CHAPTER IX

WOOD-BASED TECHNOLOGY: HOUSES, FIREWOOD, AND LUMBER

Maya Houses

The general form and structure of Maya houses has apparently been as stable through time and as widespread in area as a dispersed pattern of rural settlement and occasional use of market and ceremonial center.[1] Details of house plan, materials and assembly do vary, but it is precisely this range of variation which seems not to have broadened much after 450 years of contact with Europeans. Even the terminology for some structural members has endured through the differentiation[2] of Mayance languages.

Domestic architecture is one of the principal intersections of culture and nature, but it is equally true that house form and materials are not strictly controlled by habitat resources.[3] How the Q?eqči? build their homes is therefore worth documenting, but why they do it as they do is not open to proof. However, the consequences of traditional modes of house construction for health and social interaction can be pointed out and are relevant in an ecological context.

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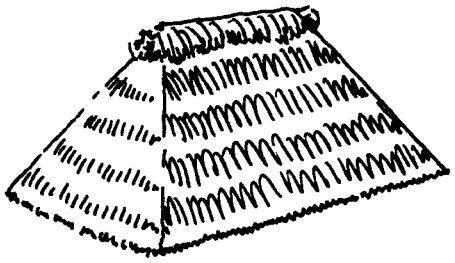
[1] Wauchope, 1940; MacBride & MacBride, 1942; McBryde, 1947: 131-147.

[2] Wauchope, 1940: 239; Wisdom, 1940:121-130; Redfield and Villa R., 1934:54-55; Thompson, 1954, fig. 18 (opp. p. 228).

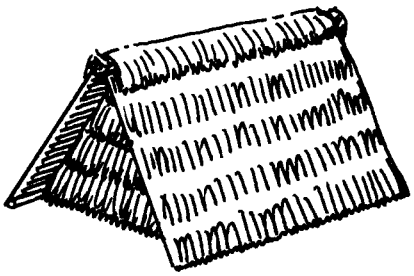
[3] Rappaport, 1969: 13,20-25.

FIGURE 8

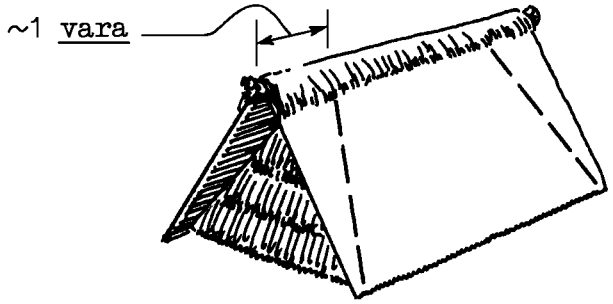
HOUSE CONSTRUCTION DETAILS



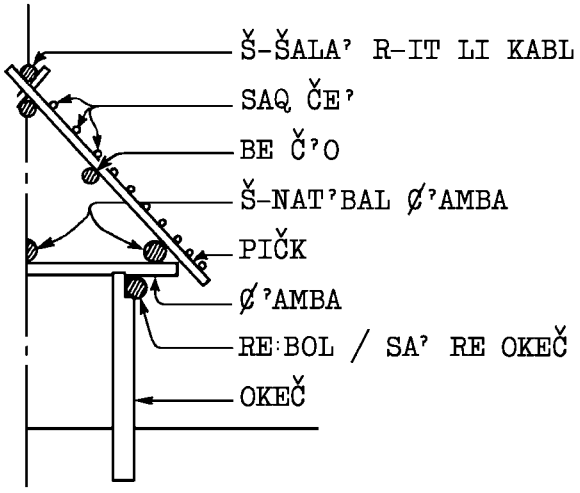
ŠOX KABL ("coyote house")

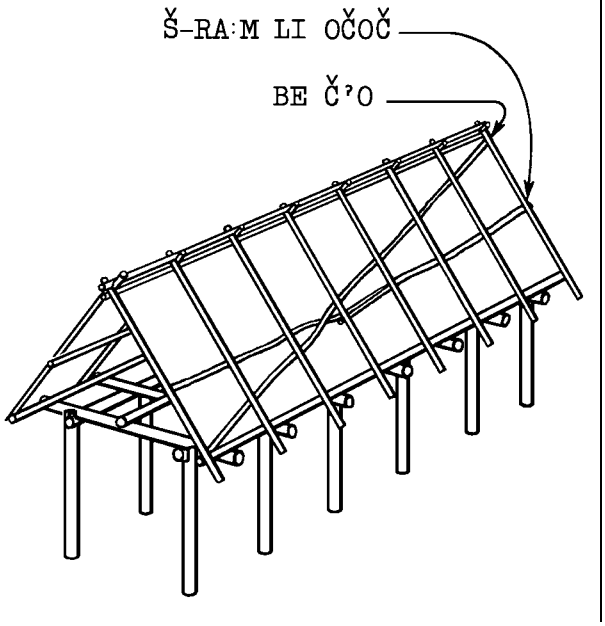


WAKAŠ KABL ("cow house")



