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Autor:	Sorenson, E. Richard / Gajdusek, D. Carleton
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National Institute of Neurological Diseases and Stroke
National Institutes of Health, Bethesda, Md.

Nutrition in the Kuru Region

I. Gardening, Food Handling, and Diet of the Fore People

E. RICHARD SORENSEN and D. CARLETON GAJDUSEK

Nutritional factors, perhaps in association with genetic susceptibility, have been suspected of playing an important role in the pathogenesis of kuru since its first description in 1957 (8, 9, 25). With recent demonstration that the disease is transmissible and probably of viral etiology (7), there remains the possibility that nutrition and its qualitative and quantitative aspects may have a bearing on the susceptibility to, or act as a precipitating factor of kuru (6). Kuru is confined to the Fore people of the Eastern Highlands of New Guinea and their neighbours with whom they intermarry.

At the time of entry of civilized man into Fore country during the 1950s, cannibalistic consumption of dead relatives was practiced by all Fore (10, 2). The possibility that the handling and eating of the flesh of dead kinsmen might give rise to the ingestion of still viable microorganisms, or at least hypersensitization to brain through eating of incompletely denatured human proteins, was entertained from the onset of kuru investigation (6). The pattern of kuru incidence has been altering strangely over the past decade of surveillance with progressive increase in the age of the youngest victims (1). This has prompted a continuing interest in the traditional Fore nutrition and its changing pattern in association with changing epidemiology. This study is based on observations and data collected by the authors during twelve years of nearly annual field trips to the Fore region to study kuru (with an accumulated period of residence of about five man years). It has been a period of dramatic cultural change during which the Fore have altered their primitive, isolated neolithic culture to one increasingly influenced by Western law, government, religion, and trade practices.

The Fore practice of slash and burn agriculture is not greatly different from that of other peoples of the Eastern Highlands, and their methods of food preparation and cooking are similar to those used in much of the New Guinea Highlands. In this paper we are

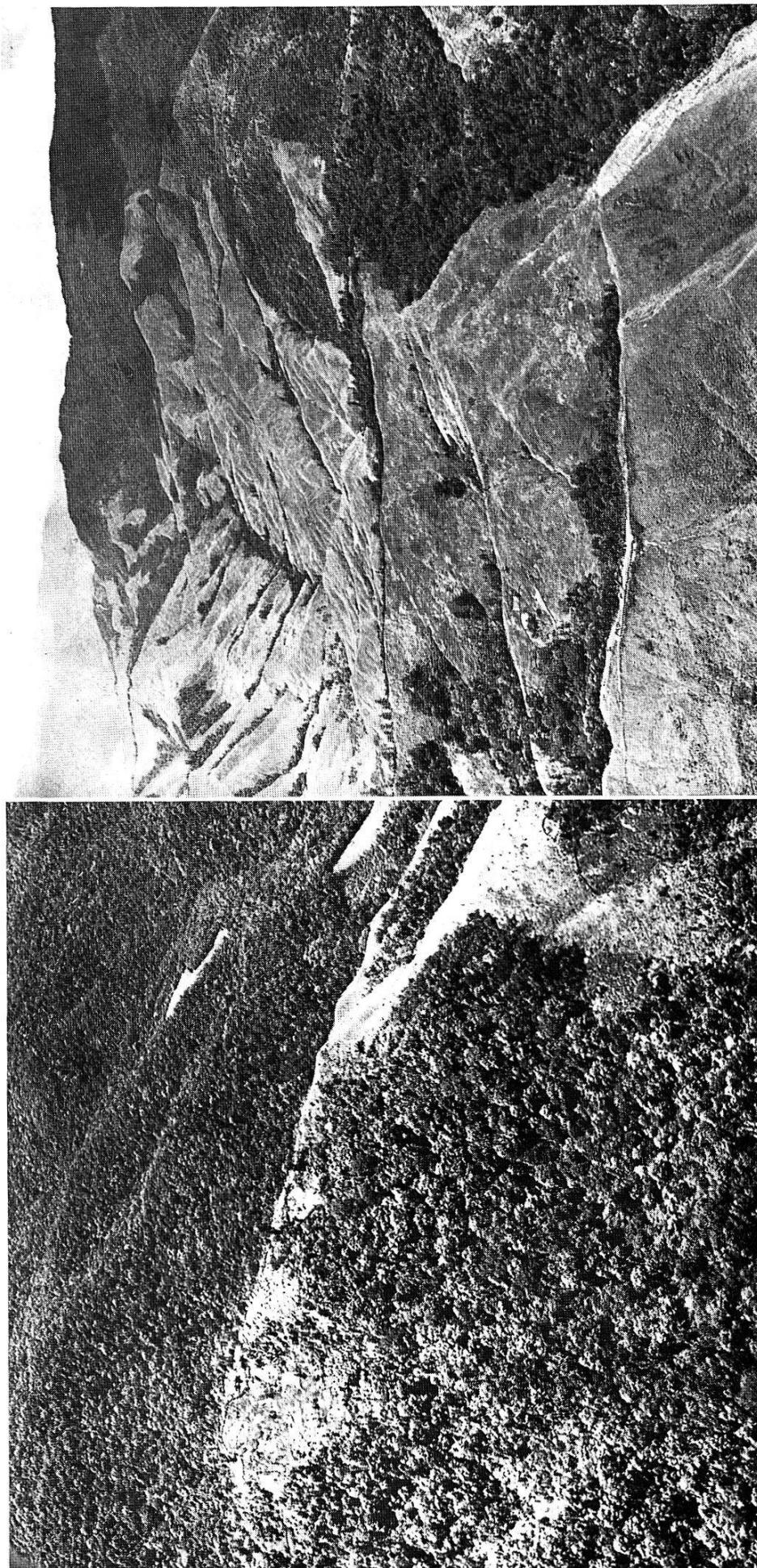
devoting emphasis to the Fore features of food handling since they may have bearing on the changing incidence of kuru.

The Fore Homeland

Making their homes in the Eastern Highlands of New Guinea, south of the central New Guinea divide, the 14,000 Fore people are bounded by the Lamari and Puburamba valleys on the east and the Yani and A'niyara rivers on the west. They have common boundaries with 9 other tribal groups, each with its own distinct language and culture. It is a region of considerable ethnographic diversity: four language families and three language stocks touch at the Fore boundaries (23). The 400 square miles of steep valleys and mountain ridges belonging to the Fore people are divided into 65 distinct village regions, each containing several small affiliated hamlets¹.

The ubiquitous ridges rise as high as 9,500 feet and the river gorges descend to 1,000 feet. Flat land is rare. Most of the population lives on ridges between 4,000 and 7,000 feet. Vast stands of virgin rain forest cover much of the mountains and valleys, particularly at higher elevations. Irregular clearings of varying size punctuate this rain forest, probably indicating past cultivation (Figure 1) (17, 16). In areas of greater population or those with a history of earlier habitation, these clearings merge to form large zones of predominantly forest-free land. Smaller cleared tracts mark sites where diverging Fore groups have cut away forest to make hamlets and gardens. Pseudopod-like extensions of garden and grassland penetrate the virgin rain forest along the edges of the larger cleared areas. Inhabited zones are marked by garden clearings (Figure 2). At the onset of Kuru studies in 1957 the uninhabited forests to the far south contained a few sites where the Fore had penetrated to malarial regions below 4,000 feet in eleva-

¹ Fore villages, like those in most of the New Guinea Highlands, are not tight compact settlements but, rather, a collectively claimed territory containing forest, grasslands, gardens, and several dispersed hamlets. It is not uncommon for a hamlet to be separated from its nearest neighbor by an hour's walk; and it is possible for a hamlet to be nearer to a hamlet of a different village than to any of its own village. In precontact times, people thought of themselves more in association with their kinship ties than with named village regions. But with the advent of government administration, local affiliations have had village names somewhat arbitrarily designated by patrol officers as they established census units. This has more firmly established the idea of belonging to a specific political unit among the Fore and has stabilized their political geography.



and a trail of kunai grassland tracing the movement of the settlement and gardens up the ridge into new forest. In a few areas with a long history of settlement (picture b) there may be extensive grasslands covering an entire valley.

a: Awarosa village, 1968. b: Abomatasa village, 1968.

Fig. 1. The Fore Lands: The Fore clear land for their mountain-side gardens from virgin rain forest. Kunai grass and later secondary forest growth replace abandoned gardens, but permanent grassland may follow in the wake of extensive cultivation. In the more recently settled areas (picture a), rain forest cover is virtually unbroken except for the hamlet yard, the adjacent gardens,

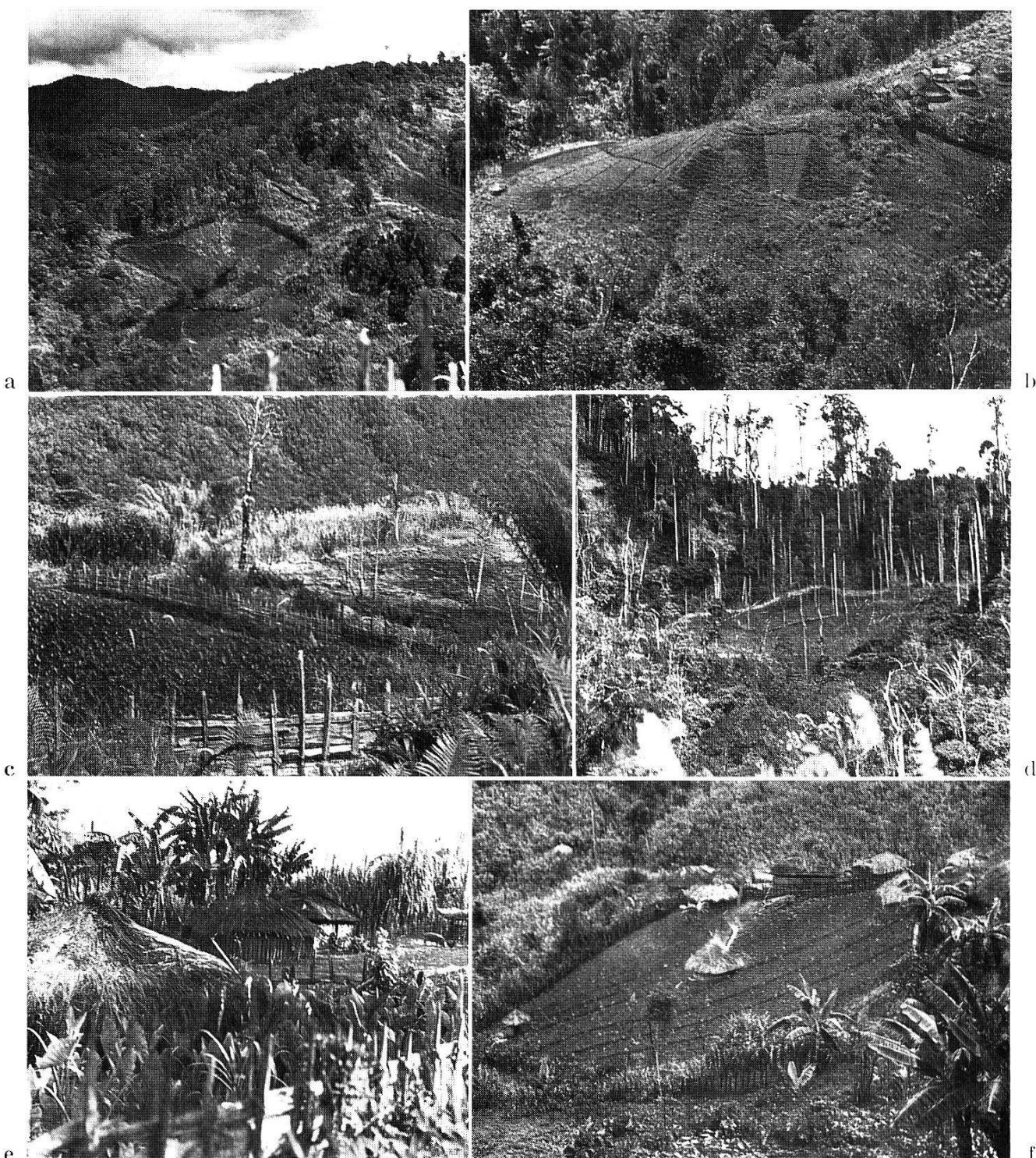


Fig. 2. Garden Sites: The mountain dwelling Fore are slash and burn cultivators whose food comes from the gardens situated on ridges and hillsides. Gardens are frequently near a hamlet (pictures a, b, e, f). However, there are also always gardens at greater distances (pictures c, d). Hamlets and gardens are often near the edge of forests, where new gardens have been cleared from either virgin forest or secondary growth. In the precontact period, women often had their houses on the edge of a garden, or, occasionally, even in the garden (picture f), while the large men's houses were situated in the hamlet yard.

a: Takai village, 1968. b: Ilesa village, 1963. c: Agakamatasa village, 1951.
 d: Takai village, 1968. e: Waisa village (Waiambisi), 1963.
 f: A hamlet near Anumpa village, 1957.

tion and had lived for a generation or so only to abandon these unhospitable, unhealthy sites before European contact. Only in these now abandoned village sites of Abonai and Yanaraisa did the Fore ever use sago palm (*Metroxylon* sp.) as a source of food.

