

3 AOUT 1983

SPC Library
03816
Bibliothèque CPS

SPC 64-1.1
HOL
1955

ACKNOWLEDGEMENT

I should like to thank His Honour the Resident Commissioner, the Chief Medical Officer and all members of the Government Service who assisted me in this survey.

Susan Holmes

(Nutritionist)

SOUTH PACIFIC HEALTH SERVICE.

INTRODUCTION

The Cook Islands are situated between 9-23° longitude and 156-167° latitude. The group consists of 15 small islands with a total land area of approximately 100 square miles. The islands fall into two distinct groups. In the south there are 8 islands of volcanic origin. Here the land is fertile and tropical sub-tropical plants grow to profusion. There are seven atolls in the northern group. These are sand and coral, and support little but coconut, pandanus and limited bread-fruit trees and root crops.

The climate in the south is very mild. Average temperatures range between 70.8 - 78.6° and the average annual rainfall is 84". In the north, there are wide differences in annual rainfalls, and at times, the islands suffer from severe droughts. The Cook Islands lie in the hurricane belt and it is usual for one island to suffer hurricane damage about once every two years.

The Cook Islanders are Polynesians. They are closely related to the New Zealand Maoris and many of the tribes are able to trace their descent back to a common ancestor. The present population is 191,657.

The islands were discovered by Captain Cook in 1773. A protectorate over the Southern Group was declared in 1888, and in 1895 the boundaries of New Zealand were extended to include the Cook Islands.

Index.

Page:

1. Method of survey.
2. Survey in Karotonga.
6. Summary food preparation and use.
9. Daily fare in Cook Island villages.
10. Average amounts of food consumed per head
Food habits.
11. Nutritive value of the diet.
12. Food and health.
13. Improvement of food supplies.
14. Manihiki Island - economic background.
15. Preparation and use of food.
17. Average amounts of foods used per head per day.
18. Daily meals.
19. Symptoms suggestive of malnutrition -
Heights and weights.
25. Infant nutrition.
Hospital feeding.
Nutrition and home science education.
26. Discussion.
Summary.

REPORT OF NUTRITIONAL CONDITIONS IN THREE VILLAGES IN THE COOK ISLANDS.

A survey of the health of Rarotongan villages carried out by Faine and Hercus in 1950, indicated that changes in diet from native to European foods had little effect on general nutritional status. In the absence of signs of nutritional deficiency, they concluded that the high incidence of dental caries and gum conditions was not due to a serious lack of specific nutrients, but was rather an oral problem.

The present survey attempted to find out the amount and kinds of foods now being consumed by people living in two of the poorer villages in Rarotonga where the population largely comprised immigrants from the northern islands. In addition, a visit was made to Maminia, which is a wealthy island in the northern group.

These surveys attempted to find the following information:-

- (1) What kinds of food are used?
- (2) How is the food prepared?
- (3) How much food does the average adult eat?
- (4) What is the nutritive value of diet and its effect on the health of the people?

Information of this nature has a definite value in planning health, agricultural and educational programmes.

Method of Food Survey:-

Twelve representative households containing a total of 212 people were chosen in these villages. The age composition of the households was as follows:-

TABLE I

	<u>MAINIHI</u>	<u>RAROTONGA</u>	
<u>VILLAGE:</u>	<u>Tahuna.</u>	<u>Puc.</u>	<u>Tutakimore.</u>
<u>YEARS:</u>			
0-1	4	1	4
1-5	5	11	12
5-10	8	6	12
10-12	3	16	20
20+	43	36	36
Total number:	63	70	84
% of Total population:	7.6	2.57	

At the beginning of the survey, the total food present in the house was weighed. Households were then visited once a day and the people were asked to state the amount and kinds of food they had bought from the store. Any food obtained from the garden was weighed. A record was made of foods eaten at evening and morning meals and the food prepared for the main meal was weighed. This method of survey proved satisfactory for Cook Island conditions. Evening and morning meals nearly always consisted of bread, sugar and tea, or food left over from the main midday meal. Bread was sold in standard sized loaves and test weighings showed that there was very little difference in the weights of loaves.

Daily purchases were checked, and at the end of the week the remaining foods were weighed, and the amount subtracted from the total.

It is possible that a few items were not recorded, but it was considered that this disadvantage was out-weighed by the fact that the people responded in an unselfconscious manner and did not become tired of the visits. On previous occasions it has been noticed that villagers become worried when all the meals were weighed and they are ashamed to produce small amounts of food and as a result the normal dietary picture tends to become distorted.

The amount of daily consumption was arrived at by dividing the total amount consumed per day by the total number of adult units. Children 0-1 year were not counted, 1-5 years were $\frac{1}{2}$, 5-10 years $\frac{1}{3}$ a unit those over 10 years represented 1 unit.

Method of Clinical Survey:

In Manihiki, infants, school children and some of the adults were weighed, measured and examined for signs of malnutrition. School children at Mitutaki school and the Catholic Mission School in Rarotonga were weighed and measured. Groups of infants, and children attending the Government school in Rarotonga were seen, and cases of malnutrition were referred to the Medical Officer or Assistant Medical Practitioner. Dental caries was recorded by inspection.

SURVEY IN RAROTONGA.

It was generally agreed that some of the worst dietary conditions existed in the settlements of people from the northern islands, who for the most part live in villages near Avarua. Although they constitute a minority group, their low standard of living and health is of concern to the authorities. Accordingly, it was decided to spend two weeks surveying family food consumption in the Pukapuka village of Aue, and in Manihiki and Palmerston Islands.

Aue village is situated just outside Avarua. The majority of the people living here come from the northern island of Pukapuka, although several of the larger households are owned by Rarotongan landlords. Most of the houses have thatched roofs and walls made of native materials, wooden boards, or corrugated iron. There are one or two living and sleeping rooms and a kitchen attached to the house. On the whole the majority of homes are clean and tidy.

Economic Status:

All the people from the outer island rent land and building sites from the Rarotongan land owners. There were three groups of people in this village. (1) The Rarotongan landlords who owned land in or near by the village. (2) Tenants who rented building sites in the village and who derived their income from home crafts or work in Avarua. (3) Tenants who rented sufficient land to grow crops for the market.

The amount of rent paid to landlords varied considerably. Sometimes this was rendered in food and services, for example one old woman plaited kilau (coconut leaf thatch) for her landlord, whilst others had to produce food for special feasts.

The uncertainty of the amount of the landlords' demands seemed to introduce an element of instability into the life of the "Out-islanders". However, most of them seemed to think that life in Rarotonga was infinitely preferable to that in their home islands, and they were prepared to draw in their belts and borrow from friends in times of stress. The economic conditions found in 12 households are summarized in Table II.

Tutakimore village:

Housing conditions were poorer than in Pue village. Rooms were overcrowded and often poorly ventilated. Most houses were similar to those in Pue village, although space was more cramped and construction of a lower standard. Few people had kitchens, and most of the cooking was done in an umu or on the open hearth under a shelter. Very few people had banana or pawpaw trees near their houses and any food plants growing in the village were jealously guarded.

Economy:

Almost all the people were dependent on an income from employment in or near Avarua. Some worked on the wharf, several were sailors and a few had permanent jobs with the Government or merchants. The young girls tried to find work in the nearby clothing factory. A few families derived some income from shares in copra, or shell in Manihiki. In comparison with the wage earners, they were fairly wealthy.

Life in Tutakimore is more insecure than in Pue village. One of the reasons being that families are constantly having to house and feed friends and relations who arrive without warning from the northern islands. During the last few years, there has been a considerable increase in the number of ships calling at Manihiki for shell, copra, and as a result the people have had more opportunities to travel.

Visitors often brought tins of salted clam, coconuts, and dried fish with them. When this food was used up, they tried to find work and sell pearls. When money was scarce, families lived on borrowed food, bread, flour and water dough baked in the umu (earth oven).

The twelve families visited in this survey appeared to be representative of poorer groups in the settlement. They admitted that they did not have enough money for adequate food and clothing. When they had to buy clothing or pay for a passage on a ship, they were forced to reduce the daily intake of food. Any surplus cash was put aside for a visit to the pictures on Saturday night. When questioned about their economic conditions, the majority agreed that they would rather stay in Rarotonga than return to the islands. Their reasons for staying were that they liked to go to the pictures, dances, and to visit the shops. A few married women wanted to return home because they were tired of trying to feed their families under such difficult conditions. The economic conditions of 7 families are summarized in Table III.

