 4.186 was applied to the kilocalorie figures to convert them to kilojoules. Nutrient losses through cooking and overnight storage were ignored.

Results

Food, energy and protein intakes

The results for the three households are presented in Table 11, where the apparent adequacy of the energy and protein intakes is also shown, in terms of the percentages of theoretical requirements actually consumed. There are several quite striking differences in the composition of the diets in the three households.

In Household 1, energy intake was close to the theoretical requirement (92.3%), while protein intake was 69.2% of the requirement. Garden foods contributed over 95% and 90% of the energy and protein respectively, with small quantities of pork, mutton, rice, tinned meat, dripping and beer making up the balance. Of the garden foods, sweet potato was by far the most important, with taro and sugarcane supplying significant additional amounts of energy, and taro also, with leafy greens, supplying small amounts of protein.

In Household 2, energy and protein intakes were both just above theoretical requirements, at 107.8% and 104.2% respectively. Store foods were more significant in this household, providing nearly 15% of the energy intake, mostly as white sugar and rice, and nearly 18% of the protein intake, mostly as rice, and tinned meat and fish. Several small portions of beef, pork and mutton accounted for 4.3% of the protein intake. Sweet potato was again the largest single contributor to energy and protein intakes, but leafy greens, consumed in much larger quantities than in the other two households, provided nearly 20% of the protein intake.

In Household 3, energy and protein intakes were both well below the theoretical requirements, at 58.8% and 44.3% respectively. Store foods contributed only 1% of energy, and 2.4% of protein intake; fresh animal protein in the form of a few insect larvae and a small portion

TABLE 11 TOTAL FOOD INTAKE OF THREE AWANDE HOUSEHOLDS OVER ONE WEEK

(Expressed as uncooked weight of edible portion, energy content and protein content)[†]

	Household 1						Household 2						Household 3					
	Wt.E.P.		Energy		Protein		Wt.E.P.		Energy		Protein		Wt.E.P.		Energy		Protein	
	kg.	MJ	%	g.	%		kg.	MJ	%	g.	%		kg.	MJ	%	g.	%	
Sweet potato	34.58	169.54	85.0	449.6	72.2		54.08	265.12	72.8	703.0	48.1		43.35	212.52	87.9	563.6	71.3	
Taro	2.42	10.54	5.3	45.9	7.4		2.18	9.52	2.6	41.5	2.8		3.12	13.60	5.6	59.3	7.5	
Ripe banana	-	-	-	-	-		0.80	3.15	0.9	10.4	0.7		0.25	0.98	0.4	3.2	0.4	
Sugarcane	2.26	6.73	3.4	6.8	1.1		2.10	6.25	1.7	6.3	0.4		0.65	1.94	0.8	1.9	0.2	
Leafy greens	0.53	0.90	0.5	26.3	4.2		5.80	9.96	2.7	290.0	19.9		0.40	2.41	1.0	70.0	8.9	
Pitpit	0.88	0.99	0.5	4.4	0.7		6.21	7.03	1.9	31.1	2.1		2.64	2.99	1.2	13.2	1.7	
Cabbage	0.15	0.16	0.1	2.4	0.4		1.05	1.10	0.3	16.8	1.2		0.40	0.42	0.2	6.4	0.8	
Pumpkin	0.82	1.14	0.6	10.7	1.7		-	-	-	-	-		0.10	0.14	0.1	1.3	0.2	
Cucumber	-	-	-	-	-		0.50	0.27	0.1	4.0	0.3		-	-	-	-	-	
Green beans	0.20	1.38	0.7	22.6	3.6		0.30	2.11	0.6	34.7	2.4		0.31	2.20	0.9	36.0	4.6	
Corn	0.05	0.18	0.1	1.6	0.3		0.04	0.16	0.1	1.4	0.1		-	-	-	-	-	
Beetle larvae [∞]	-	-	-	-	-		-	-	-	-	-		0.08	0.61	0.3	4.9	0.6	
Pork	0.10e*	1.53	0.8	12.0	1.9		0.10	1.53	0.4	12.0	0.8		0.10e	1.53	0.6	12.0	1.5	
Mutton	0.10e	1.04	0.5	15.0	2.4		0.13	1.30	0.4	18.7	1.3		-	-	-	-	-	
Beef	-	-	-	-	-		0.20e	2.20	0.6	32.0	2.2		-	-	-	-	-	
Rice (dry wt.)	0.20e	3.02	1.5	13.4	2.2		1.35	20.36	5.6	90.5	6.2		0.05e	0.75	0.3	3.3	0.4	
Tinned meat	0.06e	0.56	0.3	11.2	1.8		0.20e	1.83	0.5	36.3	2.5		-	-	-	-	-	
Tinned fish	-	-	-	-	-		0.43	5.59	1.5	93.5	6.4		0.06e	0.79	0.3	13.2	1.7	
Dripping	0.03	1.12	0.6	-	-		-	-	-	-	-		-	-	-	-	-	
Biscuits	-	-	-	-	-		0.16	3.03	0.8	7.7	0.5		0.06	1.04	0.4	2.6	0.3	
White sugar	-	-	-	-	-		1.00	16.22	4.5	-	-		-	-	-	-	-	
Peanuts (pkt.)	-	-	-	-	-		0.08	1.82	0.5	19.5	1.3		-	-	-	-	-	
Beer	0.37	0.54	0.3	1.1	0.2		3.70	5.43	1.5	11.1	0.8		-	-	-	-	-	
TOTAL INTAKE [§]	42.75	199.37	100.2	623.0	100.1		80.41	363.98	100.0	1460.5	100.0		52.57	241.92	100.0	790.9	100.1	
RECOMMENDED INTAKE		216.1		900.0				337.6		1401.5				411.7		1786.0		
ACTUAL/REC. x 100		92.3%		69.2%				107.8%		104.2%				58.8%		44.3%		

[†]For details of households and of calculations of food composition and recommended intakes see text.

*e - estimated from verbal report.

[∞]Composition estimated as sago grub.[§]Items not shown: Household 1, 30g. salt; Household 2, 50g. salt, 50g. tea, 175g. instant coffee.

of pork provided only 2.1% of total protein intake. Sweet potato once again accounted for by far the greatest part of total food, energy and protein intakes; taro, leafy greens and green beans were the other garden items contributing significantly to protein intake.

In Figure 4, results from the three households have been combined to give diagrammatic representations of the composition of the average diet in terms of energy and protein. The overwhelming importance of the starch, staples, and predominantly of sweet potato, is clear in both. Store foods, having a protein:energy ratio which is generally higher than that of most garden foods, contribute disproportionately to protein, as compared to energy, intake. Using data from the food composition tables already cited (WHO, 1972), the percentage of dietary energy derived from protein was calculated. For the combined diets of the three households, this figure was 4.25%. Once again, the predominance of sweet potato, with only 3.0% of its energy as protein, is the main determining factor.

Comparison with 1957 Moke survey

Several differences in methods of measurement and analysis render invalid a direct comparison between the results of this and the earlier study by Reid and Gajdusek (op.cit.); major differences in method were as follows:-

- i) Measurement of food intake: Reid and Gajdusek took no account of wastage through sweet potato or taro peelings, and assumed a conversion factor of 50% for *pitpit* hearts as harvested, to edible portion (cf. 35% in present survey).
- ii) Food composition tables: Reid and Gajdusek used the tables compiled for the New Guinea Nutrition Survey Expedition (Hipsley and Clements, 1950).

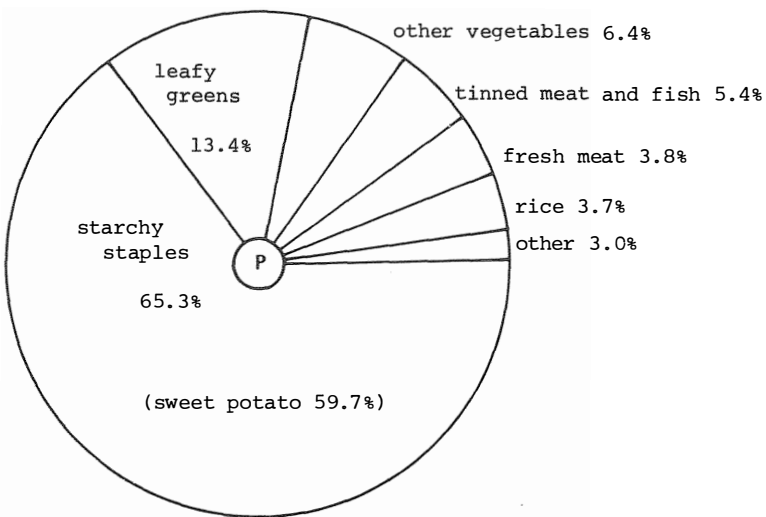
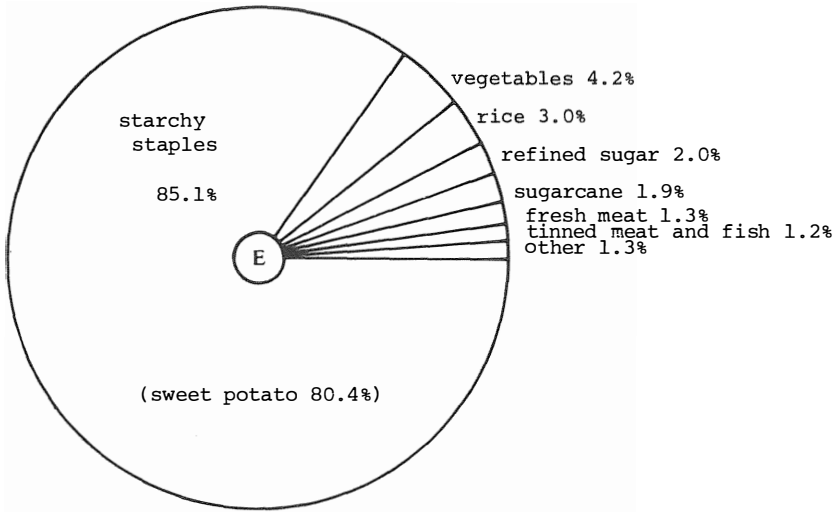
These tables give figures for energy and protein composition which differ from those used in the present study for certain important foods. Per 100 g. edible portion, the figures used by Reid and Gajdusek were as follows (figures used in present study in brackets):

	Kcals.	g. protein
Sweet potato	150 (117)	0.9 (1.3)
Taro	145 (104)	1.4 (1.9)
<i>Pitpit</i>	38.4 (27)	4.1 (0.5)
Sugarcane	58 (35.5)	0.4 (0.15)
Leafy greens	44 (41)	4.0 (5.0)

(Reid and Gajdusek's figures for *pitpit* refer to the lowland species, Saccharum edule, not to the highland species, Setaria palmaefolia).

FIGURE 4, MAIN SOURCES OF ENERGY(E) AND PROTEIN(P) IN AWANDE DIET

(Percentages derived from aggregate data from three households)



- iii) Energy and protein allowances. Reid and Gajdusek used the 'Suggested Dietary Allowances for New Guinea Natives' given by Langley as part of the Nutrition Survey Expedition Report (Hipsley and Clements, *ibid*). These allowances are on average about 10% lower for energy intakes, and about 80% higher for protein intakes, than those used in the present study.

Comparison between the results of the two surveys can only be made if the same methods of measurement and analysis are used in both. To make such a comparison possible, the data from the Awande survey were reanalysed using the same methods and sources as were used by Reid and Gajdusek for the Moke Survey¹. The two alternative sets of results for the Awande Survey are compared with the results from the Moke Survey in Table 12.

TABLE 12

COMPARISON OF 1957 MOKE DIET, WITH 1977 AWANDE DIET

Survey	Percentage of recommended allowances (Average of three households over one week)	
	Energy	Protein
Moke, 1957 (Reid and Gajdusek, 1969) ¹	142.0	61.3
Awande, 1977, analysed by Reid and Gajdusek's methods ²	135.7	60.3
Awande, 1977, analysed by alternative methods ³	86.3	72.3

¹Average of results shown in Table 3 of Reid and Gajdusek's paper.

²Methods described fully in Reid and Gajdusek (*ibid*), and summarised in this chapter.

³Methods described fully in this chapter. Average figures derived from results in Table 11.

These results are interesting in two respects. First, the Moke and Awande results, when calculated on the same basis, are remarkably similar. Whether this similarity is mainly fortuitous, or reflects a real consistency in the level of dietary intakes over a twenty year

¹Some items in the Awande diet were not listed in the food tables in Hipsley and Clements (*ibid*); for such items, the WHO tables were used in the reanalysis. Figures for calcium, thiamine and ascorbic acid were not calculated.

period cannot be established, given the very small samples and the brief duration of the surveys. The composition of the diets differed most significantly in the inclusion of purchased foods, including fresh meat as well as processed store foods, in the Awande diet. No store foods were consumed by the Moke sample households; otherwise, in terms of garden foods, the composition of the diets was not very different in the two surveys, variation within each being as great as variation between them.

The second interesting feature in Table 12 lies in the comparison between the alternative sets of results for the Awande survey. The large difference in apparent adequacy of energy intake is mainly accounted for by the differences in the food tables used in each case (see above). The difference in apparent adequacy of protein intake is not so great as for energy intake; in my own analysis, the effect of the much lower allowances derived from the FAO/WHO recommendations is partly offset by the very much lower figure used for the protein content of *pitpit*.

Two important conclusions can be drawn from the comparison of the Moke and Awande surveys. The first is that surveys of this size and duration are inadequate both for assessing the typical diet of a large group of people at one point in time, and for judging changes in that diet over a period of time. The second conclusion is that the use of alternative conversion factors, food composition tables, and recommended dietary allowances can lead to quite different sets of results¹.

Discussion

Despite the narrow scope of the survey described in this chapter, it is of some interest to compare the general findings with those of other studies, and with the findings of the dietary recall surveys described in the previous chapter.

Composition of diet

Hipsley and Kirk (1965) give figures for the percentage composition

¹Both these conclusions were, to some extent, anticipated in my original decision not to use small weighed intake surveys as the principal source of data; the decision seems to be justified by the empirical exercise described in this section.

of the average adult diet in the Chimbu village of Pari, in 1962. Sweet potato contributed 77% of energy, and 41% of protein (cp.80.4% and 59.7% respectively in Awande). Beans and corn were of greater importance in Pari, but at the time of the Awande survey these crops were not in their most productive season. Leafy greens contributed 21% of the protein intake at Pari, compared with 13.4% at Awande. The main difference between the diets lay in the complete absence of store foods from the Pari diet, while these items contributed over 9% of the energy, and over 13% of the protein in Awande. It is quite likely that by 1977, fifteen years after Hipsley and Kirk's survey, store foods would have become more significant in the Pari diet as well. In a more recent survey in another village in the Chimbu area, carried out in 1975, sweet potato contributed 83.5% of the total energy intake, while store foods (mostly rice, bread and tinned fish) contributed 8% (Lambert, 1975a, Table 5).

Another recent survey, at Lufa, an area of the Eastern Highlands about 50 km. from Awande and in a similar ecological setting, is reported by Norgan et.al. (1974). In the Lufa diet, sweet potato contributed 63.8% of the energy, and 37.2% of the protein intake. Animals, mostly pig, contributed 5.3% of energy, and 16.5% of protein. Store foods contributed 10.3% of energy, and 15.0% of protein. Thus there was a lesser dependence on sweet potato, and a higher intake of animal and store foods than in Awande. Had a pig been killed and eaten within the sample hamlet during the Awande survey, the animal protein intake would have been greatly increased; as it was, the small amounts of pig, beef and mutton that were consumed came as gifts from other hamlets, and from a *singsing* at another village.

In general, then, the composition of the Awande diet as assessed in the weighed intake survey of three households, is close to that of other Eastern Highland and Chimbu populations studied. Seasonal variation in consumption of garden crops and store foods, and the irregular pattern of consumption of pork, are not reflected in the brief period over which the Awande survey was carried out; the composition of the diet averaged over the whole year might therefore be quite significantly different from the one described here.

Adequacy of the diet

Because they were gathered on a household basis, the results of the survey cannot be used to calculate per capita intake figures. The

figures given in Table 11 for the actual energy and protein intakes, by household, as percentages of the FAO/WHO theoretical requirements suggest that there is considerable variation between households in the adequacy of these intakes. In two of the households, the levels of energy and protein intakes were probably satisfactory, given the likely margin of error in the survey. In the third household, however, the levels of energy and protein intake were well below the recommendations, such that clearly visible signs of malnutrition might have been expected. Such symptoms were not in fact observed, but it may be relevant to note that the mother in this household, aged about thirty years, weighed only 35 kgs. while her 18-month-old son weighed 7.3 kgs., about 65% of the Harvard standard weight for his age. However, the point must be made once again that the diet of a household over a single week may not be representative of its usual intake.

Averaged over the three households, the percentages of theoretical requirements actually consumed were 86.3% and 72.3% for energy and protein respectively. These figures compare favourably with those given by Lambert (op.cit.) for the Chimbu in 1975, using the same FAO/WHO requirements. The Lufa survey (Norgan et.al., op.cit.) uses a higher score for the quality of dietary protein than the 70% net protein utilization rate assumed for Awande and Chimbu, and the protein intake was well above the safe levels for all adult groups except lactating women, whose intake was 88% of the safe level. The Lufa survey compared energy intakes with actual expenditure, rather than with theoretical allowances, so the results can not be compared with those from Awande¹. Sinnett (1977, pp.71-2), citing an earlier WHO expert committee on protein requirements (WHO, 1965), states that, "if the protein content of the diet contributes less than 5% of the total calorie intake, an optimum intake of protein cannot be achieved as appetite is satisfied before protein requirements are met." In his own study among Enga sweet potato cultivators living at Murapin in the Western Highlands, Sinnett (op.cit.) found that protein accounted for less than 4% of total calorie intake. In the Lufa study, Norgan et. al. (op.cit.) give figures of 6.5% and 7.2% of total energy intake as

¹The results for energy balance from the Lufa survey, and the associated survey on Karkar Island, were intriguing; they revealed an apparent deficit in energy intakes which the research team found impossible to explain satisfactorily on either theoretical or practical grounds.

protein, for adult men and adult women respectively. In the Awande survey, the figure of 4.25% is intermediate between these, reflecting an intake of store foods higher than at Murapin, and lower than at Lufa.

Because of the many potential sources of error, already discussed, in the calculation of the figures for adequacy of energy and protein intakes, the Awande survey should be regarded only as broadly indicative of the general composition of the diet. Reliable assessment of the degree to which the diet satisfies nutritional requirements must await a much more thorough survey, not only of nutrient and energy intake but also of physical health itself.

Comparison with dietary recall data

The weighed intake survey results confirm the conclusions reached on the basis of the recall survey results. Both sets of results indicate the bulky nature of the rural Fore diet, with its preponderance of sweet potato; the low consumption of animal protein; and the relatively small contribution of store foods to the diet.

In two of the households covered in the weighed intake survey, leafy greens and *pitpit* were consumed less often during the week than the results of the recall surveys suggest is typical for Awande as a whole; in the case of one of the households, this may have been due to the absence of the mother, who would normally have collected these items from the garden. In other respects, there were no obviously unusual items in the diets of the three households. The consumption of one kilogram of white sugar, used in hot drinks, by one of the households does not represent a regular feature of the diet, but, rather, a luxury indulged in from time to time by most households.

Comparing the relative merits of the two kinds of dietary survey used in this study, it is clear that the recall method provides a better overall picture of the nature of the typical diet in terms of items of foods consumed, while only the weighed intake method can provide figures for actual nutrient or energy intakes. An alternative method might have been to combine features of the two described, by asking people to recall not only what items were consumed on the previous day, but also their approximate quantities in terms of number of tubers, length of sugarcane etc. The data thus obtained might then have been converted to approximate weights, derived from a series of sample measurements, and subsequent

analysis have been based on the use of food tables and theoretical requirements, as above. However, this method would not have provided very reliable figures for nutrient and energy intakes, for which seriously inaccurate figures may be worse than no figures at all.

CHAPTER 11

A HOUSEHOLD EXPENDITURE SURVEY IN LAEIntroduction

For people whose food supply is mostly purchased from stores and markets, rather than produced in their own gardens, the pattern of cash expenditure is of major significance to the diet. Such is the case with the Fore living in Lae, and this chapter describes the findings of a small household expenditure survey, designed to throw some light on the relative values placed by the urban Fore on different food items, and on food compared to other categories of expenditure.

Several household expenditure surveys have been carried out in urban centres in Papua New Guinea, most of them in Port Moresby. Information contained in earlier studies (Belshaw, 1957, on Hanuabada; Spinks, 1963, on Hanuabada and Koke; Hitchcock and Oram, 1967, on Rabia Camp in 1963-64; and Oeser, 1969, on Hohola in 1962-63) is now somewhat dated, because of the great increase in real incomes over the past decade or so, and the substitution of cash for rations, a major source of income in kind for many employees included in the surveys. Nevertheless, it is interesting to note that a common finding of all these early studies was that the urban groups surveyed were largely dependent upon imported foodstuffs, in particular rice, for their energy intakes; and that this choice was economically rational because of the high prices of traditional starchy staples in the Port Moresby markets.

Malcolm (1973) uses data from a Department of Labour income and expenditure survey carried out in 1970 among low income public servants in Lae. Malcolm's interests are specifically related to nutrition, and he used the data to calculate figures for dietary intake in the 18 households:

"Overall expenditure on food and beverages was \$15.70 per fortnight¹ or 45% of income. Calories derived from protein, carbohydrate and fats were 12 per cent, 77 per cent and 11 per cent respectively. Of the protein consumed, 38 per cent was from animal sources... The protein intake was estimated to be 68 per cent higher than the FAO/WHO (1965) recommended allowances per household and the only dietary deficit shown was calcium. Calories derived from sugar and sugar-containing

¹Before the changeover to Kina the \$PNG was at parity with the \$Aust.

biscuits was 21 per cent, presumably a major factor in the high caries rate observed in the town." (ibid, p.162).

Strathern (1975), in a study of Hagen migrants in Port Moresby in 1970-72, includes data on the budgets of nine unskilled migrants over one fortnight. Their wages ranged from \$15 to \$56, and their expenditure on food from \$2 to \$16.20, with a further sum, reaching \$20 in one case, being spent on beer (ibid, Table 7.2, pp.322-3). Only one of the men was married, and he had no children. Strathern states that these budgets give "some idea of the proportions in which migrants *see themselves* as spending money" (p.320, my italics). Four more budgets, based on account-keeping rather than notional figures, are presented in an appendix (ibid, pp.441-9). They show great variability between subjects, and between pay periods. Strathern summarises:

"it would seem that unskilled workers on a relatively low wage also spend relatively less on food and household items than higher wage-earners. The borrowing and lending of small amounts of money ('spending on social relationships') is also more frequent. Higher wage-earners may send more money back home, but be less financially involved in the urban networks." (ibid, p.441; original parentheses).