IBOY KABL ("armadillo house")





Construction Methods

The methods and costs of house construction can be documented by interview or participation. Both methods were used, since one allows exploration of the topic's breadth while the other offers insights into details of practices and problems which would not necessarily crop up in conversation. Refer to Figure 8 for clarification of the terms used in the description of construction which follows.

Choice of Site

The usual layout of property lines runs from ridge crest to valley floor, at least in a narrow valley like that of Koxila, and some houses can be found in foot, flank, and crest locations on the slope. There are advantages and drawbacks to each class of site, and the trade-offs among these are indicated in Table 25. The relative weights assignable to factors is not a part of the table since these vary from family to family and because social factors (such as privacy or hostility) influence the siting decision at least as much as comfort and economy of effort. However, rocky sites are absolutely excluded from consideration since construction is founded on posts set in the ground directly; this need for at least 84 cm. (33 in.) of "foundation" might account for the otherwise erratic distribution of house platforms of rubble in present and archaeological lowland Maya sites.[4] Carefully laid rock piles can be seen around Chamelco, but these are deposits of stone commissioned for masonry; Q?eqči? houses always have earthen platforms. Compass alignment of house

[4] Noted in Wauchope, 1940:233.

axes was never mentioned by my informants; on level ground no pattern of orientation can be seen, even in airphotos, but on slopes the long axis is always parallel to, and the door facing, the valley. This randomness exists despite respect for the widespread Amerindian concern with the four sacred directions in other contexts.

Site Preparation

On any nearly level site almost no preliminary work is done, but on slope flanks a cut-and-fill bench has to be made and the fill allowed to dampen and settle. This job is easiest if done in March, when the subsoil clay is neither butter-soft nor brick-hard, and it is done with whatever tools are available – hoes for certain and shovels if possible.

Plan layout is done with pegs, string, and a stick cut to the measure of one vara. The length of houses is generally eight *varas*; ten for the wealthy, six for the poor or for outbuildings. The spacing of wall posts within these dimensions can vary between one and two *varas* depending on the size and durability of the posts which are used and the kind of wall used to fill the gaps (see p. 213, below). How wide a house is depends on the length of beam timbers (*c?amba*), usually no greater than five or six *varas* or four to five meters.

Once the platform is level, the dimensions are laid out, and the principal timbers laid by, post holes can be dug. The tool for this job is a wedge-tipped pole (*pat* *č**e?*) made up from surplus post wood,

generally *ca?ax.* When the subsoil clay is just wet enough to be plastic and adhere to the wedge surfaces a man can pry off chips of clay, weld them into lumps, and extract the lumps at a remarkably fast rate. Otherwise, hours of effort get him nearly nowhere.

Timber Preparation

Few Q?eqči? men have the money to keep a house-building crew at work steadily, so they accumulate posts and poles whenever they can during a year or more. The available working time is further restricted by the belief that for maximum durability wood should be cut in the two weeks following full moon.[5] The choice of woods for each application is shown in Table 26, in approximate order of decreasing quality – that is, durability. The choice of woods in an actual case will depend on which trees are of the appropriate lengths and diameters on one's own land, also on the trade-offs between labor or money cost and durability.

Trees are felled with an axe (*ma:l*), cut to rough size as measured with a *vara*-length stick, skidded to the house site as convenient, and barked with a machete before the sap dries, preferably.

The only pieces which require pre-shaping are the *oke*č, which are notched to take the *re:bol*, and the *re:bol* themselves which are roughly squared to uniform dimensions along their length. Both jobs are done with the axe, freehand. Polished stone axe heads are commonly unearthed in excavation and cultivation, but they are

[5] *Warapo*: moon sleep; cf. Carter, 1969: 38,44,101; Wisdom, 1940: 400.