Age.	Good average Weight.	Level Teaspoon milk.	Oz. boiled water.	Level teaspoon sugar.	No. feedings per day.	Co. liver oil teaspoon.	Additional to the diet.
1st week:		3 1/2	13	2 1/2	5	1	
2nd week:		5 1/2	20	5	5	1	
3rd week:		7 1/2	23	5	5	1	
1 month	10-12	8-9	24-25	5	5	1	1-4 teaspoon. orange or pawpaw juice in 1-2 oz. nimata juice. Give in the afternoon.
2 months:	12-16	9-11	27-33	5	5	1	4 teaspoon. fruit juice or 1-4 teaspoon. washed ripe pawpaw or 1-4 teaspoon. vegetable soup, water from cooked breadfruit or kumara. Give in afternoon.
3 months	14-15	11-12	33-35	6 1/2	5	1	Same.
4 "	15-18	12-13	35-40	6 1/2	5	1	1-4 teasp. soft green coconut, ripe pawpaw, vegetable soup.
5 "	16-19	13-14	40	6 1/2	4 or 5	1	1-4 teasp. soft washed roots, taro, kumara or rice pudding, cooked utu, fruit juice, soup nimata (green coconut).
6 "	17-20	14-15	40	6 1/2	4	1	1-2 teasp. soft boiled egg mixed with pudding or washed vegetable.
7 "	19-22	14-15	38	6	4	1	1-4 teasp. fish or chicken soup mixed with vegetables.
8 "	19-23	15-	38	4	4	1	Egg, soft fish mixed with vegetables.
9 "	20-23	15	30	4	4	1	Increase amounts of all foods. Give the
10 "	22-24	15	30	4	4	1	baby some solid food three times a day
11 "	23-24	15	30	4	4	1	following by milk drink. Teach him to drink
12 "	24-26	15	30	4	4	1	from a cup. Make sure he has some of these foods every day.
							1. Fruit or green vegetable or nimata.
							2. Roots or rice.
							3. Fish, egg, shell fish soup etc.

II.

2 CONDITIONS IN 11 HOUSEHOLDS.

	6.	7.	8.	9.	10.	11.
	5 2	3 1	3 5	2 5	5 3	2 1
	Housing site only.	about 3 acres round the house.	Housing site only.	Iraki family owns half the village land.	3 pieces on bush and in village.	Land rented from Pangatina.
	3 or 4 banana trees. 6 hens. 1 pig.	Bananas, oranges, tomatoes, pawpaw, a little taro.	Pawpaw, bananas, 15 chickens.	Tomatoes, oranges, banana, breadfruit, taro, owns 20 hens, 1 pig.	Kunaras. taro melon, 36 chickens, 3 pigs.	Taro, banana, coconut, 1 pig, 1 cow.
	£2.	£2.	£1.	?	Worker at power station. £3-£4.	Prison warden. £3. 3. 0.
t. 3	3 males fairly good. Position at wireless station. Printing office, hospital.	1 male £6, works at wireless station.	Varies according to trade ranges between 10/--£1 per week.	?	£2. 10. 0	10/- - £1.
	-	-	This man runs a tailoring business in his house. This appeared successful.	-	-	-

TABLE II.

RUE VILLAGE. SUMMARY OF ECONOMIC

No. of family.	1.	2.	3.	4.	5.
Adults: Children:	3 5	2 4	4 2	1 1	3 2
Land Owned:	rent 3 pieces of land from the Parotongan village.	Owns land.	family owns land	rent half a house.	none.
Crops Grown:	Grows most of food: breadfruit, tomatoes, bananas, taro, none sold.	1 planter grows tomatoes, melon, and kumaras for the market.	Sells food from family gardens, when necessary.	none.	-
Estimated amount spent on food per week.	2.	21.-21.10.0	21.10 when the girls are not working, family depends on native food.	-	?
Type employment and weekly income:	Casual Labourer. 22. 10. 0	varies, but in a good season, earn sufficient for family needs.	2 girls work in the clothing factory for 8/- & 10/- a day.	varies. This woman has lost her husband. She is very poor.	2 boys are shop assistants. 1 boy cooks and runs the house.
Home Industries:	-	-		Occasionally plaits kikan for 6/- a day.	-

TABLE III.

TUTALIMORE VILLAGE. SUMMARY OF ECONOMIC CONDITIONS IN 8 HOUSEHOLDS.

Household.	1.	2.	3.	4.	5.	6.	7.	8.
Adults: Children.	4 2	3 7	5 3	2 4	6 4	3 6	3 5	3 7
Land Owned:	Housing site and about 2 acres.	Housing site.	Housing site.	Housing site.	Housing site.	Housing site.	Housing site.	Housing site.
Crops Grown:	Kumaras. Cassava, Pawpaw, Banana.	Nil	Nil	Nil	Nil	Nil	Few fruit trees round the house.	Nil
Estimated amount spent on food per week.	?	£1.	£3-6d.	£2.	14/-	£1.10-02.	£3.	£3.
Weekly income:	Casual Labourer.	£1.10.0	£12. 4 adults work mostly casual labours.	£3.17.0 Wireless station.	All family temporarily out of work.	£2. Carpenter.	£5. Makes 1 or 2 guitars or ukaleles a month.	£9. 3 sons are working.
Home Industries:	Nil	Nil	Nil	Make hats occasional.	Nil	Nil	Make string instruments.	Nil

FOODS - SUMMARY OF PREPARATION AND USE.

Starchy roots and fruits:

Taro - (*Colocasia antiquorum*) puraka (*Cyrtosperma chamissonis*)
- Baked or boiled. Taro is the most popular starchy roots.
Seventeen varieties are known in Rarotonga. Taro - tarua
(*Xanthosoma atrovirens*) is also widely used.

Kumara - (*Ipomea batatas*). Baked or boiled is a popular root.

Manioc - (*Manihot utilissima*) - Used occasionally in Rarotonga.
Baked, boiled or grated and made into porridge. Not so popular
as other staple roots.

Banana - (*Musa sapientum*) and plantain (*Musa paradisiaca*)
are boiled or baked. These provide an important staple for
poorer families.

Breadfruit - (*Artocarpus communis*). Baked or boiled or made
into a pudding. To make this, cooked breadfruit is pounded
and mixed with coconut cream. The mixture is then cut in
squares and served with coconut sauce.

Coconut - (*Cocos nucifera*).

Coconut green - Juice used for a drink. This is the main
beverage in Manihiki. The soft transparent flesh is considered
a good infant food.

Green husks and small nuts - There is a large number of
palms bearing sweet nuts in Manihiki. The sweet juicy husks
and the young undeveloped nuts are favourite foods.

Germinating Coconut - The embryo seedling is a favourite
food in Manihiki. It is eaten raw, grated and mixed with
juice from the green coconut to make a thick drink. In
addition, the soft embryo provides an accompaniment for
fish when baked or boiled.

Mature coconut flesh is grated and mixed with rice, sugar
flour etc. The cream is extracted mixed with a little water
and seasoned with salt and chillies to make a sauce. This
may be used fresh, or allowed to ferment. Every Cook Island
household has a bottle of coconut sauce. It is used as a
relish with all types of food.

Vegetable fruits:

Pumpkin (*Curcubita maxima*). 1. Cooked, and mixed with flour
and coconut to make a pudding (puke) which is baked in the umu.
2. Cut in pieces and boiled with sugar and finally thickened
with flour. This mixture may be eaten alone or used as a
filling for a pie.

Green leaves - China cabbage (*Brassica chinensis*). Ruko
(young leaves for taro) and English cabbage are widely used.
These are usually cooked with coconut cream.

Fruit - Pawpaw (*Carica papaya*).

Eaten raw, cooked and made into soup or mixed with flour and
coconut to make a pudding (puke).

Tomatoes - (*Lycopersicum esculentum*) are stewed to make a
thick soup, or eaten raw.

Other fruit - In Rarotonga there are plentiful supplies of avocado pear. (*Persea gratissima*), mango (*Mangifera indica*), orange, (*Citrus sinensis*), lemon (*Citrus lemonia*), pineapple (*Ananas comusus*) in season. Bananas (*Musa sapientum*) and pawpaw are available throughout the year.

Fish:

This is boiled or baked in the umu wrapped in leaves. Raw fish is served with a coconut cream and lemon juice dressing. Dried fish is eaten cooked or raw. Many kinds of shell fish are used in all the islands. These are eaten fresh, salted or dried. Certain kinds of beche de mere are prepared by a fermentation process. The Cook Islanders use a variety of methods for preserving fish which warrant further investigation.

Meat:

Chicken, beef, are boiled or baked in the umu. Pork is baked in the umu.

Eggs:

These are boiled, fried or combined in flour mixtures to make cakes.

Imported Foods:

Rice is boiled and eaten with sugar, grated coconut or coconut sauce.

Flour is used to thicken soups, to make dough puddings, pastry cakes, and bread.

Puddings vary from a fairly nutritious mixture of flour, coconut and fruit to a glutinous mass made from stiff flour and water dough. These are usually cooked in the umu (earth oven).

Sugar is included in drinks, puddings and cakes. Jam is occasionally used on bread.

