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Construction Techniques and Traditional Architectural Knowledge on Elato Atoll, Caroline Islands

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This paper describes the application of traditional knowledge in the building and in the renovation of buildings of Elato Atoll, Caroline Islands, Micronesia. The paper consists of three parts; (1) typology of buildings, process of building, and the system of measurement; (2) techniques of renovation of buildings; (3) and traditional knowledge, called *rong*. Buildings on Elato Atoll are usually constructed differently according to function and purpose. Three basic types are distinguished locally: *imw*, *fale*, and *mwaluumw*. The *imw* category includes the dwelling house, spirit house, menstruation house, and delivery house; *fale* denotes the canoe house and meeting house; and *mwaluumw* mainly refers to the cooking house. The Elato measurement system used in building construction plays important roles in determining the sizes of the buildings as well as in the constituent parts. Measurement is mainly based on the "halving system", especially important being (1) the ratio between beam and girder, (2) the ratio between girder and kingpost, and (3) intervals in laying rafters.

The traditional knowledge applied to building repairing and reconstruction is called *rongolibaang*. It permits a small group of people to quickly reconstruct a building without taking it entirely to pieces. This knowledge deals with six major parts of the building; posts, main beams, crossbeams, rafters, ridgepole, and the whole roof. Two types of knowledge are locally distinguished; *reepiy* (common knowledge) and *rong* (closed knowledge which is kept by a specific membership and concerns the spirit, *yalius*). This *rong* is esoteric knowledge and is considered to be handed down directly from *yalius*. It is inhibited according to specific rules. Since 1954, Elato has been Christianized and indigenous beliefs have declined. Most traditional knowledge has also been forgotten. However, this particular *rongolibaang* is the one of the few elements that still remains, since it is technically effective and useful in the daily life of the islanders.

Keywords: traditional knowledge, ethno-architecture, typology of buildings, renovation of buildings, measurement, Elato Atoll.

INTRODUCTION

The purpose of this paper is to present an ethnographical description of traditional knowledge associated with the construction and renovation of buildings on Elato Atoll (hereinafter abbreviated Elato) of the Central Caroline Island Group, Micronesia. The paper is divided into three sections: (1) a description of the measuring, building processes and a general overview of buildings on Elato, as well as their typology; (2) an explanation of the techniques involved in the renovation of buildings; and (3) an overview of traditional knowledge related to buildings in general.

Various reports have been published relating to the subject of buildings on Elato. Earliest among these is one by Paul Humbrush [KRÄMER 1937] who stayed on Elato during a portion of the very early German "Südsee Expedition 1908-1910." Sections of that work dealing with buildings include a list of dwelling names [KRÄMER 1937: 30-31] and information about a portion of the gable end walls which are like a round gimlet [KRÄMER 1937: 84-86]. Observations of buildings and island customs were also made by during a short visit to Elato by packet boat. He states that the buildings on Elato were fundamentally the same as the flat, hexagonal structures found on Yap, but had no foundation platform and were simply built over pieces of coral which had been piled into an arrangement somewhat like round plinths on flat ground [SOMEKI 1945: 407]. Alkire spent three weeks on Elato, primarily investigating relationships between the island and Lamotrek Atoll, but his report also includes names and diagrams of buildings [ALKIRE 1965: 156].

Several reports exist dealing with Micronesian architecture and research on Micronesian domiciles.¹⁾ No detailed work, however, has been done to date on building renovation. Brief mention of housing renovation techniques is made in an ethnography of Ifalik Atoll [BURROWS and SPIRO 1970]. In that work, the replacement of supporting poles and beams, reroofing techniques, and the supplementary materials employed are briefly touched on [BURROWS and SPIRO 1970: 65-68]. This work is limited since it covers only the term of that particular investigation and does not address the full range of techniques involved in building restoration.

1) Building research in Micronesia in the past has often been treated as part of ethnography or research in material culture [KUBARY 1895; BOLLIG 1927; KRÄMER 1932, 1937; DAMM & SARFERT 1935; DAMM et al. 1938; MATSUOKA 1943; SOMEKI 1945; LEBAR 1963, 1964; BURROWS and SPIRO 1970]. But recently it has come into its own as a separate entity, which incorporates ethnography, in the study of architecture [SUGIMOTO 1980, 1984]. Examples of this are the reports on careful investigations of the architectural processes and structures of the buildings of Yap in the western Caroline Islands [KOBAYASHI 1978], the record of architectural processes on Tol, Truk [ASAKAWA 1980], and traditional knowledge concerning renovation and building architecture of Elato Atoll of the Caroline Islands which formed the basis of this paper [SUGITO 1982b].

Table 1. Elatese Vowels and Consonants

| Vowels | front | | central | back |
|--------|--------|---------|---------|---------|
| | (flat) | (plain) | (round) | (round) |
| high | i, ii | | iu | u, uu |
| mid | e, ee | | eo | o, oo |
| low | | a, aa | | oa |

| Consonants | lips | lipteeth | teethgum | hard palate retroflexed | hard palate | soft palate |
|-------------|------------------|----------|----------|-------------------------------|----------------|----------------|
| stop | p, pp | | t, tt | | ch | k |
| nasal | m, mm mw, mmw | | n | | | ng, nng |
| fricative | b, bb | f, ff | s, ss | sh r | | g |
| flap | | | l | | | |
| semi-vowels | w, ww | | | | y | |

Rongolibaang (Phonology of Elatese is in Table 1), traditional knowledge having to do with housing restoration on Elato, is included within the category of knowledge known as *rong*. A person who obtains this knowledge is called *taubaang*. *Rong* is shrouded in the secrecy of traditional religion and thus may be thought of as holding an important key to the understanding a considerable range of traditional knowledge in the Caroline Islands.²⁾

Elato, where I conducted this study, is located roughly in the center of the Caroline Islands. It consists of four small islands perched atop a coral reef and two enclosed lagoons (Fig. 1). Residents live on Elato Island, which is approximately 3 km in circumference and situated in the northeast edge of the atoll. As of June 1979, the population was 96 persons, 47 males and 49 females.

Elato describes a large crescent which fills out to the north. The side facing the lagoon is sandy beach where that facing the sea is exposed coral reef. The highest point on Elato Island is on the ocean side and reaches an elevation of only four meters. The lagoon side is low at every point. There is a wet region in the center of the island, one kilometer in circumference, where taro root (*wot*: *Colocasia esculenta*, *bulag*: *Cyrtosperma chamissonis*) is cultivated. Elsewhere, useful trees

2) Ethnographies of Ifalik Atoll [BURROWS & SPIRO 1970] and Truk [BOLLIG 1927] related to traditional religions extend to *rong*. There are, taking Truk as one example, works dealing with *rong* related to material culture, *i.e.*, canoes and buildings [LEBAR 1963, 1964], "cultural values" [CAUGHEY 1977] and relatives and the idea of wealth [MURDOCK & GOODENOUGH 1947]. There have also been studies of *rong* on Satawal Island [ISHIMORI 1980, 1985] as it relates to divination [ISHIMORI 1979], its connection to traditional navigation [AKIMICHI 1980a, 1981; SUDO 1979b, 1980a], as well as an analysis of its role in the grappling techniques of Ulithi Atoll [LESSA & VELEZ 1978].

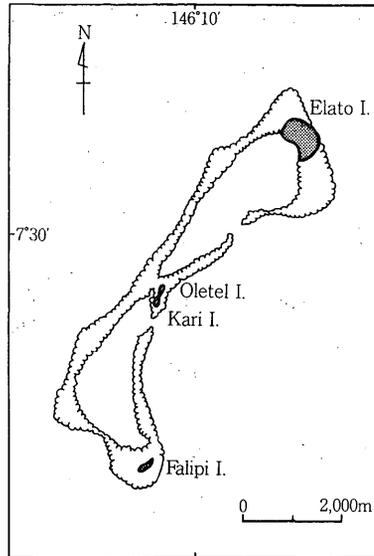


Figure 1. Elato Atoll

such as coconut (*liu*, *Cocos nucifera*) and breadfruit (*mai*, *Artocarpus spp.*) are grown.

Information for this paper was obtained during two periods of fieldwork: May 1979 to March of the following year and December 1980 to January 1981. Of all the data presented in this paper, information related to buildings and the system of measurement for houses was obtained mainly from Messrs. Maliumai (47), Sautal (64), and Chigwemal (27) (Ages in 1979). I received occasional instruction concerning *rongolibaang*, traditional knowledge of building restoration techniques, from Mr. Maliumai in particular, who, fearing that he might be overheard by third parties, requested that all discussions take place in broad daylight in a place where he could see if anyone was approaching from any direction. Information was for the most part received by oral instruction. He said that this method is traditionally favored means for passing on such knowledge.

BUILDING STRUCTURES

The Houses of Elato

Structures on Elato are roughly divided into three types: *fale*, *imw* and *mwaluumw*. *Fale* designates a men's house-cum-canoe house, *imw* are structures used as sleeping places, and a *mwaluumw* is a small shed used for cooking. All of these structures follow the same conventions governing the layout of posts that are found throughout the broad area which stretches from Southeast Asia to the numerous isolated islands of Oceania [SUGIMOTO 1977: 175].

There are 32 buildings on Elato (Table 2, Figure 2); 6 *fale*, 16 *imw* and 9

Table 2. Houses in Elato

| Name of Houses | Kingpost Height | Girder Length | Beam Length | Category | Clan Name |
|---------------------------------|-----------------|---------------|-------------|----------|------------|
| (1) Latowa | 440 | 350 | 450 | f | Mo, Gw |
| (2) | 285 | 240 | 350 | m | Mo |
| (3) Gasuereol (Libolirang) | 410 | 330 | 720 | i | Mo |
| (4) Geleisiya | 420 | 370 | 690 | — | — |
| (5) Spital | 390 | 640 | 1450 | — | — |
| (6) Welipiy | 570 | 440 | 640 | f | Gw, Go, Sw |
| (7) Sepal | 380 | 310 | 700 | s | Gw |
| (8) Metaar | 650 | 520 | 1080 | f | Gw, Sf |
| (9) | 295 | 200 | 390 | m | Gw |
| (10) Fasseour | 400 | 300 | 540 | i | Gw |
| (11) Lugal | 410 | 330 | 500 | i | Gw |
| (12) | ... | 490 | 730 | — | Gw |
| (13) Gatiyafash | 400 | 330 | 520 | i | Gw |
| (14) Woilppar (Weligeshushu) | 400 | 270 | 430 | i | Gw |
| (15) Maifash | 380 | 320 | 640 | i | Gw |
| (16) | 270 | 280 | 430 | m | Gw |
| (17) Rugulong | 500 | 390 | 470 | f | Sw, Sf |
| (18) Gateopalei | 560 | 620 | 1030 | f | Sw |
| (19) Fassefang | 340 | 250 | 350 | i | Sw |
| (20) Faliyap | 410 | 300 | 750 | i | Sw |
| (21) | 325 | 260 | 380 | m | Sw |
| (22) Lugeriya | 450 | 340 | 960 | i | Sf |
| (23) | 360 | 250 | 540 | m | Sf |
| (24) Gatiyerang | 320 | 250 | 350 | i | Sf |
| (25) Faligiliyaw | 470 | 390 | 700 | i | Sw |
| (26) | 295 | 290 | 220 | m | Sw |
| (27) | 280 | 180 | 280 | m | Sw |
| (28) Lemeoluw | 370 | 240 | 370 | i | Sw |
| (29) Lemeoluw | 430 | 340 | 900 | i | Sw |
| (30) Imwepeo | 370 | 240 | 330 | i | Sw |
| (31) | 400 | 280 | 570 | m | Sw |
| (32) Salingeluw | 370 | 320 | 650 | i | Sw |
| (33) Gatiyafash | 390 | 350 | 630 | i | Gw |

Table Note:

1) category

f : *fale*, canoe housei : *imw*, house for sleepingm : *mwaluumw*, house for cookings : *sepal* small, canoe house

2) clan name

Go : *Geofaliu*Gw : *Gailengaliweleya*Mo : *Mogolifash*Sf : *Saufalashig*Sw : *Sauel*

mwaluumw. In addition there is a church (*geleisiya*) and a medical clinic (*spital*).³⁾ Of all these buildings only the *spital* was constructed according to structural methods common to the rest of the world. It is a prefabricated building made of steel reinforced concrete and the roof is furnished with a means of collecting rainwater. Some of the other structures have non-traditional features, such as walls made of imported materials, but were fundamentally built following traditional architectural forms.