Steep, rough, often muddy footpaths connect the hamlets with each other and their outlying gardens. Precontact hamlets were small, varying in size from a single garden house to a cluster containing up to a half dozen women's houses and one, or occasionally two, large men's houses. Shortly after the Australian government established a patrol post in the Fore region in 1956, patrol officers began to set up a system of thatched, native built rest houses for overnight stops throughout the region in order to better establish the government presence and to facilitate patrolling. Missionaries soon sponsored similar native style buildings in many villages to be used for occasional church services. Many Fore wanting to be near the bearers of medicine and law as well as new steel tools, textiles, foods, and knowledge moved out of their small hamlets and settled near the new rest houses and houses of worship. In doing so they developed much larger hamlets than they had ever had before. During this same period most Fore shifted from traditional separate men's and women's houses to the use of family houses for married couples and their children. The house building style also rapidly changed to incorporate features of new styles introduced by the government and missions.

Days are warm, usually ranging between 65° and 90°F., and nights cool, between 55° and 70°F. Rain falls almost daily with an approximate total of 90 inches per annum. Mornings become sunny as low lying clouds quickly dissipate. In the afternoon new clouds form, bringing showers. During the course of the year there are occasional dry periods which may last a few weeks, or, rarely, months. Sometimes these can be severe enough to cause drought damage to crops, but not famine. There are similar periods when rain falls almost continuously, sometimes analogous weeks. Crops grow easily and well in these moist tropical highlands, and it is not necessary to expend much labor to grow one's food requirement.

Cannibalism

Until recent times, the Fore have eaten their dead kinsmen as a rite of mourning and of love and respect for the dead. Close relatives of both sexes took part in the death feasts; but women and children were the principal cannibal mourners. Men and older boys were less avid in eating the dead relative, particularly if the

dead person was a female. The ritual was often described as a deep desire to remain close to and preserve inside oneself the traces of dead loved ones. Human flesh was, however, a very small part of the total diet, since such cannibalism was restricted to dead kins-people.

All portions of the dead body were consumed. The flesh was carved from the bones with bamboo knives and the visceral tissues carefully removed for cooking. Even all brain tissue was poured from the smashed skull into a bamboo cylinder for cooking over a low fire in the manner that the other tissues were cooked. The human flesh was usually cooked in these bamboo cylinders along with fern leaves or other greens. However, occasionally it was cooked in steam pits over hot stones with other foods.

Frequently the body was eaten only after 2 or 3 days of mourning and after decay had already set in. Cooking was rarely extensive, and partially cooked human meat was often consumed. The lower boiling temperature (usually less than 95°C at the elevations of most Fore hamlets) increased the possibility that micro-organisms could survive the cooking.

Cannibalism seems to have had a relatively short history among the Fore, probably not having been practiced extensively for more than 60 to 100 years before the arrival of missionaries and government officers. Soon after the establishment of a patrol post in the Fore region, cannibalism was made a punishable offense, and participants of cannibal mortuary feasts were jailed. The Fore were also quick to recognize the abhorrence that missionaries and government officers showed toward their method of handling the dead and, eager in those early days to please the white strangers, they quickly began to bury their dead as they were told to do. Through 1957 and on into 1958 and 1959, episodes of cannibalism were still encountered, especially in the more remote hamlets of the South Fore. But by 1960 it was all but gone, with only a suspicion that some of the older women still carried on the practice surreptitiously into 1960 and 1961. It would be hard to believe that any persists now. We have not personally encountered any since 1959.

Women, particularly older women, and children attended to the dismembering and cooking the bodies, even to the extent of carving off the flesh, which in butchery of pigs is done only by men. Girls and young boys habitually clustered about the women during cannibal feasts, taking part in the carving, cooking, and eating of the dead relatives. Men, especially older men who were close kin to the deceased, would sometimes take part in eating the dead body as well. However, men rarely ate women kinsmen, re-

stricting their cannibalism to male relatives. They also considered kuru a women's disease and avoided eating kuru victims. Warriors abstained, some claiming fear that cannibalism would diminish their prowess.

Butchering and cooking of the dead relatives required extensive handling and thus repeated contamination with tissue of the hands and body of those engaged. The participation of the hamlet toddlers resulted in wider spread contamination; for in their inquisitiveness they handled, rubbed and occasionally mouthed and nibbled sections of the dismembered body, as they regularly did with pigs during pig butchery. The extensive tissue contamination of hands and nails and other skin areas certainly made self-inoculation by oral, nasal, or conjunctival routes likely as well as through the skin from accidental injury or scratching. Self-mutilative mourning practices such as scratching or bruising the forehead and chest and the amputation of fingers further increased the chance of self-inoculation.

The Sweet Potato

Sweet potato (*Ipomoea batatas*) horticulture supports the Fore population and makes their settled village lives possible. Growing rapidly and easily on the tropical mountain slopes of the highlands, the sweet potato has replaced earlier dietary staples of the New Guineans (21, 12). There are at least 70 native designated varieties of sweet potato in the highlands, and most of these can be found in the Fore region. In most hamlets, however, the people have narrowed their preferences to not more than a dozen or so of these.

It is likely that the sweet potato made its entrance into New Guinea after European discovery of the Pacific – introduced from America via the East Indies. Just when and how it reached the New Guinea Highlands is unknown (24, 4). Yet it appears to have been in some areas for over 200 years, while it is just now being introduced in others: The Fore have had it for probably more than 100 years, but in the Western Anga and Tairora regions, adjacent to the Fore, sweet potato has replaced taro as the staple only within living memory. Among the Simbari speaking people of the Western Anga, it is only now becoming the staple. Sweet potato is the most plentiful food of the Fore and it is always available. The most garden space is devoted to it, and it is eaten at virtually all meals. It is the first solid food given to babies, and its pre-eminent role in diet continues through to old age and death. Other

cultivated plants play a significant part in the Fore diet, but all of these together do not contribute as many calories to the diet as does the sweet potato.

Other Common Traditional Garden Products

Before the introduction of sweet potato, the Fore population, as other highland groups, was smaller and probably semi-nomadic, relying to a greater degree on hunting and gathering and on small scattered taro (*Colocasia* spp.) and yam (*Dioscorea* spp.) plantings, as well as isolated sugar cane (*Saccharum officinarum*), banana and plantains (*Musa* spp.), and, possibly, a now rarely eaten legume with large tubers (*Pueraria lobata*) (20, 22, 19, 15, 18).

The gardens are usually heterogeneous, with many varieties of plants mixed in one plot. Next to the sweet potato, the most common traditional crops are a few of the over two dozen kinds of green leaf vegetables (of several species) collectively called *kumu* in Neo-Melanesian Pidgin as well as over 15 native designated varieties of a thick stemmed, low grass with a succulent heart called *pitpit* (*Saccharum* spp.). Several varieties of sugar cane also rise above the plants in many gardens along with maize (*Zea mays*), the winged bean (*Psophocarpus tetragonolobus*), and bananas. Yam and taro are also always planted. Taro gardens require more moisture than sweet potato gardens and they are thus often separately planted.

Kumu, *pitpit*, sugar cane, and, less frequently, maize are harvested and eaten almost daily. Yam, taro, and winged beans are also popular but less regularly eaten because they are seasonal. The season for beans is extended, since the leaf, flower, young pod, mature bean, and tuber are all eaten.

In the high forests of the village lands, nut pandanus (several species) is propagated in isolated plantings (Figure 3). Similarly, in bushy wet areas, often near rivers, one may see a few planted red pandanus trees growing on otherwise unimproved land. This protohorticulture, carried on by the men, is only slightly removed from the exploitation of wild pandanus as a gathering activity. Fruit from the now rare wild trees is usually considered free for the taking, or at most the property of the community claiming the lands. Individual ownership usually comes with transplantation or the planting of a cutting or even the improvement of the ground around a small wild tree such as by clearing. Planted pandanus is indistinguishable from the wild both in appearance and setting.

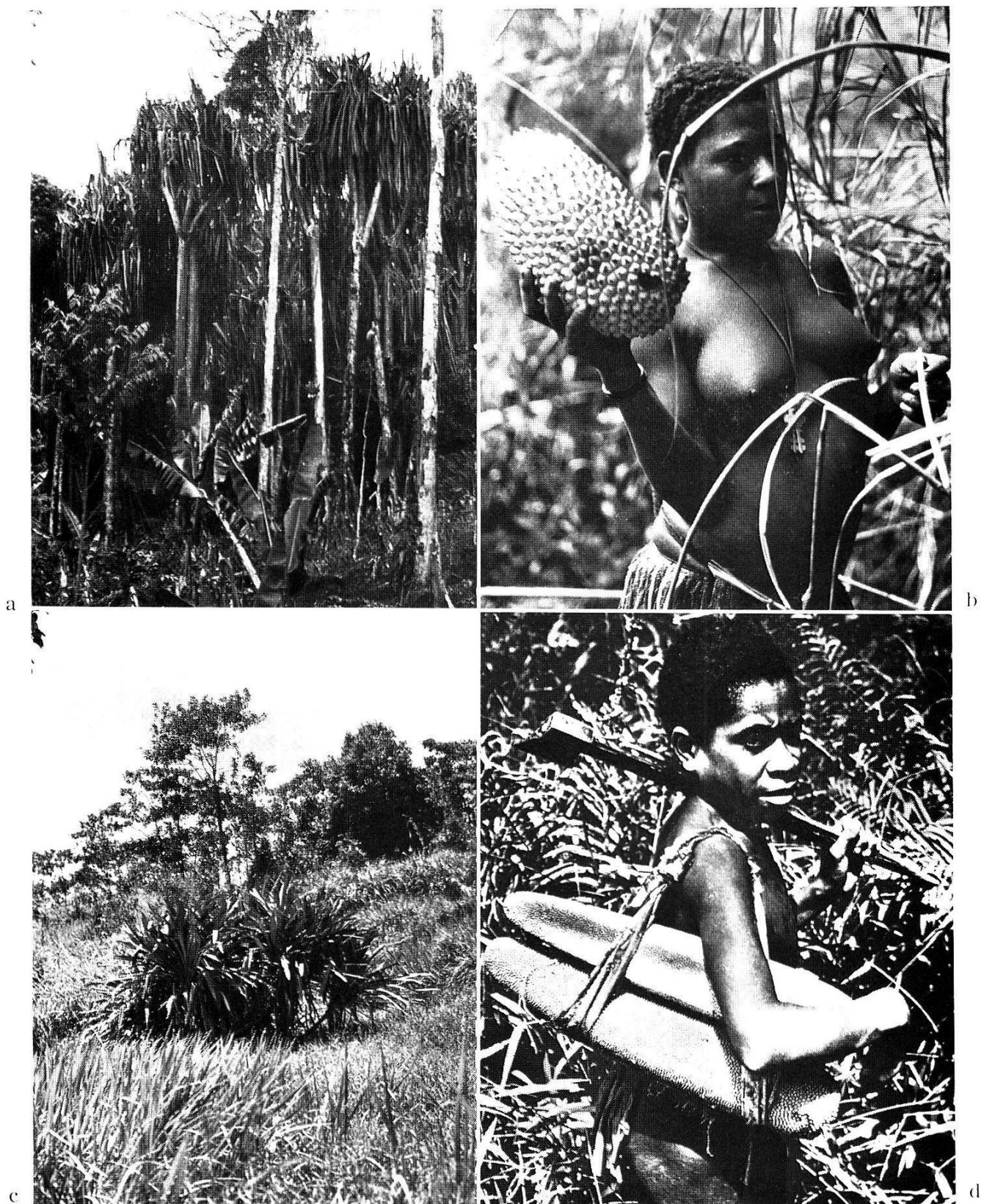


Fig. 3. Pandanus Plantings: In isolated bush or forest locations, nut pandanus (pictures a, b) and red pandanus (pictures c, d) are planted as single trees or in small stands, sometimes as cuttings from wild trees. The pandanus bearing edible nuts is usually planted in elevations higher than the hamlets, while red pandanus thrives better at lower altitudes in damp valleys or beside streams. These semi-cultivated trees represent a transitional stage between gathering wild foods for sustenance and gardening. Only in a few villages has the red pandanus been introduced into gardens.

a: Agakamatasa village. b: Yagareba village, 1968. c: Weya village (Saburosa), 1967.