The most recent data available on household expenditure arise from the Bureau of Statistics Household Expenditure Survey 1975/76. The survey was intended mainly to provide up-to-date information on expenditure patterns for use in calculating the Consumer Price Index, but it also sought information on housing conditions, income and household composition. Preliminary results for Lae (Bureau of Statistics, 1978b), are based on a sample of 84 Papua New Guinean households, 38 of them in low covenant dwellings, 26 in self-help dwellings, and the remaining 20 in a variety of other dwellings. The modal income of these households was K40 to K59 per fortnight, comparable to that of the Fore households contacted in 1977. Unfortunately the preliminary hand tabulations so far available do not include data on food expenditure as such, but include it in the "other goods and services" which on average accounted for 71.3% of household expenditure. One of the findings of the preliminary analysis is that,

"Compared to similar surveys overseas in both developed and developing countries, the proportion of expenditure on rent is very low and the expenditure on beer, tobacco and cigarettes is very high." (ibid, p.39).

Beer and spirits accounted for 7.4%, and tobacco and cigarettes for 5.8% of average household expenditure. Comparable figures for Port Moresby

were 5.9% and 5.1% respectively (Bureau of Statistice, 1977).

The Bureau of Statistics survey shows the importance of gift exchange, both as cash and in kind, among urban households, and between them and visiting *wantok* from rural areas. It also shows that home produce is an important source of income in kind for many households (e.g. it contributed an average cash equivalent of K11.47 per fortnight to households in self-help dwellings in Lae). Calculations of income and expenditure patterns are further complicated by the practice of '*mekim Sande*', whereby several wage-earners form a money-sharing pool to which each contributes every fortnight, the pooled sum going to each contributor in turn.¹ All these factors emphasise that urban budgeting behaviour in Papua New Guinea cannot be studied without giving due attention to cultural norms and attitudes which contrast markedly with those prevailing in industrialised Western countries.

Methods

My own survey of income and expenditure of Fore households in Lae was small in scope, and serves to illustrate the variability which exists in a small number of budgets, particularly as regards food expenditure, rather than to provide a statistically reliable summary for the urban Fore population as a whole.

Eight separate households were selected, each of them satisfying three conditions: first, they contained at least one literate adult; second, they were willing to co-operate; and third, their locations were such that each household could be visited at least every second day for checking its expenditure records. Details of household composition, employment, and housing conditions are included in the results section, below, where each household is treated as a separate case study.

In each household, those adults who could read and write Pidgin, which in practice meant the adult males, were asked to record details of daily income and expenditure on prepared sheets. As well as listing every item purchased by themselves or their dependants, its price and

¹This scheme is alternatively known as going '*kampani*', or '*bung wantaim*' (collect together); see Strathern (1975) for examples from Hageners in Port Moresby.

where it was bought, the respondents were also asked to record details of the following: any foods brought from their own garden; any gifts of food from outside the household; any food or drink provided at their place of work; any wages received, including overtime; whether they or their dependants had sold any food at the market; and how many men, women and children ate in their house that morning and evening.¹

The procedure was given a trial run over one or two days in each household, and then continued over a full fortnight with record sheets being checked every two, or at most three, days. Seventeen individuals (fifteen adult males and two schoolboys) were issued with record sheets. One man left Lae to visit his home village for a funeral four days after the start of the survey, and did not return until the survey period was over; all other respondents were present at the start and the end of the full survey period, though with some temporary absences.

The question on daily expenditure was answered, as far as can be judged, quite fully and accurately, as was the question on income from wages. The remainder of the questions were answered less reliably, in particular those concerning the quantity of food collected from gardens or given to the household by outsiders, and the number of people eating in the household each morning and evening. For this reason, the results have not been analysed in terms of food expenditure per capita or in terms of total food intake. Both would be misleading given the uncertainties regarding the value of foods received as gifts, or collected from gardens, and regarding numbers of people present at main meals.

Results

The budgets of the eight households in the sample are summarised in Table 13, arranged in decreasing order of household incomes from wages. It should be noted that 'cash in hand' at the beginning and end of the survey period was not recorded, and some savings bank transactions and informal cash loans and gifts may also have been missed. Thus the

¹No attempt was made to include data on expenditure over a longer period on major items, or recurrent expenditures such as school fees (cf. Bureau of Statistics, 1978b, p.36). Thus the results refer to actual expenditure by the household over a particular fortnight, not to the estimated average fortnightly expenditure by that household.

figures for the apparent cash balance over the fortnight do not necessarily imply indebtedness on the one hand, or spare cash on the other.

A breakdown of total food and drink expenditure for each household is shown in Figure 5, with the households arranged in the same order as in Table 13. The income and expenditure patterns show considerable variation between households, this being associated with variation in such factors as household size and structure, number of visitors, and individuals' priorities in how they spend their money. Before discussing the results in more general terms, the results will be discussed separately for each household, in relation to its particular circumstances.

Household 1:

This household consisted of seven people: D., a Fore man married to a coastal woman, as yet without any children; D's cousin K., also married to a coastal woman, with two young sons, one 2½ years, the other 12 months old; and another cousin about 16 years old, attending Standard V in a Lae primary school. The household occupied a self-built two-room wooden house in the Boundary Road settlement. Usually the whole household shared their meals, but there was some mutual visiting and sharing of meals between this household and Household 4, which was nearby and whose male members were from the same village of Kagu, in North Fore.

D. worked as a cook in a restaurant in Lae, for a basic gross wage of K53/fortnight¹; K. worked in a match factory for K60/fortnight. K's wife had a part-time job as a domestic, for K32/fortnight. D. paid the ground rent of K12/year to the municipal authority. The household shared a garden in the foothills above the settlement from which they collected sweet potato nearly every day of the survey, and cassava, taro and highland *pitpit* less frequently; from a small plot inside their yard they regularly picked *aibika*.

In the second week of the survey period, D. went to a funeral party in his home village, leaving on the Tuesday and returning on the Thursday. On the way he bought seven chickens in Kainantu for K16 and

¹Some figures have been rounded for convenience, or where accurate data were not available.

TABLE 13. CASH INCOME AND EXPENDITURE OVER ONE FORTNIGHT IN EIGHT FORE HOUSEHOLDS IN LAE

	Household 1	Household 2	Household 3	Household 4	Household 5	Household 6	Household 7	Household 8	Mean for eight households	
Full-time wage earners ¹	2½	1	1	1½	1	1	1	1		
INCOME	K.	K.	K.	K.	K.	K.	K.	K.	K.	
Wages (after tax)	130.50	93.10	89.91	78.10	78.01	71.72	71.30	61.33	84.25	
<i>Sande</i> , loans, cash gifts ²	55.00	8.00	-	-	6.10	-	-	-	8.64	
Other	44.72 ³	20.00 ⁴	25.00 ⁴	-	10.00 ⁴	-	-	-	12.47	
TOTAL INCOME	230.22	121.10	114.91	78.10	94.11	71.72	71.30	61.33	105.35	
EXPENDITURE										%
Food & Drink										total expenditure ⁶
Rice	10.74	9.42	6.63	3.75	3.60	19.96	2.16	7.33	7.95	7.5
Flour, bread, biscuits	4.57	4.01	1.02	5.60	1.25	1.97	0.12	2.45	2.62	2.5
White sugar	2.01	1.38	1.35	0.91	-	1.48	1.27	1.55	1.24	1.2
Butter, dripping, spreads	0.82	0.70	-	1.08	-	-	1.06	0.37	0.50	0.5
Freezer & fresh meat	15.04	20.04	56.39	3.90	4.66	5.21	6.05	5.25	14.57	13.8
Tinned meat	3.19	4.69	3.09	2.41	0.44	5.35	1.30	3.44	2.99	2.8
Tinned fish	8.29	3.85	4.96	2.52	2.01	7.08	4.17	4.40	4.66	4.4
Eggs	-	-	3.09	-	-	-	-	-	0.39	0.4
Milk, milo, tea, coffee	2.73	1.40	0.65	0.60	1.05	1.95	-	0.87	1.16	1.1
Starchy vegetables	1.80	2.60	3.70	2.35	-	0.20	-	0.40	1.38	1.3
Other vegetables	3.43	2.30	7.12	2.33	3.00	1.10	1.00	-	2.54	2.4
Fruits, nuts, sugarcane	3.20	1.20	9.40	1.43	1.20	1.10	0.40	0.30	2.28	2.2
Hot 'takeaway' foods	17.76	6.65	-	8.42	8.99	1.60	1.41	2.96	5.97	5.7
Aerated drinks	16.73	5.84	1.74	10.84	6.34	2.88	3.06	2.36	6.22	5.9
Buns, cakes, cheesepops	1.76	1.06	-	2.90	1.45	-	-	-	0.90	0.9
Ice cream, milk shakes	2.74	2.54	0.20	1.35	1.00	0.60	1.58	0.20	1.28	1.2
Beer	-	5.00	12.45	-	10.00	-	-	-	3.43	3.2
Other food	0.17	0.40	-	0.20	-	0.47	-	-	0.16	0.2
SUB-TOTAL: FOOD & DRINK	94.98	73.08	111.79	50.59	44.99	50.95	23.58	31.88	60.23	57.0
Other expenditure										
Rent	-	6.00	9.20	-	-	7.40	-	-	2.83	2.7
Transport	10.90	1.80	1.60	6.60	9.80	5.70	2.40	0.60	4.93	4.7
Clothes	17.60	16.50	9.60	9.00	-	9.00	7.90	-	8.70	8.2
Tobacco	8.29	9.05	1.49	-	11.41	-	1.09	0.20	3.94	3.7
Kerosene	0.90	1.00	-	0.70	0.80	0.30	0.50	-	0.53	0.5
Cleaning materials	1.80	3.76	1.70	1.38	-	1.38	1.67	0.75	1.55	1.5
Other goods & services	3.18	1.50	-	7.82	10.60	4.80	20.70 ⁵	-	6.07	5.7
<i>Sande</i> , loans, cash gifts ²	66.00	57.00	-	-	12.00	-	-	-	16.87	16.0
SUB-TOTAL: OTHER	108.67	96.61	23.59	25.50	44.61	28.58	34.26	1.55	45.42	43.0
TOTAL EXPENDITURE	203.65	169.69	135.38	76.09	89.60	79.53	57.84	33.43	105.65	(100.0)
APPARENT BALANCE OVER FORTNIGHT	+26.57	-48.59	-20.47	+2.01	+4.51	-7.81	+13.46	+27.90	-0.30	-

Notes 1. Part-time wage-earners counted as ½.

2. For details of *Sande*, loans, gifts see text.

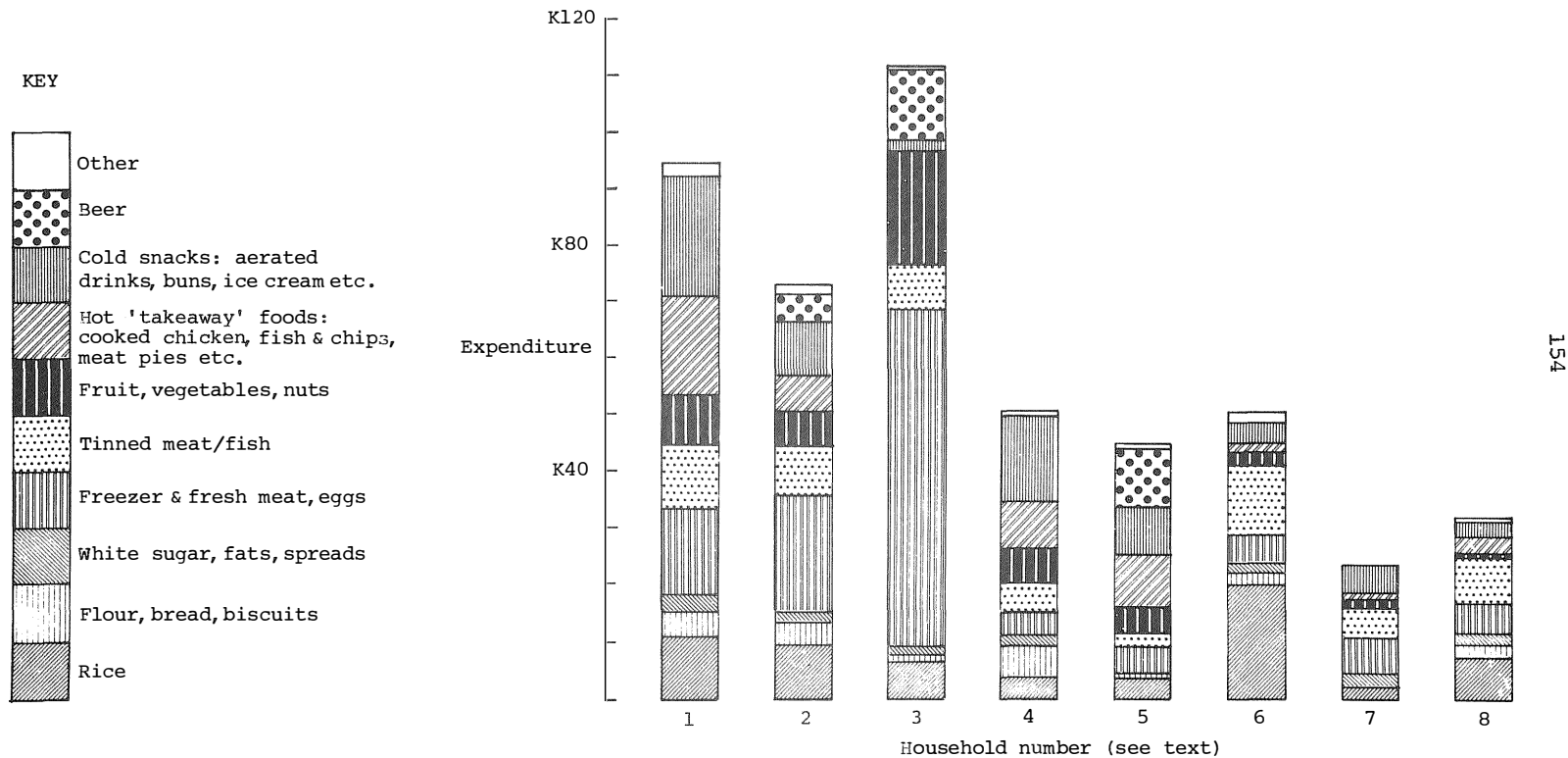
3. Income tax refund.

4. Bank withdrawals.

5. Includes K20.00 for radio.

6. % of total expenditure by whole sample.

FIGURE 5 . TOTAL FOOD EXPENDITURE OVER ONE FORTNIGHT IN EIGHT FORE HOUSEHOLDS IN LAE (Derived from figures in Table 13)



contributed K30 towards the purchase of a cow from a cattle ranch at Dumpu. This expenditure is included under 'gifts' in Table 13. He received only K5 in wages for this week. His income for the previous week, however, was boosted by an income tax refund of K44.72. He also received K20 from his *sande* partners in the first week, but did not contribute in the second.

K's incomings and outgoings were less complicated; he received K60.70 in net wages with overtime, contributed K20 to his *sande* pool in the first week, and received K35 from it in the second. His wife received K16.90 net wages each week.

Turning now to actual expenditure on goods and services, nearly K95 of the total household expenditure (including gifts) of K204 went on food and drink. In this food budget, the most notable feature was the very high expenditure on hot 'takeaway' foods, and cold snack foods and drinks, especially aerated drinks; these categories accounted for nearly K39. The other main items of food expenditure were fresh and freezer meat, tinned fish (with smaller quantities of tinned meat), and rice. Fresh vegetables, fruits and nuts added up to only K8.43; only K1.80 was spent on starchy staples, all of it on bananas, reflecting the supply of sweet potato and taro from the household's own garden.

Excluding *sande* contributions, and contributions by D. to the funeral party in his village, clothes and tobacco were the main non-food items in the budget. The figure of K10.90 for transport included K10.00 spent by D. to get to and from the village.

The expenditure pattern of this household is illustrative of several common features in urban Fore budgets: first, the enduring importance of the relationship to the home village, expressed in D's trip home, which involved him in considerable expense;¹ second, the high expenditure on snack items which, from a nutritional point of view, are highly uneconomic; and third, the significance of the food garden in providing starchy staples, though the data are inadequate to quantify its contribution in kind to the budget. The household, with one part-time and two full-time wage-earners, was relatively affluent, and well

¹I did not enquire as to whether K. had any share in these expenses; he did not indicate any such expenditure on his daily record, but this may have been an oversight; alternatively, his relationship to the deceased in the village may not have placed any obligations on him.

able to support its dependent children, including the teenage schoolboy.

Household 2:

This household consisted of O., a 25-year-old man from Awande, with his Keiagana wife, and his 12-year-old niece who was living with them in town on a semi-permanent basis. O. worked as a taxi driver, for a basic gross wage of K95/fortnight. The household occupied one room on the second floor of a block owned by the taxi company, at a rent of K6/fortnight. They used the communal latrines and kerosene cooking stoves provided on the ground floor, and had electric light in their quarters. They had no garden.

During the survey fortnight, O. was visited by his father's brother with his wife and three children, from Awande. They stayed in Lae for a week, staying with O. on some nights, and with other *wantok* on other nights. O. was also visited by his brother's wife and her two children, who were on holiday from Port Moresby, where his brother worked in the Defence Force. These visitors put considerable strain on the household's budget, as well as on its living space. O. had to borrow K8 from his employer, and withdrew K20 from his savings bank. As well as providing food for his visitors, on their departure he gave the party from Awande K49 in cash. He received some return in the form of food donated by his visiting *wantok*. They brought taro, banana, sweet potato, *kumu* and pandanus nuts from the village, and contributed K4.10's worth of food purchased in Lae. His sister-in-law from Moresby bought K9.58's worth of food, and a *wantok* from Awande employed in Lae gave him food worth another K8.51. This total of K22.40's worth of purchased food is not included in the budget in Table 13.

Food and drink accounted for K73 of the household's total expenditure of K170. Just over K20 went on fresh and freezer meat, nearly all of it on poultry (K5.00 for a fresh chicken from the market, K12.59 on frozen chicken). Rice, tinned meat, tinned fish, aerated drinks and hot takeaway foods were also major items of expenditure. O. frequently consumed Coca Cola and meat pies during his work, and he and his wife often gave snacks such as cheesepops and ice-creams to the visiting children. The expenditure of K6.10 on vegetables, fruits, and nuts included K2.60 on starchy vegetables, which, given the relative costs per unit of energy, provided much less of the energy intake of the household than did rice.¹ O. spent K5.00 on ten

¹See Appendix B, in which relative costs of energy and protein contents of various fresh and processed foods are listed.

bottles of beer, immediately after the departure of his *wantok*. Of non-food expenditure, clothes, rent and tobacco were the major items, other than the cash gifts already described.

Overall, O's budget showed an apparent deficit of nearly K49 over the fortnight, despite his loan and bank withdrawals. It is possible that he received some help in the form of unrecorded cash gifts or loans from his employed *wantok* in Lae, but it is clear that the visitors from the village were a major cause of his high expenditure, a point which O. emphasised himself in conversation with me.

Household 3:

This household consisted of J., from Kasoru in North Fore; his wife from the same village; their 1-year-old daughter; his sister's son, 19 years old and with a full-time job in Lae, and two younger children, 15 and 10 years old, from his wife's *lain*. J. worked as an electrician in a major radio repairs business, at a basic gross wage of K95.51/fortnight. His net income in the survey fortnight was K89.91, after K5.50 tax. Unfortunately I did not obtain details of his sister's son's income or expenditure, but according to J., he rarely contributed food to the household, though he often ate with them.

The household lived in a Housing Commission house in Taraka (see Plate 6.4) with two bedrooms and a kitchen/living room (with two electric rings for cooking), and an outside laundry and latrine. Sometimes they cooked on an open fire outside. Their rent was K9.60/fortnight. They had a few sweet potatoes left in an old garden near Boundary Road, and in their yard they grew some bananas and pawpaws, but no home-produced food was harvested during the survey period.

For the whole of the survey period, two young women from Kasoru were staying in the household, and on the first day of the survey (a Saturday), several *wantok* arrived for the weekend, bringing some sweet potato, corn, *kumu*, *pitpit* and cabbage with them as gifts. There were other visitors for meals throughout the fortnight, but I found it impossible to record the exact details.

Of J's total expenditure of K135, nearly K112 was spent on food and drink. Of the K112, one half was spent on fresh and freezer meat, beef and chicken accounting for about equal proportions. K3.70 was spent on fresh eggs, for which J. and his family expressed a particular liking. Over K12 was spent on beer, most of it drunk by J. and

his *wantok* from the village on the first day of the survey. (His wife was a Seventh Day Adventist, but J's membership of the church had lapsed since leaving his SDA primary school). The household spent over K20 on vegetables, fruits and nuts: K4.50 on starchy vegetables, K7.12 on greens and tomatoes, K4.30 on pineapples and pawpaws, K2.00 on peanuts, and K2.10 on sugarcane. Rice, tinned meat, tinned fish, and snack foods and drinks made up the balance of food expenditure.

Of non-food expenditure, rent accounted for K9.20, clothes for K9.60, and transport, tobacco and household cleaning materials for the remaining K4.79. The departing village *wantok* received no gifts of cash.

J's budget, to summarise, was distinguished by very high expenditure on fresh foods, especially meat, and relatively low expenditure on snack foods and drinks, and on non-food items. Despite withdrawing K25 from his bank account, J. ended the fortnight with an apparent deficit of K20.47. It would be interesting to know whether his rather extravagant pattern of expenditure on fresh meat would be sustained over the long term, or whether the survey period was unrepresentative in this respect.

Household 4:

As has been mentioned, the men of this household were related to those of Household 1, coming from the same village, Kagu, in North Fore. The household consisted of E. and his wife, who came from Salamaua, south of Lae; E's patrilineal cousin A., whose wife and two children were still living in Kagu; another cousin R., 17 years old and in Form I at a high school in Lae; and L., E's wife's brother, in Standard IV at a Lae primary school. They occupied a house in the Boundary Road settlement, self-built to a higher standard than is common. The house was on a concrete base, with fibro walls and a corrugated iron roof, with two rooms and a sheltered front verandah. Cooking was mostly done on a kerosene stove, but sometimes on an open fire.