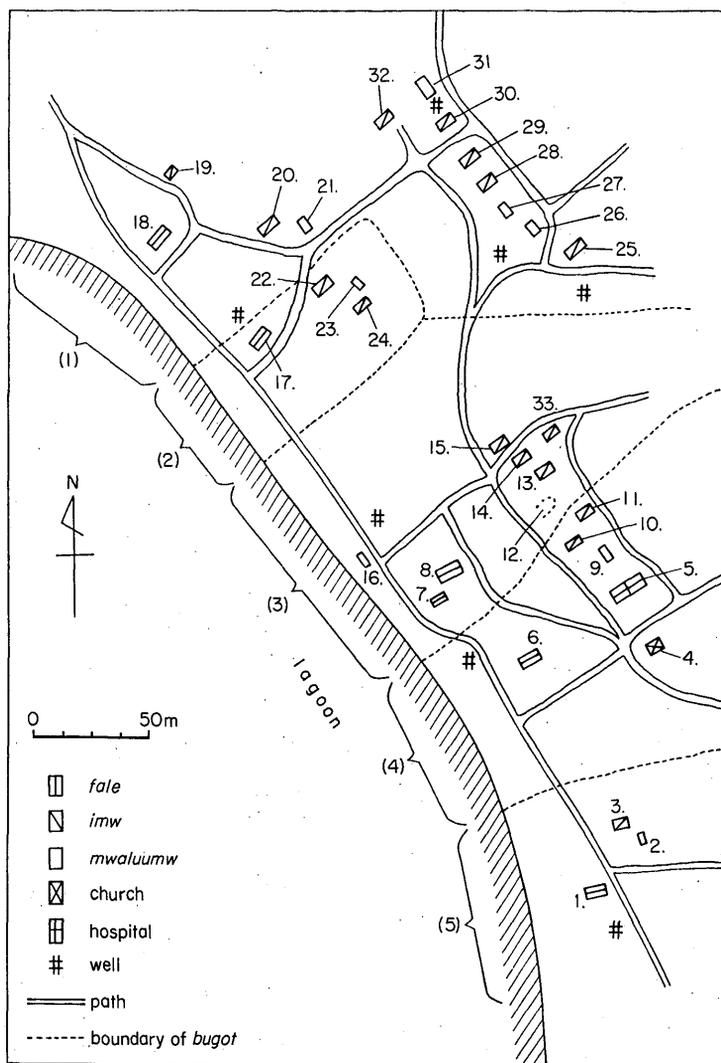


Figure 2. Dwelling Area on Elato

3) *Geleisiya* is a phonological adaption of the Spanish word for "church" and *spital*, English "hospital".



Figure 3. *Fale*

The society of Elato is matrilineal and succession to the position of chief, alienation of land, and group membership of newborn children are determined by matrilineal descent groups (*gailang*). *Fale* (Fig. 3) are also occasionally known as either *fennepaliwa* or *fennap*. *Fennap* is a term derived from the combination of *fale* and *lap*, where *lap* means “large”. *Fennap* may also stand for a large-scale *fale*, but normally designates the *fale* of the *gailang* in the highest position. *Fennepaliwa* is composed of the roots *fennap* and *wa*, the latter being a word for canoe. This compound word refers to *fale* where meetings involving the entire population of Elato are held. *Falyaramat* means the *fale* of the *yaramat*, or people, but also refers to the *fale* belonging to *gailang* other than that of the chief.

Ordinarily, the term *imw* is used for structures utilized as sleeping spaces. There are, however, several types of *imw*. First, *imwtamwol*, *imwlap*, and *imwshig* are distinguished by the position held by the *gailang*. *Imwtamwol* means “chief’s house” and refers to the structure belonging to the *ushang* of the *gailang* to which the chief succeeds. *Imwshig* means “small house” and refers to structures belonging to ordinary *gailang*. *Imwliyalius* means the home of *yalius*. I will go into the meaning of *yalius* in more detail later on but, for the moment, suffice it to say that it stands in general for supernatural being. An *imwliyalius* is distinguished from other structures in that it is placed so that its longitudinal side parallels the beach. It is said that *yalius* is worshipped by *tauyalius* in an *imwliyalius*. *Tauyalius* was once a sorcerer who delivered oracles while in a trance state, but the details of this have been lost. Further, there are no longer any *imwliyalius* on Elato. *Imw*, a contraction of *imwettemwaiu*, refers to huts used for the isolation of menstruated women and what we may term “partition” huts. *Temwaiu* means “illness”, thus *imwettemwaiu* means “house of sickness”.

There are three types of these partition huts: *imwlipal*, *imwlipeopeo* and

imwlifaamw. In *imwlipal*, *pal* itself indicates a “partition hut”.⁴⁾ The *peopeo* of *imwlipeopeo* means “celebrating coming out of the *pal*”.⁵⁾ The *faamw* of *imwlifaamw* stands for the “raising” of children. There are two types of menstrual isolation huts: *imwttaing* and *imwligabuitag*. The *taing* of *imwttaing* means “menstruation” and *imwttaing* stands for “menstruation place”. In the word *gabuitang*, *ga* is a causitive prefix and *buitag* means “to ascend”. *Gabuitag* thus has the meaning to “cause to go up”. The compound word means something like “to have someone go up” from the *imwttaing*.⁶⁾

Those buildings, which formerly served as partition places or places for the isolation of menstruated women, were constructed near both edges of Elato. These *imw* were contaminated both by the menses of women and the process of childbirth. These buildings were isolated from other structures from the fear that supernatural powers belonging to a *taubaang* might be compromised. Men who were not *taubaang* were charged with the task of building these *imw*, which were not only small in scale but simple to put up. Such structures as “partition huts” or “menstrual isolation areas” no longer exist on Elato.



Figure 4. *Mwaluumw*

- 4) *Pal* is a phonetic alteration of *fale*.
- 5) During partition women retire from view to one of the above mentioned “partition huts”. As their time for delivery draws near they first enter the *imwlipal*. After birth they change on the twenty-fifth day to the *imwlipeopeo* and thence to the *imwlifamw* on the first day of the next month. Then, after staying there four months [after four new moons], a woman is permitted to return to her own *imw*.
- 6) At the first tide right after menstruation begins, they enter the *imwttaing*, staying four months from the first day of the next month. (On the lunar calendar the first month is reckoned from the first day of the phase of the moon, but on Elato it is the first day of the month). They then move to the *imwligabuitag* for four days, after which time return to one’s own *imw* is allowed. After the second menstruation, the stay in the *imwttaing* is only four days.

Mwaluumw (Fig. 4) stood for the small hut the *gailang* or *bugot* unit comprising the group used for communal cooking. *Mwaluumw* is a word composed of two elements—*mwal* and *uumw*. *Mwal* means “hide from view” and *uumw* “cook with an earthen oven”, or better “the hole used for earthen oven cooking”. In other words *mwaluumw* is “a hut which covers the hole used for earthen oven cooking”. The long side of the *mwaluumw* was built parallel to the beach line and the roof structure was somewhat elementary.

Building Structures

Traditional buildings on Elato have gabled roofs with gible-shaped eaves on the latitudinal sides. There is no ceiling and the posts are sunk into the ground. There are no lintel posts and construction is of the king post variety.

Imw, living spaces, are built on platforms, *taiif*. Some platforms have places with small hillocks and others do not, but all are made up of *faiumwag*, fragments of coral. When platform boundaries are delineated with marker stones, the platform is separated from ground level by about 20 cm, with fair stones twenty to thirty centimeters in diameter. Where marker stones are not employed, the platform is no more than a gentle little rise. Indoors there is one large space with no divisions or rooms. There is no floor. Instead mats (*teppagau*) woven of coconut palm leaves are spread all around. Before sleeping *giyegiy* (mats of pandanus, *Pandanus* spp.), are laid down.

No nails are used in construction. Building materials are bound together only with *gologol* rope made from the fibers of coconut husks. *Imwtipaap* (dwellings) which have *tipaap* (board walls) are built by means of joinery and use no nails either. There are various types of roof structures including *imwweoi*, *imwgat* (*tiwngat*), *imwgeffat* and *imwsepeig*.

Imwweoi are the parts holding the rafters. *Imwgat* or *tiwngat* are made into



Figure 5. *Imwgeffat*

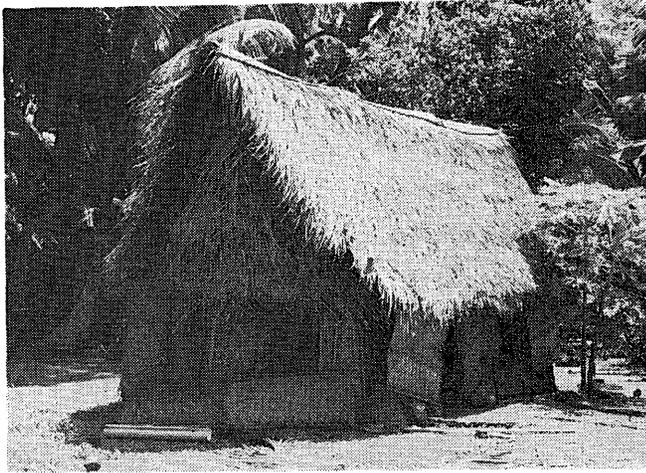


Figure 6. *Imwtegile*

a roof substructure with a framework and rafters. The former is comparatively more complex in structure than the latter and is quite durable. In contrast, the latter structure, though it can be simply put together, does not hold up well over time.

Imwgeffat (Fig. 5) has no posts and is formed so that the roof comes directly into contact with the ground. The *ge-* of *geffat* is a variation of the causative prefix



Figure 7. *Imwgoshash*



Figure 8. *Imwtipaap*, Traditional Wall made of Breadfruit Tree

ga- and *ffat* means to pierce. This structure is so named because the kingpost pierces the surface of the earth. *Imwgeffat* and *imwsepeig* are small, simple lean-to roofs having no rafters. Moreover, while *imwgeffat* and *imwsepeig* are terms designating a type of roof structure, at the same time they also refer to sheds principally employed for storing coconut husks, which are used for fuel. In other words, it may be said these names are based on the function of the structure.

Under normal circumstances, *fale* are utilized as working areas of the men's house or the canoe house and have no walls.⁷⁾ *Imw*, in contrast, have walls. Wall structures comprise four varieties including *imwtegile* (Fig. 6), *imwgoshash* (Fig. 7),

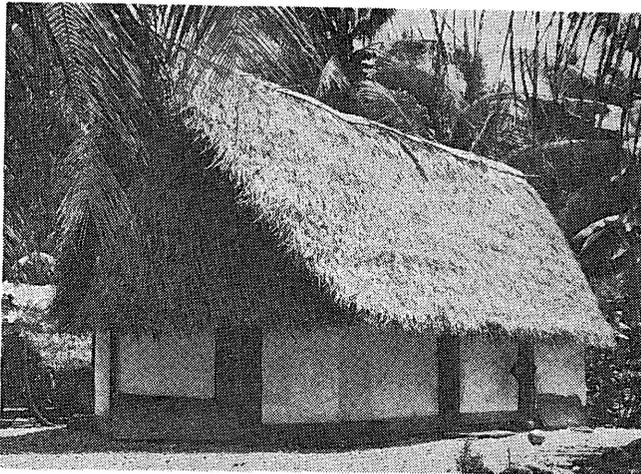


Figure 9. Modern Wall made of Plywood. House plan looks like hexagonal Yapese style

gashiliwoshunne and *imwtipaap* (Fig. 8 and 9), the first and the last, however, are the basic types.

The *imwtegle* is a wall made of mats woven from a coconut palm (*giliyepeopeo*). The small poles (*watitit*) supporting the walls have a diameter of five centimeters or less and do not support the weight of the roof.