Only the generally shared knowledge of the act of planting or improvement by clearing sustains its different status.

The Pig

At the center of the ceremonial, economic, and political life of the Fore people are the pig feasts. They provide the formal mechanism for settling disputes and debts (including bride price and death payments) and for cementing political and economic alliances. All important rites of passage, such as initiations, marriages, and funerals are celebrated by pig feasts. Domestic pig also provides most of the animal protein eaten by the Fore. When pig population in a village is high concurrently with low requirements for ceremony and debt repayment, pig may be killed and cooked for informal hamlet feasts as often as once a week for a few months. During times of shortage, pigs are reserved for important ceremonies and for traditional debt payment feasts; and pig meat may not enter the diet for a month or more. The amount of pig meat eaten can vary considerably. There may be a period of several consecutive porkless months followed by several days of pork glut after a ceremonial feast where many pigs were killed. On the other hand, there are sometimes periods of several months when pig meat is eaten as often as several times a week. More usually, however, the Fore eat pig two or three times a month.

Pig population is cyclical, mainly dependent on the periodic pig exchange feasts between villages, when over 100 pigs might be killed. These are celebrated only at 5- to 15-year intervals, and whether the custom is archaic or introduced from other highland regions is uncertain (13). The Fore pig exchange feasts are much smaller than the more famous *moka* celebrations of the Enga people in the Western Highlands, where over a thousand pigs may be sacrificed during one celebration, and even smaller than those of the nearer Chimbu who usually kill a few hundred pigs (3, 11).

The number of pigs in a Fore village increases slowly over the course of the several years between exchange feasts and then suddenly drops after the mass pig killing. To contribute an inferior number of pigs in an exchange ceremony puts a kinship group in a position of debt. Thus, each tries to contribute the most possible. As the year of a large pig exchange ceremony approaches, everyone tries to bring pig populations to the maximum that gardens can support, even going to the trouble to plant new gardens. Sometimes alliances are concluded between kinship groups in different

villages and the pigs pooled. Other important ceremonies, such as initiations, are sometimes deferred in order to conserve pigs for the exchange feasts.

Virtually all pigs are domestic (Figure 4), traditionally raised by women in their hamlets and houses. Fenced out of gardens because of the havoc they wreak in the plantings, they nevertheless have free run of the hamlets, surrounding bush, and trails. Women caretakers have fed, lived with, and cared for them since infancy, and in many cases the pigs were suckled at their breasts (although this latter practice has disappeared since 1957 through official discouragement). In the traditional hamlets, pigs live in their own section of the women's houses and sometimes have their own doors for unrestricted entrance when the human residents are away.

During the day, the pigs scavenge in the nearby bush and around the gardens where they occasionally receive bits of inferior quality sweet potato thrown to them. In the evening they come back to the hamlets where women returning from gardens often bring food for their pigs as well as their families. When the villagers cook, the pigs glean scraps, handouts, and residue. During formal feasts, many pigs gather closely to dispose of the large quantity of waste and disposable food.

Since 1966 pigs have begun to be excluded from some of the hamlets by fences as a result of government influence. Even though this practice was opposed by many of the villagers who enjoyed living with the pigs and because it presented the problem of disposing of waste from meals, many of the progressive people favor the new arrangement — particularly those who live in the new larger hamlets. Some groups have begun to hold their feasts outside the new hamlet fences in order to accommodate the pigs in the traditional fashion without having to bring them into the hamlet yard. In many villages residents of fenced hamlets have built remote ancillary houses very similar to the old traditional houses where they and their pigs can live together at least part of the time away from the main hamlet. In a few cases, small pig houses, meant solely for pigs, have been built near the main hamlet.

As the newer pattern of pig care has developed, men have begun to take on more responsibility for looking after them, and now it is more often the men who go out to live in the ancillary houses with the pigs. The overall effect of the change in the manner of housing and feeding the pigs is that they are slowly receiving a lessened degree of human contact in spite of the fact that they are still generally thought to be very desirable close associates. Abetting this trend are the attitudes of those youths most influenced by



Fig. 4. Pig Husbandry: Pigs traditionally have had free run of hamlets and nearby uncultivated lands (picture a). They often lived in separate parts of the women's houses, sometimes with their own entrance way (picture b), and woman caretakers fed and cared for them (picture c: delousing a pig; picture d: pigs loitering in hamlet yard near their caretaker). During meals or feasts the pigs frequently gathered closely to glean handouts and scraps (pictures e, f). Women returning from gardens often brought sweet potato for their pigs (picture g). In recent years, under government influence, pigs have begun to be fenced out of hamlets and food is thrown over the fence to them (picture h). Separate pig shelters are beginning to appear outside the hamlet fences (picture i). Agareba village, 1968.

contact with Europeans, who are beginning to view fondness for close association with pigs as being akin to the abandoned old ways; and they are beginning to refer to all houses not within the new style fenced hamlets as pig houses. This may include any house in the many remaining old style hamlets, even when their occupancy is restricted to man. However, 'pig house' is not yet considered an opprobrious term, for people still enjoy close association with pigs for the most part.

Other Traditional Domesticated Animals

Occasionally the cassowary (*Casuarius* spp.) is domesticated. When the young are caught, they are cared for and fed by women. Cassowaries sometimes become quite tame, and the young can be allowed free run of the hamlet. However, as they approach maturity, they are usually kept in pens. Eventually, like the pigs, they are cooked and eaten as part of a feast.

The only other wild animals occasionally kept, fed, and cared for before being eaten are the many species of cuscus (*Phalanger* spp.) and, more rarely, the tree climbing kangaroo (*Dendrolagus* sp.). These are not usually kept for more than a few weeks.

Hunting and Gathering

Small game obtained by boys is cooked and consumed almost immediately after the return to hamlets, or sometimes at the site of the catch. The meal is usually shared within the small hunting band and perhaps with a few friends fortunate enough to be in the vicinity. Rarely is the catch large enough for further division.

Young boys, between 4 and 8 years of age, occasionally hunt rats, beetles, grasshoppers, lizards, and, rarely, frogs and spiders to augment their otherwise predominantly sweet potato diet. These are often relished by the young boys, although shunned by most others. They are frequently cooked on the spot by those making the catch. When women and children are in the gardens, mothers or older children will sometimes catch insects and arthropods to cook and give to a hungry child. Occasionally the women and older girls sample this fare, but almost never will older boys and men.

After a boy's initiation, food taboos prohibit his consumption of many hunted and gathered foods, and older boys thus lose a good bit of their previous interest in hunting. After marriage most



Fig. 5. Hunting and Gathering: Boys and men do the hunting. Bows and arrows (picture a) are used, and the most common quarry are birds (picture b) and cuscus (picture c). Fishing (picture d) is less common, occurring only in the few hamlets near large streams. Some beetles are considered a culinary delicacy (picture e). Wild nuts (Fore: Kurona) are gathered (picture f); and the larva of the Longicorn beetle is relished (picture g); young cycad leaves are collected to be cooked with pig (picture h), and mushrooms, which grow abundantly in the rain forest, are frequently gathered (picture i). Women and children often gathered, cooked, and ate insects, spiders, and larvae while working in the gardens.

a, c, g, i: Yagareba village, 1967. b, e: Wanitabe village, 1963.
d: Agakamatasa village. h: Takai village, 1968.

of the taboos are relaxed, but the new family responsibilities require the married men's frequent presence in and around the gardens. Yet they often carry their bows and arrows and hunt in the vicinity of their gardens and occasionally set traps.

The best and most influential hunters are almost always among the older men who begin to spend more time hunting in the forest in their later years. Advice and participation of these older, more skilled hunters, is often sought when large hunts are organized by the village men to obtain game for special feasts.

Hunts for cuscus, kangaroo, and wallaby are usually restricted to rainy periods because of a belief that the killing and eating of them causes dry weather. Sometimes, during long periods of heavy rainfall, men of a village will organize large hunts and kill large numbers of these animals for a feast, in an effort to break the rainy spell. When the much prized wild pig is discovered to be in the vicinity, large hunts with many men are organized. In a few villages pythons are hunted and eaten after having been sliced up and cooked in bamboo cylinders.

Trapping (Fig. 6) : Cuscus, cassowary, and eel are trapped by the men, and the trapping of them is regarded as a special skill. The most successful trappers in any village are well known and their abilities are always sought when special feasts requiring wild game are planned. Some trappers limit their expertise to a single species. Rodents are trapped by young boys who like to eat them, and not uncommonly small snares or deadfall traps can be found along the edge of a garden or beside a house. Quite intricate long hollow eel traps, useable even in small streams, can provide large catches sufficient to feed an entire hamlet for one meal.

Fishing: Fishing occurs infrequently and only in the few villages near large streams or rivers. An occasional large catch may allow a fish feast that is shared with a neighboring village. Crayfish is eaten occasionally in some hamlets.

Gathering: Mushrooms growing abundantly in the rainforest are commonly eaten, and large collections are frequently shared by several families. The heart of the wild black palm (*limbum*) and certain edible wild bamboo are also eaten frequently. A wide variety of wild leaves, seeds, fruit, nuts, and ferns sporadically enters the Fore diet. The seeds of the wild breadfruit tree and a large nut called *andi* in Fore are particularly sought. Honeycomb, with the larvae, is considered a treat and eggs of bush fowl or other wild birds and witchetty grubs (*Cerambycidae* spp.) are often gathered for food. In addition there are a number of wild herbs and barks used as condiments, including several mint plants and the bark of a cinnamon tree. A number of herbs, ferns,



Fig. 6. Trapping: Traps and snares are used to catch rodents, cuscuses, cassowaries, birds, and eels. Rodent snares are often set along garden fences (pictures a, b). Cuscuses are trapped in similar snares set in trees in the forest (picture e). Long tubular bark eel traps, baited with witchetty grubs, are anchored in streams (pictures d, e). Snares (pictures a, b, e) are used more frequently than deadfall traps (picture f).

a, b: Takai village, 1968. c-f: Yagareba village, 1968.

vines, and barks are also collected for their believed medicinal properties or for use in sorcery. Since the government and mission contact in the mid-1950s, there has been a trend to rely less on many of the gathered food plants and more on garden products.