Butter is used by the more well-to-do families.

Tea - Everyone likes to drink tea at least twice a day. If they cannot afford this, they make orange or lemon leaf tea. Coffee and cocoa are used in lesser amounts.

Tinned meat and fish are used regularly by those who can afford this foods.

Milk - Condensed milk is the most popular, dried milks are used to a lesser extent.

METHODS OF COOKING:

In former times all food was cooked in the umu. Nowadays more than half the cooking is done over an open fire or on a primus. The Maori women are interested in cooking and have quickly learnt the art of cake and doughnut making.

FOOD STORAGE:

All the households visited had some kind of a locked cupboard. These varied from a wire-screened safe to a box with a hinged door.

DIET IN PUE AND PUTAKINORE

The majority of families have two meals of bread and tea, with a more substantial midday dinner. The more well-to-do have meat, fish or greens and coconut with root vegetables at midday. The poorer people manage to have two or three meals containing fish or meat or greens or breadfruit round about the week-end.

When this food is used up, they exist on bread, flour puddings, a little rice and few coconuts. At Tutakimore, three families had very poor diets based on flour and water dough or bread with small amount of fish, coconut and root vegetables.

This survey showed a marked contrast between the completely landless people and those who owned small gardens. The former appeared to be lacking in enterprise and social pride, and their standard of diet was dangerously low from a health point of view. Those with small gardens had a healthy occupation, and seemed to take more pride in their children and their homes in general. Their gardens provided tomatoes, pawpaw, some kumaras and greens, which greatly improved the diet.

Examples of typical daily diets observed in these villages are shown below:-

TYPICAL DAILY FARE IN
COOK ISLAND VILLAGES

<u>ISLAND:</u>		<u>Rarotonga.</u>		
<u>VILLAGE:</u>		<u>Pue.</u>	<u>Tutakimore.</u>	
<u>Economic Status:</u>	<u>Poor.</u>	<u>Medium.</u>	<u>Poor.</u>	<u>Medium.</u>
<u>A.M.</u>	Tea, Sugar, Bread.	Cassava, Porridge, bread, Tea & sugar.	Pancake, orange- leaf tea.	Tea and sugar, Bread.
<u>M.D.</u>	Flour & Coconut pudding. (puke)	Taro leaves, coconut cream, Breadfruit, Tinned meat.	Flour & Coconut pudding.	Bananas, Coconut sauce, Tinned meat.
<u>P.M.</u>	Nil.	Bread, Tea & sugar, Taro leaves left from midday.	Bread, Green bananas.	Bread, Tea & sugar.

At the present cost of living it is very difficult for a labourer with a family of two or three children to maintain a safe standard of living from the health point of view unless he has a garden. The poorer people exist by buying a bag of flour on pay-day. At week-ends they spend ten to fifteen shillings on roots, bananas, possibly some greens, and tinned meat. When this is used up, they depend on flour, water, sugar and bread.

The average amounts of food consumed per day by adults is shown in Table IV. Chart I shows the number of **times** different foods were eaten during the week.

Table 17.

AVERAGE AMOUNTS OF FOOD CONSUMED PER HEAD DAILY IN KOLKATA, CALCUTTA - SEP. 1934.
(oz. per head)

Middle	Starchy roots & fruits.	General.	Canned fish & meat.	Fresh meat.	Dried & fresh fish.	Milk products.	Dates.	Sugar & jam.	Green yellow veg.	Fruits.	Coconut No. nuts.	Tea & coffee.
Men:	26.24	11.02	1.49	2.11	0.37	0.02	0.50	2.51	0.62	1.07	0.15(1)	0.19
Women & children:	12.11	11.01	1.26	0.36	1.51	0	0.07	1.18	1	1.26	0.22(2)	0.00

Consumption coconut estimated to be

(1) 50 lbs.
(2) 60 "

TABLE II.

CALCULATED AVERAGE NUTRITIVE VALUE OF DIETS EATEN BY ADULT VILLAGERS IN COOK ISLAND
(33PT. 1954).

Nutrients:	Calories No.	Protein gms.	Fat mg	Calcium mg	Carbohy- drate. gms.	Iron mg	Vit. A. iu	Thiamine mg.	Ribofla- vin. mg.	Nicotinic acid. mg.	Ascorbic acid. mg.
Pue Village:	2395	59.56	52.7	347	408	17.24	1186	1.10	0.69	14.46	98.96
Tutakimore village:	2067	58.28	20.63	214	333	11.54	872	0.77	0.49	10.20	47.49
Recommended level for population living in the tropics.	2,500	60	.	0.8		20	5,000	1.5	1.8	12	30

1. E.S. Platt. 1947. Colonial nutrition and its problems.
Trans. Roy. Soc. Trop. Med. & Hyg. 40 p. 387.

FOOD AND HEALTH

Table V shows that the nutritional value of the average diet in Tutakimore is below desirable standards recommended by Platt for Colonial territories. This appears to be reflected in the health of the people. The infants in this village are considered to be the poorest in Rarotonga. There is a high incidence of skin infections and "rash". The mothers are lethargic and several do not bother to attend the weekly infant welfare clinics.

The condition commonly referred to as "rash" in Rarotonga is seen on the cheeks of young infants. In the early stages a rough pinkish eruption appears on both cheeks. This gradually becomes redder, and as the condition develops the cheeks become reddish brown and patches appear in symmetrical positions on elbows, buttocks and backs of the legs. The children become very irritable. The Chief Medical Officer, 1954, (personal communication) found that these cases responded to nicotinic acid. After a few days treatment, the rash started to clear and the general condition of the infant improved.

In one household, where the family depended on an income of 30/- a week, three small children were covered in a rash which appeared in symmetrical patches on the cheeks, elbows, and buttocks, and the backs of the legs. Cases of dry crazy pavement skin were also seen.

Examination of the diet of this family showed that they lived almost entirely on manioc, green bananas, flour and bread. Fruit was used twice, and fish four times during the week. The diet was low in vitamin and protein foods and was in fact typical of the type consumed by people suffering from pellagra in other parts of the world. No cases of rash were seen in families who owned gardens, and consequently ate tomatoes, greens and pawpaw etc., and root vegetables or breadfruit daily.

This condition appears to be specific to the Cook Islands. No widespread symptoms have been observed in Fiji, Tonga or Western Samoa where the same type of native diet is eaten. Marples (1955 personal communication) found no signs among the Maori people of Niue.

Nutrition surveys in the Pacific have indicated that villagers who obtain the bulk of their calories from starchy roots and fruits are healthier than those who depend on refined cereal foods. The probable reason for this is that the starchy roots and fruits provide a better assortment of the necessary vitamins and minerals. - See Table VI.

TABLE VI

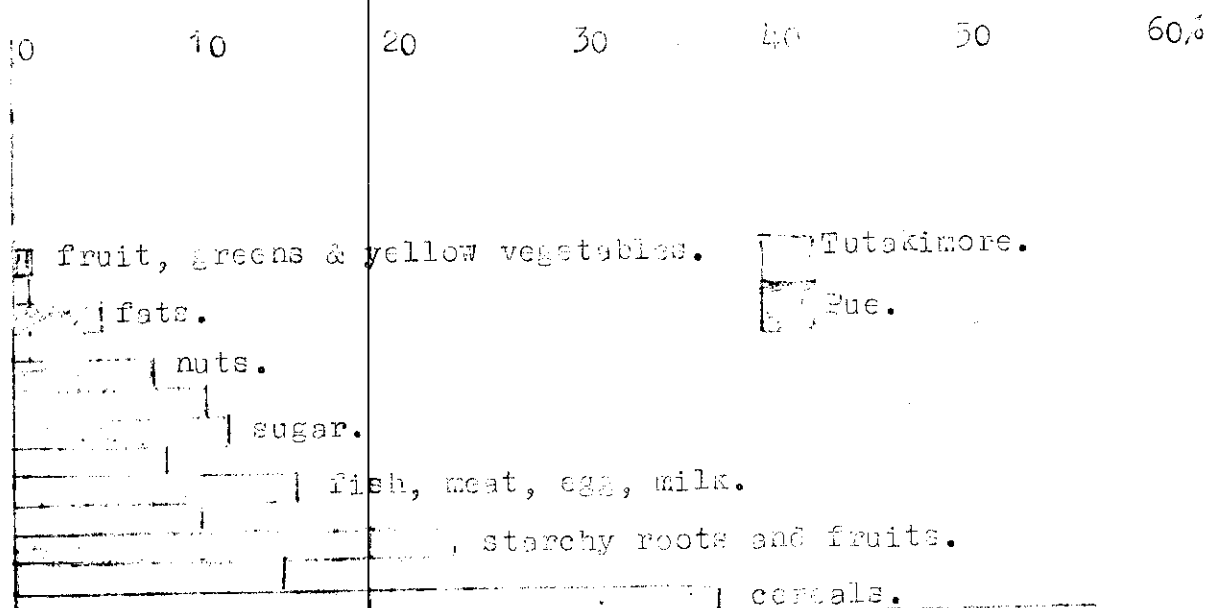
A comparison of the nutritive value of taro and white flour expressed per 100 calories.