Imwtipaap, on the other hand, is a wall surface made of boards. *Tipaap* means a board wall. Traditionally, the walls were made of trees, mostly from breadfruit trees, as much as seven or eight centimeters in diameter. There are also two existing buildings on Elato, *imwtipaap* which used coupled boards, *plaiwut*, in the

Table 3. Typology of the Elato Houses

| | | | Typology of Roof Structure | | | | Typology of Wall and Basement Structure | | | | | |
|---------------------|-----------|---------------|----------------------------|----------|-----------|-----------|---|-----------|-------------|-----------------|---|---|
| | | | imwweoi | imwgat | imwgeffat | imwsepeig | imwtegle | imwtipaap | imw-goshash | gashiliwoshunne | | |
| Functional Typology | fale | fale | faltamwol | + | - | - | - | - | - | - | - | |
| | | | falyaramat | + | - | - | - | - | - | - | - | |
| | | | fennap | + | - | - | - | - | - | - | - | |
| | | | fennepaliwa | + | - | - | - | - | - | - | - | |
| | | sepal | + | - | - | - | - | - | - | - | | |
| | imw | imw | imwliyalius | | + | - | - | - | - | + | - | - |
| | | | imwtamwol | imwlap | + | - | - | - | ± | ± | ± | ± |
| | | | | imwshig | + | - | - | - | ± | ± | ± | ± |
| | | | | imwlipel | - | + | - | - | + | - | - | - |
| | | imwettenwaiu | imwlipeopeo | - | + | - | - | + | - | - | - | - |
| | | | imwlifaamw | - | + | - | - | + | - | - | - | - |
| | | | imwttaing | - | + | - | - | + | - | - | - | - |
| | | imwligabuitag | - | + | - | - | + | - | - | - | - | |
| | | mwaluumw | | - | + | - | - | + | - | - | - | - |
| | | imwgeffat | | - | - | + | - | - | - | - | - | - |
| | imwsepeig | | - | - | - | + | - | - | - | - | - | |

- 7) When end wall thatch rafters are made to extend to the ground like continuous posts. They call the end wall supporting posts (*siurung*). In *fale*, however, it is not feasible to make end wall supporting posts because the canoe is brought in and out through the gable end.

Table 4. Materials

| I. posts | | II. other parts | |
|--------------------|-------------------------------|-------------------|------------------------------|
| 1. <i>gelao</i> | <i>Caodia subcordata</i> | 1. <i>mai</i> | <i>Artocarpus spp.</i> |
| 2. <i>gaingiy</i> | <i>Perphis acidula</i> | 2. <i>lel</i> | <i>Morinda citrifolia</i> |
| 3. <i>yaaro</i> | <i>Premna gaudichaudii</i> | 3. <i>song</i> | <i>Bruguiera gymnorrhiza</i> |
| 4. <i>uut</i> | <i>Guettarda speciosa</i> | 4. <i>talmosh</i> | <i>Pandanus sp.</i> |
| 5. <i>ragish</i> | <i>Calophyllum inophyllum</i> | 5. <i>liu</i> | <i>Cocos nucifera</i> |
| 6. <i>faaliyao</i> | <i>Eugenia javanica</i> | | |

walls. This type of structure has peculiarities in the frontal design. The usual *imwtipaap* is square and enclosed by a board wall. The semicircular walls at the ends of the eaves are covered with mats made of coconut palm leaves, resembling the small, divided room with hexagonal eaves of Yap. It is safe to assume the structures Someki saw were probably of this sort of building [SOMEKI 1945].

Imwgoshash are buildings having sills (*goshash*) while *gashiliwoshunne* have posts (*shunne*) on top of the sills. Both may be thought of as being medium sized *imwtegile* and *imwtipaap*. On the other hand, because they both have posts, walls which do not support the weight of the roof, and wall mats made of coconut leaves, they are identical to *imwtegile*. The sills (*goshash*) are a feature they share in common with *imwtegile*. However, the two differ in that *imwgoshash* have no posts at the corners of the sills where *gashiliwoshunne* do. (Table 3 summarizes all the functions and building structures described to this point.)

Materials

The buildings of Elato are made both from multi-purpose trees grown on Elato and special varieties of trees utilized primarily as building materials. The choice of the types of trees variety used for posts is viewed as especially important. The ends of the posts are buried in the ground to a depth of at least fifty centimeters. Since Elato is a coral atoll island, its altitude is minimal and the water table very high. Thus care is taken to ensure that the section to be buried in the ground is burned to prevent it from rotting. Besides being used for posts, wood is used for building materials (Table 4).

RAISING BUILDINGS AND METHODS OF MEASUREMENT

Architecture

BUILDING THE *IMWTEGILE*

1. Framework Construction (Figure 10-1)

(1) Assemble the crossbeams (*talielap*) and girders (*goisham*) prepared earlier into a curb on the intended plot.

Table 5. Parts of Houses

| | | | |
|-------------------------------|---------------------------|--------------------------------|---------------------------------|
| 1. <i>tarielap</i> | crossbeam | 26. <i>gapengagulipping</i> | end wall thatch purlins |
| 2. <i>goisham</i> | girder | 27. <i>gabaorolupping</i> | end wall eave battens |
| 3. <i>siur</i> | posts | 28. <i>gattulupping</i> | end wall mid rafters |
| 4. <i>ungolap</i> | ridgepole | 29. <i>paiulmaliugilipping</i> | end wall eave extension section |
| 5. <i>boot</i> | kingposts | 30. <i>tettalipping</i> | end wall eave extension battens |
| 6. <i>weoi</i> | rafters | 31. <i>watitit</i> | vertical wall frames |
| 7. <i>weoilimaat</i> | end rafters | 32. <i>gapangagilitit</i> | horizontal wall frames |
| 8. <i>weoiluug</i> | central rafters | 33. <i>getam</i> | door space |
| 9. <i>itibut</i> | diagonal struts | 34. <i>gilyeseisei</i> | sliding door |
| 10. <i>meleufeoiu</i> | tie beam purlins | 35. <i>gilyepeopeo</i> | wall mat |
| 11. <i>gapangag</i> | purlins | 36. <i>teppagaw</i> | floor mat |
| 12. <i>ungoshig</i> | middle ridgepole | 37. <i>faib</i> | purlin tie brace |
| 13. <i>gappiliweoi</i> | eave purlins | T1. <i>goshash</i> | longitudinal sills |
| 14. <i>gat</i> | thatch rafters | T2. <i>goshashtab</i> | latitudinal sills |
| 15. <i>yaw</i> | purlin battens | T3. <i>shunnelitab</i> | corner posts |
| 16. <i>sogoram</i> | upper ridgepole | T4. <i>shunne</i> | door posts |
| 17. <i>gappiligat</i> | thatch rafter battens | T5. <i>shunnelipping</i> | door posts |
| 18. <i>paiulmaliug</i> | eave receiver | T6. <i>tipaap</i> | wooded wall |
| 19. <i>langoliyaas</i> | eave extension battens | T7. <i>peig</i> | longitudinal lintels |
| 20. <i>gappilitittal</i> | eave extension battens | T8. <i>taab</i> | latitudinal lintels |
| 21.1. <i>faibaligapangag</i> | end wall thatch purlins | T9. <i>rishig</i> | wooden sliding door |
| 21.2. <i>faibaliboot</i> | purlin kingpost tie brace | T10. <i>teppau</i> | end wall |
| 22. <i>weoilipping</i> | end wall thatch rafters | T11. <i>keilou</i> | ledge |
| 23. <i>siurung</i> | end wall supporting posts | | |
| 24. <i>tibolipping</i> | end wall beams | | |
| 25. <i>faibalitibolipping</i> | end wall thatch purlins | | |

(2) Dig holes and place the posts in them. (Incidentally, the L cut near the top of the posts for securing the crossbeams is called *yaang*.)

(3) Put the crossbeams on the posts.

(4) Place the girders on the crossbeams.

(5) Using *bwau* and *faib*, mark the position of the ridgepole (*ungolap*).

(6) Tie ropes (*limmatelagrag*) to the four corners from the midpoint of the ridgepole and pull it into position.

(7) Stand the kingpost (*boot*) up and fit the purlin-kingpost tie brace (*faibaliboot*).

2. Roof Frame Construction (Figures 10-2, 10-3)

(8) Bind both ends of the four rafters (*weoilimaat*) across the ridgepole and crossbeams.

(9) Secure the central rafter (*weoiluug*).

(10) Place remaining rafters at equal intervals and secure them.

(11) Secure the diagonal struts (*itibut*) to the rafters from the inside.

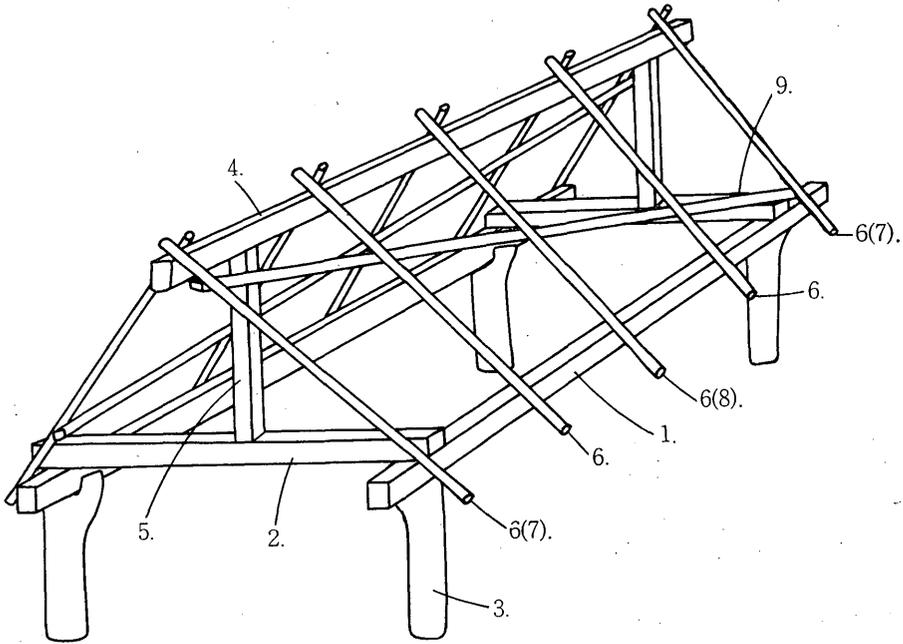


Figure 10-1. Structure of House (Refer to Table 5)

- (12) Secure the tie beam purlins (*meleufeoiu*) to the rafters at the eave ends.
- (13) Take the *limmatelagrag* off.
- (14) Tie the purling (*gapangag*) to the rafters.

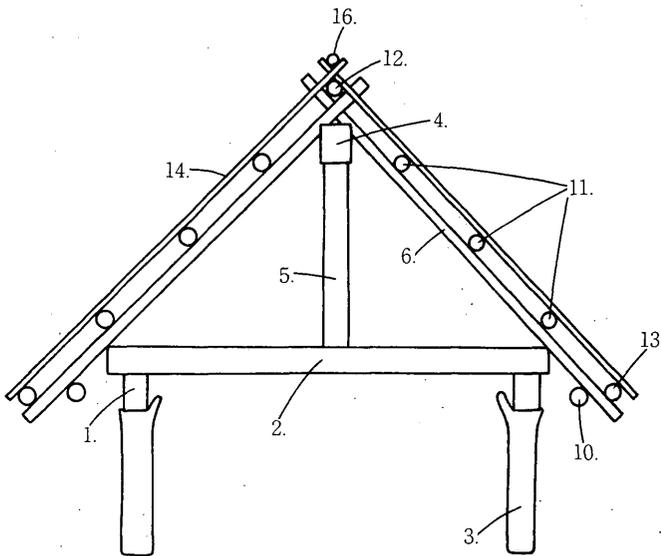


Figure 10-2. Front Part of House (Refer to Table 5)

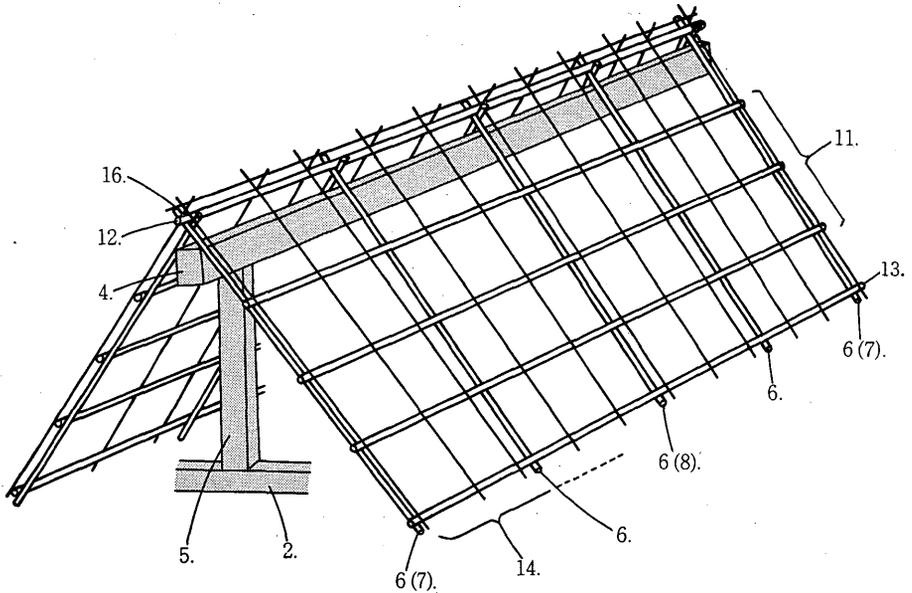


Figure 10-3. Structure of Roof (Refer to Table 5)

(15) Place the middle ridgepole (*ungoshig*) at the point where both rafters intersect and secure.