Recently Introduced Foods

Garden plants: Some new garden plants were introduced through native trade contacts and adopted by the Fore before Australian penetration of their region. Maize probably arrived sometime in the 1930s, and papaw, haricot bean, onion, cucumber, and tomato in the 1940s and 1950s before the arrival of government patrol officers. European potato, lettuce, cabbage, lima bean, pea, carrot, lemon, passion fruit, pineapple, pumpkin, squash, peanut, and coffee have been introduced more recently, after 1954, by government officers and missionaries. These latter are usually grown to sell to Europeans living on patrol stations and missions, but increasingly they are also eaten by the Fore themselves. Pineapple and papaw are liked but they grow well only in the hamlets at lower altitudes. Peanut, originally introduced as a cash crop, is now planted for moderate local consumption in most villages. Haricot beans, onions, cucumbers, and tomatoes are frequently eaten and are grown in many gardens.

Poultry: The first chicken in the North Fore arrived in the 1940s through trading with Kamano natives who were in earlier contact with Europeans. However, the chickens did not reach the remotest hamlets of the South Fore until about 1957. The self-reliant chicken thrived well by scavenging around the hamlets and did not require special care, undoubtedly a factor in its survival and quick adoption. Dogs were soon taught to leave them alone. All Fore villages now have a few chickens which make a small irregular contribution to the diet. However, nowhere yet has the raising of chickens been able to produce a dependable, regular supply of eggs and meat.

A few ducks have been brought into the region since 1956 by missionaries, but these have not done well except on mission stations. As a result they have played virtually no part in the diet of the Fore.

Goats: Seventh Day Adventist native missionaries coming into the Fore region in 1956 brought goats in an effort to encourage the people to stop eating pork. Many villagers, convinced that adopting new customs would bring them new material reward, enthu-

*Fig. 7*



Fig. 7. Cattle: The recent introduction of cattle into a small number of Fore villages has led to the adoption of new techniques of animal husbandry, such as the use of a corral (pictures a, b). The care and handling of these new animals has, however, presented problems which are frequently solved by more traditional methods. The pictures show the second episode of bull butchering to occur in the South Fore. An attack with axes (picture a) fails as the bull breaks through the corral fence (picture b); it is then hunted down with bows and arrows (pictures b, c). Weakened from the three hour hunt, and having been shot with several arrows, the animal finally collapses and is finished off in an axe attack (pictures d, e). Butchering then proceeds (pictures f, g). Traditional customs, suchs as those governing the sharing of pig meat, are not fully exercised with this recently introduced animal, and the meat is more freely distributed, causing more excitement than would be the case in pig butchery (pictures h, i). Purosa-Ai village, 1968.

siastically accepted the goats which thrived well on the local vegetation, gardens, and house roofs. It quickly became evident that fences would not keep the goats out of the gardens and their popularity did not last long. By 1968 there were few goats left in the region.

Cattle: Since 1963 a few cattle have been introduced to the area by missionaries and government agricultural officers. The missionaries keep these on their station and hire natives to care for them. The government effort, in contrast, has been to help the villagers raise their own cattle by establishing demonstration projects, sending a few older boys from several villages to government cattle schools, and making a few cows cheaply available to villages with trained caretakers. To date only a half dozen such animals are in Fore villages, but there is a desire for more. It has become a matter of status to have a cow or two in one's village, and the feasts which can be had by butchering a cow instead of the traditional pig are envied. Butchering techniques are still a bit primitive: sometimes the animal is hunted down with bows and arrows and axes (Fig. 7).

The prospect of having cattle to butcher has given rise to the idea of a meat market. A proto-market was held for the first time in the South Fore in February 1968, after the slaughter of a bull at Purosa-Ai. Disposal of beef was not bound by the traditional ceremony and debt relationships such as those governing disposition of pork, and the villagers decided to sell the meat they did not want for themselves instead of holding a feast. They advertised their intentions by word of mouth to nearby villages, saying that they would sell to any comer. They called their new undertaking a "market", after the native markets at Kainantu and Goroka.

Fish: In an effort to develop larger protein resources for the Fore people, agricultural officials built a few demonstration fish ponds in the region. The large carp stocked in these sample ponds have been used occasionally for feasts, but so far the Fore have shown little interest in making their own ponds.

Trade store foods: Until 1960 virtually no trade store food entered the Fore diet. But the extensive use of such foods by the new European residents was quickly noted by the Fore, who became eager to try them. Some of the men and youths had been introduced to new foods during work periods on plantations or while away at school or in jail. As money became more available to the Fore, both from jobs offered by Europeans, as well as from new cash crops (particularly coffee), they began to buy and eat more trade store goods — particularly rice, but also canned meats and fish, cooking oils and grease, refined sugar and pow-

dered milk. The first two trade stores of Australian entrepreneurs opened at the Okapa Patrol Post in 1960. By 1963 two other small stores were opened on the road to Kainantu in the North Fore and another irregularly opened mission operated store at Purosa in the South Fore. In 1965 a few native thatch huts were built by village entrepreneurs and lightly stocked with trade goods for sale. This presaged a movement which flowered in 1967 as many such new stores were built throughout the Fore region, putting all hamlets within not more than a 2-hour walk from at least one store (of over two dozen in the region). However, larger, better stocked and built trade stores belonging to missions and to trading companies are winning more trade than the more modest native stores, many of which were discontinued by 1968.

Native Made Salt

Before the introduction of commercial salt during the 1950s, a native salt was manufactured in several Fore villages (Fig. 8). This manufacture may be a derivative of the elaborate salt industry of the Anga salt makers of Barua, Marawaka, and Amdei, but how the trait spread into the Fore is unknown. It is also similar to salt production methods in other parts of inland New Guinea (5). Salt was made by burning and extracting the water soluble salts from the ash of an indigenous reed or cane (*Coix gigantea*) which was planted and cultivated on proper well-watered flat ground. Several villages specialized in salt making and were able to supply non-salt making villages via intervillage trade routes in return for bows and arrows, stone axes and knives, bundles of orchid stem fibre, smoking pipes, cowrie shells, tobacco, and bird feathers. Sometimes the salt bundles themselves were used as a kind of rudimentary currency rather than consumed. A few villages which made particularly good salt traded it to distant villages even across language and cultural frontiers. Different qualities of salt were recognized, and the good salts were called "sweet".

Each village jealously guarded its salt making secrets. Various villages used different recipes to produce salt of characteristic tastes, and included ferns, herbs, staghorns, creepers, and barks as well as some wild grasses and even the edible garden varieties of pitpit in their product. Some salt makers claimed that certain firewoods produced better salt than others. Villages manufacturing salt required rich forest land in order to supply the considerable firewood required for the incineration and evaporation processes.

After harvesting, the bundles of "salt reed" were piled, some-

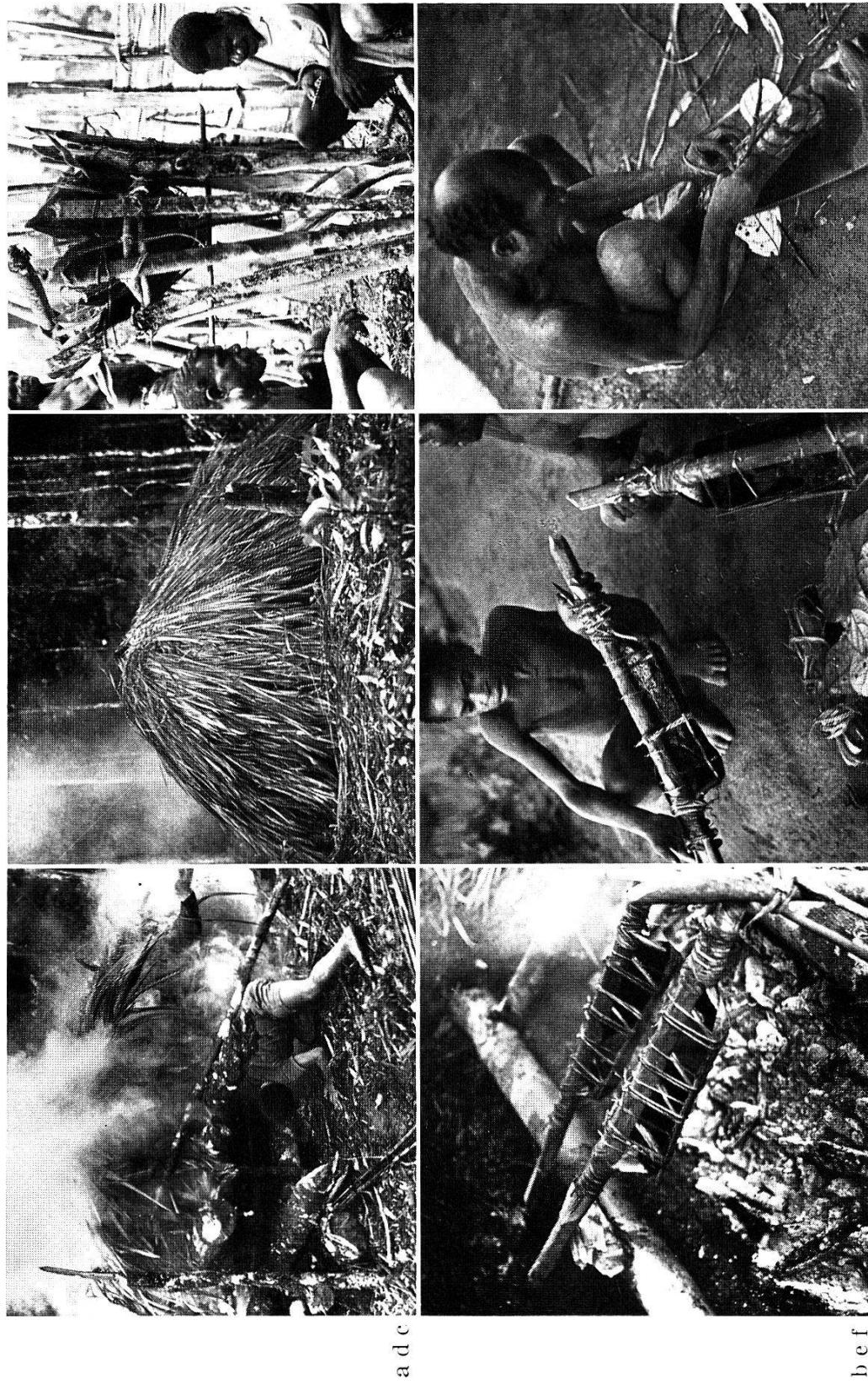


Fig. 8. Salt Making: Before government control of the Fore salt solution collected below (picture c). The solution was then evaporated in continually refilled pandanus leaf dishes over a bed of hot coals (picture d). The crystallized salt was removed from the evaporating dishes and specially wrapped (pictures e, f) for several months of curing in the smoke of house fires. Yagareba village, 1968.

Before government control of the Fore region, salt was manufactured by the natives from a locally grown salt reed. The harvested reed was incinerated on a pyre of special wood (picture a) and the ashes, protected from rain by a kunai grass shelter, were left to cool for several days (picture b). The ash was then placed in a leaf filter, water poured over it, and the

times to a depth of a few meters, on top of flat pyres made of logs. Burning, done on a day when it was believed that there would be no rain, usually began early in the morning, often before sunrise. When the pyre was burned down, leaving only ash and smouldering logs, the fragments of unburned wood were removed, and a rainproof kunai grass hut built over the hot ash. The ash was left to cool in the hut for two or three days. It was then removed, small amounts at a time, and placed in a large filter made of leaves fitted into a stick and sapling frame. Water was poured on the ash and the filtrate dripping from the bottom was collected in bamboo tubes.

During the cooling of the ash and the filtering, an evaporation house was built enclosing a rectangular bed in which to hold hot coals. The filtrate was evaporated over these coals in special dishes made from pandanus leaves. As evaporation proceeded uninterrupted these were refilled until all filtrate was evaporated dry in two days and nights. Juice from a special bark, extracted with saliva by chewing, was added, and the thickening solution was allowed to crystallize, leaving a cake of salt weighing over a pound. This salt cake was wrapped and then smoke cured over the fire in the salt maker's house for two to three months. It was then rewrapped to be used in trade. Ceremonial incantations and rituals were performed during certain times of the manufacture, and certain aspects of the production were restricted only to men who knew the secrets. Women were not allowed even to look upon the site of production.