<u>FOODS:</u>	Calories No.	Protein gms.	Fat gms.	Carbohydrates. mg.	Calcium. mg.	Iron mg.	Vit. A. iu.	Thiamine. mg.	Riboflavin. mg.	Niacin. mg.	Vit. C. mg.
Flour 70% extraction: (1 oz.)	100	2.0	0.1	21.6	9.1	0.4	0	.047	.019	.48	0
Taro: (4 oz)	100	2	0	16	29.56	0.96	26	.135	.034	1.05	3.11

It may be seen that the urban worker who derives the greater part of his calories from bread, flour or white rice starts at a much lower nutritional baseline than the villager who obtains root vegetables from his garden. To make up this deficiency the former needs extra amounts of the protective foods - fresh fruits and green vegetables, animal or fish products. In reality, this seldom takes place for he is tempted to spend a high proportion of his total income on goods other than food, and therefore tends to become increasingly dependent on the cheaper carbohydrates.

This situation exists in Tutakimore where the people obtain a higher proportion of their total calories from refined carbohydrate foods than the Pue people.

Percentage of calories derived from different food groups in Pue and Tutakimore villages.



GENERAL NUTRITIONAL LEVEL OF DIETS:

The calculated nutritive value of the average diet in Pue and Tutakimore shows that the average intake of calcium, vitamin A and the B vitamins is low. These deficiencies are to be expected where there is a low consumption of green vegetables, fish and other reef foods and animal produce. In Pue, the more wealthy families ate a fairly well balanced diet. Poverty and lack of supply appeared to be the main reasons for poor diets.

IMPROVEMENT OF FOOD SUPPLIES:

Much could be done to improve the conditions of urban families if more frequent and better regulated markets were held. Informants said that prices of root vegetables and bananas had almost doubled in the last three years. In October 1954, roots were 40.-70 per lb. and greens 60-90 per lb. tomatoes 60-70 per lb.

A very limited number of green vegetables appear to be used in the villages. Only three kinds - ruko leaves (*Colocasia antiquorum*), Chinese cabbage (*Brassica chienensis*), and English cabbage, were observed during the survey. Informants said that hibiscus manihot has been introduced by leprosy patients returning from Fiji. It would be helpful if more varieties of the strong, summer growing, green vegetables could be introduced. Those with high food value which grow easily are swamp cabbage (*Ipomoea reptans*), creeping spinach (*Basella alba*), spinach (*Amaranthus viridis*). Other summer vegetables which would add variety to the diet are loofah (*Luffa cylindrica*) the Fiji duruka (*Saccharum edule*), okra (*Hibiscus esculentus*).

As most Pacific Island communities have a fairly conservative attitude to new foods, it is suggested that any new vegetable should be introduced to the people through demonstrations and recipes given by Home Science students or teachers.

Fish are fairly difficult to catch round the coast of Rarotonga, and only limited amounts are brought into the village at week-ends, with the exception of beche de mer reef foods are not as plentiful as in other parts of the Pacific. The problem of supplying an inexpensive source of protein to the semi-urban groups needs urgent investigation. Consideration might be given to importing dried and salted fish from the northern islands. Dried shell fish (pearl, oyster and clam) are particularly good sources of the minerals and vitamins which tend to be low in these village diets. The dried and salted fish seen in Tutsikimore was well preserved and seemed a popular food.

The possibility of introducing the fish (Chanos chanos) into mangrove swamps and Tilapia mossambica into fresh water ponds has been suggested by the Tropical Agriculturalist of New Zealand Department of Agriculture. Experiments in Fiji have shown that the latter fish grows and breeds rapidly, and is very acceptable to Pacific Islanders. Fish ponds would provide a valuable protein "reserve" for Rarotonga.

The establishment of the new cold store will make more fresh meat available to the people in Avarua and it is hoped that some attempt be made to stock cheaper grades of mutton and beef for local consumption. The food value of cheap meat is equal to that of more expensive grades.

Tinned and dried milk is widely used by the wealthy families. People like to have milk in their tea. Cheap dried skim milk is available and the use of this should be further encouraged.

MANIHIKI ISLAND.

Manihiki Island lies 650 miles north of Rarotonga. It is an atoll surrounding a lagoon which is said to have one of the richest pearl shell beds in the world. There are two villages on opposite sides of the lagoon. The land in between consists of a strip of coral sand about half a mile wide covered in coconut palm, pandanus, and a few hardy shrubs.

The climate is fairly equable, and even on hot days a cool breeze blows off the lagoon. Drought is the worst hazard and in October there had been no rain for several months and the tanks were very low.

The Manihikians are sea-faring people, and there are stories of canoes travelling as far as the Ellice Island. In former times they lived between Manihiki and Rakahanga Islands. They stayed in one place till food supplies were exhausted, and then moved on to their crops on the adjacent island. The early missionaries are said to have persuaded them to settle in permanent villages in order to protect their lands from exploration. Both islands were visited by blackbirders in the 1800s.

The Manihiki people are shrewd and industrious. When the weather is fine most of the men are out diving for pearl shell, cutting copra, fishing, or boat building. The women cook the food, care for the children, sew, weave hats and baskets, open and trim the shell, or turn the copra. They are interested in home crafts, and appear to derive a good deal of pleasure out of sewing, knitting, or weaving. They are good dress-makers and cooks, and are always anxious to learn something new.

Both men and women like to enjoy life. Their dances and singers are reputed throughout the islands. Nowadays, they like to spend their evenings at the pictures or at the local dance. Leisure time is too often spent sitting round the house drinking. During bad weather and at week-ends, there is a good deal of drunkenness in the villages. The young people are interested in sport, and play tennis or cricket. There are two Girl Guide patrols, but at the time of this visit one patrol had been disbanded because of dissension amongst elders of the L.M.S. Church.

The average Manihikian appears to be very satisfied with his lot. He has plenty of entertainment, money to buy the things he really needs and a.s. an abundant food supply.

Amongst the more intelligent men and women there appears to be a keen desire for better educational facilities. Traders are anxious to have their sons taught accounting and mechanics. The women want to learn how to feed their babies, how to cook imported foods, dress make and knit. It was interesting to see how anxious people were to learn any new technique introduced into the island. Women were adept at copying dress designs and one of the school teachers was constantly being asked to teach girls to knit.

ECONOMIC BACKGROUND:

The main income of the island is derived from pearl shell. The gross value of the 1953-54 export was £67502. Copra is the second most important crop; the value of the exports for the same year being £14,630. The annual net per capita income of the 828 Manihiki inhabitants in the last two years has been £250 to £360. There is a good deal of variation in individual income depending on the diving ability of the members of a family, and whether they are rented divers or own a machine. It is estimated that a rented diver of fair efficiency can earn £2 a day, whilst a good diver makes up to £5.

The greater part of this money is spent at the trade stores. Imported foods are the most important item purchased. Other popular articles are cloth, sewing machines, bicycles, lamps, primuses, pots and crockery. The fishermen spend a good deal of money on the maintenance of their boats. These are kept in excellent repair and are a source of pride to the owners.

At first glance very little money appears to be spent in the home. Furniture is limited to a few home made chairs and tables, and perhaps a bed. Sewing machines, irons, lamps, primuses, and bicycles are owned by the more well-to-do families. Their most treasured possessions are kept in the family trunk. Some of these contain dozens of dress lengths and other articles which have little real value to the people.

THE SURVEY:

During the first week a qualitative survey was carried out in the school at Tahunu. Every morning the teachers asked the children to state the number of times different foods had been eaten on the previous day. The results were entered on a chart.

The following week, 12 households were selected for quantitative survey. Unfortunately, owing to changes in shipping schedules it was not possible for the Nutritionist to complete this personally. However, methods of recording were explained to the Dresser who continued with the collection of data till the end of the 7 day period. The results give a good qualitative picture of village diet, but quantitative information is lacking in some items.

The average amounts of food consumed per head daily are shown in Table VI. Chart 1 illustrates the number of times foods were eaten by the families during the 7 days survey.

Local Foods - Preparation and Use:

The indigenous diet of the northern islanders is very like that of the Gilbertese. The three main plant foods are pandanus, puraka (*Cyrtosperma chamissonis*), and the coconut (*Cocos nucifera*). In addition there are small plots of banana (*Musa sapientum*), Pawpaw (*Carica papaya*), Sugar cane (*Saccharum officinarum*), Pumpkin (*Cucurbita maxima*), and Kumara (*Ipomoea batatas*).