(16) Secure the eave purlins (*gappiliweoi*) to the lowest of all the purlins.

(17) Tie the purlin battens (*yaw*) to both ends of the purlins at the eave ends. These will enclose the purlins and attach them.

(18) Tie the thatch rafters (*gat*) at equal intervals along the purlins.

(19) Place the upper ridgepole (*sogoram*) on the thatch rafters.

(20) Secure the thatch rafter battens (*gappiligat*) at the eave ends so that they fit in from top to bottom along the thatch rafters.

(21) Join the kingpost and the second purlin from the top (of both roof planes) and secure the purlin tie brace (*faib*). At the place where the number two purlin and the middle rafter cross, secure supports.

3. Eave Frame Construction (Figures 10-4a, 10-4b)

(22) Add eave extension sections to each thatch rafter at the level eaves receiver (*paiulmaliug*) and secure.

(23) Secure the eave extension battens (*gappilitettal* and *langoliyaas*) above and below the end of the eaves.

4. Gable and wall construction (Figure 10-5)

(24) Lay the end wall thatch purlins (*faibaligapangag*) across the highest purlins.

(25) Secure the end wall thatch rafters to the midpoint of end wall thatch purlins.

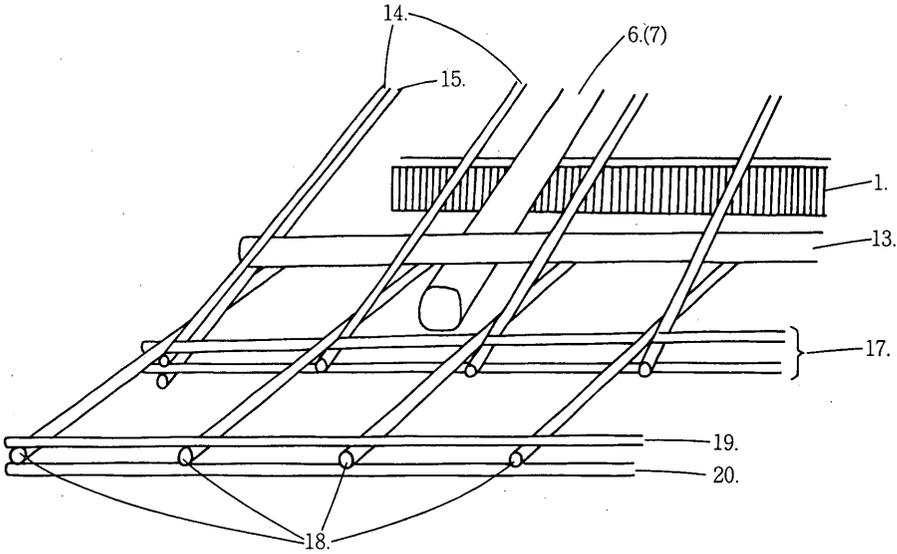


Figure 10-4a. Eave Frame Structure (Refer to Table 5)

- (26) Place two end wall beams (*tibolipping*) so that they extend, out from the roof. These are placed over the girders and secured at the end.
- (27) Secure the end wall thatch purlins (*faibaltibolipping*) to the end of the end wall thatch rafters and tie to the two end wall beams.
- (28) Secure the end wall thatch purlins and end wall thatch rafters.
- (29) From each purlin of the roof girder drop end wall thatch rafters perpendicularly and parallel to the central end wall thatch rafter.
- (30) Attach the end wall thatch purlins (*gapengagulupping*) parallel to the ground or to the roof angle and secure to end wall thatch rafters.
- (31) Secure the end wall midrafters (*gattulupping*) to the end wall thatch purlins.

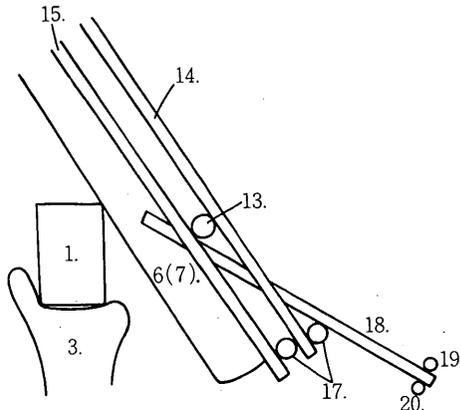


Figure 10-4b. Eave Frame Structure (Refer to Table 5)

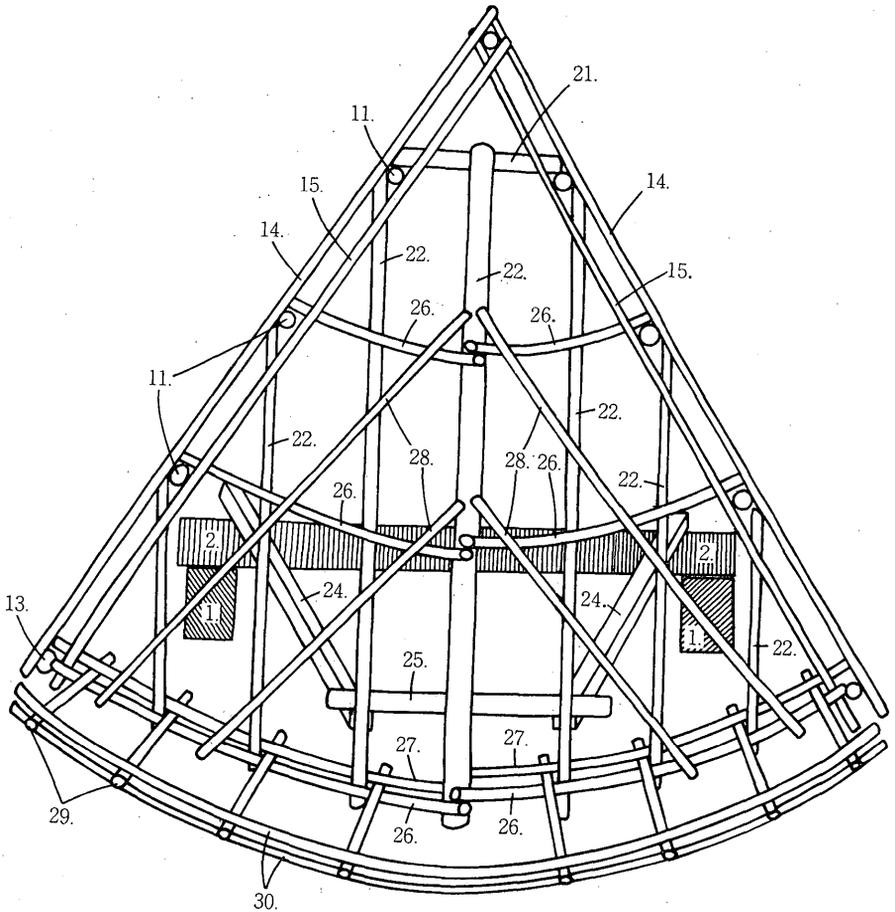


Figure 10-5. Structure of End Wall (Refer to Table 5)

5. End Wall Eave Construction

- (32) Secure the end wall eave batten (*gabaoroluppung*) to backside (under roof) of end wall eave.
- (33) Push the end wall eave extension section (*paiulmaliugilipping*) below eaves receiver and over the end wall thatch purlins.
- (34) Secure the end wall eave extension battens (*tettalipping*) above and below the end of the end wall eave extension section.

After the framework has been completed as described above, the roof is covered with roofing materials (*yaas*) woven from coconut palm leaves. Then the wall surfaces are finished. When building small-scale *imwtepile* (Figure 11-1~11-9), the usual method is to complete steps from (3) to (9) on the ground. Then the prebuilt roof is lifted on to the poles by hand and the remainder of the tasks finished.

Fale are put up, in fundamentally the same fashion as *imwtepile*, but the steps

involved with horizontal eave construction (22) and (23) and gable end eaves (32) to (34) are not present. Furthermore no walls are set up.

CONSTRUCTING AN *IMWTIPAAP* (Figures 12-1, 12-2)

1. Wall Construction

- (1) Place the longitudinal sills (*goshash*). These rest on the ground surface, in contrast to those in the *imwetegile*.
- (2) Place latitudinal sills (*goshashtab*) on the *goshash* and fit them together.
- (3) Stand the cornerposts (*shunnelitab*) in the four corners where the two pairs of sills cross.
- (4) Stand the door posts (*shunne*), 8 altogether, on the longitudinal sills. Set up entrance/exit points at two places on each of the longitudinal sides.
- (5) Stand a total of four door posts (*shunnelipping*) on latitudinal sills. Establish a single entrance/exit at the midpoint of each.
- (6) Install the board wall.
- (7) Install the wooden sliding door (*rishig*).
- (8) Put the longitudinal lintels (*peig*) in place. These have L-shaped wedge cuts in them.
- (9) Install latitudinal lintels (*taab*). From this point on the assembly process is the same as for *imwetegile* and *fale*. However, in the case of either *fale* or *imwetegile*, the parts are not placed on the longitudinal rafters and secured, but instead are pushed into the L-shaped cut of the longitudinal lintel. After work on the gable end wall and small roof has been completed, the end walls (*teppau*) and ledges (*keilou*) are put on.

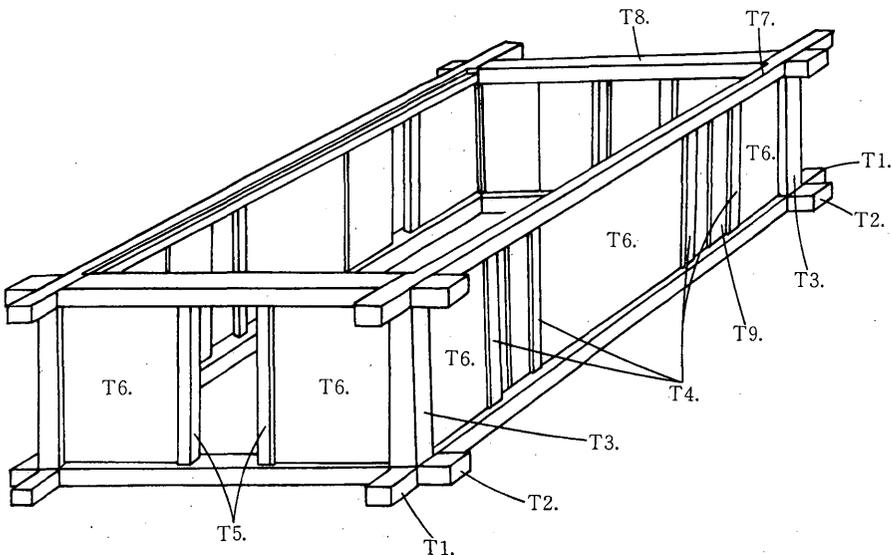


Figure 12-1. Basic Structure of House (Refer to Table 5)

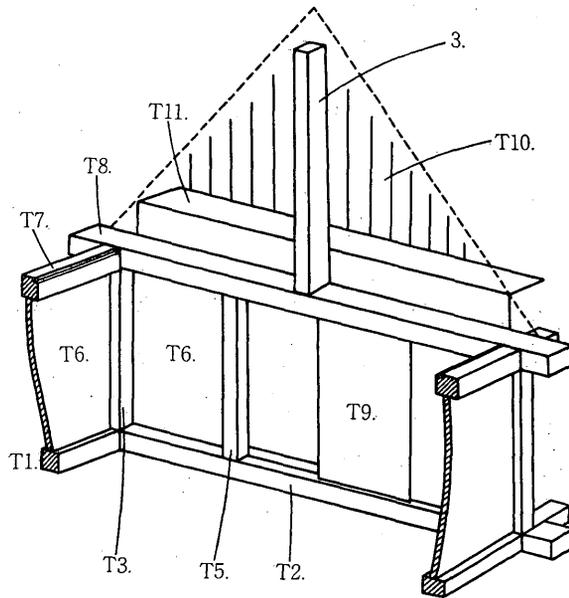


Figure 12-2. End Pieces of House (Refer to Table 5)

2. ROOFING WORK

The roofing work is called *fatefat*. Dried leaves from the coconut palm are used as the roofing material (*yaas*) leftover portions at the base of the roof and ends being rendered into a wickerwork. Roofing materials are bound to the middle rafters using ropes cut from the bark of the hibiscus plant (*giligo*, *Hibiscus tileaceus*) and stacked on the roof front to back in a longitudinal direction with a slight overlap.