In the yard was a small garden plot, containing taro, sugarcane, *aibika*, beans and banana. Two dozen taro tubers were harvested during the fortnight of the survey. The household did not cultivate any land further afield.

E. worked in a brewery for a gross basic wage of K56/fortnight, but actually received K78.10 net, with overtime, in the survey period. His wife worked as a part-time domestic in an expatriate home for K10/week. A. worked as a packer for K54/fortnight, but did not receive any wages in the survey period because he left for the village on the fourth day and did not return. E. went to the village for two days in the second week of the survey, for the same funeral as D., from Household 1. He did not, in contrast to D., contribute cash towards the funeral party. He brought back three cassava tubers and three cabbages from the village, giving two of the cabbages away to his *wantok* in Lae. The two schoolboys in the household, R. and L., were given cash gifts of K4.40 and K2.00 respectively, by E. and *wantok* in other households; they also received some food at midday at their schools.

The household's total recorded expenditure of K76 included K59 spent on food and drink. The largest expenditure on a single category was K10.84 on aerated drinks, the two boys accounting for K5.33 of this. The next highest expenditure was K8.42 on hot takeaway foods, of which meat pies were the main item. A further K4.25 went on cold snack foods, ice-creams, milk shakes etc. Thus well over one-third of total food and drink expenditure was made up of hot and cold snacks. The household spent K5.60 on flour products (excluding buns and cakes which are included under snack foods), most of it on plain biscuits, some on bread, and the remainder on flour, cooked into *skon* at home. Vegetables, fruits and nuts accounted for a further K6.11, and the balance was spent on rice, fresh meat, tinned fish, tinned meat and miscellaneous items such as tinned milk, butter, dripping and sugar.

Expenditure on non-food items amounted to K25.50, clothes accounting for K9.00 of this, and transport for K6.60 (including K4 contributed by E. for petrol for the journey to and from the village, made in a *wantok's* PMV). The balance was spent on cleaning materials, entertainment (soccer and snooker games), stationery, kerosene, and betel nut (of which 60 toea's worth was bought).

Household 4's expenditure, then, was dominated by nutritionally wasteful items of food and drink, but no money was spent on tobacco or beer (A. and R. were firm Seventh Day Adventists; E. was more half-hearted, allowing himself the occasional beer; given the nature of his job, this is hardly surprising!). E's visit home caused little disturbance to the budget, but the effect of A's absence on his individual budget

and that of the communal household could not be assessed. Over the fortnight, ignoring A's income and expenditure while absent from Lae, the household's budget appeared to be roughly in balance; through less extravagance in the form of snack foods and drinks, savings could easily have been made.

Household 5:

This household was occupied by E.A., a young man from Awande, with his wife who came from Salamaua, their 3-month-old son, and E.A.'s brother S., 17 years old. They lived in a self-built home in the Boundary Road settlement (see Plate 6.1, left-hand house), with iron walls and roof, and a wooden floor raised on posts. Cooking was done on an open fire in a small kitchen built of wood and situated behind the house. The household grew a few vegetables near the house, including sweet potato, taro, sugarcane, banana, and snake beans. During the survey period the only food harvested was a hand of ripe bananas. On one occasion E.A.'s wife picked a few leaves of *tulip* from a wild tree growing nearby.

E.A. worked in a biscuit factory for gross wages of K56/fortnight, but received K29 in overtime in the survey period. S. was unemployed, and spent a good deal of his time going around town visiting his many *wantok*. On these visits he was often given food, and sometimes money; the cash gifts he received account for the figure of K6.10 in Table 13, but this does not include K2.00 from E.A.

During the survey the household was visited by two *wantok* who had been home to Awande, and returned with gifts of a variety of foods including sweet potato, taro, banana, *kumu*, *pitpit*, pandanus nuts and sugarcane. There was also mutual visiting and meal-sharing between their household, Household 2 (the taxi driver's), and another Awande couple living in Lae but not included in the survey. Such visits are commonplace but were made more frequent by the arrival of the party consisting of the taxi driver's uncle and his family, recounted above.

The household spent a total of K90, half of which went on food and drink. Beer was the biggest single item of this expenditure, consisting of a carton of two dozen bottles bought for K12 on the black market (a *wantok* from Lae contributed K2 towards this). The next largest expenditure was K8.99 on hot takeaway foods (fish and chips, chicken and meat pies), followed by K6.34 on aerated soft drinks. Freezer meat,

rice, green vegetables (mostly European cabbage), fruits and nuts, and tinned fish accounted for over K2 each, the balance being spent on biscuits, bread, coffee, tea, ice-cream, milk shakes and tinned meat.

Non-food expenditure included cash gifts of K5 to E.A.'s sister, living in Lae with a Fore man, and K7 to E.A.'s father-in-law. A further K11.41 went on cigarettes and tobacco, both E.A. and S. smoking quite heavily. K9.80 on transport was used by E.A. to get to and from work, and by the whole household on their numerous trips around town. Other items included K7.50 for a *bilum* bought at Lae market by E.A.'s wife, K3.00 for cinema tickets, and K0.80 for kerosene.

This household, like Household 4, spent a remarkably high proportion of its income on snack foods and drinks; in addition, it spent further large amounts on beer and tobacco. While most of this money was spent by the wage-earner in the household, his young unemployed *wantok* spent about a quarter of it. The fact that employed people are prepared to support their *wantok* in this fashion testifies to the strength of the kinship bonds which persist in the urban environment. As far as I could tell from the day-to-day atmosphere in the household, the situation caused neither resentment on the one hand, nor embarrassment on the other.

Household 6:

This household consisted of H., from Amusa in North Fore; his wife, from Kainantu; their 2-year-old son and 2-month-old daughter; his wife's 18-year-old sister; and his adopted 10-year-old 'brother', treated as one of his own children. H. and his wife were firm Seventh Day Adventists. They lived in a Housing Commission house in Taraka, similar to that of Household 3, and only a couple of hundred yards from the latter. Cooking was done on an open fire under a polythene-roofed shelter in the front yard, since the kerosene stove in the kitchen was broken.

H. worked as a storeman in a chemicals company, for a gross wage of K72/fortnight, which included a housing allowance of K7.40 equivalent to three-quarters of the fortnightly rent. Perhaps because of the nature of his job, and his completion of six years of primary school, H. kept neater records than did most of the sample; his budget was also less complicated than many by visitors and communal household arrangements.

H. and his wife tended two gardens in the bush, where they grew

sweet potato, taro, cassava, banana, corn, sugarcane and *kumu*; in the house yard they grew pineapple, pumpkin, snake beans and banana. During the survey period they harvested two large bags of sweet potato (about 15 kg. each), two sticks of sugarcane, and two meals' servings of beans. They were also given a bag of sweet potato by a friend in Taraka, and a whole frozen chicken by another friend.

For the whole of the second week, H. provided hospitality to a male *wantok* from his village; another *wantok* accompanying him on the trip to Lae stayed for one night with H., then moved on to a different *wantok* in Taraka. Of H's expenditure of K9.00 on clothes, K8.20 was spent on clothes for his brother in the village, to whom he also sent a teapot costing K4.80.

Of H's total expenditure of nearly K80, food and drink accounted for K51. The high expenditure of K19.96 on rice included a 25 kg. sack costing K9.50, bought two days before the end of the survey period. The other major items were fresh meat, tinned meat and tinned fish, adding up to K17.64. H's regular midday meal was a meat pie and a bottle of Coca Cola, together accounting for most of the K4.48 spent on hot and cold snacks. The remainder of the food and drink expenditure was fairly evenly divided among flour products; white sugar, tinned milk and milo; and vegetables, fruits and nuts. Other expenditure was on rent, the clothes and teapot for H's brother in the village, cleaning materials, and transport; the latter cost K5.70, and included trips into town by the whole household at the weekend.

H's food expenditure shows a more rational use of resources, from the nutritional point of view at least, than the high expenditure on fresh meat and on snack foods described for other households in the sample. The complete absence of beer and tobacco from the budget, characteristic of Seventh Day Adventist households but rarely found in others, is also beneficial to health and nutrition, whatever its other merits or drawbacks.

Household 7:

This household occupied a house next door to Household 5, on the same plot of land in the Boundary Road settlement (see Plate 6.1, right-hand house). It consisted of W., from Awande, and his Keiagana wife; I., a 20-year-old male *wantok* from Awande who had been with them for several months, and W's 7-year-old brother, also a long term resident in the household.

W. worked in the same biscuit factory as E.A., for the same basic gross wage of K56/fortnight; his net pay for the survey period, after K5.74 tax, was K71.30, which included overtime. I. was unemployed but spent much less time going around town than did his wantok S. in Household 5; instead, I. was more likely to '*stap nating*' (sitting around, doing nothing) or to sleep during the day. O. gave him K5 during the fortnight, which he spent mostly on soft drinks, cigarettes and a shirt.

The household cultivated a small plot near their house, and during the survey harvested sweet potato, sugarcane, *aibika* and bean leaves.

The household's overall expenditure of nearly K58 included K23.58 spent on food and drink. Of the latter, fresh and freezer meat was the biggest item, at K6.05, and tinned fish next at K4.17. The low figure of K2.16 for rice is misleading, because the household had 15 kg. (about K7's worth) in stock at the start of the survey. Aerated drinks and milk shakes together accounted for K4.64, and hot takeaway foods for another K1.41. Only K1.40 was spent on vegetables, fruits and nuts, K1.30 on tinned meat, and the remaining K2.33 on margarine, dripping, white sugar and a packet of plain biscuits.

Most of the non-food expenditure of K34.26 went on a radio, costing K20.00. Clothes accounted for K7.90, cigarettes for K2.40, and transport, kerosene, cleaning materials, a mosquito coil, one metal hinge, and a ball of wool for the remainder.

W's food budget was a modest one, with a fairly even apportionment between snack foods, animal protein and carbohydrates. W. was a more reticent personality than most of the Fore I had contact with in Lae. He had been there for only a year and, despite his six years' primary schooling, did not feel himself to be a 'town man'. He was apparently much less involved with the visitors from Awande, although a few weeks earlier he had himself been providing hospitality to several men from the village.

Household 8:

The last 'household' in the sample in fact refers to T., a single young man, living with a married couple and their child in a self-help area in Taraka. It had been the intention to include these *wantok* in the survey, but the head of the household departed for his village on

two weeks' leave soon after the start of the survey. T. stayed on, usually eating with some *wantok* living next door. It was impossible to assess from his expenditure sheets whether he provided all his own food on these occasions, or whether he was given food by his *wantok*; probably the sharing of food was mutual.

T. had a job as a motor mechanic, for a basic gross wage of K56/fortnight, added to by overtime to give a net income after K3.99 tax of K61.33 over the survey fortnight. His expenditure over the same period was only K33.43, nearly all of which went on food and drink. He spent K7.33 on rice, K5.25 on frozen chicken, K4.40 on tinned fish, K3.44 on tinned meat, and K2.45 on bread. Another 'meat pie and coke' man, he spent K2.96 and K2.36 on these two items respectively. The balance was spent on white sugar, a small amount of vegetables, fruits and nuts, margarine, tinned milk, milo and ice-cream. Transport, soap, and one packet of tobacco were his only non-food expenses.

Because of the absence of his commensal *wantok*, T's expenditure pattern may have been atypical over the survey period. It does present evidence, however, of the considerable opportunity which employed single men have for saving money, should they so wish.

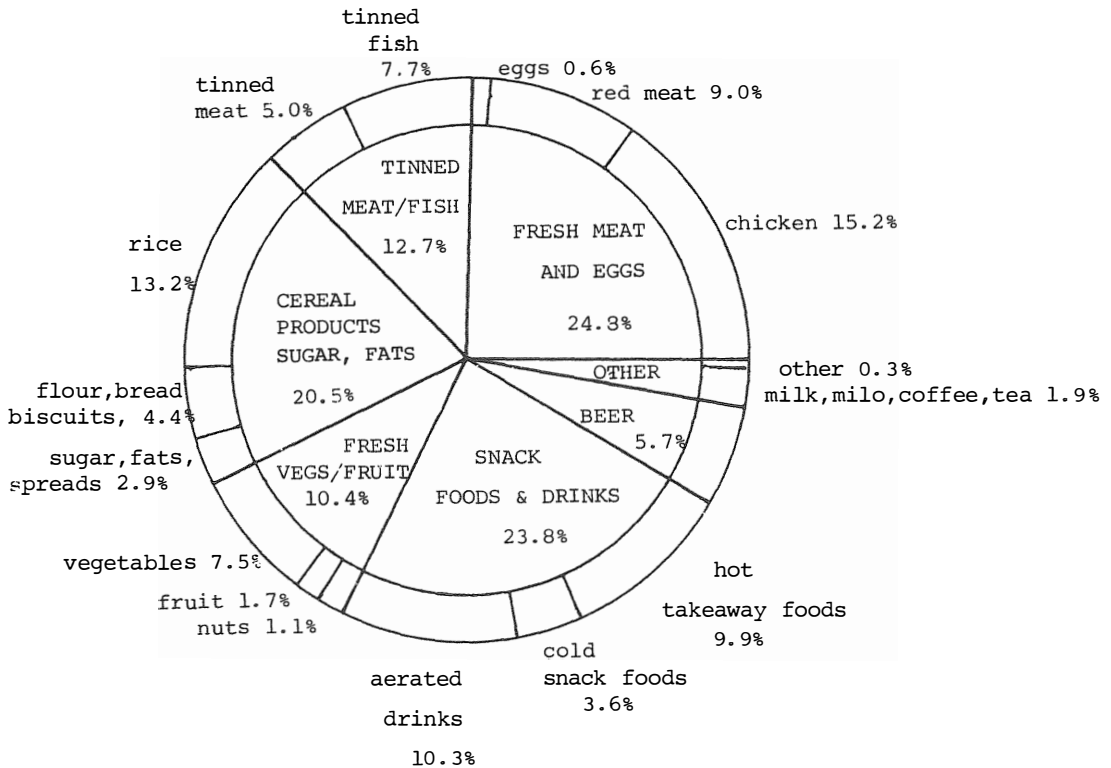
General results

The last two columns in Table 13 show the mean income and expenditure per household, and the mean expenditure on different categories as a percentage of the sample's total expenditure.¹ Figure 6 shows the breakdown in percentage terms of the total food and drink expenditure by the whole sample.

In the presentation of results for individual households, attention has been drawn to the great variation between them in their income and expenditure patterns. This should be borne in mind when considering the results in general terms. For instance, cash gifts were a feature of expenditure in only three out of the eight households; thus, although 16% of total expenditure was spent as cash gifts, this might not be a typical figure. Similarly, only three households paid any rent,

¹Note that this figure is different from that which would have been obtained by calculating the mean of the percentages for each household; in effect, it is weighted according to the total expenditure of each household.

FIGURE 6 BREAKDOWN OF TOTAL FOOD AND DRINK EXPENDITURE
OF EIGHT HOUSEHOLDS COMBINED



and in only three households was any beer reported to have been bought. Overall, food and drink accounted for 57% of total expenditure. As shown in Figure 6, fresh meat and eggs was the biggest major category (24.8% of total food and drink expenditure), but snack foods and drinks were close behind (23.8%). Cereal products, mostly rice, with sugar and fats were next in importance (20.5%), followed by tinned meat and fish (12.7%), fresh vegetables, fruits and nuts (10.4%), and beer (5.7%). Other items, constituting milk, coffee, milo etc. accounted for the final 2.2% of food and drink expenditure.

Of the other expenditure, apart from cash gifts, clothes were the major item (8.2% of total expenditure), followed by transport (4.7%) and

tobacco (3.7%). Rent, cleaning materials, and a variety of items including entertainment and miscellaneous goods and services made up the remainder. Kerosene accounted for only 0.5% of the total expenditure.

On average, the household budgets were in debit by K0.30 (less than 0.3% of mean total income). The figure has little significance in absolute terms, but it does suggest that there is little inclination towards substantial savings in this sample.

Discussion

Limitations of the survey

The households in the sample were probably slightly better off financially, and their male members slightly better educated (though none had been to secondary school) than would be typical of Fore households in Lae. The two households occupying Housing Commission houses represent the upper end of the range of housing conditions experienced by Fore migrants, while those occupying self-built homes in the Boundary Road settlement are more typical.

As was pointed out earlier, the results from this survey refer to income and expenditure over a single fortnight, and not to budgets averaged out over a longer period. A survey of longer duration would be particularly valuable in indicating the overall significance of visits from *wantok*, both temporary visitors from the village who make heavy short-term demands on the budget, and long-term 'visitors' who constitute a chronic drain on resources, at least for as long as they remain unemployed. A longer survey would also reveal the incidence of major purchases (radios, bicycles etc.), school fees, payments for ground rent and housing repairs and so on. Finally, it would give more reliable data relating to the use of savings banks and the transfer of money back to the village.

A more detailed analysis of gift exchanges, in cash and kind, between urban households would be another valuable exercise. Other potential topics might include the division of expenditure within households, and especially between husband and wife; and the use made of various retail outlets where food may be on sale at varying prices (i.e. supermarkets, intermediate stores, small trade stores, and markets). Unfortunately, however, the more detailed a survey of this kind becomes,

and the longer it lasts, the greater the burden it places upon the subjects concerned, and the more difficult it becomes to execute.

Priorities in expenditure

a. Gifts and exchanges in cash and in kind. Several of the budgets described above included payments of cash gifts to visiting village *wantok*, to *wantok* within Lae, and to dependants within the household but not of the immediate family. In addition, there were frequent gifts of food between urban households, sometimes in the form of specific contributions to help out when village visitors had to be entertained, sometimes simply in the form of meal-sharing in each other's homes. Finally, casual consumption of snack foods and drinks, and beer, would often have been in company with friends, at home or met by chance in town. Probably a more extensive survey would also have identified long-term loans between migrants, and contributions to joint enterprises such as the purchase of a vehicle, as described for the Hageners in Port Moresby by Strathern (op.cit., pp.328, et seq.).

Only two men in my sample, both belonging to Household 1, were involved in *mekim sande*, which Strathern regards as 'expenditure on social relationships'. Conversation with other Fore in Lae suggests that many people regard the practice as inconvenient when a man has a family to support, because he may well find himself short of money, and therefore food, towards the end of the period when he has contributed to but not received from the pool.

Although difficult to quantify precisely, it is clear that gift-giving within the urban migrant community, and between it and the rural community, is an important feature in urban expenditure patterns. As Oeser (op.cit., p.77) puts it:

"The European classification made in budgeting literature of essential and non-essential needs cannot be applied without considerable modifications in Papua New Guinea. For example, gifts need to be regarded as essential and perhaps head this category, rather than be classified as non-essential extras, as in European budget systems."

b. Goods and services other than food and drink. Consumer durables, whose acquisition is such a major preoccupation in most Australian households, do not seem to receive high priority among the urban Fore, with the exception of clothes. A radio was the only major item purchased during the survey, but doubtless over a longer period more

items would have featured in the budgets.

Tobacco was regularly purchased by most of the households; its complete absence from two of the budgets was a consequence of Seventh Day Adventist influence in the rural areas from which these households originated.

Expenditure by urban migrants on transport falls into three main categories: travel to and from work (which for many employees is free, on company-owned trucks); travel around the urban area, mainly at weekends, which can be regarded as recreational; and travel to and from the home village, which can often be regarded as essential expenditure on maintaining social relationships. In monetary terms, the last category is most important, but in terms of frequency, the first two are far more so.

Cleaning materials (mostly soap) and kerosene, for lighting as well as cooking, are regular items of urban expenditure, but neither takes up a significant proportion of the total. The amounts spent on miscellaneous items, including entertainments such as the cinema, or snooker sessions, are also relatively small in most households. As far as I could ascertain, card-playing was not a regular pastime in any of the households in the sample, despite its popularity in rural areas, and in many urban migrant groups (see Strathern, op.cit., pp.216-225; and Oeser, op.cit., p.72); I occasionally observed games in progress in other Fore households in Lae.

c. Food and drink. Food and drink expenditure comprised 57% of total expenditure in the sample, and if the problematical item of expenditure on gifts were excluded, this figure would be about 68%. The most striking feature of the food and drink expenditure in this sample is the high proportion which was spent on items which, from a nutritional point of view, are at worst useless or even harmful (e.g. sweet aerated drinks) and at best very uneconomical (e.g. cooked chicken and chips). The expenditure on beer, however, was lower at 3.2% of total expenditure than that reported in other surveys. For instance, the Lae Household Expenditure Survey by the Bureau of Statistics (op.cit.) gives figures for expenditure on beer and spirits of 7.3% of total household purchases in self-help housing, and 9.5% in low covenant housing; and Christie, in a preliminary analysis of results from a household expenditure survey in twelve low-income Chimbu households in Lae, gives a comparable figure

of 16.3% (personal communication).¹

Expenditure on relatively expensive forms of animal protein such as frozen chicken was also high, and in one household in the sample expenditure on fresh and frozen meat reached the extraordinarily high figure of K56.39 in a fortnight. In contrast to these 'luxuries', the basic urban staples of rice, tinned fish and tinned meat, and starchy vegetables together accounted for only about one-third of food and drink expenditure.

Strathern reports that Hagen migrants' expenditure on subsistence foods is kept to a minimum so that they will have money left over for spending on social relationships, which includes communal beer-drinking as well as cash gifts, loans, etc. (op.cit., pp.320-6, ff.). The Fore migrants seem to differ in that a large proportion of non-subsistence food expenditure is spent on foods and drinks enjoyed for their own sake, albeit sometimes in a social context.

The quality of the urban diet

There are no major discrepancies between the results of the urban dietary recall survey reported in Chapter 11, and those of the household expenditure survey reported in this chapter. Comparison suggests that there may indeed have been some under-reporting of consumption of certain snack foods and drinks in the recall survey, but this is impossible to determine. It is worth noting, too, that the high consumption rates reported in Chapter 11 for hot sweetened beverages, green and yellow vegetables, and tinned meat and fish are consistent with relatively low expenditure on these items, servings of which are all relatively cheap. Conversely, the high expenditure on fresh and frozen meat is consistent with its reported consumption rates, given the expense of these items.