After the introduction of Western commercial salt in the 1950s, use of native made salt declined quickly and was completely replaced in less than a decade. The North Fore, brought under administrative control earlier, received their first commercial salt in the late 1940s. The first such salt to be introduced to the South Fore was in the 1950s. As soon as trade salt became available, native salt production went into immediate decline and by 1959 all salt making has ceased. The old, carefully protected fields of cultivated salt reed were no longer tended, and the reed was left to grow wild or die. Boys were no longer required to have made salt before they could be married, and the secrecy, taboos, and ceremonialism surrounding salt production were abandoned. The accomplished salt makers state that they lost interest in their own salt, as soon as they had tasted the new salt, and put their energies into finding ways to get it rather than continuing to produce their own. Since the new salt was relatively cheap and frequently distributed by the early European visitors in trade for food and services, it replaced native salt quickly.

Occasionally, as late as 1963, some of the men would make small amounts for nostalgic reasons, or, as some claimed, because they thought the native salt might give some protection from kuru. In a few South Fore villages, some men claimed that more people started getting kuru when the native salt was no longer being eaten, while others blamed it on the greater ease with which sorcerers could move about outside their own villages after the opening of roads and the abolition of warfare.

Daily Meals

A casualness typifies the day-to-day Fore approach to eating, and much of the daily food intake, rather than occurring during formal meal times, is done whenever one feels the urge to eat. Only the occasional feasts are managed by formal planning. Cooked and uncooked food is stored in the houses for consumption by adults and children as desired: These stocks frequently include pre-cooked sweet potato, taro, yam, and at times pork, sugar cane, raw pitpit, greens, pandanus nuts, and peanuts. Although cooking usually occurs more or less regularly early in the morning and again in the late afternoon, it is nonetheless not unusual to see one or two or more individuals at any time during the day building a small fire to cook portions of food obtained from the bush or garden or to warm up snacks found in the houses (Fig. 9). The fare is usually the same at these times as for the more regular morning and afternoon meals. Only the greater irregularity of time and place and the lesser quantity eaten at one time are different.

Cooked meals often consist of pitpit and green leaf vegetables cooked in bamboo cylinders augmented by sweet potato, corn, taro, or a banana baked in the coals. Sometimes there are wild foods such as mushrooms, baby birds, wild bush fowl eggs, beetles, rodents, or witchetty grubs. Portions of hot food, such as greens and pitpit, cooked by the women, are occasionally carried by a girl to a male relative who may be in the vicinity. In the last few years some discarded tins and an occasional cooking pot bought in one of the new trade stores have begun to be used to cook the vegetables. So far the use of these has been mainly by the boys.

Attendance at meals is not required or even necessarily expected. One may eat where and with whom one chooses. There is a tendency, however, to eat in small groups made up of many of the same members of the larger group of friends, relatives, and hamlet mates most of the time. Before the advent of government administration, men and women lived in separate houses and ate



Fig. 9. Daily Meals: During the day, particularly in the morning and afternoon, small groups of friends and relatives build fires to cook food in bamboo cooking cylinders or in the flames or coals. These meal times are usually unscheduled and depend often on the degree of hunger and conviviality of the participants. The top two pictures (a, b) are of the same group around the same fire. They are using bamboo cooking cylinders to cook kumu (a spinach-like green leaf vegetable) just picked from a nearby garden. In picture c a group of boys have built a small fire to cook pitpit and kumu (in the bamboo tube), corn, and sweet potato. This has attracted the interest of some small children who had been playing nearby who by lingering nearby around may be offered some of the food when it has been cooked. The last picture (d) shows banana, yam, sweet potato, and bamboo cooking cylinders possibly containing cut pitpit and sweet potato. a, b: Waisa village, 1963. c: Ketabi village, 1963.

separately in groups of their own sex. The married women co-operated in the cooking in their own houses assisted by the unmarried older girls and the haphazard participation of the younger children. If they desired, the girls would eat or even spend several nights in the house of a relative. In the much larger men's houses,

where up to a dozen men and boys would live, there were often three or four fireplaces allowing small groups to cook whenever they wished.

Men and boys were more free to roam to and visit distant hamlets than women and smaller children, and they would often stay to sleep in men's houses there, receiving gifts of food from relatives.

The rapid decline of segregated housing after 1960 led to cooking and eating together as integrated families. Boys began to establish small residences for unmarried youths where younger boys would often join them, the married men now living with their wives. Men and women still frequently do their casual eating separately, but during the morning and evening meals a husband may eat in his house with his wife and children. However, many of the Fore still seem uncomfortable in such mixed eating groups, and even in 1968 it was not uncommon to see groups of men cooking for themselves out-of-doors or in houses of bachelors or widowers rather than with the women. In some houses, said to be family houses, one would find only men cooking and eating, and in others only women. This reappearance of separate men's and women's eating groups takes place almost imperceptibly in some instances when the female residents of a family house start spending more of their time in the house of a close female relative or friend, leaving the husband's house to the men who begin congregating there more often. This revival of sex segregation within the family has in some cases evolved into segregated sleeping habits, bringing to full circle the recent change in living style.

Casual Eating

Small children, even toddlers, take any foods whenever they desire and eat whenever they feel the urge (Fig. 10). They are permitted to take food from the house or garden or demand it from older children or adults who may be cooking or eating nearby. Young children are rarely denied the food they want, even if it was not intended for them and is being eaten by others. Fore infants are accustomed to free access to food from their earliest experiences in nursing when they fed whenever they wanted from the always accessible breasts of their mother.

The custom of eating according to one's impulses is well established among the Fore and accepted as natural. Consequently it is not unusual at any time of the day or night to see one or two people in a group eating while the others do not, or a person



Fig. 10. Casual Eating: Children as well as adults eat whenever they like, taking food from their houses or gardens or sharing that being eaten by friends and relatives. Frequently such snacks are eaten during the course of play or other activities. A group of small children plays while nibbling on ears of maize (picture a); a young boy idly chews a piece of sugar cane (picture b); an adolescent girl eats raw pandanus nuts (picture c); held in his mother's arms, a toddler sucks a piece of sugar cane while another is lifted holding a sweet potato (picture d); a boy breaks a pre-cooked sweet potato in two for eating (picture e); and a boy casually nibbles pieces of raw meat and skin from a pig that is being butchered (picture f).
 a, b: Kamira village, 1963. c: Yagareba village, 1968. d, e: Paiti village, 1964. f: Wanitabe, 1963.

nibbling on raw garden products or cold food found in the houses. Yet eating is not a purely individualistic quest solely to gratify one's momentary gustatory needs. Rather, underlying much of its seeming casual irregularity is a diverse sense of social interest extending to a large kinship group. This can be seen when fires are built on which to warm or cook food, or when one sees how much food is shared. Sitting around fires as well as eating is one of the important forms of social engagement among the Fore.

Fires draw friends, who may come to smoke and talk and who will often put bits of food on the fire to cook and share. Reciprocated conversation, sharing of food, aid, and eating are all part of a larger concept of kinship and friendship among the Fore which can be seen in microcosm around the fire.

Feasts

Feasts are a time of glut and a means to restock houses with the precooked food needed for snacks and casual meals. Informal hamlet feasts are held as often as a few times a week, when the weather is good (Fig. 11). Formal feasts including more than a



Fig. 11. Informal Feasts (Mumu): As often as two or three times a week, a group of hamlet residents, together with some of their friends and relatives from nearby hamlets, assemble to cook assorted garden produce in a steam pit. Here a group waits while the food, sealed in the pit with leaves and dirt, cooks. Yagareba village, 1967.



Fig. 12. Traditional Formal Feast: The formal mumu feast is an occasion for the assembly of much of the community and its guests. Segregation of men's and women's activities is traditional. Women usually prepare and bundle the vegetables while the men butcher and prepare the meat, heat the stones, and prepare and load the cooking pit. Feasts are often held as a traditional means of settling a condition of debt between two groups of people. In such cases the guests usually keep to themselves while awaiting the cooking of the feast, as seen in the far left, and even while eating. Small children usually stay near their mothers, and older children gather in age groups to watch, wander about, and occasionally assist their elders.

Awarosa village, 1959.

hundred participants, or an invitation to another village, are much less frequent (Fig. 12). They include more than one kinship group and are celebrated with cooked pig. Most often these are repayment feasts of one kind or another, held to eliminate or reduce obligations to other kinship groups or families. Such feasts can be to pay bride price, death debts, or damages, as well as to settle more general social obligations, such as those arising from the reciprocal song and dance festivals; or they may be used to sustain political or defensive alliances. Other feasts celebrate initiations and marriages. However, all formal feasts involve gifts and exchanges of food, as well as other goods, according to a complex relationship of obligation existing between individuals, families, and kinship groups².

Planning: Inception of a feast is left to the men, who through discussion do the planning and work out the details. Some of the feasts are fraternal and may involve but a few contributing participants together with friends from one or a few neighboring hamlets. Others are more formal. The organization of the smaller fraternal feasts is easier and more spontaneous because it is more local. Hamlets are small, and the daily familiarity of the residents allows such feasts to materialize during the flow of daily discourse. Those interested in participating determine how big such a feast will be and how to implement it. Sometimes an hour or so is all that is necessary to get a small feast under way.

Larger feasts which are to settle social obligations or debts with another group or village, or to consummate a marriage or an initiation, require more serious organization and are often considered political or social problems. A decision to hold such a feast may require weeks of discussion and negotiation. But recognition of an outstanding debt is a source of worry to many in a kinship group or hamlet and they will eventually come up with the way to resolve it by means of an appropriate feast. Too great a delay in settling such debts may cause deterioration in relations and possibly an increase in the amount needed to settle the problem. Since payment feasts invariably involve people from other hamlets and villages, emissaries go back and forth to work out the details for the participation of the more distant groups, whether as co-hosts

² One village in the South Fore has recently begun devoting one of its very prized crops to develop a previously very remote relationship with a distant North Fore village. The South Fore villagers needed a place for resting and eating while en route to the new trading and administrative center of Kainantu. To assure their welcome at the North Fore village, they began to give a large feast consisting primarily of one of their annual winged bean root crops for the benefit of the North Fore villagers.