The coconut palm leaves are usually laid so that what is considered the outside of the leaves are facing up. However, at the eaves of the roof (*ung*) they are reversed. Also, the stem of the coconut leaves are always laid so that they from the spine of the coconut leaves are always laid so that they from the spine of the roof at the edge of the eaves in a gabled roof. It is necessary, therefore, to have two varieties of roofing materials, one with the middle of the leaves emanating from the left and another from the right.⁸⁾

INWTEGILE WALL CONSTRUCTION

Equidistant posts (*watitit*) are placed describing an area slightly larger than that circumscribed by the posts at four corners. The gables have posts standing in them in a semicircle. Straight materials of no more than five centimeters in diameter are

8) When building from scratch, one side or the other of the roof is sparsely covered so that it may be shifted about while the roof is in a state of disrepair. This is done to avoid having to take time while working to thatch both sides. Roofing materials will last two to three years, it is said.

used as posts, their bases being sunk slightly into the soil and their upper ends secured to the middle rafters. Openings are made at two places on each side at the same level and crosspieces (*gapangagilitit*) tied to the posts. The number of crosspieces are adjusted so that the shape described by the posts and crosspieces will be more or less square. Pieces rendered from leaves of the coconut palm into wickerwork are secured to the posts and crosspieces as walling (*gilyepeopeo*).

Measuring Methods

The basic principle for measurements used for construction on Elato is the calculation of relative lengths of the principal materials and the positioning of the major parts at the time a building is erected. A halving system is employed initially [ALKIRE 1970: 19–23, 68–69; BURROWS and SPIRO 1970: 20, 75; LEBAR 1963: 62, 1964: 131–132]. In this halving method first a coconut palm rope is cut to the length of some part and then used to make marks on other parts by taking the midpoint of the rope.⁹⁾

DETERMINING THE SIZE OF THE BUILDING

The rule for determining building size is based on the length of tie beams. The size is determined by taking into consideration the length of the canoe that will be stored in the building and the number of people who will be living there. The size of the house is expressed by the length of the beams and calculated in a unit termed *ngaf*, the distance between the tips of the fingers when both arms are extended to the side. In contrast, on Truk building size is said to be expressed by the number of thatching sheaves which may be laid on the roof in a longitudinal direction [LEBAR 1963: 64–65; ASAKAWA 1980: 147]. In other words, roofing materials are standardized and can therefore be used as a unit of measurement. On Elato, however, the lengths of the coconut palm leaves used for roofing vary considerably. Therefore, lengths are traditionally measured in units determined by a span between body parts. Once the beam length is decided, this is used as the standard to determine the length of the other parts.

THE RELATIONSHIP OF BEAMS TO GIRDERS

The size of the girder module (*shoilapal*) is decided by its relationship to beam length (*erail*). When stating the names of the parts, the girder module becomes *goisham* and beam length (*taliyelap*).

On Elato it is said the ideal relationship between beam and girder is from 8 : 3 to 8 : 5. The 8 : 3 and 8 : 5 ratios are obtained by the halving method. First the standard length is halved three times to obtain the 8 : 1 ratio. The subunit is then repeated 3 or 5 times to obtain the 8 : 3 and 8 : 5 ratios.

The relationship of length to width can be calculated from the length of buildings still existing on Elato (See Table 2). Here we call this relationship the relative length

9) The midpoint or halfway is called *luug*, a quarter *lugolitab* an eighth, *lugolipeg*, a sixteenth and thirty-second *galus*.

and breadth. We obtain the ratio of length to breadth by dividing the length of the girder module by the beam length (taken as one). The average length-to-breadth ratio is 0.59 with a total distribution ranging from 0.83 to 0.35. The 8 : 5 ratio corresponds to a value of 0.63 and the 8 : 3 ratio to 0.83. Of the twenty-two buildings investigated thirteen fell within the ideal range, one had a lower ratio and eight a higher ratio than the ideal. In other words sixty percent of the present buildings lie within ideal parameters.

THE RATIO OF GIRDER TO KINGPOST HEIGHT

The ratio of girder to kingpost height is determined by dividing the beam length by the kingpost height. Here this is termed "comparison of heights".

On Elato, there are two ideal height relationships. One of these includes the ratios between 8 : 7 and 32 : 25 where as the other covers ratios from 8 : 7 to 16 : 15. The former is a ratio of the height of *falyaramat* or *imwshig* and the latter is said to be the height of *faltamwol* and *imwtamwol*. Thus the difference in the ratio of heights is a way of indicating differences in position.

When the height ratios of existing buildings on Elato are calculated (Table 2), we see that the values range from a low of 0.65 to a high of 0.94, the average being 0.81. Buildings falling within ideal height parameters were fourteen of twenty-two or some sixty percent. The other eight had height ratios below the ideal. As stated above, ideal proportions are divided into two ranges, the cutoff point being at 8 : 7 (0.88). Eight buildings exceed the value of 0.88. The 0.93 Wolippar and 0.94 Metaar heights among those eight buildings were for structures belonging to Saufalashig of the *gailang* chief. The other Wolipiy, Rugulong, Faliyap, Lemeoluw, and Imwepeo are all in the possession of Sauwel of the present *gailang* chief. Thus we can say that buildings with height proportions better than 0.88 are, without exception, *imwtamwol* of *faltamwol*.

RIDGEPOLE AND BEAM LENGTHS

Ridge poles must be longer than beams. That is, the ridgepole is made longer and extended beyond the beams for the purpose of rendering the roof into a keel shape. However, there seems to be no concrete means measuring the ridgepole length in Elato.¹⁰ On other places like Woleai Atoll, the length of ridge poles of buildings are measured. They are cut into the length which is longer than beams by a distance from the elbow to the fingertips [ALKIRE 1970: 20]. On the island of Stawal the ridgepole is made to be about six feet longer than the beam length [SUDO 1980b: 178].

DECIDING THE POSITIONING OF THE POSTS

The framework beams and girders is put together at the site where the building is

10) The length of the ridge piece of the buildings of Woleai are measured so that both ends project by a length determined by the distance between the elbow and the fingertips [ALKIRE 1970: 20]. On Satawal Island, the length of the ridgepiece is made at least six feet longer [SUDO 1980b: 178].

to be erected. Ropes are stretched diagonally from the four corners and the framework adjusted until lengths of both ropes are equal.

DETERMINING THE POSITIONING OF THE RIDGEPOLE

This is the method by which the ridgepole is positioned to project out equidistantly from the gable ends. Four ropes of equal length are tied at the mid-point of the ridgepole, and its position adjusted until the rope ends touch the posts.

SPACING BETWEEN RAFTERS

The number of rafters in a structure may be 5, 7, 9, 11 or 13. Among the buildings on the island, the largest number have seven rafters. Using the halving system, the basic measurement method used to decide the spacing between rafters, it is quite easy to determine the rafter positions for 5 or 9. It is somewhat more complicated, however, when 7, 11 or 13 rafters are employed.¹¹⁾

BUILDING RENOVATION TECHNIQUES AND KNOWLEDGE

The Varieties of *Baang*

Rongolibaang or traditional knowledge of building renovation does not refer only to knowledge related to building renovation. In fact, three varieties of *rongolibaang* exist: *bangiwa*, *bangiyaramat*, and *bangifal*. *Bangiwa* means *baang* of *wa*, "canoe". This is the knowledge useful for righting a craft which has capsized at sea. *Bangiyaramat* is *baang* of *yaramat*, "humanity". Here, *baang* stands for "grappling techniques". *Bangifal* is the *baang* of *fal*, where *fale* means "canoe storage place-men's house". The *rongolibaang* we are concerned with here is *bangifal*.

According to Mr. Maliumai, the reason the word *fale* is used in the term describing knowledge of building restoration is that because the *fale* is much larger than ordinary structures, special knowhow is required. As the term *bangifal* implies, *fale* were once the primary structures renovated by this techniques. Mr. Maliumai says, however, that at times structures other than *fale* e.g., *imw*, were involves. Nevertheless *imw*, the inclusive term for *imwettemwau* and *mwaluumw* or *sepal*, are now excluded from *bangifal*. The exclusion of *imwettemwau*, as I explained earlier, is because the powers of the *taubaang* were meaningless in the face of the impurities

11) Alkire reports an example from Woleai Atoll in which the spacing between the seven rafters is obtained only by the halving method [ALKIRE 1970: 21, 22]. It goes as follows: the builder first places marks at the nine spots for the rafters on the main plate (both sides). That means the halving method is repeated three times and an assumption made as to where each of the rafters will be placed at the eight equidistant locations. Then three eighths of this length is measured and half that determined to obtain three sixteenths. That distance is halved again to determine the midpoint. Put that midpoint on the quarter point of the girder and mark the three sixteenths length. Thus when the original seven rafters are positioned, the spacing ought to correspond to one sixth, which is close to the value of three sixteenths.

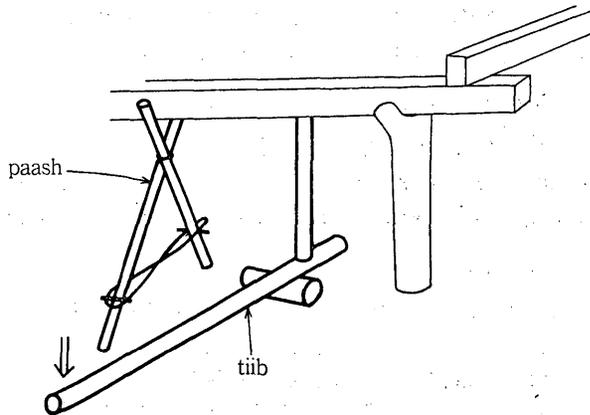


Figure 13. Replacement of Posts

which accompanied menstruation or partition. If however, one speaks purely from the point of building structure, since these buildings are small and of simple construction, all of them thought of as well within the restorative abilities of a *taubaang*.

REPLACEMENT OF POSTS (Figure 13)

- (1) Place a lever (*tiib*) below the beam at a point near where the posts cross.
- (2) Position an x-type prop (*paash*) near the midpoint of the beam.
- (3) Secure several props (*yaramat*) to the opposite side of the beam where the exchange is to be made. This is to prevent the structure from falling when one side has been lifted up.
- (4) Push the lever and raise the main beam.
- (5) Secure the x-type props.
- (6) To support the raised main beam, set up props near the x-type props.
- (7) Put in the new post and fill in the hole.
- (8) Push on the lever and remove the props from beneath the main beam.
- (9) Loosen the x-type props and lower the beam onto the new post.

REPLACEMENT OF MAIN BEAMS (Figure 14)

- (1) Secure supporting purlin (*meleufeoiu I*) at the eave ends parallel to the main beam to be replaced. This may be attached at all joints to the eave frame, but usually the supporting purlines are two or three parts and patched together and secured.
- (2) Place levers (*tiib*) in position at either end of the supporting purlins.
- (3) Place x-type props (*paash*) at both ends of the supporting purlins. The number of props will be determined by the roof size.
- (4) Several props are secured on the side opposite from the beam to be replaced.
- (5) Levers are pushed and one side of the roof raised up.
- (6) X-type props are secured.