In former times puraka (*Cyrtosperma chamissonis*) provided the staple carbohydrate. During the last 50 years this has partly been replaced by the introduction of the breadfruit tree (*Artocarpus communis*) which grows well and bears prolifically. These foods are supplemented by considerable amounts of fresh and dried fish and shell fish.

Nearly every family owns one or two pigs and some fowls. Pigs are kept in pens outside the village, and appeared to be well cared for, in fact the standard of pig farming was higher than that observed in any other Pacific village community. Pig production might well be improved by introducing better stock. The 1950 Agricultural Census showed that there were 600 pigs and 870 fowls on the island.

Poultry more or less run wild round the villages. Both eggs and fowl meat are popular items of diet, and again, much might be done to improve production by introducing good stock.

Coconut: is the most important local food. Every household has a supply of green and germinating nuts at hand. Green nuts are used for drinking, and the soft flesh is a popular food for infants and adults. The germinating nut is split and the "coco apple" removed. This is eaten raw, whole or grated, and mixed with coconut water, or combined in flour puddings, or baked or boiled whole. Ripe nuts are grated and eaten with fish or sugar. The cream is extracted and used with fish, in the preparation of puddings, or mixed with a little salt water for a sauce. It was estimated that the average adult used 3 to 4 coconuts daily.

Pandanus: is now regarded as a children's food. The children like to chew the ripe segments raw.

Diet:

Since the price of shell has risen, imports of manufactured food stuffs has considerably increased. Between 1949 and 1954 twelve to twenty ships have called here annually. The ten stores and bakeries on Makihiki sell large quantities of flour, sugar, rice and tinned meat. Between March and October 1954 nine stores imported 12 tons of flour, 11.3 tons of sugar, and over 5.2 tons of rice, besides biscuits, lollies and jam. The average daily consumption per capita during these eight months was:-

Flour	3-4 oz.
Sugar	2-3 oz.
Rice	1-2 oz.
Biscuits	1 oz.

Taking into account the fact that one store in Tukaia did not supply data, the actual consumption level is probably nearer the higher figure.

Most of the flour is eaten in the form of bread, doughnuts and a heavy pudding known as puke. There are three bakeries and several doughnut and friar scone makers. Bread is

sold at 4d. for 6 oz. loaf, 6d. for 12 oz. loaf, 1/- for 17 oz. loaf.

Doughnuts are considered to be a very profitable business. The art of doughnut making was learnt from the Americans during the war. One woman who was the largest maker on the island, fried 100,4oz. doughnuts per day. These were sold at 4d. each, or two doughnuts for a coconut. This enterprise yielded over 50% profit.

There is a belief among the younger people that imported foods are better than local variations. In many families children are given priority when imported foods are scarce. In Manihiki and Karotonga women would say "We ate breadfruit but the children had rice". Manihiki school children were perpetual eating sweets, gum and doughnuts, with disastrous results to their teeth.

It is unfortunate that the people are neglecting cultivation of the basic food plant puraka, for if at any time they are deprived of flour, sugar and rice, there will be a serious shortage of carbohydrate food on the island until new plantings came into bearing.

Table VII shows the extent to which Manihikians depend on imported foods.

New comers to Manihiki are impressed by the misuse of income. It seems a great pity that part of the island wealth cannot be invested into some fundamental research project, such as an atoll agricultural experiment station which might provide real assistance in the future.

Throughout the Pacific there is an urgent need for sound advice on the methods of cultivating the indigenous foodplants to feed growing atoll populations. Failure of shipping for any length of time, would leave many islands in a difficult food situation.

Method of Food Preparation:

Most of the family cooking is done in the uumu, or in pots over the open fire. A few people have iron stoves.

Food Storage:

This is very poor. A few people have fly proof safes but for the most part food is kept in baskets or left on tables or shelves.

Daily Fare:

Manihiki people eat 2-3 times a day. It is usual to have a fairly substantial meal at night when the men return from diving or fishing; breakfast and lunch are meagre feasts. One of these meals is fairly substantial whilst the other usually consists of coconuts, or may be omitted altogether.

In talking about the local diet one woman said "The Maories do not eat like white men - we, we eat any time, any kind. Some eat nothing but coconuts and fish - just walk about the bush and get what they want".

TABLE VII

AVERAGE AMOUNTS OF FOOD CONSUMED PER HEAD DAILY IN MANIHIAL. SEPTEMBER 1954.
(oz. per head).

	Starchy roots & fruits.	Cereals.	Canned meat and fish.	Fresh meat.	Fresh fish.	Milk products.	Fats.	Sugar & Jam.	Green. & yellow veg.	Fruit.	Coconut NO. NUTS.	Tea & coffee.
VILLAGE:												
MANIHIAL:	6.14	15.26	3.20	0.	20.11	+	+	2.57+	0	+	4	+

+ Indicates food was commonly eaten

TYPICAL DAILY MEALS

1.	2.
A.M. Germinating coconut.	Biscuit, tinned meat, tea, milk, sugar.
M.D. Clam, breadfruit.	Germinating coconut. Green coconut.
P.M. Bread, doughnuts, green coconut.	Auraka, fish.

Food and Health:

There were 30-60 infants 0-5 years on the island, and 24 were examined, weighed and measured.

A total of 136 children 5-14, and 92 people 15-40 years were seen. The results of the examination are shown in Table X.

Unlike other areas of the Pacific cases of poor nutrition were most frequently found in infants under one year. Six out of twenty-seven infants were found to be seriously undernourished. Further investigations showed that these were being fed on dilute mixtures of condensed milk. In the year August 1953-1954, 10 infants had died under one year, the main causes of death being gastric and pulmonary infections. Looking back on the records there appears to be little reduction in infant deaths during the last ten years. The Catholic priest said that he considered the main cause of death to be poor feeding, and the present investigation confirmed this.

A few cases of malnutrition which appeared to be attributable to vitamin and protein deficiencies were found amongst infants of 1 to 5 years. Several babies had a rash on the cheeks which investigations in Rarotonga have shown responds to nicotinic acid. One little girl was covered in follicular keratosis and generally undernourished.

These deficiencies could be remedied by the proper use of local foods. Mothers of malnourished infants were visited in their homes and shown how to prepare milk mixtures. A meeting for village women was held in the Council Hall. This was very well attended, and women showed an active interest in a demonstration on the preparation of foods for young children. Notes on infant feeding were translated into Maori by the school teacher for distribution on the island.

School Children:

A few cases of poor nutrition, sores and scabies, were found among the 5-7 age group. Dental caries and gingivitis were by far the most serious conditions. Out of 47 children from 5.5 to 10.5 years, 30 had advanced caries. Although caries was more prevalent in primary teeth, numerous cases were also seen in secondary teeth. One week of teeth cleaning with coconut husk and sea water brought about a remarkable improvement in dental hygiene. It was suggested that teeth cleaning be made part of health instruction.

A qualitative survey of the foods consumed by 37 school children at Tahunu school showed the average daily diet pattern to be as follows: (Based on six day survey).

Average number of times food eaten in one day.

Tinned meat and fish (mainly meat)	1
Fresh fish.	1
Bread or biscuits (mainly bread)	1
Doughnuts.	1
Sugar.	2
Breadfruit.	0.5
Green coconut.	1.5
Ripe coconut.	0.5
Germinating coconut.	1.7

Other foods eaten once or twice in six days were:-

Tinned milk (14 children had milk 1-5 times).
 Shell fish.
 Rice.
 Taro.
 Pandanus.
 Bananas.

This diet is high in carbohydrate and low in calcium containing foods, it is therefore not surprising to find such a high incidence of dental caries. According to the older people, caries was never seen in the old days when the people lived on plant foods and fish. Several leading Islanders were anxious to have free milk in Manihiki schools. Although this would be beneficial, it might be more satisfactory to encourage a school lunch programme based on local foods, and at the same time arrange for dried skim milk powder to be distributed at a low price through the trade stores. Most people like to have milk in their tea, but at present high costs this luxury is usually foregone in favour of other foods.

INCIDENCE OF SYMPTOMS SUGGESTIVE OF MALNUTRITION.

A summary of the conditions observed among the 659 people examined is given on Table VIII. In Rarotonga 10% of the children 6-10 years were graded as poorly nourished whilst in Manihiki the highest incidence, 12%, occurred in the 0-5 year group. These children were thin and undersized and some had follicular keratosis or unusually dry skin.

Dental caries appeared to be the most serious problem in all the groups.

Heights and Weights:

It is not possible to draw conclusions from averages based on such small numbers. The figures for the three groups are comparable with those found by Faine and Marcus (1950), who after surveying 339 people, suggested that Rarotongans children appeared to be of approximately the same build as New Zealanders.