TABLE 25

CONSIDERATIONS IN HOUSE SITE CHOICE

slope site

	fresh water	waste drainage	fuel wood	trail access	conserve milpa
crest	--	.+	.+	.+	.+
flank	-- (if no spring)	.+	.+	--	.+
foot	.+	--	--	.+	--

+ favorable -- unfavorable

TABLE 26

WOODY SPECIES AND THEIR CONSTRUCTION USES
(in approximate order of decreasing durability)

OKEČ	C?AMBA	RE:BOL	Š-N.C	PIČK	BE Č?O & SAQČE?
Č?UT	Q?ANAIŠ	OQOB	OQOB	Q?ANAIŠ	IŠIM ČE?
Q?AN XI	OQOB	Q?ANAIŠ	ŠUBUTI?	KAQUT	ISTE?
AQA?AL	CA?AX	KAQU:T	KAQU:T	AQA?AL	MES ČE?
CA?AX	R-O MAŠ			ISTE?	Q?OL ČE?
Q?AKUK ČE'	Q?AN XI			Q?AN XI	Q?ANPARAWAY
AM CE?	Q?AKUK ČE?			Q?AKUK ČE?	Q?ANAIŠ
NOGAL	ŠUBUTI?			CA?AX	CA?AX
Q?AN CA?AX	KAQU:T			ŠUBUTI?	ŠUBUTI?
R-O MAŠ	SEPRES			Q?ANPARAWAY	Q?AN CA?AX
SEPRES	Q?OL ČE?			Q?OL ČE?	XOU
RAŠ XI	IŠIM ČE?			MES ČE?	
K?AP K?U	ISTE?			R-O MAŠ	
IŠIM ČE?				OQOB	
ŠO?OT				SIB ČE?	
O:NK ČE?					

WAČ?I:L (lowland) ČAHIB (lowland)
K?ANTE? (lowland)

considered to be natural features: *š-ma:l ka:q*, “lightning’s axe”. However, small trees can presently be felled in roughly two minutes plus another five to limb and trim to length, and pre-Conquest use of stone tools would not have increased significantly the effort put out in this phase of house construction.[6]

Ritual

Before the start of construction it is customary to bring in an expert to do an approximation of the following rites. No rationale for this custom was offered, and since the durability of a house is a practical matter one assumes that the ritual is intended to deflect tragedy while the house lasts.[7]

An altar is arranged among trees and rocks near the house site and furnished with pine boughs, *k?ib* fronds, and a shelter of banana leaves folded over a crosspole. The cross, crosses or other sacrae of the house-to-be (often those of a former house on the same site) are placed within this enclosure and the paraphernalia in Table 27 set before them. A large candle is lit before the cross(es) and small candles are lit beside every post-hole; if the wind is too high the latter may be lit another day. Incense (*kopal pom*) is placed on embers in the censer and its smoke directed first over the cross, then over each post-hole, in a clockwise round, and finally over the stack of timbers. Next a hole is dug in the center of the

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[6] Cf. Iverson, 1956.

[7] This is the explanation offered in Redfield and Villa R., 1934: 146-147.

floor plan and the sacrificial rooster's head buried there; his feet and wing-tips go into the corner post-holes, and entrails in the remaining holes.

TABLE 27

INGREDIENTS FOR CONSTRUCTION RITUAL

article	quantity and price	total
rooster	1 at Q 2.00	Q2.00
censer	1 at .05	.05
candle	1 at .05	.05
	12 at .0024	.05
cigarettes	1 pack	.08
kopal pom	1 oz. at .02	.02
box	1 kuk	.60
dilute blood	1 bottle	nil
raš kakau	1 bottle	nil
		Q2.85

TABLE 28

THATCH SPECIES, THEIR COST AND DURABILITY

name	durability (yrs)	cost per 100-lb carga
TAM	12 to 15	approx. Q0.50
AQ	15 to 20	approx. 0.30
ŠAX UC?A:L	5 to 10	approx. 0.25
ŠAX K?AL	2 to 3	approx. 0.15

Three rounds of aspersions follow: with diluted blood of the rooster; with *raš kakau* (see Chapter VI, p. 92); and with *box*. Each liquid is poured from bottle to hand and sprinkled first over the central hole, then over each posthole, then over the stacked timbers.

Construction begins after this set of procedures, which take up only half an hour, but the ritual continues in the form of several rounds of *box*[8] and a formal mid-day meal at which the wives (or their substitutes) of all the workers are supposed to be present.

Construction

All Q?eqči? houses made of wood have a single type of framework, with variation only in the roof shape and wall surface. A few Indians have masonry-walled houses with carpentered wood in roof and doors, but those are Ladino-style houses. Figure 8, above, includes the basic frame, variations, and the terms for each.