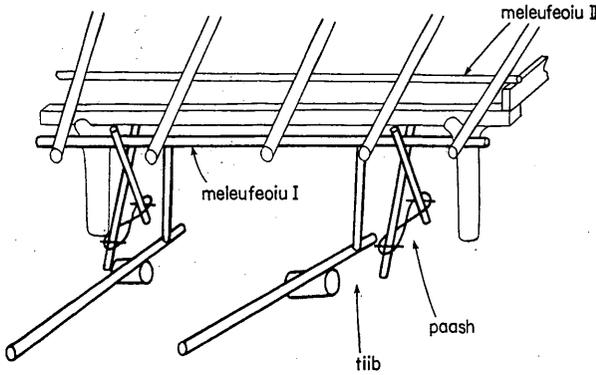


Figure 14. Replacement of Main Beams

- (7) Make props (*yaramat*) into supports for underside of supporting purlin I. The number of props will be determined by the roof size.
- (8) Bring two supporting poles (*bwau*) under the roof, placing each near the foot of the posts on the beam side of the member to be replaced and laying them perpendicular to the floor in the longitudinal direction. These supporting poles are slightly longer than the portion of the posts which is above ground.
- (9) Bring the new beams under the roof (8) and place them on the earlier prepared supporting poles. When the supporting poles are raised up, this position will coincide with the height of the beams.
- (10) Ready supporting purlin (*meleufeoiu II*) and attach it to the rafter at a place above the cross beams.
- (11) Tie the cross beams and supporting purlin II together to prevent the beams from coming loose. If they do come loose, they will shatter under the weight of the cross beams.
- (12) Tie the supporting tie beam to the rafters and kingpost on the upper part of the cross beam. This is to prevent slippage of the kingpost.
- (13) Pass two pulling lines (*tal*) through the space in the roof members just above supporting purlin II and secure to both ends of the beams after passing over support purlin II.
- (14) Cut the ropes connecting the rafters, cross beams and girders.
- (15) Lower supported girder with the pull ropes.
- (16) Take out the girder.
- (17) Tie the same pull ropes to the new girder that was placed the support poles.
- (18) Pull the ropes and raise the girder. At this point the support poles hold up the girder. Place the new girder in its intended position.
- (19) Push the lever remove the props and loosen the x-type props.
- (20) Tie the new girder to the cross beam and rafters.

REPLACEMENT OF CROSSBEAMS (Figure 15)

- (1) Put support poles at the nose of the pole on one side or the other of the cross beam to be replaced and lay them sideways on the floor beneath the roof.

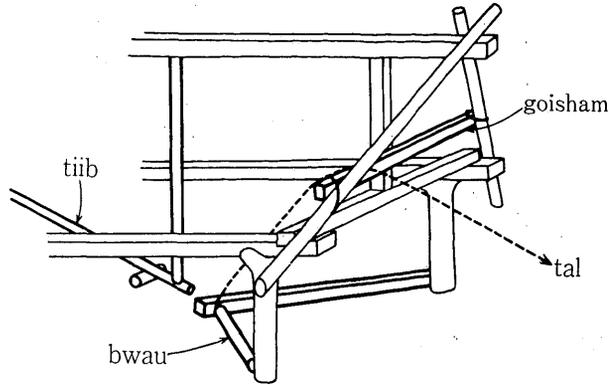


Figure 15. Replacement of Crossbeam

The length of the support poles (*bwau*) must be somewhat greater than the length of the above poles.

(2) Tie a supporting tie beam (*goisham*) to the kingpost and rafters above the beam to be replaced.

(3) Drape the pull ropes (*tal*) over the supporting tie beam.

(4) Bring the new cross girder under the roof, place one end on the supporting poles and the other end at the foot of the pole on the opposite side.

(5) Secure pull ropes draped over the supporting tie beam to the new cross member and support poles.

(6) Draw in the pull ropes and move the new crossbeam onto the posts.

(7) Remove the pull ropes retie to the end of the new crossbeam touching the ground.

(8) Draw in the pull ropes and place the other end of the new cross beam on the girder. Now both the old and new members are placed side by side or on the girders.

(9) Place lever close to the kingpost on the side of the new cross member so that it touches the ridgepole at an appropriate place.

(10) Sever ropes binding cross beam to be set in girders.

(11) Push lever and push ridgepole up.

(12) Thrust replacement cross beam, release kingpost and lower old crossbeam into intended position.

(13) Put new crossbeam into intended position.

(14) Release lever and place kingpost on crossbeam.

(15) Tie new crossbeam and girder with rope.

REPLACEMENT OF RAFTERS I (Figure 16)

(1) Sever all ropes binding the rafter to be replaced. (Here we deal with the situation where rafters on both sides, *weoilimaat*, are to be replaced.)

(2) Cut the rafter where appropriate at several places.

(3) Pull out the cut rafter segments.

(4) Tie pull ropes (*tal*) to the rafters and drape over the ridgepole.

(5) Draw in the pull ropes and raise the new rafter.

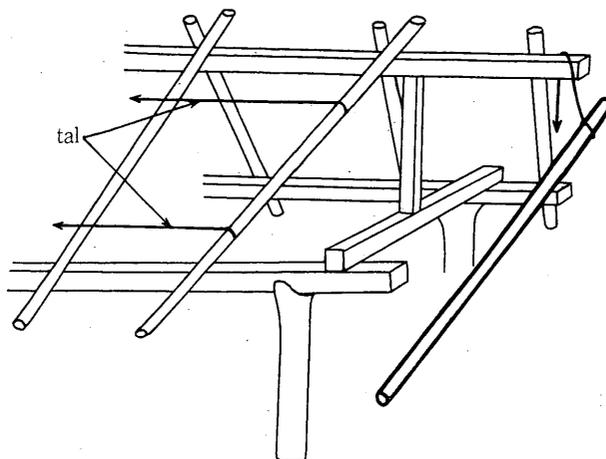


Figure 16. Replacement of Rafters I

- (6) Push the new rafter into its predetermined position from the gable end side.
- (7) Tie the new rafter with rope and stabilize it.

REPLACEMENT OF RAFTERS II

This section describes the replacement of rafters from the central part of the roof. The second rafter from the gable end wall is used here as an example. Any of the other rafters may be moved and replaced by repetition of steps 4 through 7.

- (1) Sever all ropes holding rafter to be replaced.
- (2) Cut the rafter in several places.
- (3) Remove the cut rafter segments in order.
- (4) Drape two pull ropes (*tal*) (top and bottom), over the rafters on the side farthest from the gable end away from gables which have been removed and tie them to rafter (*weoilimaat*) on the gable end side.
- (5) Cut ropes stabilizing rafter on gable end side.
- (6) Draw the pull ropes (*tal*) and using the precut gauge (*gatiyeti*) to measure the spacing between rafters, position rafter with correct spacing.
- (7) Tie down and stabilize the rafter that has been removed.
- (8) Drape pull ropes over ridgepole and tie to the new rafter.
- (9) Draw on pull ropes raising new rafter up.
- (10) Raise new rafters from gable end.
- (11) Tie new rafters with rope and stabilize.

REPLACEMENT OF THE RIDGEPOLE (Figure 17, 18)

- (1) Set up scaffolding (*gannebong*), scaffolding is made of poles as long as the girders and as tall as the highest horizontal piece (*yaramat*). Poles are arranged at equal intervals and bound to the *yaramat*. This is done on both

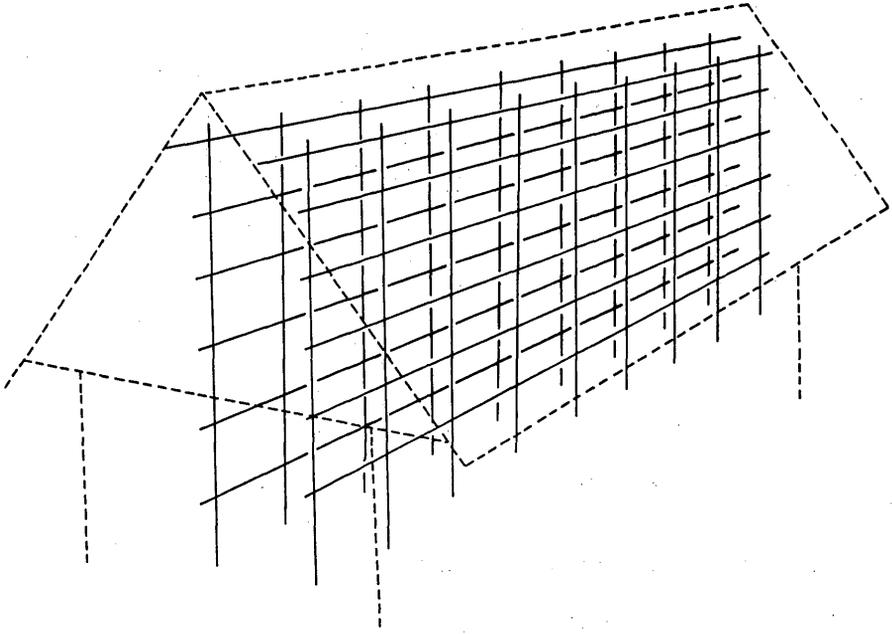


Figure 17

sides. The number of poles in the scaffolding will depend on the size of the building.

(2) Attach other poles at equal intervals horizontally. The interval will depend on the weight of the ridgepiece.

(3) Lay two supporting sticks at the highest point in the scaffolding to be used as a bridge on the scaffolding set up in (1) and (2).

(4) Tie two pull ropes at either end of the ridgepiece, pass them over the second ridgepiece, pass them under the roofing materials so that they come out on the outside of the roof.

(5) Arrange several rollers (*laango*) on the ground between scaffolds (*gannebong*).

(6) Sever all ropes tied to the ridgepiece.

(7) Draw in the pull ropes (*tal*) placed outside the roof and secure the ridgepole.

(8) Push out and remove the kingpost.

(9) Loosen pull ropes and while securing the scaffolding, *gannebong*, laid down with the supporting purlin, lower the ridgepiece. Break beams on one side in order.

(10) Place lowered ridgepiece on rollers and remove.

(11) Place supporting tie beams on main plate at a point equidistant from both tie beams and tie down.

(12) Put up several supporting posts (*yaramat*) as props for supporting tie beams.

(13) Dig a shallow hole directly below the midpoint of the supporting tie beam.

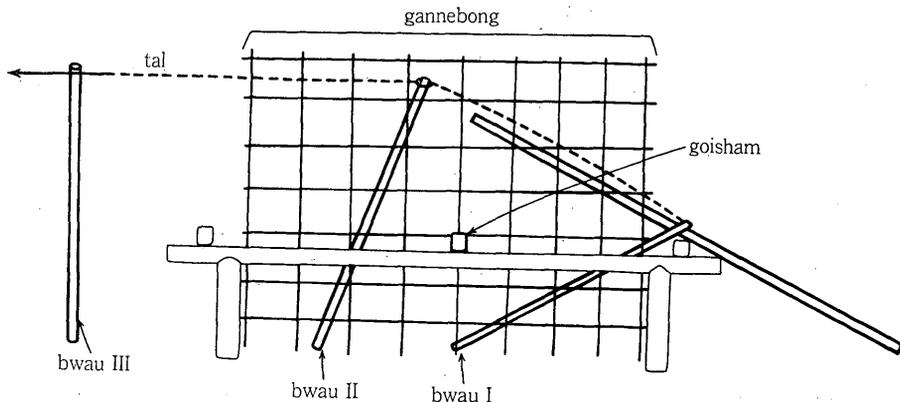


Figure 18. Replacement of the Ridgepole

- (14) Prepare two support poles of a height sufficient to reach the ridgepiece ready and tie two support poles (*bwau*) to reach the supporting tie beam.
- (15) Put one end of the support pole into the hole below the supporting tie beam and raise it up to whichever side of the crossbeam is more convenient. These support poles will be standing in such a way that they are between the two sets of scaffolds.
- (16) Place the new kingpost on the crossbeam in (15) above and push support poles so the midpoint of the new ridgepiece is positioned in such a way that the supporting tie beam may be tied to it.
- (17) Tie new ridgepiece to supporting crossbeam.
- (18) Secure pull ropes to both ends of the new ridgepiece.
- (19) Stand second support posts between the side of the crossbeam not supporting the first support poles and support tie beam and then stand third set of support poles outside the roof.
- (20) Tie pull ropes II to support poles II and support ropes III from the midpoint of ridgepiece. Pull ropes II must be of sufficient length.
- (21) Draw pull ropes and while maintaining a balance between the pull ropes and the setting rope, *sogosog*, rise the new ridgepiece.
- (22) Once the new ridgepiece has reached a point where the supporting poles are at the supporting crossbeam, tie pull Poles II to a nearby coconut palm or the like and stabilize it.
- (23) Secure pull ropes to support cross beam.
- (24) Draw in the pull ropes and fit in the kingpost as the ridgepiece is adjusted into position.
- (25) Secure the new ridgepiece and predetermined parts with rope.

RESTORING THE ROOF ON AN *IMWTIPAAP* (Figure 19)

- (1) Rearrange all roofing that has been disordered by wind, etc., into a position suitable for conducting work.
- (2) Dig holes at a suitable place in front of the midpoint of both latitudinal sills.