INFANT NUTRITION:

The majority of infants appeared well nourished, although the nicotinic acid deficiency rash was fairly common in Rarotonga. Cases of malnutrition were usually attributable to the use of inadequate milk mixtures. The common practice of adopting young infants and weaning them onto the bottle should be discouraged.

In former times adopted infants were breast fed by a foster mother. Now, especially in the outer islands they are given a dilute mixture of condensed milk and water.

TABLE VIII.
INCIDENCE OF CLINICAL CONDITIONS OBSERVED AMONGST 659 COOK ISLANDERS.

[illegible]

The weights of infants collected in Rarotonga and Manihiki suggested that the rate of growth is more rapid during the first 6 months of life than among New Zealanders.

TABLE IX.

Average weights of Cook Island infants compared with the expected weights for normal New Zealand infants.

Age: Months:	New Zealand:	Manihiki:	Rarotonga:	
	lbs.	lbs.	No.	lbs.
1.	8.1	12.88	2.	10.
2.	10.1	17.	4.	12.5
3.	12.1	14.25	2.	13.33
4.	14.	17.	2.	16.
5.	15.1	20.42	3.	18.
6.	16-17.	18.75	1.	17.2

INSTITUTIONAL FEEDING:

The daily fare in the hospital and the Sanatorium was examined. Three meals are served daily. A main meal consisting of roots and meat and vegetables is given at midday, whilst evening and morning meals are usually based on bread, butter, jam, and tea. It was suggested that the latter meals might be supplemented with fruit and either milk, soup, or porridge. Inadequate cooking stoves and poor supplies of fresh foods make hospital catering very difficult, and under these circumstances the food served is of a good standard. It is hoped that the guide for rationing (Appendix III) the cookery lessons and special diet lists ~~that~~ were given to the staff will assist to raise the general standard of catering in the future.

NUTRITION AND HOME SCIENCE EDUCATION:

During the visit to Rarotonga a great deal of time was spent lecturing to nurses and giving talks at community centres. The people showed considerable interest in the talks and demonstrations and during discussions intelligent questions were asked. It was considered that a great deal could be done to raise the standards of family nutrition and general welfare through Home Science demonstrations in the villages. Time and time again people said "Yes we could do these things you tell us about if we were shown the right way".

The Cook Islands provide excellent ground for Home Science extension work and it is to be hoped that the Administration might give serious consideration to establishing this work in the near future. The Education Department in Fiji have already offered to train two of the Home Science teachers, trainees at the Suva, and District Technical centres.

Rarotonganschool children receive an excellent course in Home Science. It was encouraging to find that one of the Rarotongan teachers had started a most successful course for girls at the school in Atia Island. Besides holding regular classes she visited the homes of her students to see that lessons were put into practice.

MANAHIKI FEMALES:
TABLE X.
AVERAGE HEIGHT AND WEIGHT OF COOK ISLANDERS.

AGE YEARS:	NO. SAMPLE:	HEIGHT IN INCHES:	RANGE:	WEIGHT IN POUNDS:	RANGE:
1	2	27.75	28 - 27.5	19.38	17.5 - 21.25
2	2	31.25	30½ - 32	23.00	20- 27
3	6	36.08	33 - 39.5	29.96	23 - 38
4	8	40.31	36 - 44.5	36.28	28.25 - 44
5	4	42.13	42.5 - 44	39.94	33 - 42.5
6	16	46.17	41.5 - 49.5	50.53	39 - 60.25
7	2	48.13	46 - 50.25	42.75	24.5 - 61
8	6	49.38	48 - 52.5	56.21	48.5 - 76
9	5	49.55	46.75-52.5	55.75	48 - 63.75
10	6	50.63	48 - 53.75	58.29	56 - 68.5
11	5	55.10	52 - 59.75	77.10	60 - 104
12	6	54.33	52.5 - 56	70.25	63.5 - 78
13	4	59.25	56.75-61.5	95.81	81.25 - 107
14	8	58.72	59 - 62.5	102.31	90-139.5
15	2	60.88	59.5-62.25	131.25	102.5 - 160
16	3	61.75	59.5 - 63	114.91	106.75 - 120
17	2	61.75	61 - 62.5	116.50	116 - 117
18	3	62.67	60.75-64.5	138.33	115 - 170
19	1				
20	34	60.50		128.00	90 - 190.5
20-30	13	62.07	58 - 64.75	140.73	108 - 185.5
30-40	11	62.02	58.5-62.25	138.04	109.75-171.5
40+		62.73	59.75-65.5	143.83	

MANIHIKI MALES: AVERAGE HEIGHT AND WEIGHT OF COOK ISLANDERS.

AGE YEARS:	NO. SAMPLE:	HEIGHT IN INCHES:	RANGE:	WEIGHT IN POUNDS:	RANGE:
1	1	29.50	26.35	20.25	20.25-45
2	4	30.63	26.36.75	30.56	19-22
3	4	33.25	36.39	32.88	32.5-36.75
4	5	37.35	39.25-45	35.25	33-50
5	8	41.47	38.75-48.25	38.03	35-51
6	10	44.08	41.5-51	43.58	38.5-53.75
7	7	46.25	46.25-55	47.43	42-74.5
8	8	48.06	47.5-56.5	52.53	49.5-75.75
9	11	51.73	46.25-53	63.73	49.25-72.5
10	12	51.06	51.55.5	61.44	58.5-71.75
11	7	53.36	55.58	67.32	60-85
12	7	55.25	53-59.5	74.79	79.5-102.5
13	2	56.25	59.75-65.5	91.00	98-121.75
14	2	62.63	57.75-62	109.88	87.5-110.25
15	3	59.88	64.5-66.25	87.08	111.5-145.5
16	2	65.38		128.50	
17	1	65.00		136.08	
18	1	65.00		144.75	
19	1	66.50		129.75	
20-30	5	68.05	65-72	164.00	140-208
30-40	5	67.25	62.25-71	179.35	162-216
40+	5	69.03	66.75-75	183.60	140-202

TABLE XI.
AVERAGE HEIGHT AND WEIGHT OF COOK ISLANDERS.

AGE YEARS:	NO. SAMPLE:	HEIGHT IN INCHES:	RANGE:	WEIGHT IN POUNDS:	RANGE:
<u>RAROTONGA FEMALES:</u>					
5	5	43.70	43.25-44.75	44.25	41.75-47
6	11	44.70	42.5-47.25	48.95	41.5-65.5
7	5	48.85	45-54	57.10	46-67.5
8	7	49.54	46.51-75	58.64	52-66
9	8	49.94	45.75-53.5	66.94	45-86
10	4	51.44	49.5-53.75	64.25	58-71
11	10	56.00	55-61	80.15	70-118.5
12	10	56.83	52.75-59.25	85.50	66.5-12.6
13	16	59.84	49.5-64.5	97.88	77-118.5
14	14	60.91	54.5-65.5	104.07	70-127.5
15	15	62.43	60-64.75	114.67	99-132
16	4	62.81	62.25-63.5	124.38	120-135
17	5	62.10	60.25-64.75	120.60	105-135
18	2	63.00	62.75-63.25	126.75	113.5-140
<u>RAROTONGA MALES:</u>					
5	4	44.31	40.75-47.5	45.33	34-56.5
6	11	44.70	42.53-48	46.23	40.5-55
7	4	48.56	45.75-52.25	51.13	45-60
8	4	46.75	42.48	45.75	39-51.5
9	3	53.42	51.25-56.5	66.00	60.5-72
10	4	51.38	44.75-52.25	56.50	41.5-71
11	3	56.67	55.25-50.25	78.67	74-87
12	4	56.88	54.5-59	79.13	68.5-91
13	5	57.65	55.25-61	82.50	70.5-100
14	4	60.31	56-61.5	94.38	82-106.5
15	3	64.75	59.5-69.25	14.00	87-13.0
16	4	62.88	55.5-67	14.25	77-143.5
17	4	65.60	61.5-68	27.70	98-155
18	5				

TABLE XII.
AVERAGE HEIGHT AND WEIGHT OF COOK ISLANDERS.

AGE YEARS:	NO. SAMPLE:	HEIGHT IN INCHES:	RANGE:	WEIGHT IN POUNDS.	RANGE:
<u>AITUTAKI SCHOOL MALES:</u>					
5	4	43.69	42.75-44.75	41.50	37.48
6	23	44.26	41.75-46.75	43.40	34.5-55
7	19	46.25	40.75-48.75	48.28	38-62.5
8	13	49.17	44.25-51.75	53.13	48-64
9	4	49.25	45.75-53	56.50	48.77
10	1	54.75		76.50	
11	7	54.86	51.75-58.5	70.43	64.76.5
12	3	55.92	50.75-60.5	73.33	60.95
13	10	57.35	52-60.25	79.63	64.5-93.5
14	1	56.25		83.25	
<u>AITUTAKI SCHOOL FEMALES:</u>					
5	7	42.89	41.75-44.75	39.32	36.5-44
6	32	43.94	40.75-47.75	42.77	39.52
7	22	46.52	43.75-51.75	46.08	41.5-51.5
8	21	48.23	44.75-50.75	51.56	41.5-63
9	4	50.25	50.75-49.75	56.38	47-63
10	2	51.25	49.75-52.75	61.50	55-68
11	5	53.45	49.75-55.75	64.40	53.5-57
12	6	55.58	53.75-57	79.50	63.5-88
13	9	59.02	52.75-64.5	91.50	71-110
14	2	59.38	57-61.75	86.75	83.5-110

TABLE XIII.