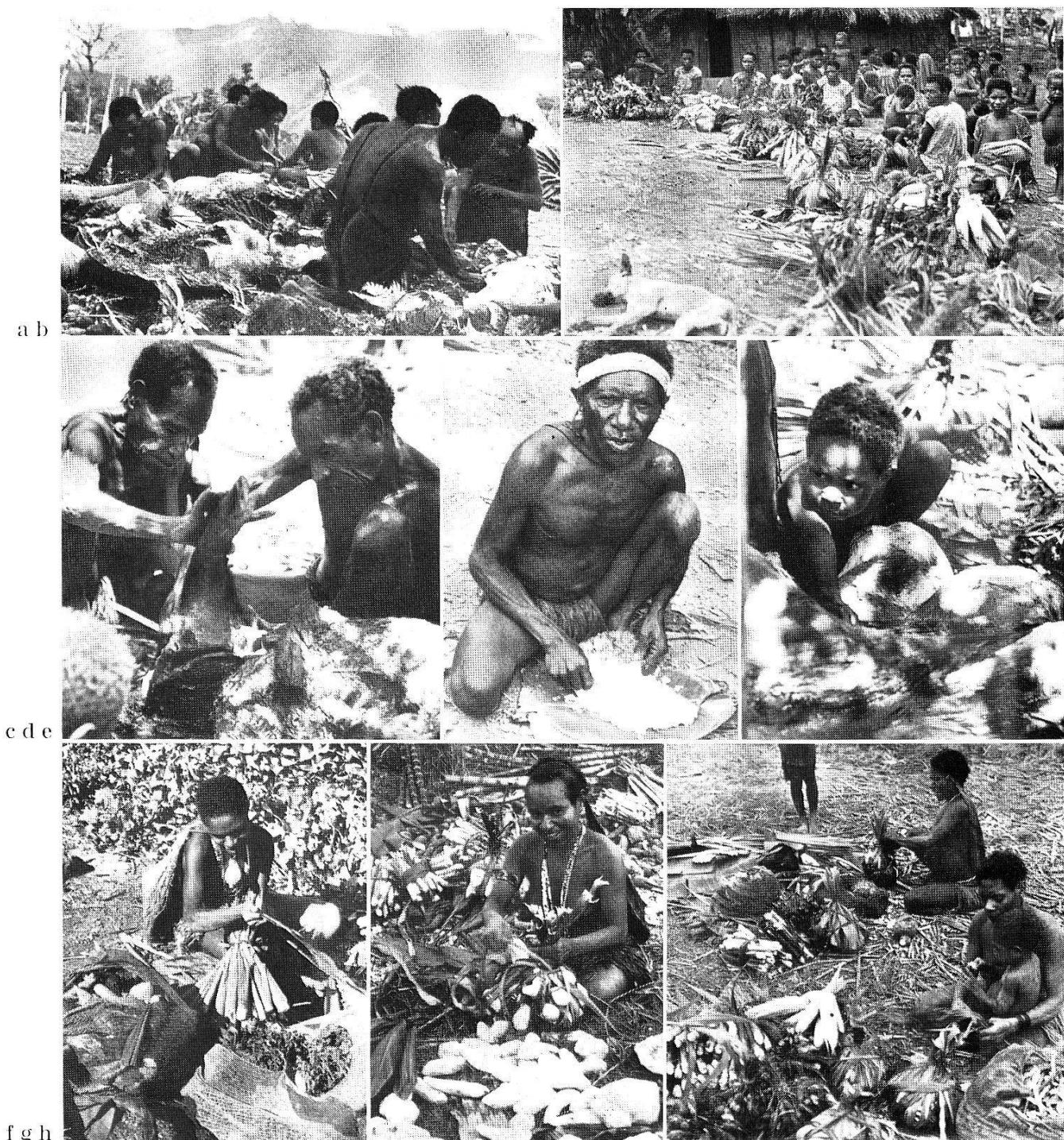


Fig. 13. Preparing Food for a Feast: Men carry on their tasks in separate groups from the women and children (pictures a, b). Men do the butchering (picture c) and prepare certain vegetables such as grated taro (picture d). Children may participate in any aspect of food preparation at their pleasure and often play in the pig carcass as it is being butchered (picture e). Women cut, peel, and bundle most of the vegetables including pitpit and kumu (picture f) and sweet potato (picture g), accumulating these bundles about them (picture h) as the men prepare the cooking pit.

a: Agakamatasa village, 1962. b: Yagareba village (Kinenti), 1967.
 c, e: Wanitabe village, 1963. d: Kasokana village, 1957.
 f: Agakamatasa village, 1961. h: Waisa village, 1963.



Fig. 14. Cooking the Feast: Mumus are feasts in which quantities of food are steam cooked in covered pits. The cooking stones are heated on a specially laid fire near the pit before they are pushed into the pit with long sticks (pictures a-d). Then leaves are placed over the hot stones, and bundles of vegetables and sections of butchered pig are piled on top of them (pictures e-h). Notice the pig carcass being held on the left of picture f. The food pile is covered with leaves and sealed with dirt (pictures i-m). From long bamboo containers, water is poured into the pit through small openings left in the cap or made by pushing the bamboo containers through the cover of dirt and leaves (picture n). The water poured into the pit produces steam when it reaches the hot stones at the bottom. Cooking is usually completed in about 1 to 2 hours.

a, g, n: Agakamatasa village (Waieti), 1962. b, c, e, f: Kasokana village, 1957.
 h, k: Wanitabe village (Kagumuti), 1963. i: Ketabi village, 1963.

or guests. Similarly for the wedding and initiation feasts, men having kinship connections with the principals work out the details on the basis of existing friendship, kinship ties, and obligations. Many of the feasts which have been traditionally established are easier to organize because their format is already set.

Preparation: On the morning of the feast, women gather garden produce and bring net bags full of sweet potatoes, yams, taro, pitpit, and green leaf vegetables from their gardens. Men may bring sugar cane, bean roots, pandanus fruit, and pig. In the case of debt payment feasts, accumulations of bark cloth and other non-edible gifts are also brought into the feast area. By mid-day the women are seated among their friends and have begun to cut, peel, and package the vegetables (Fig. 13). The men begin the butchering and the laying of the fire on which the cooking stones are heated. Boys clean the trash and water from the cooking pit. Women dress the pig intestines and other viscera.

When the fire has burned down, the men push the hot stones into the adjacent cooking pit with long sticks (Fig. 14). Special leaves are brought and placed on top of the hot stones, and the bundles of vegetables and sides of pork are placed on the leaves. When the pit is filled, the food is covered with banana leaves and dirt to retain the heat and steam. Water is poured from long bamboo containers through small openings left in the pit's cap. Upon sealing the first cooking pit, the men may go on to fill another, if necessary. Otherwise they sit nearby and wait. Customarily the men sit together on one side of the feast area and the women together on another. Boys tend to gather in small groups of age mates sitting and walking about. Girls sit in small groups among the women. During the course of the preparation of the food, young children and toddlers freely run about the feast site sampling and playing with bits of food and other objects of interest and poking and even nibbling on the raw pig as it is butchered. The young children are not discouraged from this kind of play.

An estimate of the necessary cooking time is made by the men; this is often from one to two hours. Sometimes estimates are off and the pit may yield semi-raw pork and vegetables or an overcooked pile of meat and vegetables.

Distribution and eating: When they think the food is cooked, the men open the pit and distribute bundles of food to the waiting guests and participants (Fig. 15). Traditionally, most people would leave once they had received their share, to further divide and eat the food in the privacy of small family groups. The traditional mumu was more the social event of cooking together than of eating together. The women further divide and exchange food among

*Fig. 15*



Fig. 16. Eating the Feast: Eating begins as soon as the food is distributed, friends and relatives gathering in small groups. Traditionally men and women tended to eat in separate groups (row 1). But in the last few years this custom has begun to be ignored (row 2).
 a, c, d: Agakamatasa village. b: Waisa village (Anati), 1963.

Fig. 15. Opening the Mumu Pit and Distributing Food: When the food is thought to be sufficiently cooked, the cap of dirt and leaves is removed (pictures a, b). Removing the cooked vegetables and sides of pork (pictures c, d, e, f), the men apportion the food first among themselves (pictures g, h), and then, aided by a few children, to the waiting women (pictures k, l). The women in turn supply their children and exchange food gifts with friends and relatives (pictures m, n). More food than can be eaten is always cooked at a feast (picture o), and the surplus is carried to dwellings to be eaten later.
 g, l, n, o: Waisa village (Mugagori), 1963.
 i, k, m: Yagareba village (Intamenti), 1968.



Fig. 17. Children Eating the Feast: The habitual ties of friendship, and debt are not as binding on children. Thus, during a feast they are freer to move about the feast area scavenging or searching for the most favorable eating situation. Often they do this as part of a fluid group of age mates.

a, c: Agakamatasa village, 1961. b, e: Awarosa village, 1959.

their close friends and children, and the eating begins (Figs. 16 and 17). Distribution of the food generally follows the lines agreed on by the men as they organized the feast. For formal feasts careful planning and long discussion determine the distribution; whereas in the informal hamlet feasts distribution is unplanned and often spontaneous among relatives and friends. A rough mental record is kept, however, of who has contributed.

Cooking variations: More common in the past, but still occasionally utilized during feasts as an auxiliary cooker, is the upright hollow wooden cylinder used instead of the pit for the *mumu* (Fig. 18). These have been made from large tree trunk sections burned out by blowing on a coal placed on the part to be removed.



c



b



a

Fig. 18. Cooking in a Hollow Wooden Cylinder: Sometimes, more commonly in the past, vegetables are cooked numu fashion but using a wooden cylinder set into the ground. The hot stones are placed in the bottom and the vegetables arranged on top, they are capped by banana leaves and dirt (a). The steam cooked food is removed by hand when cooking is completed (b, c).
Yagareba village, 1968.



b



a

Fig. 19. Introduction of Rice to Feasts: As the Fore have become more integrated into the money economy brought by the Europeans, they have begun to buy rice in increasing quantities from the new trade stores. Since 1967, feasts in the wealthier villages have often included a pot of rice cooked over the remains of the fire used to heat stones for the cooking pit. Yagareba village, 1967.

Only a few hamlets still possess these cooking cylinders. Cooking procedure with them is much the same as that for the pits, i.e.: hot stones carried with split branch tongs and dropped into the bottom of the hollow cylinder.

More recently, particularly in the last two or three years, cooking pots and large metal dishes have come into greater use, particularly in the wealthier hamlets. Since 1967 it has not been difficult to find a feast where a few men can be seen tending a pot of boiling rice to be distributed with the more traditional foods (Fig. 19). Rice is considered a welcome treat by most Fore, and a contribution of rice to a feast raises the status of the donor and significantly decreases his social indebtedness. No rice is grown in the region and all rice entering the diet is purchased in the newly established trade stores.

Dietary Fluctuation

Although the Fore diet is predominantly the sweet potato, yam, taro, pitpit, and greens, there are occasional sudden transient dietary changes lasting for several days or longer. These may occur several times a year and are the result of fortuitous discoveries of wild foods (such as honey, wild pandanus fruit, fish, grubs, mushrooms, wild mangoes, or berries), particularly successful hunts (wild pig, birds, cassowary, cuscus, and tree climbing kangaroo), or of seasonal ripenings of pandanus nuts or the red pandanus fruit, winged bean legumes, taro, andi nut, and breadfruit. Feasts are often celebrated on these occasions and may consist exclusively of the special food, thus creating a surfeit of this one food lasting several days. Some of the seasonal variations in diet may last longer, as with taro, which becomes a large part of the Fore diet for several months each year and the red pandanus (mareta) which may occupy a large part of the diet for a month or two. Unusual fortune in hunting or fishing or in a large pig payment feast sometimes results in inordinate stuffing with animal protein after long periods without fish or meat.