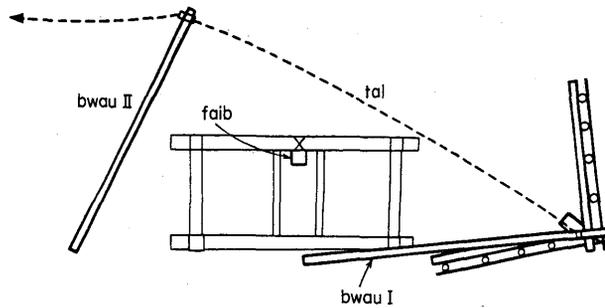


Figure 19. Restoring the Roof

- (3) Place one end of each of the two supporting poles I (*bwau*), having a height equivalent to that of the ridgepole and fix the other end so that it matches the end of the ridgepole near the roofing materials which have been damaged.
- (4) Prepare supporting poles II (*bwau*) in an opposite position between the building and the roof.
- (5) Tie supporting sticks (*faib*) at both sides of the midpoint of the latitudinal lintel. One end of the supporting stick should protrude out beyond the roof. The supporting poles I will prevent anything from going too far and falling down when the roof is pulled off.
- (6) Firmly secure ridgepole and supporting poles I with pull ropes passing around supporting poles II leaving sufficient rope end for pulling.
- (7) Draw in the pull ropes and tie support poles I to support sticks.
- (8) Undo pull ropes and place them at the predetermined position on the roof.

TRADITIONAL KNOWLEDGE AND ITS CHANGES IN FORM

Rong and Reepiy

Rong, traditional knowhow on Elato, is not knowledge possessed by just anyone. Such everyday, ordinary knowledge is called *reepiy*. *Reepiy* is the knowledge considered essential for everyday living, such as, how to paddle a canoe, how to scramble up a coconut palm, or how to cook. Yet among that body of knowledge is *yalius*, without which one cannot make do.

Yalius is regarded as having to do with the universal. For example *yalius* is what causes storms, rainfall, drought and so on. Humans become sick, even die, because of *yalius*. Being unable to catch fish or suffering a poor harvest of breadfruit is due to *yalius*. The supernatural being bringing about all these phenomena is seen as *yalius*. Knowledge having to do with *yalius* is called *rong*. In other words *rong* designates knowledge about how to determine whether a particular phenomenon has been brought about by *yalius* and how to cope with the situation. That *rong*, in other words, is associated with *yalius* and not something that every person is aware of. It is seen as high level and covert knowledge accessible only to select specialists.

These specialists are called *taurong*. They see *rong* as having been granted them by *yalius*.¹²⁾ Originally, the core of *rong* was a part of the body of sorcerer's lore used in the performance of *yalius*, and taboos were strictly maintained concerning the transmission of *rong*.

The *rongolibaang* concerning which the author received information from Mr. Maliumai had no such elements of sorcery¹³⁾, but did include elements of *bangitab*. *Tab* means taboo and *bangitab* means "taboos having to do with building renovation".

On days when building renovation is conducted, the *taubaang* and those assisting him are not allowed to eat or drink anything except water from the time they arise until their day's work is complete. Neither may any work, brewing or the like, normally undertaken in the early morning hours be conducted. Then, aside from people whose job is to pick up scraps after the days work, everyone who worked together dines together. The incantations of which Mr. Maliumai was aware, however, were those performed after work at meals and those requesting something of *yalius*, the guardian diety of *rong*, or having to do with the transmission of *rong* and had no direct relationship with the present study.

When the *taubaang* is ready to have work get underway, he intones the chant related to the transmission of the *rong* he seeks to perform. The chant begins with the name of the *yalius* which will transmit *rong* to humans and is followed by a recitation of the names of *taubaang* to whom *rong* had been disclosed over the generations. His own name comes at the very end. Then a request is made to the *yalius* which will transmit *rong* to watch over the following proceedings. Then, he waves an object made of *ragish* (*Calophyllum inphyllum*) leaves (green) and coconut palm tied together with new coconut palm leaves (white).¹⁴⁾

Once the work is finished, all who had a hand in it gather and dine. At this point the *taubaang* first takes a handful of food, casts it toward the sky, and says a blessing intended to give thanks to *yalius* for the safe completion of the day's work. This is looked on as an offering to *yalius* for spiritually supporting the work of the *rongolibaang*.

The Social Import of Rong

RONG AS AN ASSET

As mentioned previously, *rong* is knowledge of which very few people are aware, and *taurong* the title of the person who possesses this knowledge. Because of this *rong* is a valuable thing and much prestige is attached passing on of *rong* by the *taurong*.

Traditionally, youths on Elato competed with each other to gain access to

12) *Taurong* either received *rong* through another *taurong* or directly from *yalius*.

13) The period when Mr. Maliumai received *rongolibaang* was after the island had converted to Christianity and thus did not learn *rong* related to *yalius*.

14) This is called *bangibeng*. *Bangibeng* is also conducted in the case of several other ceremonies.

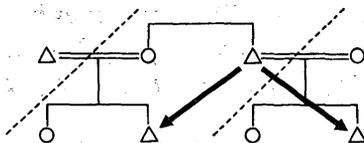


Figure 20. Transmission Patterns of *Rong*

rong. It is said that they went back and forth constantly to and from the *taurong*. *Rong* was not merely the prerogative of individuals, but constituted an important possession of the group with which an individual was affiliated.¹⁵⁾

THE TRANSMISSION OF *RONG*

There were two ways of transmitting *rong*. One was for it to be passed along particular blood lines. The other way was an "apprentice" system. Transmission via blood lines was in two forms: from father to son and from maternal uncle to nephew (Figure 20).

In a matrilineal society, a father and his son belong to different groups. In this situation, knowledge is often passed from the father's group to the son's group. Marrying a man who knew a great deal of *rong* meant for a matrilineal group came into possession of *rong* from elsewhere. Meanwhile, the *taurong* would be requested to pass their knowledge to the next generation within his own group, *i.e.*, to the sons of his female siblings. In this way, *rong* was passed from the maternal uncle to nephew.

The other method of *rong* transmission was the apprentice system. If in the group to which a young man belonged there was no *taurong* of marked distinction, or if a young person sought new *rong* outside his group, he would take either fish or palm wine to the *taurong* every evening. Furthermore if the *taurong* fell ill the young man would take care of him. The *taurong* picked the most outstanding among those who came to him or the one who gave him the best care and taught *rong* to him. The youngster, if he wanted to learn all the *rong* there was to know, had to be prepared to do very many favors.¹⁶⁾

Usually *rong* was transmitted only to males, but that is not to say females never learned anything about it. Women did have access to the knowledge in cases where there were no available males, *i.e.*, sons or nephews of male members of the group. In other words, females learned *rong* in order to pass it along to the next generation, to

15) According to Caughy, there are four types of assets that the people of Truk regard as desirable. They are *fenu* (land), *mwenge* (food), *pisek* (goods), and *rong* (special knowledge) [CAUGHY 1977: 43]. They do various things to renew or increase their stores of these assets. *Rong* is decidedly an abstract asset [GOODENOUGH 1954: 52g54] and land and food or goods or other types of *rong* are matters which admit conversion. This point is not exceptional on Elato either.

16) A traditional sash (*toer*) and *gologol* (bundles of coconut palm rope) were traditionally used to offer thanks for the transmission of *rong* [SUGITO 1982a: 78-79].

avoid suffering the loss of this knowledge which could be regarded as an asset of the matrilineal group. A woman *taurong*, however, never taught anyone other than her own son and never, it is said, passed her knowledge to an apprentice.

CHANGES IN THE CONTENT OF TRADITIONAL KNOWLEDGE

During the 1950's the islands of the Caroline Group were converted to Roman Catholicism. The people of Elato were converted in 1954. The motivation for conversion was not strictly religious, but rather political. The western island of the Carolines, of which Elato is a part, belong to Mogmog Island of the Ulithi Atoll. Becoming aware that the people on Mogmog Island had converted to Christianity, the Elato islanders decided to do the same. This primarily politically motivated act resulted in sweeping religious changes.

Rong is knowledge of *yalius*, the traditional deity, and the incantations used to communicate with *yalius* were the basis of *rong*. With the acceptance of Christianity, *rong* underwent a transformation. The adoption of a monotheistic faith like Christianity meant that *yalius* became poorly distributed, and indeed, was lost. Both the need to communicate with *yalius* and the usefulness of *rong*, or knowledge associated with *yalius* were reduced dramatically.

Nevertheless, there is still considerable *rong* in existence. Much of this knowledge is related to the navigation of canoes, shipwright techniques having to do with canoes, means of righting capsized vessels, construction and restoration of buildings, care of the sick, etc. In all these cases, *rong* forms part of certain special techniques [ISHIMORI 1980: 45], which retain practical value in the present day society. However, belief in *yalius* at the expense of belief in Christianity is not permissible. Therefore, everything to do with *yalius* has been excised and only the matters related to technology are transmitted. Present day *rong* is, in the strictest sense, *rong* minus *yalius*, or traditional knowledge without the traditional deity and religious context [ISHIMORI 1980: 45].

In traditional structures no nails are used, the parts being tied together only with coconut palm ropes. Tying parts of structure together with these kinds of ropes is considered ordinary knowledge of *reepiy*, as is the weaving of the mats, made from coconut palm leaves, used for the roof. The same applies to putting up a shed. None of this is *rong*. Formerly, *rong* was backed by the authority of *yalius*, in fact it was a type of special knowledge transmitted to humans by *yalius*. With conversion to Christianity, traditional knowledge concerning building and renovation has taken on a different cast. Prior to the influx of Christianity in the 1950's, the uttering of incantations was central to *rong*. *Rong* was closely associated with magical behavior and was surrounded by an air of secrecy.

Nowadays, however, *rong* consist more or less of one's ability to observe the work process and to emulate that act. Thus *rong* is not limited to those who can obtain the knowledge of incantation. The better part of *rong* at present has been shown of the secrecy of neither sorcery nor ritual. To the extent that one "imitate"

the work that is going on, that is the extent of *rong*. This is the one of the aspects of secularization of traditional knowledge in Elato.

CONCLUSION—TOWARD A STUDY OF ETHNOARCHITECTURE

In this paper an ethnographical description of traditional knowledge concerning the construction and renovation of buildings on Elato has been presented. Along the way, however, certain issues have arisen that I would like to deal with briefly in conclusion.

(1) *Rong*, particularly the portions of this knowledge having to do with the supernatural being, *yalius*, were at one time very much at the center of life on Elato. After acceptance of Christianity, however, *rong* which survived in *rongolibaang*, for example, lost its association with *yalius*. However, the fact that this knowledge has not acutally disappeared suggests that a comparison of these portions of practical knowledge remaining on all the islands should be conducted. There are undoubtedly many factors which could be made much clearer through the joint research of architectural scholars.

(2) The spells which form the basis of *rong* contain the lineage by which the *rong* was transmitted. I believe, therefore, that may be possible to understand the relationships among these islands by carefully examining the genealogy of *rong*.

(3) According to Mr. Maliumai, the following three major points are the essence of *rongolibaang*:

- (a) To minimize or prevent the damage of building materials other than those to be replaced.
- (b) To use the fewest number of people possible in the work.
- (c) To conduct the work in the shortest time possible, *i.e.*, work must be commenced early in the morning and completed by the afternoon.

The amount of work to be done is planned with these three factors in mind. There are two approaches to accomplishing the set amount of work with manpower only without resorting to machinery: completing the job in a short time by using a great number of people, or using whatever time in required with as few as possible. But, as Mr. Maliumai states, the tenets, of *rongolibaang* require that the work be carried out not only in a short time, but also with a minimum number of people. Traditionally, the fact that this was possible was thought of as a result of being under the aegis of *yalius*. Now, however, it is possible to complete the same work even though there is no *yalius*. In this case each of the various methods of *rongolibaang* take into consideration the ideal of limited use of manpower and time.

In other words, *rongolibaang* is based on a type of rationalism the people of Elato have developed. It is possible to say that an ethnoarchitecture has been achieved here. This rational basis to the ethnoarchitective of Elato is one of the most important areas for future study. Moreover, a complete analysis of these rational foundations will take us beyond the subject of *rongolibaang* as ethnoarchi-

ecture, and may well provided new clues to the understanding of “cultural values” in the society of Elato.