On the basis of the data presented in this chapter, it is not possible to describe the quantitative composition of the typical urban Fore diet, as was done for the rural diet in the previous chapter; still less is it possible to assess accurately the adequacy of this diet. It is however, possible to confirm the findings of the dietary recall survey, in stating that the urban diet is more refined, sweeter, less bulky, and

¹Results to be reported in the Consumer Behaviour Project of the Papua New Guinea Human Ecology Programme (Christie, in preparation).

richer in protein than the rural one. This is evident from the nature of the foods purchased in the town, as compared to those produced in the village. This conclusion agrees with that of Malcolm (op.cit.), whose quantitative findings were quoted in the introduction to this chapter. Malcolm concluded for his sample that:

"The figures are significant in that they indicate a dietary intake in what may be regarded as the average urban dweller, which is substantially better, particularly as regards protein, than that of the village."

Although Malcolm's 1970 sample consisted of lower paid public servants, whom he supposed to have an income almost twice that of unskilled workers, relative rises in incomes and prices in the intervening period in fact make the average unskilled worker of 1977 better off in real terms than the lower paid public servant of 1970.¹

The question as to whether the high expenditure on relatively non-nutritious items, characteristic of the urban migrants, actually threatens the adequacy of the diet cannot be fully answered without doing a detailed weighed intake survey, but it is worth considering. There are two dangers: one is that those who control food expenditure (ultimately the wage-earners, who are usually the men) may divert money from the rest of the household's needs to their own wants; the second is that the whole household may consume so much of the less nutritious foods that the quality of their diet is seriously reduced. On the evidence available from the survey data I suspect that the latter danger is more real than the former, but that neither constitutes a serious problem at present. In Appendix B (p233), the results of a food price survey carried out in Lae soon after my expenditure survey are presented, and the conclusion is drawn that a married man with four children could provide a well balanced diet for his family for approximately K32 per fortnight. This diet would consist of rice, margarine, tinned fish, green leaves and sweet banana, but obviously many substitutions could be made. Regardless of what they actually bought, and although the numbers of consumers in each household could not be accurately ascertained, it seems clear that none of the households in the sample would have been economically unable to provide a diet of this standard. What is more, several of the households harvested significant amounts of food

¹Unpublished Dept. of Labour statistics show that the minimum urban wage rate for labourers rose by nearly 300% between 1971 and 1977, while the consumer price index (Bureau of Statistics, 1978c) rose by only 180% over the same period.

from their own gardens, thereby sparing an equivalent amount of cash which could have been used in the purchase of nutritious foods. This is an advantage generally denied to households living in company quarters, or in settlement areas where land is in particularly short supply, such as the Bumbu Settlement.

In conclusion, then, the household expenditure data do not justify unequivocal assertions about the adequacy of the urban diet. They do, however, indicate that most households can quite easily satisfy their nutritional needs without seriously curtailing the satisfaction of other needs.

CHAPTER 12

FOOD CONSUMPTION IN ITS ECOLOGICAL SETTING

In this chapter I return to the conceptual model summarised in Figure 1 (p. 8), and discuss some of the interrelationships between food consumption and other components of the system outlined in that model. In particular, I refer back to the main findings in Part II (on food resources) and in Part III (on food beliefs and preferences) and examine the consistency between them and the findings presented in the last three chapters, on food consumption itself. Some of the points made in this discussion have already been raised in Chapters 4 and 7, on the basis of evidence relating to food resources, and to stated food beliefs and preferences respectively; they are re-emphasised here with the added support of the evidence from the surveys of actual food consumption. The implications of the observed patterns of food consumption for health and well-being will be discussed in Part V.

The relationships between village and town

Before discussing food consumption separately for the village and the town, it is worth emphasising once again the close relationships which exist between them. In material terms, there is a two-way flow of foodstuffs between the rural and urban environments. Villagers visiting their *wantok* in town usually bring gifts of garden food with them, and often return with a few coastal items, especially coconuts and betel nut, to share with other villagers¹. Urban dwellers on visits home take coastal items with them, and return to Lae with village produce, among which sugarcane is especially valued. There is also a transfer of foods in the form of *kago* consisting of cartons of tinned fish, sacks of sugar and rice, and similar items, bought at wholesale prices in Lae for retail sale in village tradestores or *kentin*². Sometimes villagers with

¹On my return to Awande in October I shared a vehicle with four villagers, returning from a visit to Lae, and four live ducklings and a large hen which they had bought in the town. At the head of the Markham valley we bought coconuts, bananas and betel nuts; unfortunately we had no room for a K10 sack of fresh peanuts, welcome though they would certainly have been in Awande.

²See Appendix A for a description of tradestores in Awande.

sufficient cash will go to the town (not necessarily Lae, but also nearer urban centres such as Kainantu or Goroka) to fetch such goods; sometimes men living in town take the goods themselves, or send them with their *wantok*, for sale in tradestores which they own, or in which they at least have a share.

As well as the flow of food itself, there is a constant flow of ideas and habits between the town and the village. In terms of actual food consumption, this might mean a young man on leave in the village for a couple of weeks who finds difficulty in readjusting quickly to the sweet potato diet, and who therefore persists in his urban rice-and-fish habit. In the other direction, it might mean an older villager visiting the town and finding his urban *wantok*'s diet unpalatable, and insisting that he should buy some sweet potato from the market. Conversely, a visiting urban *wantok* may well be treated to a large *muu* feast replete with garden produce, in the same way as he himself will entertain his rural visitors in style, with frozen chicken, ice-cream and perhaps beer.

Food consumption in relation to food resources

The food consumption of the rural Fore is largely determined by the nature of their subsistence activities, with the availability of store items a secondary factor. The food consumption data from Awande (Chapters 9 and 10) confirm the general description (Chapter 2) of the rural food resources, in showing the population's high degree of dependence on garden foods, especially sweet potato; the seasonal availability of some of those foods, such as wing bean root; the significant but irregular contribution of the domestic pig to the diet; the sporadic consumption of bush foods such as mushrooms and small game; and the use of store foods from time to time. Although it was expected that consumption of store foods would be higher during the coffee season when more cash was in circulation in the village economy, this was not borne out by the dietary recall surveys. This may have been because the surveys were too small in scope and too short in duration to detect significant fluctuations in what is, at most, a small component of the diet.

There is no evidence to suggest that serious food shortages occur regularly in the annual subsistence cycle, in Awande at least. If nutritional problems do exist in the area, as will be argued later,

they are likely to be due to the nutritional quality of the foods available, combined with the selective use made of them, rather than to any quantitative deficiency in food resources.

For the Fore in Lae, food consumption is influenced to some extent by subsistence production in urban gardens, but it is the nature of the foods offered for sale in stores and markets which is more important. From the consumer's point of view the availability of these foods is a function of their physical availability and their price. Physical availability is rarely a problem in Lae, with its well-developed public transport and shopping facilities, and its steady supply of foods imported both from the local hinterland and from overseas. Fresh food markets, however, are less accessible, in terms of time and money, to some areas than to others. Price fluctuations have some effect in the fresh food markets, and longer term effects in the case of processed foods. However, data from the household expenditure survey (Chapter 11) suggest that most households with full-time employees, and without too many unemployed dependents, are well able to purchase amounts of food adequate for their nutritional needs. In practice, many people seem to spend large amounts of money on snack foods and drinks whose ready availability in numerous snack bars and stores throughout the town is a constant temptation.

If more urban land were available for gardening, it seems likely that the Fore, in common with other inhabitants of the low covenant and settlement housing areas, would make use of it. The consequences in terms of food consumption would probably be an increase in the quantity and frequency in the diet of fresh green vegetables and fruit, and perhaps of starchy vegetables as well. Urban gardening on a sustainable basis will require changes to present systems of land tenure and cultivation, and will need careful supervision and monitoring by extension officers.

To influence food consumption habits by modifying the food resources available is a policy option with different implications in rural and urban environments. In the former, where the people are responsible for producing most of their own food, it would mean trying to persuade them to alter long-accustomed subsistence practices. In the urban environment, where most food is purchased, it might mean direct intervention through pricing and marketing policies. The first approach

could face major problems of cultural resistance¹, and the second might meet with opposition both from vested financial interests, and from the urban public at large. The complementary policy of trying to influence consumption through modifying people's beliefs and preferences, for instance through nutrition education, will be discussed in the next section.

Food consumption and food beliefs and preferences

In Part III, the food beliefs and preferences in Awande and in Lae were compared, and the conclusion drawn that in both places there was a growing awareness of the significance of food to health, and an increase in the range and diversity of food tastes and preferences; both trends were more pronounced in the town. The food consumption data are congruent with these generalisations, insofar as the urban diet is richer in protein and concentrated energy sources, and is more variable, than the rural diet. Also, the rural diet of today appears to be more varied than that of twenty years ago (see Chapter 10). However, it is difficult to distinguish the effects of growing nutritional awareness, changing tastes and preferences, and the increasing availability of different foods.

Despite the apparently greater awareness among the urban mothers of the needs of young children, those in Lae do not seem to be fed much more often in the middle of the day than those in Awande. In both places, about one-quarter of those in the recall surveys had nothing to eat or drink at midday. On the other hand, the urban toddlers were given a more varied diet and more frequent servings of animal protein. The use of tinned baby foods by urban mothers, although not a practice encouraged by the health authorities, suggests that these mothers do indeed recognise that young children may have special nutritional needs. The avoidance of bottle-feeding by most of the urban mothers is another sign of their acting in accordance with nutritional advice.²

The major differences between village and town in the diets of older children and adults seem to result less from differences in nutritional beliefs, than from the greater range of foods available to

¹This does not apply so much to the introduction of cash-cropping activities, where material benefits are immediately obvious, in contrast to the hypothetical long term nutritional benefits of modified subsistence activities.

²The sale of baby feeding bottles was actually made illegal early in 1978.

people in the town, and their greater disposable cash income. Some of the food beliefs prevalent among the urban Fore, such as those associating certain coastal foods with sickness, are in fact restrictive rather than permissive. The same can be said of the food taboos which are more prevalent in the rural environment, such as those on the consumption of tinned fish and tinned meat during a first pregnancy. Unfortunately the food consumption data are too limited to allow any judgement of how closely these beliefs and taboos are followed.

Fore food beliefs and preferences are changing, and will continue to change, under the influence of many factors, as discussed in Chapter 7. The consumption data suggest that any deliberate attempts by the authorities to modify these beliefs and preferences should, in the rural environment, concentrate on the needs of small children for a less bulky diet and more frequent feeding; in the urban environment they should concentrate on the frequency of feeding and the dangers of consuming too many sweet snack foods and drinks. Such attempts can take two forms. The first is explicit nutrition education, and the second is the promotion, on other grounds such as taste, ease of cultivation or preparation and so on, of foods which are also nutritious. Both approaches stand more chance of success if they are aimed at gradual modifications to the current dietary pattern, rather than at major changes. In the village, this might mean encouraging increased consumption of the nutritious foods which are already eaten in small quantities, such as beans, peanuts and dripping; in the town, it might mean trying to persuade mothers to restrict snack foods to a minimum, rather than to deny them altogether to their children.

Competing needs and values

If people do not always eat what they say they would like to be eating, it may be because the preferred diet is simply not available from the local food resources, or it may be because of other needs and values which compete with those relating to food consumption.

In the rural environment, the food resources already available could provide a larger and more regular supply of pork to the diet. However, pigs are valued not only for their dietary contribution, but also as symbols of wealth and prestige, and as a form of investment for future sale, debt repayment or ceremonial presentation. The use made of cash income is another indicator of competing needs and values: many

families spend much of their cash on clothes, visits to relatives in town, and other good and services, rather than on store foods, popular though they are. Of the money which is spent on foods, it is common for villagers to spend large amounts on a single occasion of drinking, feasting and celebration (such as a *singsing*, or an initiation ceremony) rather than spending it on a steady supply of purchased foods.

In Lae, household expenditure data provide similar evidence relating to the scale of needs and values in which food consumption is but one item. In practice, it appears to rank quite high in the scale, accounting for the greater part of cash expenditure. In the short term, such as the sudden need to return to the village to take part in a social event, food may be relegated to a lower position on the scale, while during a visit to the town by village relatives, it may become still more highly valued than usual. In the subsistence sector, many more Fore would probably cultivate small gardens and hence eat more fresh vegetables, if land were more readily available, and cultivable on a sustainable basis. As it is, they prefer to spend their time and energies in other ways.

Conclusion

The food consumption data alone cannot be used to draw firm conclusions about the health and well-being of the rural and urban populations studied. The evidence suggests that the rural diet is excessively bulky, and low in protein, while the urban diet is more satisfactory in these respects, but is highly refined and contains many sweet items. Thus the diets have different nutritional implications in the two environments, and these will be considered further in Part V. I have also tried to place food consumption in the context of other needs and values; in Part V I shall emphasise that, just as food consumption is only one aspect of behaviour, so nutrition is only one component of total health and well-being.

PART V

HEALTH AND WELL-BEING

CHAPTER 13

WEIGHTS FOR AGE, MORBIDITY AND MORTALITY IN CHILDREN IN AWANDE AND LAEIntroduction

This chapter describes surveys of weights of under-fives in Awande and Lae, which were carried out in order to obtain a simple index of the nutritional status of what is probably the most vulnerable age group in these populations. Because this index is not an easy one to interpret, the latter part of the chapter includes some discussion of the interrelationships between growth rates, nutrition, and morbidity and mortality patterns in young children. The chapter concludes with some suggestions for appropriate policy measures which might be adopted in the rural and urban Fore populations.

According to Jelliffe (1966, p.74),

"In developing regions, the prevalence of protein-calorie malnutrition appears to be best indicated by weight deficiency in all age-groups and by growth failure in children. Weighing is the key anthropometric measurement."

Monthly weighing of infants (under 1 year) and toddlers (1-4 years) is the cornerstone of the Papua New Guinea Health Department's nutrition surveillance policy. It is facilitated by the provision of a free *Helt Buk*, or health record book, for each child attending an MCH clinic¹ (see Plate 10). This booklet is given to the mother and brought to the clinic each month. It carries a record of the child's date of birth, clinic attendances, details of any medical treatment received, immunisations, and weight at each clinic attendance. The weight is recorded on a chart in the middle of the booklet, on which lines for 100%, 80% and 60% of the Harvard Standard weights for age are displayed. A child whose weight falls below the 80% line is defined, for statistical reporting purposes, as malnourished, and his or her mother will be told that the child's weight is too low; if the weight falls below 60% of the standard, the child will usually be admitted to hospital for treatment.

¹The booklets were first introduced in 1975, to replace the variety of record cards or books previously in use, and should be available throughout the country in the near future.

The use of the Harvard Standards (Jelliffe op.cit., p. 221) may not be strictly appropriate for populations in Papua New Guinea, but locally derived standards are not yet available. For purposes of comparison, the use of a uniform set of standards is essential, and the Harvard Standards are widely used throughout the world. According to the Nutrition Section of the Department of Health, "evidence from well fed population groups within the country indicates that many ethnic groups here have the potential to equal if not exceed these standards." (Personal communication, 12th July, 1977). Further consideration will be given to the use of the Harvard Standards in the discussion section of this chapter.

I had originally intended to make use of the data contained in the health booklets of Awande children to make some assessment of nutritional status. It soon became apparent that an independent weight-for-age survey would be more useful, for two main reasons. First, many toddlers rarely or never attended the MCH clinic; second, the clinic weight records included children whose ages had been estimated, from dental eruption or other evidence, and the accuracy of such estimates could not be assessed. In Lae, weight charts had not yet been introduced at the MCH clinics by the time of my fieldwork, so an independent weight survey was also necessary there. In both places I collected some supplementary data on clinic attendance and breast-feeding, and gained a general impression of the main health problems.

Methods

Only children under five years old whose ages could be reliably determined were included in the weight surveys. In Awande birthdates were accepted from health record booklets if they were recorded to the day, and not just the month; otherwise they were taken from Baptism certificates issued by the local Lutheran pastor, or in a few cases, from slips of paper kept by the child's parents on which the date of birth had been written by a literate villager¹.

¹Village census patrols are no longer a regular feature of administration activity in the Okapa District. It is also worth noting that the Lutheran Church denies Baptism to children of polygamous marriages, thus incidentally depriving them, and outsiders, of a reliable record of their birthdate and parentage.

In Lae, where the educational and literacy levels were higher, nearly all fathers knew their young children's birth dates from memory; sometimes reference was made to health records, Baptism certificates, or personally written slips as in Awande. By these methods, presumably accurate ages were obtained for 85 out of roughly 105 under-fives in Awande, and for 65 out of 67 under-fives in the Fore population contacted in Lae.

In Awande, children were weighed on a set of bathroom-type platform spring scales; their weights were recorded to the nearest lb., and later converted to kg. In Lae, children unfortunately had to be weighed on a different set of metric bathroom scales, which were cross-calibrated with those used in Awande and found to agree to within 0.5 kg.; weights were recorded to the nearest 0.5 kg. In both places, smaller infants and less co-operative toddlers were weighed in the arms of an adult, usually their mother, whose weight was subsequently subtracted; babies were removed from their *bilum* before weighing. Children were not required to remove their clothing, but in both Awande and Lae this rarely consisted of more than a loincloth, a light skirt or a pair of shorts.

In Awande, all parents were asked to show their children's health record booklets, and children were recorded as regular attenders if they had attended the Awande clinic at least twice within the previous six months. In Lae, where health record booklets had not yet been provided, parents were simply asked if they took their children to the clinic to be weighed : this procedure may have resulted in an overestimate of regular attenders.

In both places parents were asked whether the child was still breastfeeding; no distinction was made between children feeding many times a day, and those feeding only once every day or two.

Results

Weights for age

The weights by age of all the children included in the Awande and Lae surveys are plotted on the upper and lower graphs respectively of Figure 7, in relation to the curves representing 100%, 80% and 60% of the Harvard Standards (Jelliffe, op.cit., p.221). In Table 14, the absolute numbers and percentages of each sample falling into four

FIGURE 7: WEIGHTS BY AGE OF UNDER-FIVES IN AWANDE AND LAE, IN RELATION TO 100%, 80%, AND 60% OF THE HARVARD STANDARD WEIGHTS FOR AGE.

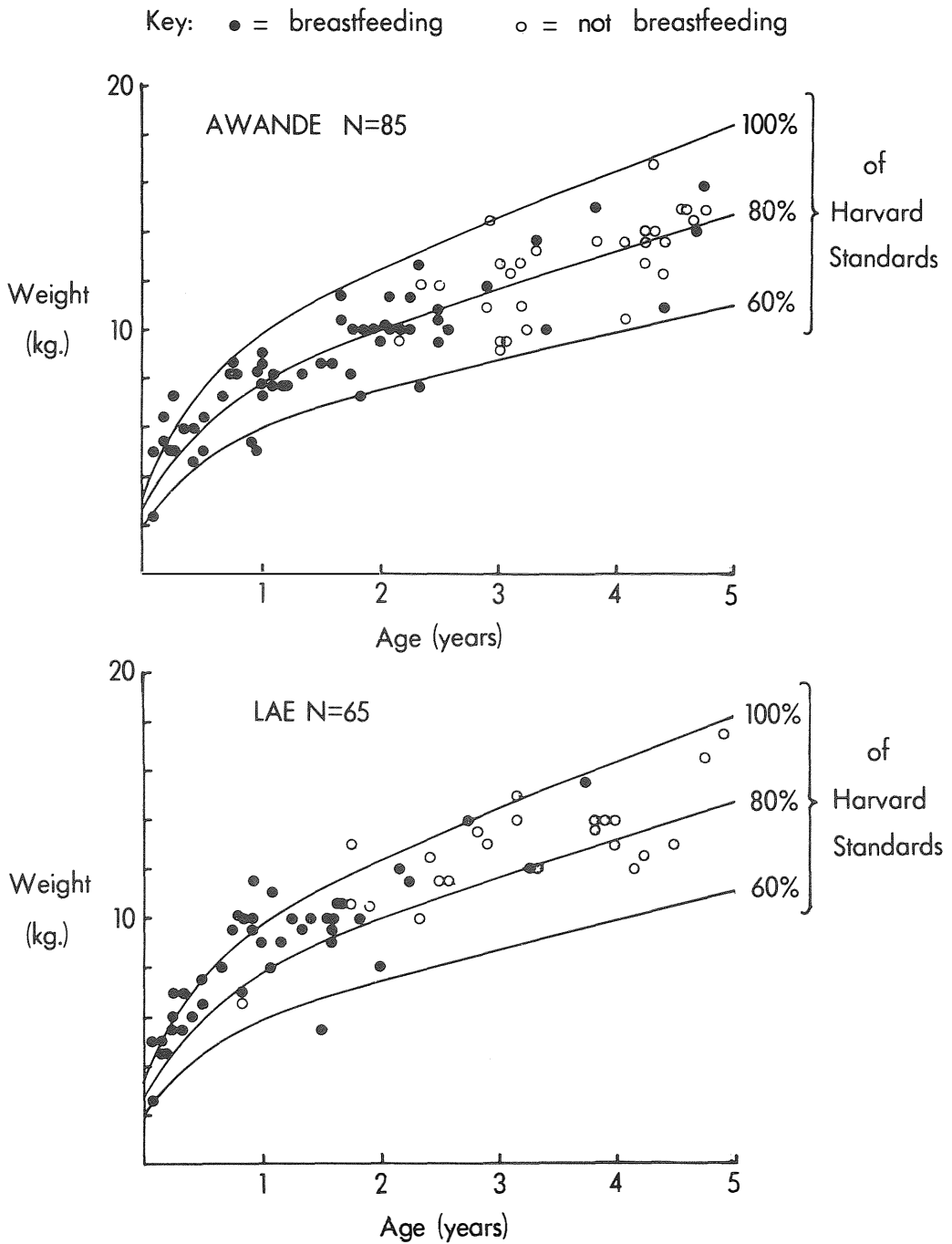


TABLE 14 DISTRIBUTION OF UNDER-FIVES IN STANDARD WEIGHT-FOR-AGE CATEGORIES, AWANDE AND LAE¹

Age group Months	AWANDE								LAE							
	Weight in relation to standard for age								Weight in relation to standard for age							
	Under 60%		60-79%		80-99%		100% +		Under 60%		60-79%		80-99%		100% +	
	N	n	(%)	n	(%)	n	(%)	n	(%)	N	n	(%)	n	(%)	n	(%)
0-11	19	3	(16)	2	(11)	10	(53)	4	(21)	22	0	(0)	3	(14)	8	(36)
12-23	18	0	(0)	11	(61)	7	(39)	0	(0)	18	1	(6)	2	(11)	13	(72)
24-35	19	1	(5)	10	(53)	7	(37)	1	(5)	10	0	(0)	2	(20)	7	(70)
36-47	13	0	(0)	6	(46)	7	(54)	0	(0)	8	0	(0)	2	(25)	5	(63)
48-59	16	0	(0)	7	(44)	9	(56)	0	(0)	7	0	(0)	4	(57)	3	(43)
TOTAL	85	4	(4.7)	36	(42.4)	40	(47.1)	5	(5.9)	65	1	(1.5)	13	(20.0)	36	(55.4)

¹Standards based on Harvard Standards (see Jelliffe 1966, p.221) as used by Dept. of Health, PNG.

weight-for-age categories are tabulated by one-year age groups. Using the DPH criterion for malnutrition, that is the percentage of children falling below 80% of the standard weight-for-age, the malnutrition rate was 47% in Awande, and 21.5% in Lae. In Awande, three infants (the youngest of whom died at the age of 3 months) and one toddler were below 60% of the standard weight for age, and five infants and one toddler were above 100%; in Lae the corresponding figures were one toddler below 60%, and eleven infants and four toddlers above 100%. These figures are too small to establish differences, but are suggestive of better growth rates in Lae.