Construction really begins with the collection of a fresh supply of vines for lashing the structural timbers together. Dry vines get brittle; fresh ones are so easily available that no effort is made to economize by storage in water, though some care is used to collect a minimum beyond what probably will be used in a day's work. Suitable vines include *saqi qul*, *q?eqi qul*, *ko:kom*, *k?akak*, *k?a:m čokl*, *ta:b mama?*, *kaqi qul*, *k?ot ak?ač?* in order of decreasing

[8] The house "owner" must be served first on each round even though – as in my case – he may be nearly delirious with fever.

quality. Corner posts are placed and a string run around their tops so that they can be adjusted vertically to put the *re:bol* notches in one plane, with vertical plumb checked by a rock on a string.[9]

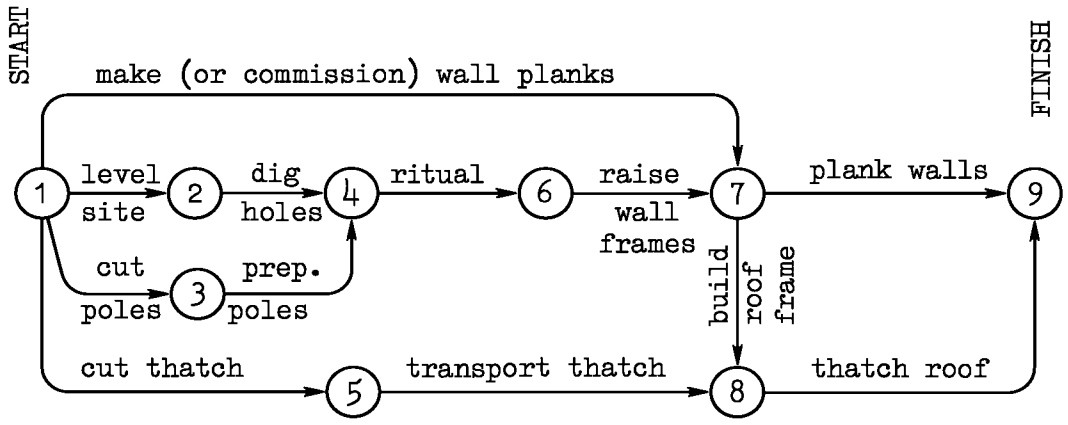
With this alignment phase completed to everyone's satisfaction the remaining *okeč* can be dropped in their holes and all of the postholes tamped full of clay; then the string comes down and the two *rebol* go up and are lashed into place. Ritual and completion to this stage add up to about a day's work for four men. The rest of construction can then go forward with as few as two workers; a larger team speeds construction only by allowing separate jobs to be done simultaneously, as shown in the critical path diagram, Figure 9.

Roof construction begins with placement of the *c?amba* (beams) at a more strict one-vara spacing than was used for the *okeč*. Once in place and rotated to its most stable position, each beam can be notched to receive the two outer *š-nat?bal c?amba* (beam's press or binder), which must be held against the splaying force of over 1,000 kilos of thatch on the *pičk* (rafters). The latter are tied together in pairs, notched near their lower ends to fit over the *š-nat?bal c?amba*, and erected and aligned with the aid of a scaffolding of poles and planks (*če? maš*, monkey's tree) built within the attic space. The two end pairs of *pičk* go up first, then the rest, and the whole rafter assembly is finally held in position by a tie-pole halfway up each side (*š-ra:m li očoč*, the house's short-cut?) and

[9] I introduced a bubble level made from a nearly-full wine bottle on its side.

FIGURE 9

CRITICAL PATH DIAGRAM FOR HOUSE CONSTRUCTION



operation	man-days
1→2	4.5
1→3	11.0
1→5	15.0
1→7	60.0
2→4	3.0
3→4	6.0
4→6	0.3
6→7	3.0
5→8	7.0
7→8	12.5
7→9	19.0
8→9	18.5
	159.8 total

secured against longitudinal collapse by diagonal braces or *be* č*?o* (rat's trail). The final phase before thatching is to tie small poles across the *pi*č*k* at a spacing such that the length of thatching leaves will always rest firmly across three of these *saq* č*e?*. This spacing is maintained by frequent use of a template stick cut for the job.