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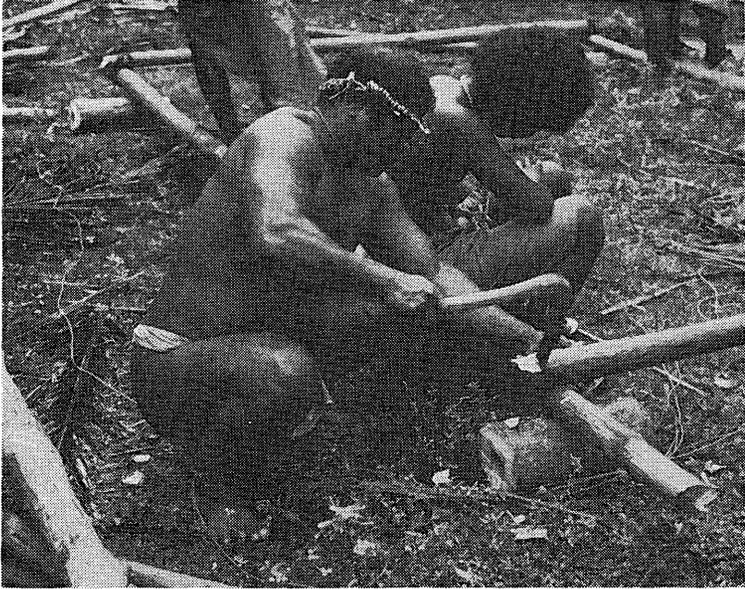


Figure 11-1. Put the crossbeam on the girders.

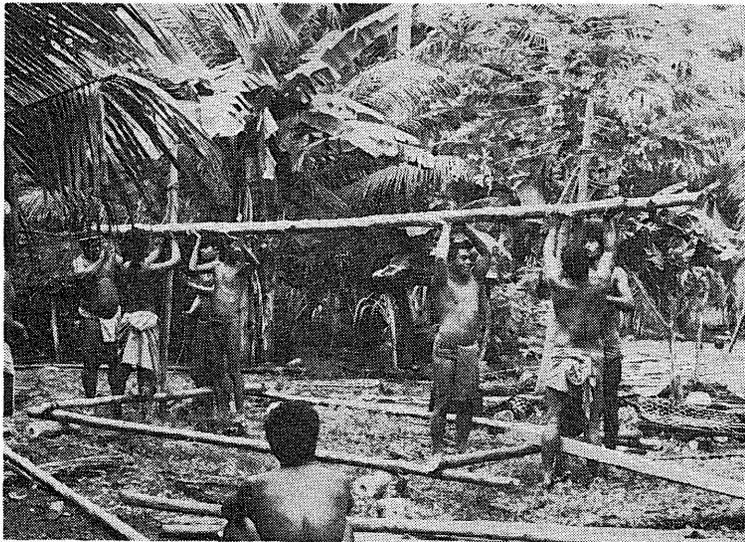


Figure 11-2. Using *bwau*, mark the position of the ridgepole.

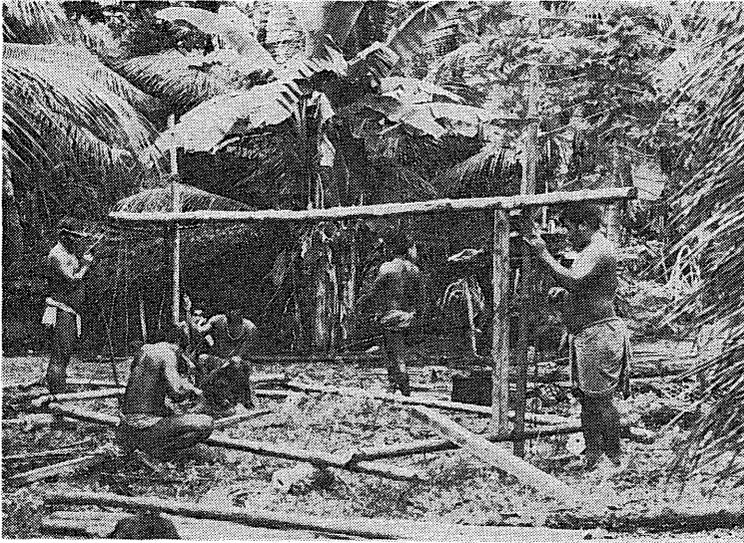


Figure 11-3. Stand the kingpost up.

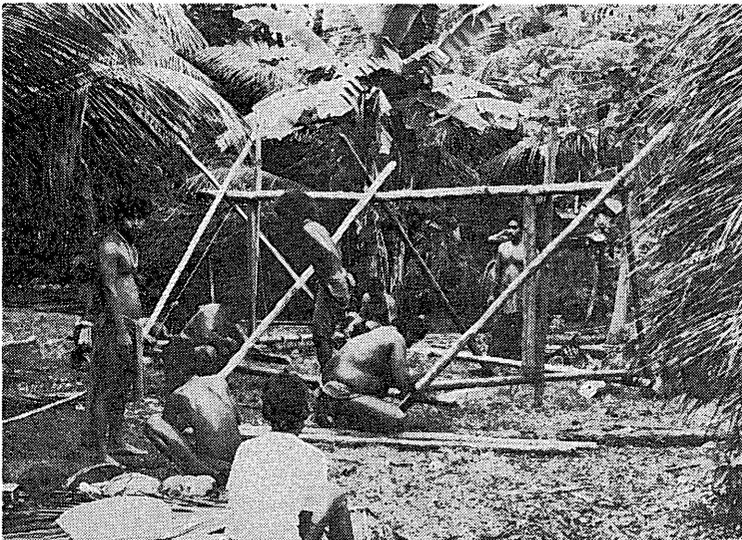


Figure 11-4. Tie ropes (*limmatelagrag*) to the four corners from the midpoint of the ridgepole and pull it into position. Bind both ends of the four rafters across the ridgepole and crossbeams. Secure the central rafter.

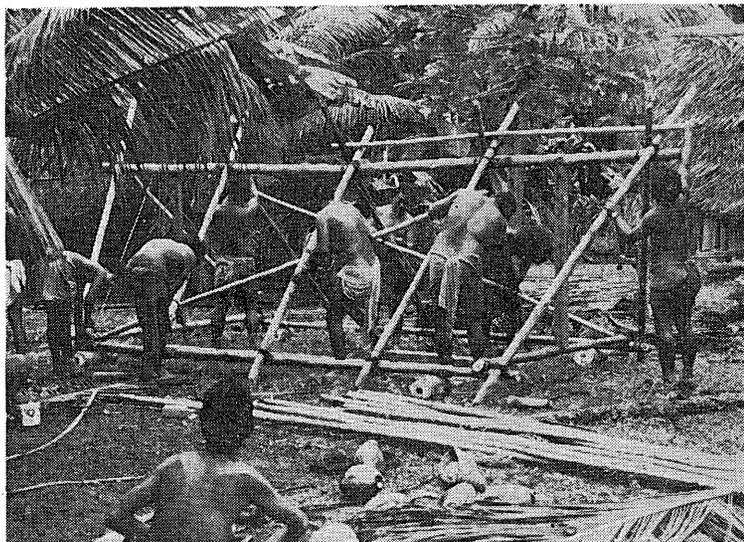


Figure 11-5. Place remaining rafters at equal intervals and secure them. Secure the diagonal struts to the rafters from the inside. Place the middle ridgepole.

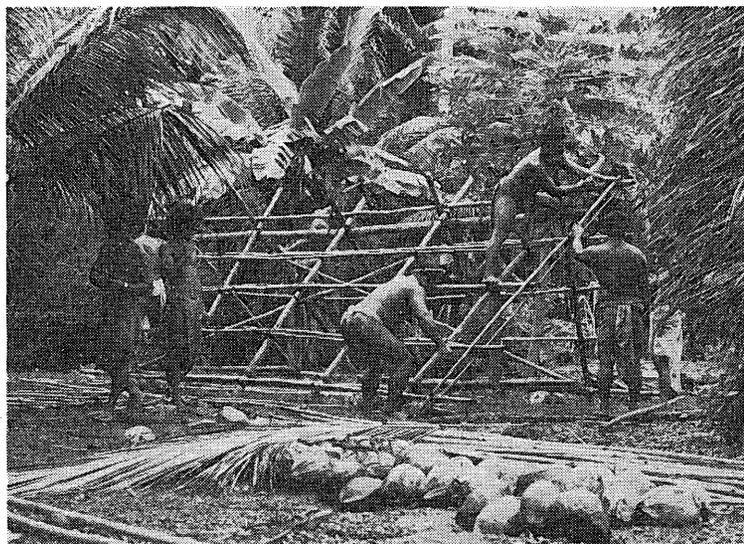


Figure 11-6. Tie the purlins to the rafters. Tie the purlin batten to both ends of the purlins at the eave ends.

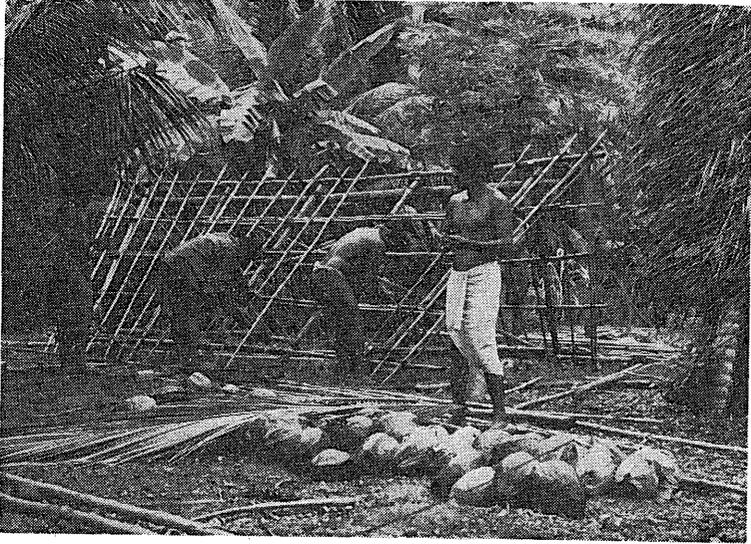


Figure 11-7. Tie the thatch rafter at equal intervals along the purlins.

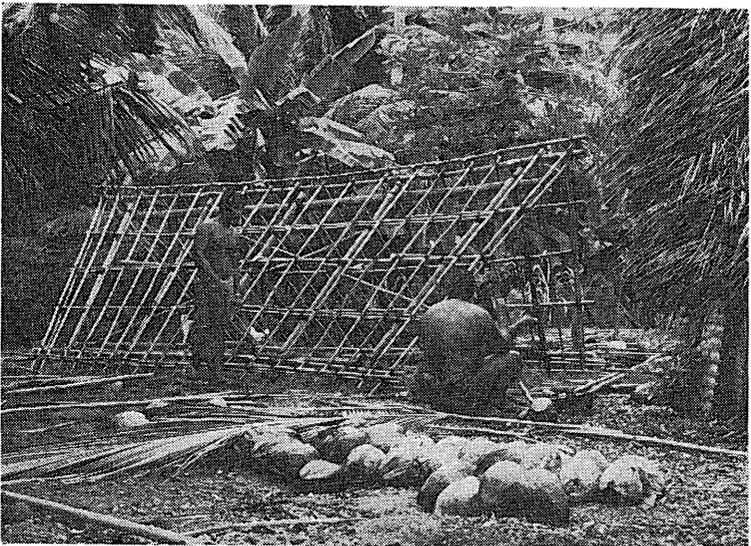


Figure 11-8. Place the upper ridgepole on the thatch rafters.

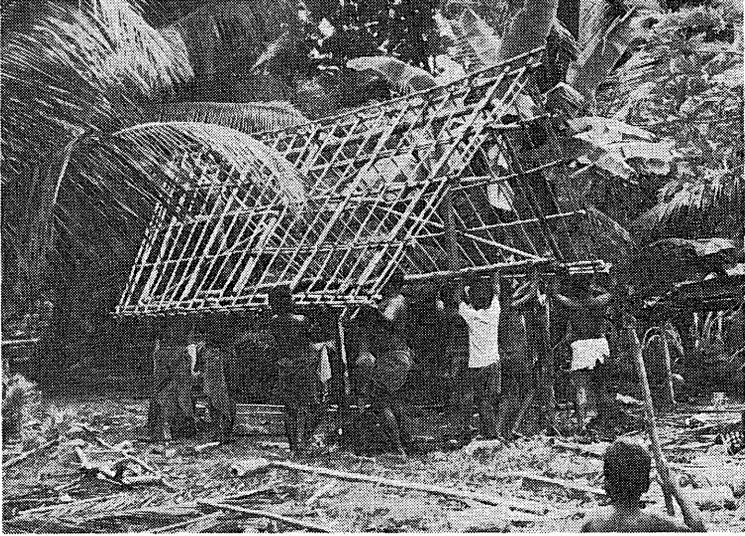


Figure 11-9. Put the roof frame on the posts.