Gardening

Gardens are the center of daily Fore life and the source of most of the food (Fig. 20). 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

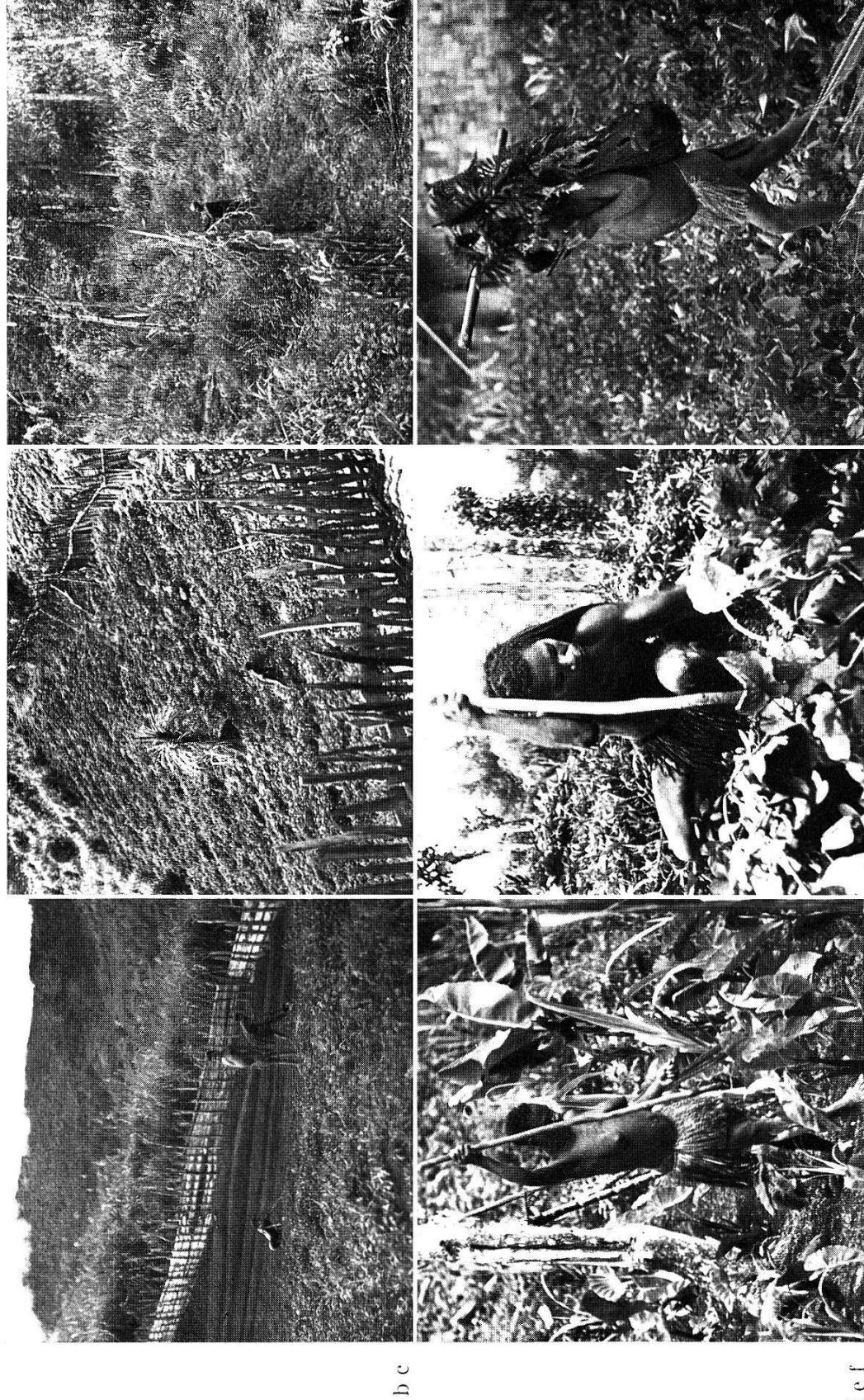


Fig. 20. Gardening: Planting and cultivating, largely the responsibility of the women and girls, are traditionally done by hand and digging sticks, and more recently with steel spades (pictures a, b). Men build and maintain the fences (picture c) and are responsible for protecting the women and children from possible marauders. New seeds may be planted in a garden already containing growing crops (picture d), planting corn among growing

taro plants). Women with kuru continue their gardening activities even after they require a stick for support (picture e). Harvested produce is carried from the gardens in net bags and piled atop the head (picture f).

a: Yagareba village, 1963. c, f: Yagareba village, 1968.

d: Kamira village (Wagiri), 1963. e: Mloke village.

Fig. 20. *Gardening:* Planting and cultivating, largely the responsibility of the women and girls, are traditionally done by hand and digging sticks, and more recently with steel spades (pictures a, b). Men build and maintain the fences (picture c) and are responsible for protecting the women and children from possible marauders. New seeds may be planted in a garden already containing growing crops (picture d), planting corn among growing



Fig. 21. Children at Play in the Garden: Young children accompany their mothers to the gardens, preferring to play there instead of in the near-deserted hamlet yard.

mingle their social, family, and erotic pursuits with their garden work in a salutary and emotionally filled gestalt of garden life. Older boys and unmarried youths spend less of their time in gardens than the others, preferring to devote at least part of their time to hunting or exploring with a few of their age mates. Young children spend most of their day playing in the garden as their mother and sisters engage in their activities (Fig. 21).

The swidden (slash and burn) agriculture practiced by the Fore makes continuous inroads on the forest near all inhabited areas (Fig. 22). As fertility of the soil is exhausted, gardens are abandoned and new gardens sites cleared — usually from the rain forest where the ground is considered better. Making and abandoning of gardens can also be dependent upon the shortage or excess of foods, and, thus, upon vagaries of weather and fluctuation of

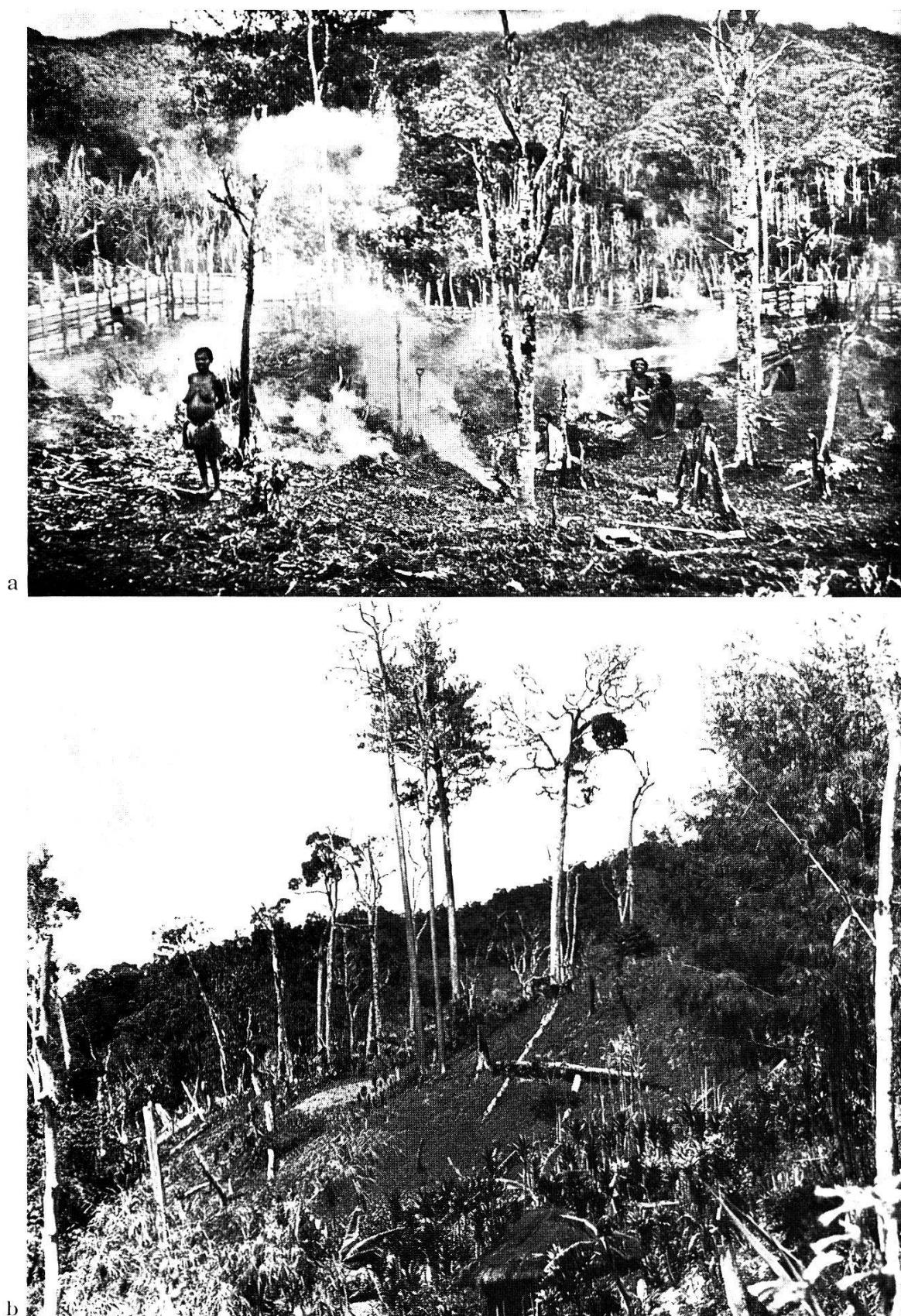


Fig. 22. Garden Clearing: Land for gardens is cleared by cutting down and burning the trees and brush. In the top picture (a), clearing and burning are nearly complete in a previously forested area, and the fence already built. Some of the trees, now dead from having been girdled, remain standing. In the lower picture (b), first crops grow in a recently cleared garden.

population. Occasionally, in some villages, a cycle of plenty followed by shortage develops as too many gardens are created when food is in short supply, and then too many of them given up when they start producing an excess.

In recent history, as population has increased, the boundaries of village lands have become more closely defined, thus interposing limits on continued migration into new forest lands (14). In a few of the older settled regions, where much of the original forest has been removed, this has led to recultivation of previous garden sites after a fallow period of 15 to 20 years; but reuse of abandoned and reforested garden sites in only 8 to 12 years is often considered satisfactory. Cutting away grasslands has become more common in most areas since the replacement of the digging stick with steel spades. The recently introduced, fast growing Casuarina tree has been planted on some abandoned garden sites to improve the soil more quickly, permitting re-gardening within a decade. Garden sites on which Casuarina trees are planted remain the property of the planter, in contrast to gardens which are completely abandoned and able to become the property of any villager who later works the land. New garden sites are selected by the men and, because of the rarity of flat land, they are almost always on mountain slopes. Planting can occur any time during the largely seasonless year, although rainy periods are usually preferred. Whether the new gardens are taken from the forest or reclaimed from second growth bush or grass, the technique of preparing the land is that of slash and burn. Branches of large trees are chopped off and their trunks girdled by the men, who also fell small trees, cut away the bushes, burn off the wild grass, dig ditches for water diversion or drainage, and construct the fence. Women clear the smaller bushes and grass and collect the debris into small piles for burning. Before 1950, garden clearing was done with stone axes and fire-hardened digging sticks. Since then the introduction of steel axes, machetes, and spades has made this work much easier, and new gardens are made more frequently now.

After the new gardens have been cleared, plants from existing gardens are selected and transplanted. Sometimes the plants from an old garden about to be abandoned are transplanted en masse. Women usually carry most garden produce to and from the gardens. The women's main gardening responsibilities include the planting, cultivation, and harvesting of the sweet potato, bean, pit-pit, corn, the several leaf vegetables, some newer varieties of taro, occasionally manioc and ginger, and whatever newly introduced vegetables have been adopted from the European since his arrival.



Fig. 23. Mixed Gardens: Older gardens, particularly those close to hamlets, often contain a variety of vegetables planted one among the other. These four pictures show such gardens: picture a: taro, sugar cane, yam, sweet potato, and edible green leaves (kumu); picture b: taro, yam, tobacco, sugar cane, and sweet potato; picture c: yam, corn, sweet potato, and a decorative plant in the lower right; picture d: young banana trees coming up among taro, beans, kumu, yam, and sweet potato. None of the plants seen in these gardens are weeds.

Women are, thus, responsible for growing the bulk of the food, and cultivation is primarily women's work. Women's houses in the precontact hamlets tended to be in or on the edges of gardens, reflecting their preoccupation with gardening activities (Fig. 2, picture f). Men are traditionally responsible for planting sugar cane, yam, taro, banana, tobacco, and coffee and take on a role in their cultivation and harvest. Building and maintaining the fences is a major occupation of the married men who devote much of their

time to this important task. Weak or broken fences allow pigs to enter the gardens, where they quickly destroy the plants.

New gardens have a somewhat disorderly appearance with gaunt, dead tree trunks rising out of them and with the fallen trees, stumps, and roots haphazardly situated among the crops. The neatness of the gardens increases with age. In many of the older style gardens, particularly those close to the hamlets, mixed plantings of several crops may occur in various stages of ripening (Fig. 23). Older gardens also have bamboo clusters planted in thickets in or near the gardens and also a few mulberry trees to supply bark for rain capes and fibers from which to weave string for making net bags and skirts. More distant gardens are likely to have crops separated into small plots. People living in large, new style hamlets have taken to developing larger communal gardens, reflecting the social aspect of gardening and a desire to garden with the people with whom they are living.