AVERAGE HEIGHT AND WEIGHT OF COOK ISLANDERS.

AGE MONTH:	NO. SAMPLE:	HEIGHT IN INCHES:	RANGE:	WEIGHT IN POUNDS:	RANGE:
1	2	21	20-22	12.88	11.5 - 14.25
2	4	24.1	21.5-27.5	17	13.5-21.25
3	2	23	22 - 24	14.25	13.25-15.25
4	2	20.5	17 - 24	17	15 - 19
5	3	28.7	26 - 32	20.42	16.75-23.25
6	1	26		18.75	
7	2	26	25 - 27	17.88	16.25-19.5
8					
9	2	27.25	26-28.5	19.88	16.5-23.25
10	3	28.33	26 - 32	21	20 - 23

AGE SEX DISTRIBUTION OF PEOPLE EXAMINED.

<u>AGE YEARS:</u>	<u>MALES:</u>	<u>FEMALES:</u>
0-1	13	14
1	1	2
2	4	2
3	4	6
4	5	8
5	16	16
6	44	59
7	30	29
8	25	34
9	18	17
10	17	12
11	17	20
12	14	22
13	17	29
14	7	24
15	6	17
16	6	7
17	6	7
18	1	5
19	1	-
20-30	5	35
30-40	5	13
40+	<u>8</u>	<u>11</u>
<u><u>T O T A L:</u></u>	<u>270</u>	<u>389</u>

DISCUSSION.

The 365 people investigated by Faine and Hercus were Rarotongan villagers. They owned land and their staple diet consisted of roots, breadfruit and banana supplemented by sea foods and coconut. Tinned meat and other store foods were widely used but only one family bought flour. The present survey showed that landless people are to a large extent dependent on imported carbohydrate foods. This change in food patterns has brought about a reduction in the nutritional value of the diet and there are indications that this is reflected in the health of young children.

Faine and Hercus state that they found no signs of malnutrition. It therefore seems likely that the common "rash" which responded to nicotinic acid, may have become more prevalent in the last five years.

The nutrition of the Cook Islanders depends on the output of land and sea. If adequate supplies of fresh foods are not available there is likely to be a deficiency of vitamins, minerals and protein in the diet. This survey showed that under present conditions the semi urban population is living at a low level of nutrition. The improvement of this depends on nutrition education and agricultural and marketing development.

SUMMARY.

1. The food consumed by three Cook Island village communities was investigated.
2. Groups of people were examined, weighed and measured in Rarotonga, Makihiki and Aitutaki Islands.
3. Poor nutrition was found among landless people in Rarotonga and in young infants in Makihiki.
4. Suggestions are made for improving various aspects of nutrition in the areas visited.

R E F E R E N C E S

S. Faine and C. E. Hercus - The Nutritional Status of Cook Islanders. Brit. Journ. Nut. Vol 5, No. 3 & 4, 1951.

C. E. Hercus & S. Faine -
The Rarotongan villagers' Environment.
Trans. Roy. Soc. Trop. Med. & Hyg. Vol. 45, No. 3, 1951.

Dept. Island Territories. Report on the Cook,
Niue and Tokelau Islands - 1954.

--- 000 ---

APPENDIX I.

FEEDING TABLE FOR NORMAL COOK ISLAND BABIES.

(Notes for Assistant Medical Practitioners and District Nurses).

Breast-fed babies are much stronger and easier to bring up than bottle-fed babies. Every mother should be encouraged to breast-feed for at least 9 months. At this age the infant can be weaned on to $1\frac{1}{2}$ pints of cows milk daily (this is 15 tablespoons dried milk, 30oz. water). When mothers cannot get cows milk they should continue to breast-feed up to 12 to 18 months and then give plenty of fish and vegetable soup every day in place of the milk.

Babies should not be adopted under 9 months. It is very wrong to substitute the bottle for mothers breast milk.

Malnutrition is caused by the following conditions:

1. Baby is fed on the wrong milk mixtures - some mothers think their breast milk is no good and give a little condensed milk mixed with water.

2. The baby is given nothing but breast milk after 8 months. At this age it is very important that the baby should receive fruit, mashed vegetables, a little fish and eggs. Breast milk alone does not supply enough food.

3. The baby is suddenly weaned at 9-12 months onto starchy foods e.g. rice, biscuits and tea. These foods do not supply the protein needed for growth. Weaned babies must have milk or fish soups, meat soup and eggs.

Milk:

There are several different kinds of dried milk and condensed milk suitable for baby feeding.

For milk mixtures use -

1. Dried Full Cream milk.

2. Special baby milks such as Glaxo and Ankorina. If ordinary dried full cream milk is used extra sugar must be added to bring it up to the strength of human milk.

Sugar must also be added to fresh cows milk. Fresh cows milk must always be boiled.

To mix dried milk:

Add a little warm, not boiling water, leave for a minute and then stir till smooth. Add the rest of the water and strain into the bottle. Mothers should be told to mix a fresh feed every time the baby is fed.

The best way to strain milk in the village is to get some fiber from the base of young coconut leaves, cut in squares, boil and dry, and keep in a box or tin.

Hygiene:

Encourage mothers to have a special cupboard or covered box. Always keep bottles and teats, strainers measuring cups and spoons covered away from flies. To clean bottles rinse with cold water and then boil in a pot.

FEEDING TABLE FOR NORMAL BABIES.

Every baby is different, some are bigger than others and need more food. Some grow more quickly than others and need more food. If a baby cries a lot and fails to gain weight, he is not getting enough food. The following table can be used as a guide:-

APPENDIX II.

CHILD WELFARE NOTES FOR FATHER MOTHERS

The health of the mother and child depends a great deal on the food eaten every day. When a woman become pregnant she feeds the baby from the food she eats. During pregnancy she feeds herself and her baby. It is very important for her to have plenty of good food.

Every day she should eat some food from these four lists

Fish	Kumara.	Nimata.	Butter.
Shell fish, clams etc.	Breadfruit.	Uto.	Cocoanut.
Crab.	Taro, or taro.	Pawpaw.	Cocoanut oil.
Dried fish.		Orange.	
Chicken.	Banana.	Lemon.	
Pork.	Yam.	Taro leaves.	
Eggs.	Rice.	Chinese cabbage.	
Tinned fish.	Flour.	Any other green.	
Tinned meat.	Bread.	Pumpkin.	
Fresh meat.	Cakebread.	Beans.	
		Tomatoes,	
		Any other fruit.	

If she has money she should buy a tin of dried full cream or dried skim milk. She should have 3-4 level tablespoons a day mixed with tea or nimata juice.

Good food is important for these reasons -

1. Good food makes a strong baby.
2. Good food makes the mother strong and helps her to have an easy delivery.
3. Good food helps the mother to have plenty of breast milk.

The mother must keep on eating plenty of these foods while she is breast-feeding the baby. Plenty of food makes plenty of breast milk.

FEEDING THE BABY

Every mother should try to breast-feed her baby. Breast-fed babies are much more healthy than babies who are fed on bottles. If a mother is very sick or if she does not have enough breast milk she must then feed with dried milk.

The best milk to use is Anchor Dried Full Cream Milk.

The mother should ask the C.I.W.P. nurse or dresser how much milk to use and how to mix the feed. This is very important. At different ages babies need different amounts of milk. Always mix the milk with warm boiled water. Stir till there are no lumps then strain through a piece of clean puru which has been washed and boiled.

Bottle Fed Babies get sick if any of these things happen.--

1. The wrong amount of dried milk is mixed with water.
2. The bottle or teat are dirty.
3. Flies crawl over the bottle or teat.

A wise mother washes the bottle and teat with cold water, and then boils it in a pot after every feed. She keeps the milk, a teaspoon and tablespoon, the bottle and teat, in a cupboard away from the flies. If there is no cupboard she covers all these things with a clean cloth.

THE BABY'S FOOD

Milk is the main food for the baby. Mothers should breast-feed to 12 months and then wean the baby and give dried full cream.

APPENDIX III

SUGGESTED BASIC RATION SCALE FOR COOK ISLAND HOSPITALS.