The mean weights in the two samples by one-year age groups are compared, and the significance of the differences tested, in Table 15. In all five age groups the mean weight was higher in Lae than in Awande, but only in the second and fourth year was the difference significant, at the 5% probability level on a two-tailed t-test. Numbers were small, and there is a possibility that differentially skewed age distributions within the age groups might have affected the statistical results; however, they too are at least suggestive of improved weights for age in the urban children. There were no consistent or significant differences between the weights of the sexes in either sample.

TABLE 15

COMPARISON OF MEAN WEIGHTS OF UNDER-FIVES BY ONE YEAR AGE GROUPS, AWANDE AND LAE

Age group months	AWANDE			LAE			Diff.of means t	
	N	Mean (kg)	S.E.	N	Mean (kg)	S.E.		
0-11	19	6.05	0.369	22	7.02	0.485	0.97	1.55 n.s.
12-23	18	8.71	0.281	18	9.75	0.351	1.04	2.33p<0.05
24-35	19	10.73	0.338	10	11.75	0.554	1.02	1.67 n.s.
36-47	13	11.63	0.524	8	13.75	0.443	2.12	2.80p<0.05
48-59	16	13.85	0.418	7	14.07	0.798	0.22	0.27 n.s.

Clinic Attendance

Data on clinic attendance include, in addition to the children whose exact ages were known, nineteen children in Awande and two in Lae whose ages could only be estimated. In Awande, fifteen of these children were aged 3 or 4, and only three of the nineteen were clinic

attenders. In Lae, the two children were 2 and 4 years old, and neither attended the clinic. Attendance in the two samples is compared in Table 16.

TABLE 16

MCH CLINIC ATTENDANCE OF UNDER-FIVES BY ONE YEAR AGE GROUPS,
AWANDE AND LAE¹

Age group (months)	AWANDE ²						LAE ³			
	N	attenders		non-attenders		N	attenders		non-attenders	
		n	(%)	n	(%)		n	(%)	n	(%)
0-11	20	13	(65)	7	(35)	22	20	(91)	2	(9)
12-23	19	13	(68)	6	(32)	18	11	(61)	7	(39)
24-35	21	12	(57)	9	(43)	11	8	(73)	3	(27)
36-47	20	5	(25)	15	(75)	8	3	(37)	5	(63)
48-59	24	9	(37)	15	(63)	8	2	(25)	6	(75)
TOTAL	104	52	(50.0)	52	(50.0)	67	44	(65.7)	23	(34.3)

¹Attenders at Awande defined as those with regular attendance recorded in their Health Books; at Lae, defined as those whose parents claim to take them regularly to clinic. Figures for the two groups are therefore not strictly comparable.

²Includes 19 children whose ages were estimated (cf. Tables 14 and 15)

³Includes 2 children whose ages were estimated.

In both groups, there was a marked reversal after the third year in the proportions attending and not attending. In the first three years, well over half of the children were attenders, while in the third and fourth years attendance rates fell to below 40%. Overall the attendance rates were 50% in Awande and 66% in Lae; however, as mentioned earlier, the data from Awande are more reliable than those from Lae, being based on inspection of health books rather than on verbal reports.

For Awande, clinic attendance data were also analysed in relation to the distance that mothers and children had to travel from their hamlets to the clinic site. The attendance rates for hamlets at varying distances from the roadside clinic site were as follows:-

Approx. walking time from hamlet to clinic	Clinic attendance rate of under-fives
10 mins. or less (6 hamlets)	34 out of 38 (89%)
11-20 mins. (5 hamlets)	9 out of 28 (32%)
21-30 mins. (5 hamlets)	6 out of 19 (32%)
more than 30 minutes (4 hamlets)	3 out of 19 (16%)
TOTAL : 52 out of 104 (50%)	

These figures show a strong negative association between clinic attendance and distance from the clinic site. The nineteen children whose ages could not be accurately determined were mostly in the older age groups; their inclusion in the sample lowers the overall clinic attendance figure for Awande from 58% to 50%.

In Lae, including the two children whose ages were not accurately known, the attendance figures for different housing areas were as follows:

Area of residence	Clinic attendance rate of under-fives
Town and <i>Polis Baret</i>	8 out of 9 (89%)
Two-mile	9 out of 11 (82%)
Bumbu/Balob	6 out of 27 (56%)
Boundary Road	15 out of 27 (56%)
Taraka	6 out of 12 (50%)
TOTAL : 44 out of 67 (66%)	

Two-mile has its own permanent clinic at the Three-mile Community Centre, and Bumbu/Balob are close to the Butibam Clinic, also permanent. Taraka is served by a monthly mobile clinic. People from Boundary Road, *Polis Baret* and within the town use the clinic at the Angau Memorial Hospital. The accessibility of clinics is a function of distance, travel costs and frequency of clinic sessions; combined with the low numbers and the possibility of over-reporting of attendance in the Lae sample, these factors make interpretation of the above figures uncertain.

Breast-feeding

In the graph in Figure 7 breast-feeding children are distinguished from those no longer breast-feeding. In Table 17, the numbers and proportions breast-feeding in each sample are shown, by

age group.

TABLE 17
BREAST-FEEDING OF UNDER-FIVES BY ONE YEAR AGE GROUPS,
AWANDE AND LAE

Age group Months	AWANDE					LAE				
	Breast-feeding		Non-breast-feeding			Breast-feeding		Non-breast-feeding		
	N	n	(%)	n	(%)	N	n	(%)	n	(%)
0-11	19	19	(100)	0	(0)	22	21	(95)	1	(5)
12-23	18	18	(100)	0	(0)	18	15	(83)	3	(17)
24-35	19	14	(74)	5	(26)	10	4	(40)	6	(60)
36-47	13	2	(15)	11	(85)	8	2	(25)	6	(75)
48-59	16	3	(19)	13	(81)	7	0	(0)	7	(100)
TOTAL	85	56	(65.9)	29	(34.1)	65	42	(64.6)	23	(35.4)

There appears to be some tendency towards earlier weaning in the urban group, but even in the latter only one child under eighteen months was not breast-feeding; the milk supply of this child's mother had dried up when she underwent a splenectomy in the child's fifth month, after which she began bottle-feeding it under nurses' supervision. In both Awande and Lae, the majority of children are apparently weaned sometime during the third year. The samples are too small to compare the weights of breast-feeding and non-breast-feeding children at the same age, but the relatively small contribution of breastmilk to the total diet after the second year would make the detection of a significant difference unlikely even in a larger sample.

Morbidity and mortality

a. Awande. Inspection of the health record booklets showed that scabies and other skin infections, respiratory tract infections (generally referred to as *kus* in Pidgin, and an almost universal condition in young children) and diarrhoeal disease were common causes of morbidity. When incidents of diarrhoea were recorded in the health booklets by the clinic staff, the note was usually added, "advised to give sugar water"; when weight losses were recorded the note was usually added, "nutritional advice given". Inspection of the booklets also revealed

that three children had been admitted to the Okapa hospital within the previous year for treatment of gastro-intestinal infections or malnutrition. In each case their weight was below 60% of the standard at the time of admission:

Case 1. A girl was admitted with severe gastro-enteritis at 9 months; four months later she was back to 80% of the standard weight for her age.

Case 2. A girl was admitted at 7 months, but four months later was still below 60% of standard. Her mother had never attended the mobile MCH clinic (she took the child direct to the hospital when it was ill), claiming that she never knew when it was held and that anyway it was too far to go (almost 1 hour's walking uphill and in the opposite direction to the woman's gardens).

Case 3. This child, another girl, spent several weeks in hospital at about 3 years old, after being admitted with marasmus, with a weight apparently only 50% of standard (her exact age, however, was not known). A year later she was around the 60% level. This child was the seventh in a family with eight living children. The clinic nurses severely criticised the mother both for failing to take her child's low weight seriously, and for having too many children.

Two children died in the village between April and September 1977. One was 4 months old; he had been under 60% of the standard weight for his age at 3 weeks (although he may have been born prematurely), and had failed to thrive thereafter. The other was about 4 years old at the time of his death, which was attributed to *pekpek blud* (literally, bloody stools; usually translated as dysentery).

Some supplementary data relating to the age incidence of death among infants and toddlers in Awande were obtained in a survey carried out in early 1978¹, in which all mothers were asked how many children they had had, and how many had died and at what age. This recall method is clearly subject to errors, but gives some indication of the mortality pattern. 82 mothers reported a total of 364 live births (including 4 twins), 5 still births, and 71 subsequent deaths. Of these deaths, 15 (21%) had occurred in the *liklik haus*, i.e. within a week of the birth; 25 (35%) before the child could walk; 18 (25%) when the child was walking but still breast-feeding, i.e. under 4 or 5 years; 3 (4%) in later childhood; 4 (3%) in adulthood; the

¹By Steve Millar and Bev Hewitt, attached to the PNG Institute of Medical Research, Goroka.

remaining 6 deaths (8%) occurred at unspecified ages. Because these are retrospective data relating to a series of birth cohorts, they cannot be used to calculate conventional vital statistics.

b. Lae. I did not obtain any detailed data on morbidity and mortality among Fore children in Lae. Malaria is endemic in the town, but I did not recognise any cases of it. On the whole, the children in town seemed to be cleaner, and hence less subject to sores, than their village counterparts. One severely underweight child of 18 months (below 55% of the standard weight for her age) reportedly suffered from a congenital heart defect and was under regular hospital observation. Her illness was said by her father and his kinsmen to be caused by *poisin* worked on her by her mother's *lain*, a Morobe group who disapproved of the mother's marriage to a Fore man. Another child, of 23 months, suffered from tuberculosis, but was just over 80% of the standard weight for his age; he was breast-feeding, on hospital advice, once a day, while his infant brother breastfed continually. The 10-month-old child who had been bottle-fed from 5 months was 70% of the standard weight for his age.

Discussion

The results of the weight for age surveys of under-fives in Awande and Lae, though based on small numbers and on weighing techniques which were not ideal, are suggestive of a significantly higher growth rate in the urban as compared to the rural population. This finding is consistent with comparable data from other groups, and with the dietary data presented earlier in this report (Part IV)¹.

Comparative data on growth rates and diet

The basic 'malnutrition rate', defined as the percentage of under-fives whose weights fall below 80% of the Harvard standard, is of limited value in comparing populations. Since many groups of Papua New Guinean children follow growth curves which are quite close to the

¹13 of the 65 Lae children had coastal mothers, and all had Fore fathers. Thus, the effects on growth of genetic differences between the rural and urban samples are unlikely to have been significant, and the genetic factor is not considered further.

80% standard curve, small differences between populations can lead to large differences in the reported malnutrition rates; the significance of the differences in growth patterns can only be assessed by using some measure of dispersion about the mean, in narrow age groups. Where such data are available, the 'malnutrition rate' is superfluous as an indicator of nutritional status. Furthermore, the malnutrition rates reported by the Department of Public Health (e.g. NPO, 1978b) relate only to MCH clinic attenders. The rate which I observed in Awande included some non-clinic attenders, and, at 48%, compares with a 1977 rate among clinic attenders in the Okapa District as a whole of 31% (unpublished records), and with a 1978 rate for the Eastern Highlands Province of 32%. Non-attenders tend to be in older age groups, to live in more remote areas, and to receive less medical treatment than attenders; on all three counts they are more likely to be underweight.

Turning to more detailed, age-specific data on weight for age, higher weights have been reported for children in Kundiawa as compared to surrounding rural areas of Chimbu (Bailey, 1963, Figure 1; and Lambert, 1975b, Table 7), and for children in urban Lae as compared to those of highland populations in Bundi and in the Asai Valley (Malcolm, 1973, 1974). For the highland children, Malcolm concludes that, "total food intake is inadequate and is a major factor in determining insufficient protein intake and consequently impaired growth" (Malcolm, 1974). He mentions the bulky nature of the staple foods, and "the reluctance of mothers to actively encourage their children to eat food at any age", as two reasons for the inadequate total food intake. In a similar vein, Hipsley (1964) considers that intake of dietary fat, and frequency of feeding, are the two critical factors influencing infant and toddler nutrition in Papua New Guinea, and he advocates greater use in infant and toddler diets of locally produced fat-rich foods, such as peanuts in the highlands, and coconut cream in the lowlands. The importance of bulk as a limiting factor in total food intake has been experimentally demonstrated among Enga children by Binns (1976b), who also achieved encouraging results in a pilot nutrition intervention programme using red palm oil as a dietary

supplement (Binns, 1976c)¹.

The Fore urban staple of white rice is not, when cooked, much different in energy content per unit weight or volume from the rural staple of sweet potato though it is marginally higher in protein content. It is probably other items in the urban and rural diets, and particularly those rich in fats, which are critical in causing the apparent differences in growth rates. In the Awande recall surveys, the main sources of fat were pig, tinned fish and tinned dripping, all consumed infrequently; pandanus nuts and red pandanus oil were seasonally available in small quantities, and a few families grew peanuts, which they mostly sold at the local market. In Lae, the recall survey revealed frequent consumption of tinned fish, tinned, fresh, and frozen meat, and fatty spreads (butter, margarine and peanut butter); dripping and coconut cream were quite often used in cooking; and children were sometimes given ice-creams and other sweets or fatty snack foods. It seems likely, then, that overall the Lae diet is more concentrated in terms of energy and protein, and that this would largely account for the observed differences in weights for age².

Morbidity and mortality

Reid and Gadajsek (1969) and Hornabrook (1976b) both report a very low occurrence of overt malnutrition among the rural Fore³ during the 1960's, when extensive medical and biological research was being conducted in the area in relation to *kuru*. During the first seven

¹A palm oil trial on a much larger scale during 1977 included sale of the oil in local tradestores, combined with publicity emphasising its use as a children's food. The palm oil was widely accepted, but preliminary analysis of the data suggests that the larger trial had less impressive results in terms of child growth than the pilot trial; a possible reason for this might be diversion of the palm oil away from infants and young children, towards general household consumption (Binns, personal communication, 1978).

²The same conclusion was reached by Malcolm (1973): "... the Papua New Guinean child has a potential for growth which is being realised in the town but not in the village. This difference may be largely attributed to the generally higher protein intake achieved in the urban diet ... as well as a probably lower rate of morbidity".

³This applied both to children and to adults.

months of 1977, only one case of frank malnutrition was admitted to Okapa Hospital; according to hospital staff, such cases are rarely seen, and are usually the result of the death of the mother at child-birth, leading to inadequate feeding and care of the newborn infant. The Fore may suffer less overt malnutrition than some other highland groups such as the Chimbu, but the general pattern of infant and child morbidity and mortality is probably similar to that observed throughout the highlands. In the highlands as a whole, respiratory and gastro-intestinal infections are the leading causes of death, infant mortality rates range from 50 to 150 per 1000 births, and toddler (1-4 years) mortality rates average about 14 per 1000 per year (Bell, 1973).

Data on mortality and morbidity in Lae are given by Malcolm (1973), who calculated an infant mortality rate of 36 per 1000 (22 per 1000 of which were neonatal deaths, a third of them attributed to prematurity), and a toddler mortality rate of 4 per 1000, for 1971. The biggest single cause of postneonatal deaths in Lae urban residents (including adults) was pneumonia (24%), followed by motor vehicle accidents (11%). Malaria accounted for 6% of deaths. Malcolm believes that squatter type shanty housing (such as that occupied by the Fore) is not a major health hazard:

"The relatively low rate of diarrhoeal disease and death ... does not support the contention that the apparent insanitary standards are leading to serious health problems. All the evidence would in fact suggest that it is healthier to live in an urban slum than a well-kept rural village" (ibid).

Growth rates, nutrition and infection

An improved growth rate is not necessarily desirable in itself, unless it can also be shown that the improved nutritional status, of which it is an indication, is associated with reduced morbidity¹. The synergism between nutrition and infection has been reviewed by Scrimshaw, Taylor and Gordon (1968), and studied in extensive field projects in Guatemala (Scrimshaw, Guzman et al., 1968) and in the Punjab (Waterlow, 1975). The relative contributions made to reducing infection by medical and

¹Malcolm (1970 a and b, 1974) and Hipsley (1976) have argued that sub-maximal growth may be a useful adaptation to a low-protein diet, and that it may be partly genetically determined. The distinction between 'response' and 'adaptation' is not a clear one, but there is certainly no reason to believe that the maximal growth rate, any more than the maximum adult body size, is the optimal one.

nutritional programmes respectively are difficult to disentangle, but where infectious diseases are highly prevalent both can be expected to achieve positive results.

In Papua New Guinea the interaction of nutrition and diarrhoeal infection has been discussed by Biddulph (1973); he emphasises that 'weanling diarrhoea' is often precipitated by a combination of two factors, the contamination of food by infectious pathogens, and the introduction of the child to a high-bulk, low-protein diet. The initial incidence of disease can precipitate a vicious cycle of infection-malnutrition-reduced resistance-more severe infection, often ending in death. While there is widespread recognition of the interactive nature of nutrition and infection, there is less agreement on how best to tackle the high morbidity and mortality rates which prevail in much of Papua New Guinea. Opposing points of view are nicely represented by two authorities who have both made intensive studies of the problems in different parts of the highlands.

Malcolm (1974), commenting on a dramatic decline in the Bundi toddler mortality rate, from 50 to 10 per 1000 between 1960 and 1967, concludes that:

"Despite these dramatic changes, child health records of weights showed no significant increase ... there was virtually no economic development to permit changes in traditional food consumption ... the changing prevalence of disease and death could be largely attributable to the provision of a simple preventive and treatment service".

In contrast, Binns (1976a) stresses the role of nutrition in improving the health status of Enga children at Wapenamanda. He found statistically significant relationships between weight-for-age status and subsequent incidence of pneumonia and diarrhoeal disease, and concludes as follows:

"Although MCH Clinics have proven their worth, there is a need for investigation of further nutrition intervention in order to overcome the limitations imposed by the bulky sweet potato diet. There seems little doubt that improving the nutrition of the Enga children would substantially reduce their mortality and morbidity rates."

The palm oil supplementation programme described earlier in this discussion was of course an outcome of these observations, but its

effects on mortality and morbidity have yet to be evaluated¹. The differing emphases of Malcolm and Binns may be due to real differences in the needs of the particular groups in question, who occupy different environments and are genetically distinct. It may also be relevant that the toddler mortality rate among the Bundi was 50 per 1000 at the start of the health care programme, compared to a rate of 12 per 1000 at Wapenamanda during Binns' study. Thus, while the health services were clearly effective in reducing the Bundi rate from its initial high level, a further reduction might have been achieved by adding a nutritional component to the programme; 10 per 1000 is still an unacceptably high mortality level.

Finally, it should be pointed out that the Department of Public Health estimates that:

"Although only 7% of hospital deaths² of children under 5 are directly caused by malnutrition, a further 72% of child hospital deaths may have malnutrition of the child or mother as a related cause." (NPO, 1978c).

Preventive and curative medicine, nutrition and health education, and nutrition intervention programmes are all necessary and complementary approaches to the goal of reducing infant and child mortality. The emphasis given to each should vary according to the specific needs of a particular population; it will also depend upon economic and organisational constraints.

Conclusions

a. The rural Fore. Infants and small children in the Fore region

¹Another study, of less direct relevance in that it concentrates on nutrient intakes and refers only indirectly to indicators of nutritional status, is that by Ferro-Luzzi et al. (1975). They studied children on Kar Kar Island and at Lufa in the Eastern Highlands, and found that energy and protein intakes were generally satisfactory on a *weight* basis. Re-evaluating the results on an *age* basis, they conclude that, "... the high proportion of nutritionally inadequate diets, assessed on an age basis using materially favoured Caucasian populations as standards, do not match with physiological or clinical signs and symptoms of malnutrition in these New Guinea children." They do not comment on mortality and morbidity rates.

²Statistics for deaths outside hospitals do not exist. These figures presumably give a rough indication at least of the general situation throughout the country.

experience growth and morbidity and mortality patterns which are similar to those in most parts of the highlands of New Guinea. These patterns are influenced partly by a total food intake which is restricted both by the bulky nature of the diet, and by the cultural conventions of infant and child feeding; the patterns are also influenced by the level of preventive and curative medical services available in the region. In order to improve infant and child health, the efforts of the authorities might most usefully be channelled in two directions. One aim should be to ensure that as many infants and toddlers as possible are enrolled, and thereafter seen regularly by the MCH clinic staff. In the long term, full realisation of this aim will depend upon increasing the level of motivation among parents, but in the short term some progress might be made by giving more publicity to the aims of the clinics, by developing better communications between clinic organisers and influential villagers, and by encouraging a more sympathetic attitude among clinic staff towards mothers of underweight children. The second aim should be to spread the idea that energy-rich foods such as pandanus nuts and peanuts, red pandanus oil, tinned fish and tinned dripping are especially good foods *for small children*¹, and should be given to them, with their normal diets, in small quantities but often; this message could be publicised through clinics, Aid Posts, local councillors, schools and tradestores.

b. The urban Fore. The diet of the urban Fore is apparently richer in energy and protein than is the rural diet, and supports a faster growth rate; it is highly probable that child morbidity and mortality rates are lower than in the rural area. As in the latter, the aims should be pursued of maximising clinic attendance, and further encouraging the consumption by small children of energy- and protein-rich foods; coconut oil in particular should be stressed as a good supplement to children's diets. Additional nutritional messages emphasising the importance of fresh vegetables and fruit, and the dangers of excessively refined and sweet foods, might also be given attention. With regard to infectious disease, the importance of using clean water (which in the settlements often means boiled water), and of preventive measures against malaria should be

¹The availability of increasing the consumption of animal fat by *adults* is of course much more dubious.

given priority. The risk that the richer urban diet might lead to new health problems, such as obesity and dental caries, will be considered in the next chapter, in which the discussion will be expanded to include older age groups, and wider aspects of health and well-being.