Before 1960, taro plantings were hidden from the women in small plots, often near the secret men's latrines which were taboo to the women. Taboos of this sort have diminished in recent years, although vestiges of them can often be detected in the current habits of the Fore people. Pandanus nut and the red pandanus fruit, still the responsibility of the men, are planted singly away from trails in the bush or forest. Only in a few western villages of the South Fore is the red pandanus planted in the gardens.

Introduction of Cash Crops

Coffee (Figure 24): In the early 1950s, before the Fore region was brought under government administrative control and before a patrol post was established, coffee planters in the Kainantu area to the north began to welcome the so-called uncontrolled natives from the northern North Fore villages as laborers. The care and attention which was lavished on the coffee crop by some of the plantation owners and the prices paid to local Kainantu natives for coffee they sold to the planters impressed some of these workers. Seeing the value of coffee they returned home with coffee beans which they planted in their own villages. In 1956 demonstration coffee plantings were started at the new Okapa Patrol Post, and natives working at the station often received coffee beans to take to their villages. Those who had learned about coffee agriculture planted them. Many Fore were eager to get these seeds because of the story spreading among them that the product of the plant could be traded for money, which in turn could be traded for such highly prized items as cloth, steel axes, knives and spades.

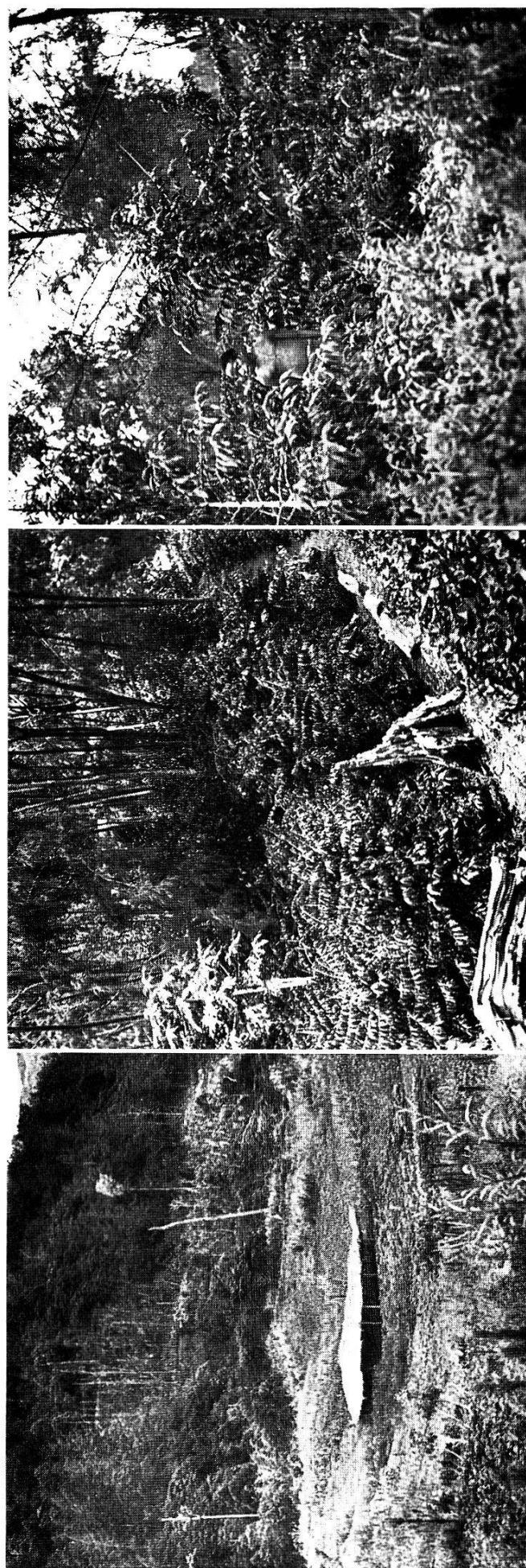


Fig. 24. *Coffee Gardens*: Coffee as a cash crop has been adopted with enthusiasm by the Fore people. In 1963 protected young coffee plantings under constructed sun shades could be seen in nearly all villages (picture a). By 1967 mature coffee plants were bearing well (pictures b and c) and the harvest began to bring rapidly increasing amounts of money to the Fore villagers.

a: Kamira village (Wagiri), 1963. b, c: Yagareba village, 1968.

Many of the first planters were government appointed village leaders (luluais and tultuls), who had been taken on educational tours of the highlands and were in a better position to get beans from the Okapa officials. There were also a number of progressive young men familiar with coffee from their work on Kainantu coffee plantations who made early plantings. Government officers at Okapa encouraged further interest by more demonstration gardens in several villages and distributing coffee to many of the natives requesting it.

Coffee grew well on the Fore hillsides, and by the early 1960s when the first coffee matured, a few thousand dollars were suddenly earned by native planters, who previously had difficulty earning even two or three dollars. Just at this time groups of young men, many of whom were now knowledgeable in the handling of coffee, began returning from the first of the two years indentured employment periods started by the government somewhat after the establishment of the Okapa Patrol Post. Together with the relatives of the early few Fore planters these returnees created a sizeable group able and interested in growing coffee. A rush to put in coffee ensued. Further abetting this general interest in coffee was the fragmentation of the traditional role of the men in their own culture, following the enforced cessation of raids, ambush, reprisal murder, and warfare. The new peace had eliminated the need for their earlier major occupation of fighting and protecting families and lands from marauding enemies. Many eagerly settled on coffee production to fill this gap.

As the newer gardens became productive in the mid-1960s, the coffee crop was sold to European coffee buyers for many thousands of dollars per annum. By the late 1960s this suddenly jumped to nearly a quarter million dollars. The coffee revolution was established.

At first the coffee was carried on the backs of the growers (sometimes for several days) over steep rough mountain trails to a place where it could be sold to a buyer with a jeep. However, as more and more coffee was produced, the villagers began to turn their efforts to negotiating routes with neighboring villagers and cutting roads through the mountains and bush in an effort to make it possible for coffee buyers to come to their villages with trucks. By 1958 many native conceived and initiated road projects were under way, extending into a system the two government jeep roads built in 1957 with local village labor. The newly built roads and the new monetary wealth of the people in turn stimulated further economic development and the opening of the new trade stores.

Peanut: Peanuts, introduced in the mid-1950s by Europeans,

gained popularity for a few years as a source of income for people who wanted money badly in order to buy the commodities being offered for sale by trade stores in Okapa and Kainantu. The peanuts grew quickly and enabled the planter to get a return on his labor without waiting several years. However, after the mid-1960s, the greater return from work in coffee became evident and many of the peanut gardens were abandoned.

Pyrethrum: In the latter half of the 1960s, pyrethrum was also introduced by agricultural officers as another cash crop in the Highlands. However, aside from several demonstration gardens, this has yet to attract much interest. A few native owned pyrethrum plantings have been made, but the depressed price for the mature flowers has discouraged further planting.

Vegetables: Since early 1957 there has been an increasingly large market for native grown foods at the government station for police and their families, laborers, hospital, school, and jail populations, and other residents. This has expanded with the increasing population of foreign natives and Europeans. Natives have regularly brought sweet potatoes and increasingly large numbers of European vegetables to this government market. Similar, but smaller outlets for food developed around each mission station and school. As the European population in the Okapa area increased, the market for fresh vegetables expanded. The Europeans' preferences for vegetables familiar to them quickly influenced many villagers to grow the European potato, tomato, onion, carrot, pea, lettuce, and cabbage for sale. At times traders have purchased Fore grown vegetables in bulk for sale in the towns of Goroka, Kainantu, and Lae. In 1957-1959 several North Fore villagers grew European potatoes by the ton for sale to a trader who sold them at Lae for shipment to the Dutch in Hollandia, West New Guinea. This potato market has since disappeared.

The growing of most produce was left to the women in keeping with the women's role in garden work. Only coffee and peanuts became the province of the men. Similarly it was the women who carried the vegetables they had grown to the government and mission stations for sale and it was the men who carried the coffee and peanuts out and negotiated their sale.

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Zusammenfassung

Während eines Jahrzehnts fast ganzjähriger Feldstudien im Kuru-Gebiet von Neuguinea haben die Verfasser Beobachtungen über Gartenbau, Nahrungsbereitung und Ernährung der Fore-Leute gesammelt, zu einer Zeit, wo diese allmählich ihrer neolithischen Kultur absagten, um eine von abendländischen Ideen beeinflußte Lebensweise anzunehmen. Die vorliegende Arbeit berichtet von überlieferten Bräuchen, die noch zu Beginn der Studien, im Jahre 1957, existierten, und wie sie sich verändert haben. Spezielle Aufmerksamkeit wird der Stellung der Batate und dem Schweinefleisch in der Fore-Ernährung und Kultur geschenkt. Daneben untersuchte man auch die Einflüsse des Gartenbaus, Jagens und Sammelns sowie der neulichen Einführung des Geldhandels und der käuflichen Nahrungsmittel. Das stetige Eindringen in den tropischen Urwald durch Rodung und Abbrennen von Bäumen bedingt, daß Gartenbau die Hauptbeschäftigung der Fore ist, und daß auch der größte Teil der Mahlzeiten und gesellschaftlichen Veranstaltungen in den Gärten abgehalten wird. Gesellschaftliche und kulturelle Einflüsse auf die Ernährung führten zu langen Perioden mit niedriger Proteinaufnahme, unregelmäßig gefolgt von Perioden sehr proteinreicher Kost. Die Diät wird weiterhin beeinflußt durch die Art und Weise, wie die Nahrung gewonnen, zubereitet und verteilt wird. Die Fore essen gelegentlich, wenn immer sie Hunger haben, doch veranstalten sie auch von Zeit zu Zeit große Festessen. Während der Zeit der Beobachtungen änderten sich die Ernährungsbräuche unter abendländischem Einfluß, und gleichzeitig veränderte sich die Epidemiologie der Kuru-Krankheit. Der alte Brauch des Stammkanibalismus und sein Platz in den überlieferten Ernährungsgewohnheiten wird hinsichtlich einer möglichen Rolle in der Ätiologie der Kuru-Krankheit untersucht.

Résumé

Pendant dix ans, les auteurs ont mené à bien des campagnes d'études presque annuelles en Nouvelle-Guinée, dans la région où sévit le kuru. Ils ont assemblé des observations sur l'horticulture, le traitement et la préparation de la nourriture et l'alimentation en général de la tribu des Fore, à un moment où celle-ci renonçait à certaines traditions de sa culture néolithique pour adopter une manière de vivre influencée par des idées occidentales. Les observations rapportées ici traitent des pratiques traditionnelles, comme elles existaient au début des contacts en 1957, et comme elles se sont transformées depuis. Une attention particulière fut prêtée au rôle de la patate douce et du porc dans l'alimentation et la culture des Fore, de même qu'à l'importance de l'horticulture, de la chasse et de la cueillette et à l'introduction récente des denrées commerciales et de l'économie monétaire. La pénétration incessante dans la forêt vierge tropicale, afin d'aménager des jardins par la méthode « taille et brûle », occupe des Fore au jardinage pour la plus grande partie de la journée, et c'est aux jardins aussi qu'ils satisfont à la plupart de leur besoins sociaux et alimentaires. Les influences sociales et culturelles sur la nutrition ont conduit à des périodes prolongées d'un régime pauvre en protéines. Celles-ci, furent suivies à intervalles irréguliers, de périodes brèves d'un régime de haute valeur protidique. Le régime est aussi influencé par la manière d'acquérir, de préparer et de partager la nourriture. Les Fore ne mangent pas à des heures fixes, mais quand la faim ou l'envie les y pousse. De temps à autre pourtant, ils organisent de grands festins. Pendant la période d'observation, les coutumes et pratiques se sont modifiées au contact des occidentaux, et, en même temps, l'épidémiologie du kuru s'est transformée. La pratique du cannibalisme familial et la place qu'il occupe dans l'alimentation traditionnelle sont examinées quant à un rôle éventuel dans la transmission du kuru.