Staff & Paying Patients:

<u>Food:</u>	<u>Amount:</u>
Milk:	1 pint or 2 oz. full cream milk powder.
Butter:	1½ oz.
Fruit:	½ lb. fresh or ¼ lb. tinned.
Green vegetables:	6-8 oz. or ¼ lb. tinned.
Root vegetables:	10 oz.
Bread:	½ lb.
Cereals - other:	3 oz.
Tea or Coffee:	½ oz.
Sugar:	3 oz.

Non Paying Patients:

Milk: or Dried Skim Milk	1 pint. 2 oz.
Butter:	1 oz.
Sugar:	2 oz.
Coconut: or Other fat:	1 nut. ½ oz.
Green vegetables: or fruit:	½ lb.
Root vegetables or Rice.	2 lbs. 6 ozs.
Bread:	1 lb.
Tea:	½ oz.
Jam:	1 oz.
Meat: or Fresh Fish: or Tinned meat or fish:	6-8 oz. 10-12 ozs. 3-4 ozs.
Oatmeal or Rice:	1 oz.

Additional rations for Tuberculosis patients:

Milk:	½ pint full cream milk. (1 oz milk powder).
Meat or Substitute:	2 ozs.
Fruit:	½-1 lb.
Vegemite in lieu of jam three times week.	

or dried skim milk. If a mother cannot get milk she can keep on giving the baby some breast milk till about 18 months.

Babies need some fruit juice and soft food and cod liver oil. This makes them strong.

This is how to feed your baby:-

Two weeks old: Give 1-2 teaspoons orange, tomato or pawpaw juice in 2 tablespoons boiled water. OR 2 tablespoons nimata juice. Give this in the morning or afternoon.

One month old: Give 2-3 teaspoons orange, tomato or pawpaw juice in 2 tablespoons water. OR 3 tablespoons nimata juice. 1 teaspoon cod liver oil every morning.

Two months to Five months: 1-2 tablespoons of water from boiled bananas, breadfruit, kumara, rice or pawpaw, kumara leaves, pumpkin leaves or water cross.

Take the water out of the pot, let it cool and then give to the baby. If there is no soup or fruit juice, you can give a little mashed ripe pawpaw or green coconut.

It is important to give the baby just a little fruit juice or soup on the first day and then gradually increase the amount like this:

- 1st day give 1 teaspoon in the morning.
- 2nd day give 2 teaspoons in the morning.
- 3rd day give 4 teaspoons in the morning.
- 4th day give 4 teaspoons in the morning, and 4 teaspoons in the afternoon.

1 teaspoon cod liver oil every morning.

Five months: Start giving soft mashed breadfruit, kumara, rice, yam, taro, etc. Mix this with a little soup from fish or vegetables.

Try to get some eggs and give the baby 1-2 teaspoons of the yellow part mixed with the taro or breadfruit etc. twice a week. Start by giving a little of these foods at dinner time and then increase the amount.

- 1st day give 1 teaspoon at dinner time.
- 2nd day give 2 teaspoons at dinner time.
- 3rd day give 4 teaspoons at dinner time.
- 4th day give 4 teaspoons at dinner time, and 4 teaspoons at night.

Keep on giving drinks of nimata and water or fruit juice every day, and 1 teaspoon cod liver oil every morning.

7-12 months: You can give more vegetables, rice, fish soup, green coconut and pawpaw. Start mixing a little soft fish or cooked liver or ruko with these foods.

See that the baby has some fruit juice or nimata juice every day. If you have no fruit give him a drink of lemon leaf tea. After 12 months give him drinks of dried skim milk.

At 12 months the baby should be having three meals a day. Always try to give Maori foods to your child - taro, breadfruit, etc etc., are much better than bread, rice, sugar and flour. The best store foods for your child are dried milk, tinned fish and tinned meat.

Keep on giving cod liver oil. This is the right kind of food for children 1-3 years:

Breakfast:

Nimata or pawpaw,
mango, Taro,
breadfruit,
kumara.

Dinner:

Egg, fish or meat,
Kumara or cabbage
Taro, breadfruit
etc.,

Tea:

Taro, Coconut
cream with bread,
breadfruit and
kumara.

For drinks give milk, soup, nimata juice, lemon leaf tea.

Clean his teeth twice a day with a piece of coconut fibre wrapped round the finger. Then make him rinse his mouth with water - sea water is very good for this.

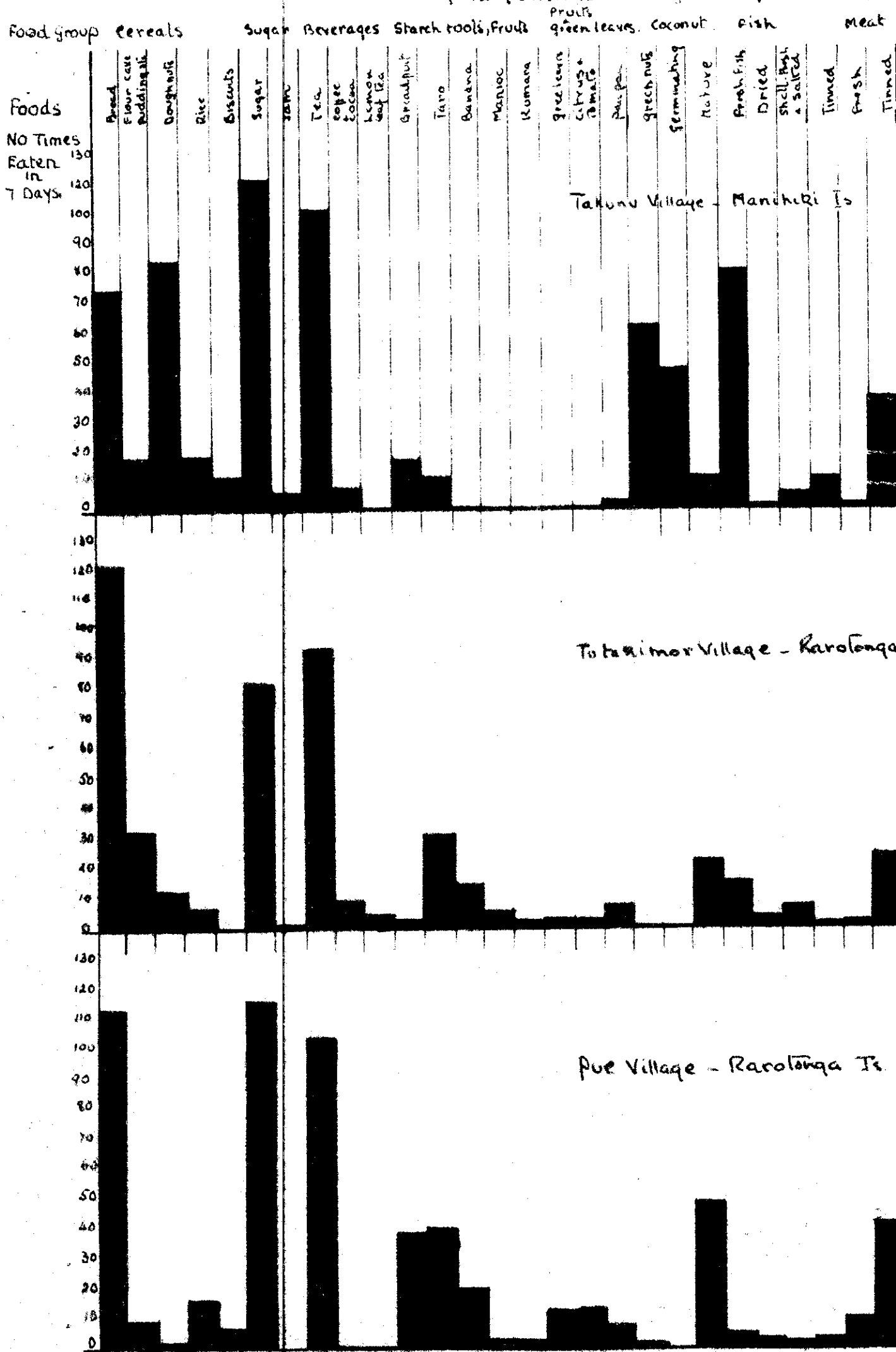
ALWAYS GIVE YOUR CHILD BOILED DRINKING WATER.

ALWAYS GIVE YOUR CHILD BOILED DRINKING WATER.

Give the smaller amount to little babies and the larger amount to the bigger babies.

1. A healthy baby age 4 months weighs 12½ lbs. give
 10 tablespoons dried milk and 53oz. water.
2. A healthy baby age 3 months weighs 14 lbs. give
 12 tablespoons dried milk and 55oz. water.

Chart I Food Habits. Showing the no. of times different foods were
 of 12 families during 7 days Survey of



Food Habits. Showing the no. of times different foods were eaten by 3 groups
of 12 families during 7 days Survey Oct 1954.