CHAPTER 14

NUTRITION, HEALTH AND WELL-BEING IN THEIR ECOLOGICAL SETTINGIntroduction

In the preceding chapter, the relationships between nutrition, growth, and morbidity and mortality in young children were discussed in some detail, in the context of the observed weight-for-age distributions in the Awande and Lae samples. For adults, no data were collected on nutritional status or morbidity and mortality, and this chapter will necessarily be of a somewhat more general and speculative nature. Once again, extensive reference will be made to related studies in Papua New Guinea. After considering nutritional status and general physical health in adults in the rural and urban environments, I shall discuss the concept of overall health and well-being in its social context, and the place within it of food and nutrition. Finally, I shall return to the conceptual model outlined at the beginning of this report, and comment on some of its strengths and weaknesses in the light of the use made of it in the rest of the report.

Physical healthAnthropometric status

a. Awande. Casual observation of people in Awande suggested that weights, heights and subcutaneous fat levels tended to be lower than current Australian standards, at all ages and for both sexes. Weight and fat levels appeared to decrease with age after the third or fourth decade, particularly in women. Maximum levels were probably reached between the ages of fifteen and twenty-five years. These observations are consistent with accurate measurements made in other areas of the highlands (e.g. Bailey, 1963; Vines, 1970; Sinnett, 1973 and 1977; Norgan et al. 1974). These generally reveal a gradual decline in weights, heights, weight:height ratios and skinfold thicknesses through later adulthood, beginning at an earlier age in women than in men. The sex difference was attributed by Bailey (op.cit.) to the chronic stress

imposed on women by their strenuous physical exertion in garden work, rather than to the effects of repeated cycles of pregnancy, childbirth and lactation. Bailey, and Sinnett (op.cit.) both conclude that the anthropometric changes are indicative of sub-optimal nutritional status, but Sinnett emphasises that such a conclusion can be reached.

"...only in the light of our knowledge of the morbidity and mortality patterns of the community and our evaluation of their acceptability." (Sinnett, 1977, pp.84-5).

Norgan et al. (1974) believe that the progressive reduction in heights and masses in older age groups may represent the "proper" physiological processes, as opposed to the European norm of a steady increase in body fat with ageing.

b. Lae. The Fore adult population contacted in Lae included very few men over about thirty-five years, and few women over thirty; the only elderly Fore in Lae were visitors from the village. Thus no observations could be made about changes with age. The stature and body build of the adults in town did not appear to differ markedly from those of their village contemporaries. No one was obviously obese by Australian standards, but skinfold measurements might well have revealed significant differences between town and village, given the nature of the urban diet. Vines (op.cit.) studied inhabitants of several "highly urbanised villages" in the course of his 1964-66 baseline epidemiological survey, and comments:

"A very significant consistent observation was the association of urbanisation ... with greater skinfold thickness, higher serum cholesterol levels, higher serum albumin levels, lower serum globulin levels, and lower height-weight ratios than the villagers or overall sample. The explanation of this phenomenon must lie partly in the bread, rice, tinned fish and tinned meat which constitute a large proportion of the diet of urbanised people." (ibid, p.272).

It must be remembered that very few of the Fore in Lae had been there, or in any urban centre, for as long as a decade. It would be interesting to observe the future physical development of long term urban residents, especially those born in town¹.

¹Most of the adult Fore now living in town expect to return to their villages eventually, but it is not clear what will happen to their children: many adolescents would probably find the prospect of moving to the village less attractive than that of staying on in the town, the environment in which they were brought up.

Physical fitness

a. Awande. Adult men and women in Awande appeared to be physically much more fit, as judged by their ability to perform arduous and energetic physical work, than would be expected for a typical urban Australian population. Women walked to their gardens almost daily, often over distances of up to 4 or 5 km. from their hamlets, spending the day in garden tasks and returning home with loads of up to 20 or 30 kg. of food on their backs. Men's daily physical activity was more variable, but quite often included such energetic tasks as tree-felling, construction and erection of fence posts, clearing of secondary bush, and carrying timber. Both sexes were able to walk up and down very steep and often slippery paths with apparent ease, even while carrying heavy loads.

Again, these casual observations are supported by measurements of physical fitness in other highland groups (Hipsley and Kirk, 1965; Sinnett and Solomon, 1968), which have shown levels as good as or better than those of Australian servicemen. Norgan et al. (op.cit.), in the most detailed study yet made of energy expenditure by Papua New Guineans, showed that, both at Lufa and on Kar Kar Island, most daily activities involved only 'light' or 'moderate' energy expenditures; this applied even to gardening tasks. Their evidence supports Hipsley and Kirk's assertion that the high levels of physical fitness which they observed were due not to a high total energy expenditure, but to frequent bursts of highly energetic activity (such as carrying a heavy load uphill) interspersed with longer periods of lower activity; this pattern increases muscular and cardiovascular efficiency.

b. Lae. In Lae, the level of energy expenditure by both sexes is almost certainly lower than in the rural environment. Some women and a few men cultivate relatively small gardens, and a few men have energetic jobs such as road-mending or wharf-labouring. On the whole, though, subsistence and work activities use less energy than in the village, few people take part in active physical recreation, and there is rather less walking from place to place, because of both the oppressive climate, and the availability of public transport. Finally, the higher ambient temperatures in Lae may result in a lower basal metabolic rate, although the FAO/WHO committee on energy and protein

requirements was unwilling to quantify this relationship (WHO, 1973).

Infectious and degenerative disease status

a. The rural Fore. General information on disease occurrence among the rural Fore in the 1960's was collected in connection with investigations into *kuru*, and is summarised by Hornabrook (1976b), as follows:

"The people are characterised by a freedom from the degenerative arteriosclerotic diseases of diabetes and of gout. Apart from *kuru* (now almost disappeared) there is a high incidence of chronic respiratory disease which is a serious problem in the middle-aged. In contrast to the picture in a western society more people suffer from anaemia, but this does not seem to be incommoding. Alimentary parasites, whilst ubiquitous, do not apparently cause any physiological embarrassment to the host. Leprosy is uncommon and malaria is only of local and occasional importance." (ibid. p.65, my parentheses).

Although chronic under- or mal-nutrition have some effect in reducing resistance to most infections (Scrimshaw, Taylor and Gordon, 1968), chronic respiratory disease is probably not greatly influenced by poor nutrition; environmental factors, such as the smoke-filled houses with poor ventilation, and the widespread use of both home-grown and commercially prepared tobacco, are probably more important. Helminthic and protozoal parasitism, and associated anaemia, tend to be exacerbated by a diet low in protein (ibid), so that the high prevalence of these diseases may be partly due to the nature of the rural Fore diet.

Hornabrook (op.cit., p.61) states that, "An unexpected observation in these villages was the existence of a high prevalence of dental caries", but he gives no details. Venkatachalam (1962), Hipsley and Kirk (op.cit.), and Vines (op.cit) all note the relatively high prevalence of dental caries in highland populations in Papua New Guinea, as compared to coastal populations, but no satisfactory explanation has been given for this difference. Mineral, and in particular fluorine intakes may be of some significance. The observed rates were lower than those prevalent in Australia and New Zealand.

b. Lae. There are no published data on morbidity rates among highland migrants in Lae, but it is possible to infer, from environmental and dietary factors, what the main differences from the rural situation might be. The most important difference is almost certainly the high

incidence of malaria in the coastal region, it being a disease to which few adult highlanders have acquired any immunity before coming to the town; several Fore men in Lae told me they had had treatment for *sik malaria*, but none took prophylactics. Sanitation and water supplies in the settlements in Lae are far from satisfactory, so that gastro-intestinal disease may be quite common. On the other hand, the absence of pigs and the low numbers of other domestic animals may reduce the incidence of parasitic infections, and the practice of cooking out of doors or on kerosene stoves, combined with the lack of any need for heating at night, may have some beneficial effect on respiratory ailments. The dietary data strongly suggest that dental caries should be more prevalent in Lae than in the rural areas, because of the relatively high consumption of refined cereals, and refined sugar in drinks and snack foods.

Turning now to the degenerative diseases, the finding by Vines (op.cit.) of higher cholesterol levels among urbanised villagers has already been mentioned; the Fore diet in Lae is likely to lead to this result, among others. Degenerative diseases tend to affect the higher age groups, so that much direct evidence of their occurrence among urbanised Fore would not yet be expected. Sinnett and Buck (1974), in an article focussing on the probable future incidence of coronary heart disease in Papua New Guinea conclude, for the country as a whole, that:

"... social and economic development is likely to result not simply in a replacement of infectious disease by chronic degenerative disease, but rather in an increase in the total spectrum of disease in which vascular disease, diabetes, hypertension, and cancer will be added to the existing problems of infectious disease."

In affluent countries, where the chronic degenerative diseases mentioned are highly prevalent, over-refined, sweet and fat-rich diets have been implicated in their aetiology. Such diets are becoming the norm in urban areas in Papua New Guinea. Furthermore, increased cash income in the towns is often associated with increased use of tobacco, thus leading to a higher risk of chronic bronchitis, lung cancer, and coronary heart disease.

Nutritional and physical health: summary

The relationships between diet on the one hand, and parameters of physical health such as growth rates, anthropometric status, and

infectious and non-infectious disease status on the other, have been summarised in relation to children in the previous chapter, and in relation to adults in the foregoing sections of this chapter. The various parameters of physical health have been shown to be inextricably linked with each other and with nutrition in a number of ways, and the main features of the rural and urban situations can be summarised as follows:

a. The rural situation. Among the rural Fore, the most significant consequences for health of the high-bulk, low-protein, low-fat diet are a slow growth rate, small adult body size, and a decline in body fat and weight:height ratios in later adulthood. The low energy and low protein contents of the diet are probably indirectly responsible for a large part of the high infant and toddler morbidity and mortality from infectious gastro-intestinal and respiratory diseases. The diet, however, supports high levels of physical fitness in adults, and is not conducive to the development of diet-related degenerative diseases such as diabetes, hypertension, or coronary heart disease.

b. The urban situation. Among the urban Fore, the diet is relatively richer in energy, total protein and animal protein, fats, and sugar. On the one hand, these factors probably result in increased growth rates in children, associated with increased resistance to infectious diseases and hence lowered morbidity and mortality; on the other, they are likely to lead eventually to increasing incidence of dental caries and obesity at all ages, and chronic degenerative diseases in later life. Because the population is still young and only recently urbanised, the latter conditions are not yet highly prevalent. The possibility of specific nutritional deficiencies, such as hypovitaminoses, resulting from the overconsumption of highly refined foods, should not be overlooked, but seems unlikely on the present diet.

Overall, then, it is a somewhat subjective judgement as to whether the rural or the urban diet is the 'healthier'. On the rural diet, fewer children will survive the vulnerable early years to reach adulthood, but those that do survive will be fitter, and less prone to degenerative diseases in later life, than their urban *wantok*. If a slow rate of growth leading to small adult size is indeed a valuable

adaptation to a low-protein diet, as Malcolm (1970 a and b, 1974) and Hipsley (1976) argue, then the faster growing and larger children brought up on the urban diet might find it difficult to adapt later to the rural diet, if and when they move to the village¹.

Other aspects of health and well-being

Food and nutrition in relation to other needs

So far I have considered nutrition as it affects certain aspects of physical health. However, an ecological view of health and well-being, even at the individual level, must adopt a wider perspective. Hipsley (ibid) quotes a definition of health given by Dubos (1959): health is "the condition best suited to reach goals that each individual formulates for himself". These goals may include a sense of physical well-being and vigour, but some people would place higher values on alternative goals, be they material, sensual, intellectual or spiritual. There are two points to be made here. The first is that some of these alternative goals may be realised through food consumption, regardless of its nutritional implications; the second and related point is that other goals, unrelated to food consumption, may be emphasised by some individuals to the detriment of their nutritional status, but to the benefit of their total sense of well-being.

With regard to the first point, the many functions of food have been discussed by Lee (1957), and also by Whiteman (1966); they both use illustrations from western societies and from several areas of Papua New Guinea. Among the functions Whiteman lists are the role of food in conferring status, food as currency, food as an exchange medium in cementing social relations, aesthetic and creative satisfaction in food production and preparation, food as a source of religious satisfaction or symbolic significance, food as medicine, food consumption as recreation, and legal functions of food. Examples of most of these can be found in Fore society, and some have been mentioned in

¹A similar argument would apply to possible metabolic adaptations to low protein intakes, if they were partly or wholly determined by early development. Two such adaptations which have been postulated, but not yet proven, to exist in sweet potato eaters in PNG are nitrogen fixation by intestinal flora (Oomen and Corden, 1970), and recycling of urea nitrogen (Hipsley, 1976). Norgan et al, (1974) seem to doubt the existence of such adaptations.

earlier chapters. For example: ownership and slaughter of a large pig confers status; garden and store foods are used on ceremonial occasions such as the payment of bride price and funerary settlements; the *mumu* combines elements of aesthetic and creative satisfaction, recreation, and expression of social relationships; some food taboos are based on the traditional belief in sympathetic magic, and others on the teaching of a newly-introduced religious sect (Seventh Day Adventism), both of which use foods as symbols of other forces; and certain foods, including pig meat and wild herbs, are used in the treatment of sickness of various kinds. In urban Fore society, some of these functions of food have been curtailed, or their form of expression modified. The recreational aspect of food consumption, for instance, is exemplified by the high expenditure on snack foods and drinks, and on beer.

Turning to the second point, the place of food and nutrition in relation to other needs has also been discussed earlier, particularly under the heading 'competing needs and values'. Hipsley (1964b) devoted a paper to this topic, using New Guinea as his example. Beyond the individual's obvious needs for ingestion, excretion and avoidance of harmful stimuli he listed the need to belong, to love and be loved, the need to understand, and the need to express self through action, described as "self-actualization - the need to pursue rewarding goals". After discussing the contrasting ways in which, and the degrees to which these needs are satisfied in rural Papua New Guinean societies as compared to western societies, he concludes:

"... there may be a tendency today to place too much emphasis on the need for food at the expense of other basic needs. It is of course desirable to provide the best possible diet, but this diet is to be considered as no more important than any other basic need."

The source of Hipsley's concern appears to be that emphasis on the provision of more, and special foods, particularly for infants, may lead to increasing dependence on outside sources and on cash income, associated with a decreasing interest in subsistence production and self-reliance, which, he believes, traditionally satisfied all the basic needs of individuals. This issue is discussed below under the heading 'Food dependency'.

The individual, then, uses food for purposes other than the satisfaction of appetite and of nutritional requirements; indeed these may not be among his or her primary values in life. The role of the authorities

concerned with food and nutrition is twofold: first, to ensure as far as possible that an adequate and nutritious food supply is readily available to every individual, and second, to ensure that every individual has the necessary knowledge to make an informed choice from the range of foods available. One can be reasonably hopeful that well-informed parents will make a nutritionally sound choice of food for their small children; but experience in affluent countries suggests that even well-informed adults will not necessarily do so for themselves.

Changing perceptions of nutrition and health

While it is true that an individual's health can only be judged in relation to his or her own goals, these goals are more or less dependent on the prevailing cultural norms, expectations and values. As these change, so will people's perception of their own health change. In the case of growth rates, for example, a whole generation of Papua New Guineans is now being taught, through the use of standardised weight charts, to regard as 'retarded', the growth rates which their parents' generation regarded as normal. Similarly, high mortality among infants and toddlers has traditionally been accepted as the norm, though not of course without grief and concern; increasingly, the effect of medical treatment and improved nutrition is to lower these mortality rates, and hence to raise people's expectations. When the connections between better nutrition, improved growth rates, and decreased morbidity and mortality are firmly established, and instilled into the consciousness of parents, the prospects for raising overall nutrition and health standards will be greatly improved.

The necessary changes in perception can be expected to occur not only through the official channels of health education in schools, clinics and the media but also, and as importantly, through the visible example of children in better-fed families. In Awande, for instance, the family of the carpenter, who earned a full-time wage and had had six years' primary education, regularly added rice and tinned meat and fish to their diet; the three young children and their mother were strikingly sturdier in appearance than average. The constant flow of people to and from the towns also provides the opportunity for villagers to observe the growth of children fed on the richer urban diet, and for urban migrants to reflect on the better growth of their

own children.

If perceptions do in fact continue to change in this direction, the long term consequences are debatable. There is little doubt that regularly supplementing the rural diet with energy rich foods, especially tinned fish with its high oil and protein content, will improve toddlers' growth and increase their resistance to infection. However, there are two obvious dangers associated with increased use of store foods. The first is that people will not learn to discriminate between the good and the bad store foods, or between moderate and excessive use of them : the result might be increasing incidence, in the village as well as the town, of the chronic degenerative diseases discussed earlier. The second danger is that of increasing dependence on outside systems of food production and supply, and on cash income to purchase these foods.

Dependency and self-reliance

The issue of food dependency has been discussed in the Pacific context by McGee (1975), who uses the term 'dietary colonialism' to denote "the subject of dietary changes initiated by colonial contact and control". He shows that among the Pacific Islands, food imports as a percentage of total imports in 1970-73 varied from 15.7% (Guam and Norfolk Island) to 39.5% (Niue Island); the figure quoted for Papua New Guinea in 1971-72 was 20.1%. By 1973-74, food and beverage imports to Papua New Guinea had risen to K59.5 million, or 26.0% of the total import bill of K228.9 million (Bureau of Statistics, 1976)¹. They were made up as follows:

	K million
Cereal grains and preparations	14.7
Meat and meat preparations	14.5
Fish and fish preparations	10.1
Sugar, honey etc.	5.7
Fruit and vegetables	3.8
Dairy products and eggs	3.4
Beverages	2.1
Coffee, tea, cocoa, spices etc.	1.3
Animal feedstuffs	1.3
Miscellaneous	2.6
TOTAL	59.5

¹ Figures are 'free on board' values of goods, i.e. they exclude freight and handling costs, hence underestimating the total cost of the imports. In 1975/6 food imports made up only 21% of total imports by value, but the general pattern of imports was similar to that described here (NPO, 1978a).

Although much of the imported food is destined for urban consumption, not only by Papua New Guineans but also by the very affluent and nutritionally conservative expatriate community, tradestores throughout the rural areas of the country also sell significant quantities.

Food dependency carries a number of dangers, among which are the following (adapted from McGee, op.cit.): a chronic drain on foreign currency reserves, and/or dependence on foreign aid; possible nutritional problems caused by the nature of the imported foods; loss of traditional skills used in food production; declining taste for traditional foods; and a general, uncritical desire for imported goods, fashions and techniques, which may be as harmful to the culture as the cost of food imports is to the economy, and the quality of some of them is to nutrition. These dangers are well recognised by the national planning authorities, and are taken into account in the new National Food and Nutrition Policy (NPO, 1973a). One of the latter's main targets is to encourage domestic production to reach a level which will at least avoid the necessity for any increase in the total volume of food imports over the next ten years.

Dangers which apply at the national level can also be identified at the local level. The mixed subsistence/cash-cropping economy of the rural Fore, for example, shows parallels to the national economy in that, at present, most food is home-produced, but cash from the sale of coffee is used largely for imported foods. If dependence on imported foods were to increase beyond a certain level, a slump in the international coffee market, or a local epidemic of coffee disease, could have disastrous nutritional and social effects. The departure of many young men for the town, at the age when they would otherwise be starting to practise subsistence skills learnt from their fathers' generation, poses another threat to the long term resilience of the subsistence mode of production. In ecological terms, the Fore have already departed markedly from the state which Clarke (1977) has called 'paleotechnic permanence', in which shifting cultivation was carried out in a self-sustaining ecosystem, and was dependent only upon local and renewable energy and material resources. But they are still far from the state of 'neotechnic impermanence' represented by fully

mechanised agricultural systems, dependent upon complex technology and continuous inputs of fossil fuels and inorganic fertilisers.

Urban migrants in Papua New Guinea, such as the Fore living in Lae, are largely dependent on imported foods purchased with cash earned in the urban economy, but there is still some flexibility in their position. Most of them still have rights of use on village land and could, if the urban economy were severely disrupted, return to take up their traditional roles in village society. Even within the urban environment, there may still be some potential for increasing subsistence gardening on a sustainable basis, which could protect permanent urban dwellers from the worst effects of an interruption or reduction in imported food supplies, however caused.

The long term dangers of food dependency are less easily perceived than are the immediate material benefits of economic growth. In a paper entitled 'The Dilemma of Development', Clarke (1973) is concerned with the long term ecological implications of economic development:

"When argued now, the case for development - 'but that's what the people want' - is unethical, for it is certainly not the obligation of a government to acknowledge and encourage the desire for development while not informing of the consequences of that development. Of course people want things, but they should know what they will have to pay for them; then the choice they make can be free."
(ibid., p.289).

The importation of foods from overseas is one aspect of 'development' as it has generally been interpreted, and Clarke's argument applies as forcibly to the specific as to the general case. Like drug addiction, food dependency can not only cause health problems while it persists, but it can also cause withdrawal symptoms when it is broken; but to extend the analogy, just as with drugs, the selective and moderate use of nutritious imported foods may offer real benefits, as in the use of tinned fish as a dietary supplement for highland children. The government may be forced to limit supplies of some imported foods, for economic reasons; it must also try to influence demand for these foods in directions which are both economically and nutritionally acceptable.

The conceptual model

This chapter has been concerned mainly with the set of variables shown in the 'Total Health and Well-being' compartment of the conceptual model (Figure 1, p.8) and with their relationship to 'other aspects of environment and lifestyle' and to food consumption itself. I have referred as well to the food resources and food beliefs and preferences of the populations under discussion, and to environmental influences on these. In the course of discussing total health and well-being, then, it has been essential to recognise the interactive nature of a wide range of variables, thus emphasising the need for a multi-disciplinary approach to the study of nutrition. Such an approach is made more easily and more logically through the use of a conceptual model suited to the purpose.

In my own model, all the causal links (except that between food resources and food beliefs and preferences) are shown as one-way relationships. This simplification was convenient for relating the findings of particular local surveys to outside influences, but there are of course causal influences in the other direction, some of which have been identified in the course of discussion. For example, nutrition and disease status are not only influenced by, but themselves influence the quantity and quality of food consumption. Similarly, beliefs and preferences regarding particular foods are often formed only after their consumption, again a reversal of the main causal relationship shown in the diagram. Finally, and most critically, government policies are, or at least should be not only responsible for, but also responsive to peoples' needs for information, for nutritious foods, and for health care. In studying the way things are in a local situation, it is most useful to focus on how national factors influence local factors; in formulating alternatives for the future, one must ask how local factors can usefully influence national policies in such a way that their application becomes more appropriate to local needs.

In conclusion, it is perhaps worth emphasising that the conceptual model is no more than it claims to be: a theoretical model for the analysis of the environmental influences on, and the health implications of, the food habits of localised populations. It is not much help in understanding the relationships between separate localised populations,

and in particular, it does not represent the interactive relationships between rural and urban Fore populations, which have been stressed throughout this report. Perhaps its most important feature is its applicability to both of these populations, and its potential applicability to the study of food habits in other populations in Papua New Guinea and elsewhere.

CHAPTER 15

SUMMARY AND RECOMMENDATIONS

In this final chapter, I present a general summary of the main findings described in earlier chapters of the report; the findings are summarised separately in relation to the rural Fore population, the urban Fore population in Lae, and rural-urban relationships. Following the summary, I list a number of recommendations relating to national and local food and nutrition policies, based on the evidence presented earlier. Anyone turning to this chapter before (or instead of) reading the bulk of the report is urged to refer to the relevant chapters for details of the sample populations and their environments, the research aims and methods, and the substantive evidence on which the summary and recommendations are based.

The rural populationa. Food resources.

i) Subsistence gardening is by far the most important source of food; the dominant crop is sweet potato, but a wide variety of other starchy staples and green vegetables is cultivated; some crops are seasonal, but there is no annual period of scarcity.

ii) Animal husbandry, mainly of pigs but including some poultry and cattle, provides an irregular supply of animal protein, but meat production is of secondary concern compared to the pursuit of wealth and status.

iii) Hunting and gathering of small game, fungi, nuts, fruits and herbs add variety to the diet, but the recreational and aesthetic associations of these activities are of more significance than their nutritional implications.

iv) Purchase of foods, mainly from local tradestores but occasionally from markets and from distant urban centres, is made possible by cash earnings from coffee sales and, in some cases, from sales of garden produce, and from wage labour; but it is not a major source of food except for those in full time paid employment.

v) Overall, there is no absolute shortage of food, but the present pattern of crop production and animal husbandry does not provide an optimum balance of nutrients; in particular, the emphasis on sweet potato in the gardens leads to a diet low in protein and high in bulk.

b. Food beliefs and preferences.

i) The most important belief is that the body's needs are fully met by sweet potato, described as a 'strong' food; other 'strong' foods are starchy garden crops, and sugarcane; green vegetables, meat and most store foods are generally regarded as good to eat for their taste, but not as being necessary or particularly beneficial to health.

ii) Small children are not thought to require any special foods; they start eating solids by about six months, and are expected to eat much the same diet as adults by the age of two or three; they are breastfed for at least two years and sometimes for four or five.

iii) Diarrhoea is known to be related to the consumption of certain foods, such as an excess of pork; emaciation in children is said to be caused by menstrual pollution or parental adultery; cures for both conditions are sought in a combination of clinic or hospital treatment, and administration of traditional herbal and dietary remedies.

iv) Certain food taboos based on ideas of sympathetic magic are imposed on pregnant women and young male initiates, and pork, game and all stimulants are forbidden to Seventh Day Adventists, of whom there are many in certain areas of the region; only the SDA taboo on pork is of much nutritional significance.

v) Food beliefs and preferences are changing under the influence of schools, clinics and hospitals, missions, new food resources and ideas brought back to the village from the urban environment; the beliefs of the older and less educated villagers tend to be more 'traditional' than those of the young and educated, who are also more likely to have experienced urban life.

c. Food consumption.

i) The diet of adults and children is dominated by sweet potato, which is eaten at least twice a day; at breakfast it is usually eaten alone,

and at the main evening meal it is usually accompanied by green leafy vegetables, *pitpit* or both, and sometimes by green beans, corn, mushrooms, meat and other items.

ii) Pork is consumed irregularly, on average once or twice a month, usually on important social or ceremonial occasions; the consumption of meat is increased by the purchase of frozen beef, pork and mutton from large stores in the region, and by hunting small game.

iii) The most common store foods are white rice and tinned fish, but on average these would be consumed only about once every two or three weeks; other store foods consumed occasionally include salt, biscuits, tinned meat, aerated soft drinks and cheesepops; beer is drunk mainly at *singsing* festivals held during the coffee season.

iv) Overall, the dominance of sweet potato makes the diet high in unrefined carbohydrate, low in protein, low in fat and high in physical bulk; such a diet is poorly suited to the needs of small children, who find it difficult to eat sufficient quantities to satisfy either their energy or their protein requirements, especially since most of them eat only two meals a day.

d. Health and well-being.

i) The average growth rate of pre-school children is well below the Harvard Standard, and approximately half these children are 'malnourished' judged by the criterion used by the Papua New Guinea Department of Health (i.e. below 80% of the Harvard Standard weight for age); gastro-intestinal and respiratory infections are highly prevalent, and child morbidity and mortality rates are probably above the national average.

ii) Individuals surviving to adulthood achieve a smaller body size, but a much higher level of physical fitness than would be typical of the Australian population; respiratory disease is the commonest cause of death, while degenerative diseases such as coronary heart disease, diabetes and cancer are virtually absent.

iii) Basic survival needs, and higher level, culturally derived needs are still satisfied mainly through subsistence activities which depend

on the use of locally available, renewable resources; however, population growth, and growing material aspirations encouraged by cash income from coffee, are tending to make complete self-reliance less attractive, less necessary and at the same time less feasible than before.

The urban population

a. Food resources.

i) Subsistence gardening makes a minor but nutritionally significant contribution to the food resources of most Fore households in Lae; suitable gardening land is in short supply and a sustainable system of garden management and tenure is not yet established; pig husbandry is not permitted in the town, but a few households keep poultry.

ii) Stores and shops, varying in size from small tradestores and snack bars to large supermarkets, constitute the main source of food; they carry a wide range of foods, most of them imported, but some produced locally; the items naturally vary greatly in their nutritional value and retail price.

iii) Several fresh food markets in Lae provide a good source of fresh fruit, vegetables and some animal products all the year round, but starchy tuberous staples are more expensive per unit of food energy provided than rice bought from stores.

iv) Overall, the food resources available in Lae are capable of providing a well balanced diet made up of a combination of fresh and processed foods; most consumers must purchase the greater part of their diet, and may therefore need guidance in the selection of suitable foods from the great diversity offered for sale.

b. Food beliefs and preferences.

i) Awareness of nutritional needs is somewhat more developed in the town than in the village, partly because the migrant population is younger and better educated; the wider range of foods available has led to a correspondingly greater range and diversity in food preferences.

ii) As well as the 'strong' foods, which in town are said to include rice as well as starchy root crops, vegetables and meat are generally known to be good for the body.

iii) Small children are believed to require special attention to their diets, in the form of the provision of a mixed diet, especially prepared mashed foods, and, in some cases, tinned baby foods; bottle-feeding is widely known to be a dangerous practice; the poor nutritional quality of sweet, sticky foods and their role in causing dental decay are less well known.

iv) Clinics and the hospital are routinely used for treatment and advice, and the importance of cleanliness in food preparation is generally recognised; emaciation of children is attributed to poor feeding practices.

v) Traditional food taboos are rarely followed, but there is a number of Seventh Day Adventists in the urban population who adhere more or less strictly to their church's prohibitions; there is widespread fear of certain coastal foods, related to sorcery beliefs, and to a belief that malaria can be caused by eating overripe fruit.

c. Food consumption.

i) The main staple in the town is white rice, but sweet potato and taro are consumed only slightly less frequently; these cooked starches are usually eaten at the main evening meal, accompanied by small amounts of green vegetables, and meat or fish.

ii) Animal protein is consumed almost every day, as tinned meat, tinned fish, fresh or frozen beef or chicken, and occasionally eggs; pork and fresh fish are rarely eaten.

iii) Breakfast most often consists of white bread or plain biscuits with or without butter and other spreads, accompanied by a hot sweetened beverage, usually coffee or Milo, sometimes with milk; hot sweetened beverages are also very popular with or after the evening meal.

iv) Working men often consume meat pies and aerated soft drinks at midday, and these items as well as ice-creams, buns, hot chicken and

chips, and fried battered fish are popular with all age groups, especially on weekend trips around town.

v) Incomes of most households are easily sufficient to secure a well balanced diet, but a disproportionate amount of the typical budget is taken up by snack foods; beer is not a major item of expenditure in most households.

vi) Overall, the urban diet is much richer in protein, particularly animal protein, than the rural diet; it is also more refined, sweeter, and higher in fat, and therefore less bulky and probably lower in some vitamins and minerals.

d. Health and well-being.

i) Pre-school children grow faster than their rural counterparts, and the proportion of 'malnourished' children in this age group is approximately one-fifth, less than half the rural rate; this is attributable partly to the higher protein and energy intakes in the town, and partly to a lower prevalence of most pathogens (except for malarial agents) and better access to medical services.

ii) The dietary data suggest that obesity, dental caries, hypertension, coronary heart disease, diabetes and cancer are more likely to develop in town dwellers than in villagers, but most migrants have lived in the urban environment for too short a time for such trends yet to be apparent.

iii) The urban population is largely dependent for its food on cash income, and much of the food which is purchased is imported from overseas; both factors render the population vulnerable to fluctuations in the national and international economy; the lack of opportunities for self-reliant, subsistence production may also have deleterious social and cultural consequences, especially for women, but this topic was not investigated in any depth.¹

Rural-urban relationships

i) The continuous flow of people of all ages from village to town and back testifies to, and ensures the continuance of, the strong

¹In another component project of the Papua New Guinea Human Ecology Programme, Dalton (in preparation) found evidence of such consequences among Chimbu women living in Lae.

sociocultural and economic links between the rural and urban populations; these are relevant to issues of food and nutrition, as follows.

ii) Gifts of food are carried by visitors in both directions: village produce to the town, and store and coastal items to the village; some food crops are also transplanted from one environment to the other.

iii) Food beliefs and preferences are carried in both directions: migrants initially arrive in town with their traditional beliefs and preferences which were learnt in the village; they modify these in the light of their urban experience, and on their return to the village exert a reciprocal influence; in particular, it is likely that villagers' perceptions of the link between diet and physical health will be modified through observation of improved growth in urban children.

iv) Actual food consumption in village and town is influenced directly by the behaviour of visitors from one to the other, and indirectly by the transfer of beliefs and preferences just referred to.

v) From the point of view of overall well-being, the villagers tend to benefit economically from the inflow of cash and goods from urban migrants, while the latter benefit from the security of knowing that they can return to village society to take up subsistence gardening (and cash-cropping) if they want to, or are forced to by changing circumstances in the town.

Recommendations

Objectives

The general objectives of national and local food and nutrition policies should be threefold:

- i) to ensure that an adequate and nutritious food supply is readily available to all, and that this food supply is produced, so far as is possible, from local resources;
- ii) to ensure that people have the motivation and knowledge necessary to select from this food supply a well balanced diet for themselves and their dependants; and
- iii) to ensure that preventive and curative medical services are

available to all nutritionally vulnerable groups, especially young children and pregnant and lactating women.

These objectives can only be realised through the development of a comprehensive food and nutrition policy which encourages integration of the activities of the various national and local government agencies involved. The recommendations listed below are derived only from consideration of the findings of the research described in this report, and are not intended to cover the entire range of issues relating to food and nutrition in Papua New Guinea. General and specific recommendations will be listed under four headings, relating respectively to the nature of the food supply, the selection of a nutritious diet, medical services and rural-urban relationships.

The nature of the food supply.

To promote the universal availability of a nutritious food supply, it is generally recommended that:

- *the Department of Primary Industry and other organisations should pursue research into the nutritional value and productivity of common indigenous crops, especially taro, sweet potato and legumes*
- *the government should consider the imposition of sales taxes and/or import duties on non-nutritious items such as aerated soft drinks, cheese-pops and sweet biscuits*
- *the government should encourage the local production and sale of more nutritious substitutes for popular items, such as fruit juices for aerated soft drinks, packeted peanuts for cheese-pops, red palm oil for dripping, and brown rice for white rice.*

In the rural Fore environment it is specifically recommended that:

- *D.P.I. extension officers should acquaint themselves with the nutritional problems and the subsistence techniques of the local population, by undertaking 'patrols' through hamlets and villages off the main roads.*
- *extension officers should encourage the cultivation of new varieties of peanuts, beans, corn and dark green vegetables,*

and ensure that where less nutritious crops such as common cabbages are grown for cash sale, they do not displace traditional greens from the household diet

- *extension officers should devote more time to assisting villagers with productive pig and poultry husbandry, and less time to cattle projects.*

In the urban environment of Lae, it is specifically recommended that:

- *efforts now underway to increase the scale and ensure the sustainability of subsistence and market gardening projects should continue to receive assistance from the local council and government agencies concerned, and that the performance of these projects should be carefully monitored over the next few years*
- *local fresh food markets should be expanded and their number added to as supply and demand for fresh foodstuffs increases*
- *settlement dwellers should be given technical assistance with small chicken projects, and the nutritional value of eggs particularly to small children should be emphasised.*

The selection of a nutritious diet

Even where a nutritious food supply is readily available, the selection of a well balanced diet depends on two conditions, namely sufficient nutritional knowledge, and a sufficient degree of motivation to apply this knowledge. It is therefore generally recommended that:

- *nutrition education should not only concentrate on teaching the components of a well balanced diet, but should emphasise the value of such a diet to the physical and mental capabilities of the individual*
- *all those directly involved in nutrition education should acquaint themselves with the dietary practices, food beliefs and preferences and nutritional status of the population among whom they work*

- *advertising of non-nutritious items of food and drink should be reduced, and simple nutrition education messages transmitted to the public through all available channels; these include schools, clinics, churches, markets, tradestores, cinemas, radio, newspapers and food labels.*

In the rural environment, in view of the bulky nature and the low protein content of the sweet potato staple, it is specifically recommended that:

- *parents should be encouraged to feed their children at least three times a day, and to mix high-energy foods such as red pandanus oil, dripping and tinned fish oil with their normal diets (red palm oil should be made available for this purpose if it is economically feasible)*
- *parents should also be encouraged to feed their children high-protein foods such as eggs from wild and domestic fowl, peanuts, beans, fresh meat and tinned fish*
- *attention of parents should be drawn, through clinic and school activities, to the associations between diet and growth rates, and growth rates and health status, using the better-nourished children in the community for illustration.*

In the urban environment, it is specifically recommended that:

- *newly arrived rural migrants, both children and adults, should be explicitly taught about any coastal foods with which they are unfamiliar, such as coconuts, fresh fish, sago, pawpaw and other fruits and vegetables; schools, clinics and women's groups could participate in this work*
- *parents should (as in the rural environment) be encouraged to feed their children at least three times a day, and to mix high-energy foods such as coconut cream, dripping, butter, margarine and peanut butter with their normal diets*
- *parents and schoolchildren should be warned of the dangers to their teeth from sweet and sticky foods, and of the poor nutritional value of many snack foods and drinks; fresh*

and packeted peanuts, boiled eggs and fresh fruits should be promoted in place of cheese-pops, sweet biscuits and ice-blocks.

Medical services for the nutritionally vulnerable

Supervision and treatment of pre-school children and pregnant and lactating women is best achieved through the Maternal and Child Health Clinic system; it is therefore generally recommended that:

- *every effort should be made to extend the geographical coverage of MCH clinics, and to increase enrolment and attendance where clinics already operate; an adequate supply of health record booklets is an essential condition for success*
- *clinic staff should acquaint themselves as thoroughly as possible with the food resources, dietary patterns and food beliefs and preferences of the local populations with whom they work, with particular reference to infant and child feeding, and practices relating to feeding in pregnancy and lactation.*

In the rural environment it is specifically recommended that:

- *the location and date on which MCH clinics are held should be better publicised through the help of influential members of the community such as teachers, committee and council members, and church leaders*
- *an interpreter from the village should be regularly available at every clinic*
- *where they do not already exist, covered shelters providing adequate privacy should be erected at every clinic site for antenatal examinations; these structures should be built and maintained by villagers with assistance from the local council*
- *clinic staff should adopt a more sympathetic approach to the mothers of underweight children, offering help rather than reprimands, and should avoid discouraging attendance by reprimanding mothers who fail to enrol their children as soon as they are born*

- *clinic staff should set a good example in their own eating habits, by not eating snacks of low nutritional value in the presence of clinic attenders*
- *mobile nutrition education displays should be carried with the MCH clinic team, for the interest of mothers awaiting their turn, and of fathers and young children who may be present.*

In the urban environment, it is specifically recommended that:

- *the location and times of all MCH clinics should be well publicised through settlement committees, churches, local radio and public notices*
- *clinic staff should take note of the area of origin of migrant mothers, and try to adapt their advice accordingly.*
- *highland mothers should have the causes, dangers and methods of prevention of malaria explained to them in simple terms; the irrelevance of fruit consumption to the disease should be stressed*
- *clinics should be made as attractive as possible to mothers and children, for instance through the provision of play areas and fruit and vegetable stalls.*

Rural-urban relationships

In view of the importance of rural-urban mobility in maintaining social, cultural and economic links between village and town populations, and in encouraging the spread of new food habits, beliefs and preferences; and in view of the inequities which would result from any further segregation of urban and rural populations, it is generally recommended that:

- *no measures should be taken to reduce the opportunities for short- or long-term migration between villages and towns.*

General comments

The recommendations listed above are expressed in ideal terms, and because of economic constraints, cultural factors and limited

manpower, some might be more easily implemented than others. There are many matters of national policy, such as the structure and function of the educational system, import and export policies, prices and incomes policies, and the position of women, which have some bearing on food and nutrition policy, but which I have not mentioned. Finally, I should point out that such matters, as well as most of the recommendations which I have listed, are explicitly or implicitly referred to in the National Food and Nutrition Policy, drawn up recently by the National Planning office (NPO, 1978a). That document gives a much more substantial and comprehensive picture of the requirements and problems than I have attempted to give, and should be consulted for a broader view of national policy.

GLOSSARY, APPENDICES
AND REFERENCES

GLOSSARY OF MELANESIAN PIDGIN TERMS AS USED IN THE TEXT¹

abus - animal food, meat, fish, eggs.

aibika - Abelmoschus manihot. Common cultivated shrub throughout P.N.G.; many varieties differing in leaf shape, colour etc. Young leaves eaten boiled or fried; high in protein.

belo - midday, noon; (from the bell signalling midday break at work).

bilum - net bag used to carry babies, food and other items. Made of locally processed fibres, or wool bought from tradestores.

binatang - small creature, insect.

bun (of food) - same connotations as *strong* (q.v.); e.g. for the highlanders, sweet potato has *bun*.

bun nating - nothing but bone; emaciated; skin and bones.

drai (*kokonas*) - mature coconut; flesh is grated and squeezed to produce coconut cream for oiling other foods (see *grisim*).

gris - grease, oil, fat; also, fertility in soil; 'goodness' in food.

grisim (of food) - to add grease, oil, fat to other foods; dripping, coconut cream and pandanus oil are examples of fats used in this way.

kago - cargo, goods; e.g. case lots of manufactured foods bought for retail sale in tradestores.

kentin - small village tradestore usually owned by one individual.

kulau - young green coconut; its milk is drunk to quench thirst; its sweet, soft flesh can be eaten.

kumu - leafy green vegetables of all kinds.

kunai - Imperata grass; used for thatching.

kus - cough, cold, runny nose.

lain - lineage, kinship group; of varying inclusiveness depending on context.

loli wara - soft drink, usually aerated.

mumu - earth oven, in which food is steamed over hot stones.

nambawan - excellent, the best; general superlative term.

pekpek wara - watery stools, diarrhoea.

pitpit - as well as edible plants Setaria palmaefolia (highland pitpit) and Saccharum edule (lowland pitpit), includes wild grasses whose stems are used in weaving walls, mats, small fences etc.

¹For some terms, reference has been made to F. Mihalic's "Dictionary and Grammar of Melanesian Pidgin" (Jacaranda Press, 1971); other terms have been translated by me to give the specific sense in which they are used in this report.

poisin - sorcery

raun - to roam around, as in *raun long tawn* at weekends.

sande, mekim sande - to pool wages; each member of the pool contributes a part of his wages every payday, and each receives the total pool in turn.

singsing - dancing, singing, any festival where these activities take place.

sispop - packeted snack products such as cheese pops, twisties, cheeseties etc.

skon - deep-fried battered scone, sometimes containing meat, fish, onions etc., sold in food bars; also home-made scones of plain white flour mixed with water and fried in dripping.

stesin - government or mission station, often used as general term for town or city.

strong, strongpela (of food) - sustaining, powerful, energy-giving; also solid, firm, hard.

swit, switpela - tasty, delicious; sweet.

tawn-meri - town women, but not Europeans.

ti - tea, coffee, milo etc.

toktok (as part of cure for illness) - magical recitation.

tulip - lit. 'two leaves': a tree, Gnetum gnemon, with paired edible leaves; grows wild in coastal areas.

tumbuna - ancestors, grandparents, great-grandparents.

wantok - strictly, person from same language group; loosely, friend, neighbour, ally, compatriot etc.

APPENDIX A

TRADESTORES IN AWANDE

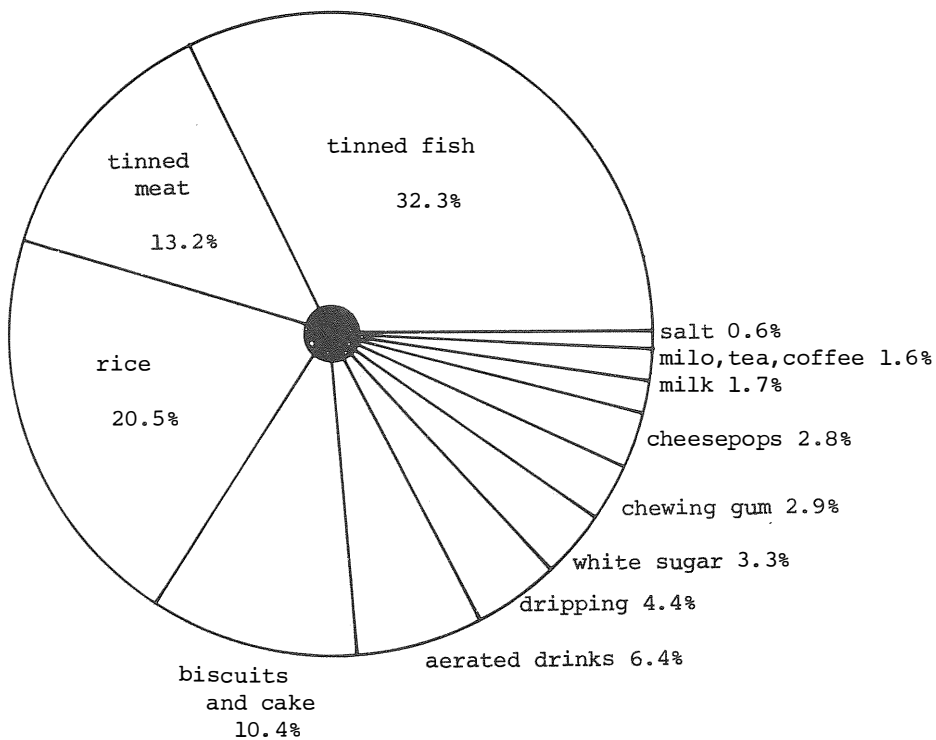
There were several kinds of tradestore in Awande in 1977, each of which will be described briefly in order to give a general picture of their place and function in the local economy, and of store food preferences in the area.

a. The Namasu store (see Plate 3.4). Namasu is the biggest nationally-owned trading company in Papua New Guinea, and has branches throughout the country; in Okapa District there are branches at Okapa, Awande and Tarabo, about 20 kms. from Awande. The Awande store is in the centre of the village, on the road which leads to the Gimi and Keiagana regions to the south and west. It is restocked regularly from Okapa and Kainantu, and contains several thousand kina's worth of goods at any one time. The level of stocks varies with assessment of local demand through the year, reaching a peak with the annual coffee flush from May to August. The majority of sales are made to drivers and passengers of PMVs and coffee trucks passing through Awande, but there is a steady trickle of customers arriving on foot from Awande and neighbouring areas, and villagers often stop to pass the time of day within, or in the vicinity of, the store. There is some resentment of its apparent success among men from the nearby hamlets, and they told me that they were intending to make a submission to the local council to have the store turned over to village ownership and management. At present Namasu employs store-keepers from outside the area (there were three in succession during 1977), who are supervised by an itinerant expatriate regional manager; the company itself is owned and administered by the national Lutheran Church.

Apart from foods, the store sells clothes, material, hardware, cleaning materials, tobacco and, sometimes, kerosene; it has no refrigerator. Some food is sold in wholesale lots, such as 25 kg. bags of rice, or 48-tin cartons of fish, usually for resale by one purchaser in his own small tradestore (see under c., below). Prices are higher than in the towns, usually by a factor of between 5 and 15%, which is governed by retail price legislation which takes transport costs into account. Aerated soft drinks were sold at 27 toea a bottle, 50% above the Lae price.

Food and drink sales were recorded for four sample weeks of the year, through the efficient and generous co-operation of the various storekeepers. The results are shown in Table 18 and Figure 8. As has been mentioned, most purchases were made by people from outside Awande,

FIGURE 8. RETAIL FOOD AND DRINK SALES AT MAIN AWANDE TRADESTORE
(Percentage of total retail sales over four sample weeks. Data from Table 18.)



but the results give a general indication of the nature of demand for the various items by a wide market which includes Gimi, Keiagana and Fore people. A number of items were bought as wholesale lots in the July and October sample weeks, but none in the other two periods; retail sales were highest in the May sample period, when income from coffee typically

TABLE 18 FOOD AND DRINK SALES AT MAIN AWANDE TRADESTORE: SAMPLE WEEKS IN MAY, JULY, OCT, 1977, JAN/FEB, 1978¹

Item	May 16-21 1977	July 11-16 1977		Oct. 3-8 1977		Jan 26-Feb 1 1978	Average weekly	
	Retail only ²	Retail Wholesale		Retail Wholesale		Retail only ²	Retail sales	
	K.	K.	K.	K.	K.	K.	K.	%
Tinned fish ³	82.47	104.26	19.20	34.20	17.64	32.14	63.27	32.3
Tinned meat ⁴	48.41	32.10	39.68	12.55	9.59	10.26	25.83	13.2
Rice	79.00	32.40	104.50	24.00	28.50	25.20	40.15	20.5
Biscuits/cake ⁵	23.55	24.78	6.50	8.80	6.05	23.89	20.25	10.4
Aerated drinks	23.75	9.99	-	4.86	5.30	11.18	12.45	6.4
White sugar	8.16	8.80	-	3.06	-	5.61	6.41	3.3
Dripping	11.12	9.84	-	2.28	-	11.27	8.63	4.4
Cheesepops etc.	17.90	*	*	1.80	-	2.04	5.43	2.8
Chewing gum	11.60	6.20	-	2.07	-	2.75	5.65	2.9
Milk, tinned/dried	4.27	4.38	-	1.84	-	2.55	3.26	1.7
Milo/tea/coffee	4.57	4.10	-	-	-	3.59	3.07	1.6
Salt	2.10	1.61	-	0.23	-	1.04	1.25	0.6
Flour	*	-	31.40	*	*	*	-	-
	316.90	238.46	201.28	95.69	67.08	131.52	195.65	100.1

¹ Data for Jan/Feb 1978 collected by Steve Millar, Institute of Medical Research, Goroka.² No wholesale sales in May 1977 or Jan/Feb 1978 sample weeks.³ Mostly mackerel, some sardines.⁴ Mostly corned meat loaf.⁵ Mostly packeted biscuits, some tinned cake.

* Out of stock.

climbs sharply¹, but the data are not continuous enough to reveal a clear trend with the passage of the coffee season. Tinned fish, tinned meat and rice were the most popular items of food and drink, accounting for over 50% of retail sales in each sample period. Interruptions in the supply of certain items, such as cheese-pops, led to major variations in their sales in different periods.

b. The Vocational School store. Situated about 100 m. up the road from the Namasu store is a small store owned and run by the Awande Boys Vocational School. The store is intended both as a source of income for the school, which is supposed by government policy to be economically self-sufficient², and as a practical means of instructing pupils in the methods of storekeeping. Stocks are purchased from wholesale merchants in Goroka and cover a much smaller range of items than are carried in the Namasu store. Where the same items are carried, prices are similar in both stores, but the manager of the Vocational School tends to carry slightly different lines where possible; thus, tinned orange juice, packeted salted peanuts, and tinned curried rabbit were popular items, unobtainable from Namasu but usually available at the school store in 1977. Most sales were to people from Awande, and the best-selling items of food and drink were the same as those from Namasu, viz. tinned meat and fish, rice and biscuits. A record of daily sales is kept by the school, but because the store's stock was gradually built up through the year, and the store was closed during school holidays, seasonal variation in sales did not bear a close relationship to the coffee season. Weekly sales from February to October 1977 varied from K25.82 to K228.26, with an average of K92.26. Most of the K3300 spent at the store over this period was spent by villagers from Awande itself.

c. Individually owned tradestores. As well as the two permanent and relatively well stocked stores just described, there is in Awande a number of small tradestores owned and run by individual villagers, or

¹See Howlett et al. (1976, p.231) for figures on the annual cycle of coffee production in the Chimbu region.

²This directive has also led the school to engage in activities such as strawberry and cabbage cultivation, and the rearing of day old cockerels, which are profitable but not particularly suited to local needs.

partnerships. Such stores, or *kentin* as they are often called, are built of bush materials, and are hence vulnerable to theft and pests. They are stocked when money is available; whether or not the stock is replenished depends on the success or otherwise of the venture, and the subsequent aims of the owner. Before a store can legally be operated, a "licence to trade with natives" (as the wording still has it) must be obtained from the local council for a fee of K6.00, renewable annually. Price controls are generally ignored, and high profit margins are set. In practice, the use of store goods for the owners' own families and friends, together with loss through theft and pests markedly reduce the actual profits made.

In May 1977 there were only two individually owned tradestores operating in Awande, both of them on the main road within a kilometre of the Namasu and Vocational School stores. By the end of July four more had opened, two of them on the roadside, the other two in hamlets away from the road, and three more were under construction. A brief survey at that time provided the following information:

Ownership and capital:

The two stores which were operating earlier in the year were self-financing, with extra capital provided by their owners' coffee sales. Another store was stocked with goods sent from Lae by a younger man employed there as a barman; the store was run by his father and brothers. Another store was owned by the locally employed carpenter, and his brother. A fifth store was opened by a young man recently returned from working in Lae, and the sixth by a pupil at the Vocational School. Of the three stores still under construction, two were being built by men with labouring jobs in Awande (as roadman and school groundsman respectively), and one by a man who had worked part-time on a labouring job for some weeks previously.

Stocks and prices:

Most of the stores contained a similar range of goods, some purchased from the local Namasu store in wholesale lots, others from further afield. The most common items were rice, sugar, tinned fish, tinned meat, biscuits, cheese-pops, cigarettes, tobacco, kerosene and wool (for making *bilum*). Total retail value of the stock ranged from K46 in the schoolboy's store, to K230 in the biggest store, which had been running since September 1976. Prices varied from store to store, and from time to time, with a mark-up on the usual Namasu retail prices of between 10 and 100 per cent. For example, a tin of fish costing 40 toea at Namasu and 45t. at the Vocational School was priced at 50t. in five small tradestores, and 55t. in the other. Cheese-pops were sold for 10t. at the Vocational School, 12t. at Namasu, 15t. in three small stores, and 20t. in two stores. At the latter price, cheese-pops were retailing for three times the wholesale price paid by the storekeeper.

From the point of view of their owners, these small tradestores provide a means by which income earned in other ways can, they believe, be invested profitably. However, the degree of competition is high, and the level of entrepreneurial skills is low, with the result that few of the small stores can survive for long. The fact that other villagers, with low cash incomes, are willing to buy items from the small tradestores at all, at prices which they know are far higher than those in the bigger stores, indicates that economic rationality is not their prime concern and that other factors are operating. Three advantages in using the smaller stores can be suggested: they are often more convenient in location and opening times (usually they will be opened on request) than the larger stores; it is easier, especially for the uneducated, to buy items from a fellow villager than from an outsider (this advantage is shared by the Vocational School store); and it is reasonable to expect that the store's owner will sometimes use his goods as gifts within the local community, and contribute store foods to communal meals.

APPENDIX B

LAKE FOOD PRICES SURVEY

A survey of food prices in Lae was carried out on 12th October 1977 by 4th year chemical technology students from the University of Technology at Lae, under the supervision of the Area Nutritionist, Marian Cast. I am grateful to them for supplying me with a copy of the survey results, which I analyse briefly in this appendix.

Thirty-four stores in four areas of town were visited, and the prices of a variety of items were recorded in every store where they were available; in addition, samples of fresh foods were weighed and priced at the main Lae market. In most cases, prices were recorded for the same size of container, package, etc., so that it is not possible to calculate whether money might be saved by buying in larger or smaller quantities.

There was considerable variation in the prices of the same item bought at different stores, but little consistency in which stores offered the lowest prices for the same items. As would be expected, the small tradestores tended to sell at higher prices than the major supermarkets. In Table 19, the results are expressed in terms of the average cost of 100g of the food; the cost per MJ of energy from that food; and the cost per gram of protein. The results for the twenty cheapest sources of energy and protein respectively are shown in the upper and lower bar charts in Figure 9. Energy and protein costs were calculated using WHO Western Pacific Food Composition Tables (WHO, 1972), which also include figures for the edible portion as a percentage of the portion as purchased. This correction for wastage is important in the case of most fresh vegetables.

In interpreting the figures for the costs of energy from different sources, it is essential to bear in mind that some of the cheapest sources are very low in protein, and some are very bulky; both qualities reduce their value as staple foods (see Chapter 13). For these reasons, white rice, with 6.7% of its energy derived from protein (WHO, 1972) is a more nutritious staple than the starchy root crops. Dripping and sugar are cheap sources of energy but supply no other nutrients in significant quantities.

TABLE 19 AVERAGE COSTS, AND RELATIVE COSTS OF ENERGY AND PROTEIN CONTENTS, OF MAJOR FOOD ITEMS IN LAE STORES AND MARKETS, OCTOBER 1977.^{1,2}

Item	Cost per 100g. of food A.P. (toea)	E.P. as % of A.P.	Energy per 100g. E.P. (MJ)	Cost per MJ of energy (toea)	Protein per 100g. E.P. (g.)	Cost per gram of protein (toea)
A. Store items						
White rice	4.2	100	1.50	2.80	6.7	0.63
White bread	5.3	100	1.06	5.00	6.7	0.79
White sugar	4.6	100	1.62	2.84	-	-
Full-fat milk powder	19.7	100	2.12	9.29	26.0	0.76
Evaporated milk	8.0	100	0.57	14.04	7.0	1.14
Dried peas	10.9	100	1.42	7.68	23.8	0.46
Dried beans	12.3	100	1.41	8.72	23.1	0.53
Fresh eggs	23.0	89	0.68	38.00	12.4	2.08
Boiled eggs	33.3	89	0.68	55.02	12.4	3.02
Peanut butter ³	23.2	100	2.37	9.79	26.2	0.89
Margarine	16.2	100	3.01	5.38	0.6	27.00
Butter	16.0	100	2.99	5.35	0.6	26.67
Dripping ⁴	16.8	100	3.73	4.50	-	-
Minced beef ⁵	15.8	100	1.10	14.36	16.0	0.99
Tinned corned beef	23.8	100	0.94	25.32	18.6	1.28
Tinned mackerel	8.9	100	1.31	6.79	22.0	0.40
Peanuts (pkt) ⁶	16.9	100	2.28	7.41	25.6	0.66
B. Market items						
Sweet potato	1.3	87	0.49	3.05	1.3	1.15
Taro (<i>Colocasia</i>)	4.2	82	0.43	11.91	1.9	2.70
Chinese taro ⁷ (<i>Xanthosoma</i>)	1.6	82	0.43	4.54	1.9	1.03
Yam	2.9	86	0.44	7.66	2.4	1.41
Cooking banana	1.4	66	0.47	4.51	1.2	1.77
Cassava	0.9	75	0.61	1.97	1.2	1.00
English potato	5.2	85	0.34	17.99	2.0	3.06
Peanuts	16.3	71	2.28	10.07	25.6	0.90
Dark green leaves	1.7	80	0.17	12.50	5.0	0.43
Green beans	5.4	91	0.15	39.56	2.4	2.47
Cabbage	3.7	69	0.10	53.62	1.6	3.35
Pumpkin	1.0	68	0.14	10.50	1.3	1.13
Pawpaw	1.6	66	0.16	15.15	0.6	4.04
Ripe banana	2.0	71	0.39	7.22	1.3	2.17

Notes. ¹. Cost data from Lae University of Technology, Food Technology Students Food Price Survey, Oct. 1977; kindly supplied by Marion Cast, Area Nutritionist, Lae.

². Composition data from WHO Western Pacific Regional Office Food Composition Tables (WHO, 1972), except where indicated. A.P.= As Purchased. E.P.= Edible portion.

³. Tables of Composition of Australian Foods (Thomas & Corden, 1970).

⁴. Tables of Foods in Tropical Countries (Platt, 1962).

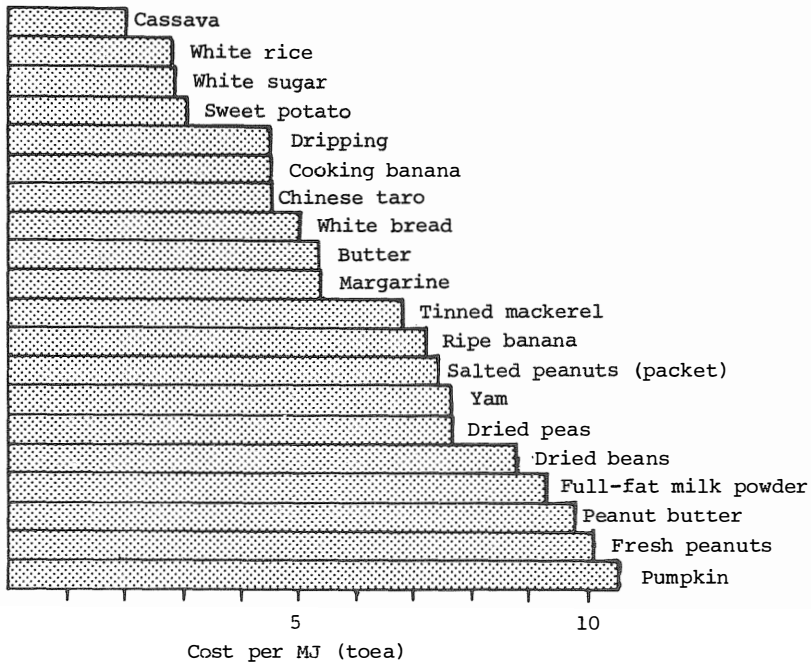
⁵. Taken as beef, fresh, from Platt, (1962).

⁶. Thomas & Corden (1970).

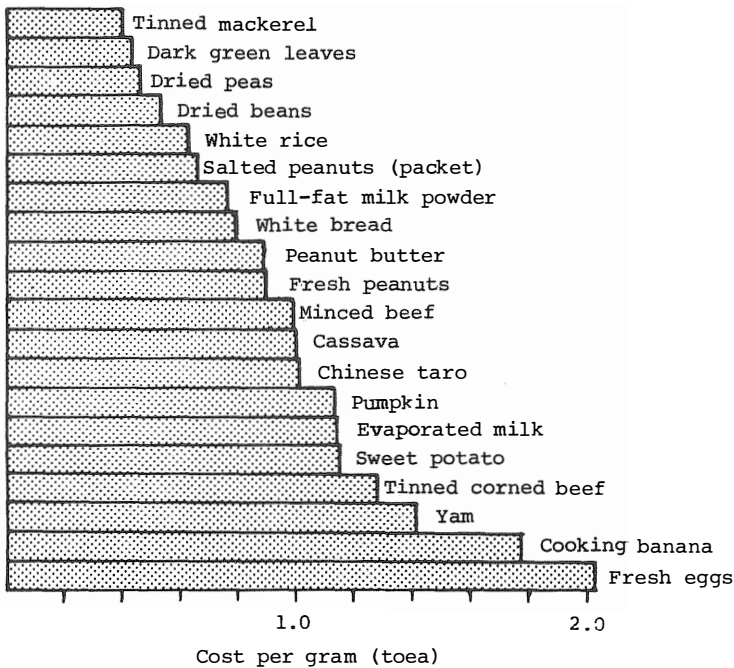
⁷. Separate composition data for *Xanthosoma* not available; taken as *Colocasia*.

FIGURE 9. COMPARATIVE COSTS OF ENERGY AND PROTEIN FROM VARIOUS FOODS, LAE, OCTOBER 1977. (Data from Table .)

A. ENERGY



B. PROTEIN



Fourteen of the twenty cheapest protein sources are vegetable products. However the protein quality has not been taken into account in these calculations; dependence on a single plant protein source is nutritionally unwise, but a complementary combination of plant protein sources can be of equal biological value to a single animal protein source. Dark green leaves, although they may contain up to 5% protein, do not provide much energy, and could therefore not form a large proportion of the diet. Tinned fish, dried pulses, rice and bread, peanuts and milk powder are all good, relatively cheap protein sources (skim milk powder was not included in the survey, but would be cheaper than full-fat milk powder as well as being richer in protein). Minced beef was the only fresh meat included in the survey, and provides protein at a cost of 0.99 toea per gram; data from the December 1977 Consumer Price Index (Bureau of Statistics, 1978c) gives the price of frozen chicken in Lae as K2.28/kg., which works out at 1.85 toea per gram of protein. Eggs are an expensive source of protein, but the latter is of very high quality.

A comparable food price survey was carried out in Port Moresby in October 1974 (M. Lambert, 1974), and the results used to calculate the cost of "the cheapest balanced diet in Port Moresby, sufficient to satisfy an adult's daily requirements for energy, growth and protective foods". This diet, its 1974 cost in Port Moresby, and its equivalent cost in Lae in 1977 were as follows (note that the new toea was exactly equivalent to the old cent at the changeover in currency units):

		<u>Moresby 1974</u>	<u>Lae 1977</u>
Cassava	1400 g	14.8¢	12.6t
Dripping	50 g	6.0¢	8.4t
Tinned fish	110 g	8.7¢	9.8t
Pumpkin	150 g	2.6¢	1.5t
Sweet banana	300 g	4.9¢	6.0t
		<u>37.0¢</u>	<u>38.3t</u>

An alternative diet would have cost the following:

Rice	450 g	17.4¢	18.9t
Margarine	50 g	7.2¢	8.1t
Tinned Fish	110 g	8.7¢	9.8t
Green leaves	120 g	3.2¢	2.0t
Sweet banana	300 g	4.9¢	6.0t
		<u>41.4¢</u>	<u>44.8t</u>

The report on the Port Moresby survey calculated the cost of feeding a family of two adults and four children at six times the cost of feeding a single man, and thus arrived at the figure of just over \$15 for the weekly cost of providing a well-balanced diet for the whole family. For Lae in 1977, the equivalent figure for the first diet listed above would have been K16.09, and for the second K18.82. Many substitutions could of course be made in the diets suggested, to provide variety without sacrificing nutritional quality or increasing the cost markedly. At the time of the Port Moresby survey, the urban minimum wage was \$40 per fortnight. At the time of the Lae survey the urban minimum wage was K58.12, a rise of 47%. Over the same period, the consumer price index for food rose 15% in Lae, and 16% in Port Moresby, and the overall CPI rose by 23% in Lae, and 25% in Port Moresby. Thus, in 1977 the urban wage-earner was considerably better off in real terms than he was in 1974.

The results presented here refer to one town in Papua New Guinea, on a single day. Their application to other places at other times might be misleading, especially as regards fresh foods. In Lae most vegetables in the market are about 20% more expensive than in Rabaul, but about 25% cheaper than in Port Moresby (data from this survey, and the December 1977 Consumer Price Index (Bureau of Statistics, op.cit.)).

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