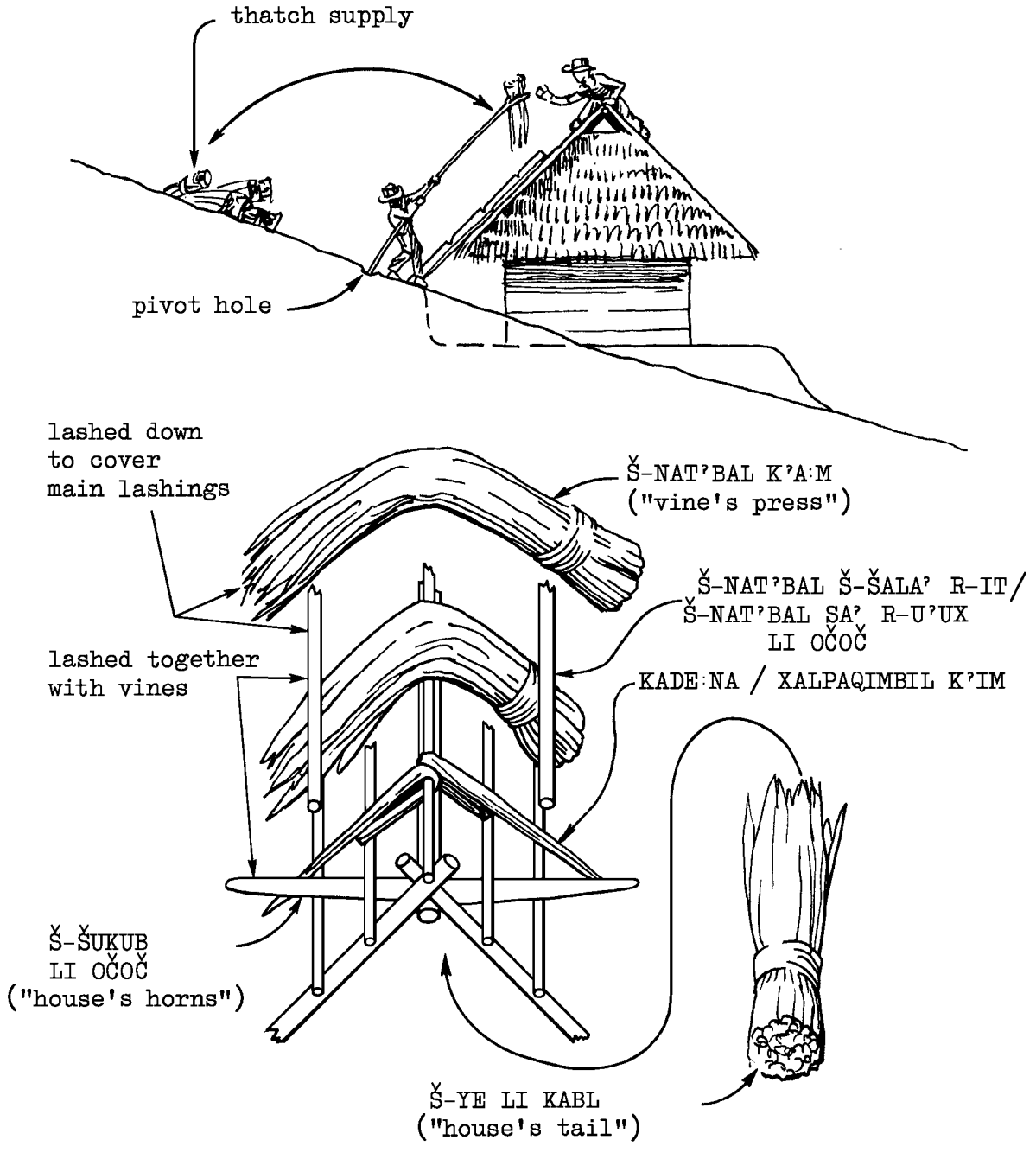
Of the three roof forms, *šoxb kabl* (coyote house) or a hipped roof, is the most frequently seen even though the hip joint of the roof is forever developing leaks. This type can offer only a minimal saving in labor and materials over the next most common type, *wakaš kabl* (cow house), but perhaps earns its prominence by resistance to wind forces whatever their direction. Custom and aesthetic preferences no doubt play a part, too, but one which is hard to elicit from the stolid Q?eqči?. *Iboy kabl* (armadillo house), the last type, is commonly seen only from Tactíc to the east and south – Pokom country – but was tried out on our Koxila house for two reasons. First, because it seemed to offer the best of both the other types in structural strength and drip-tightness; second, to see what the neighborhood reaction to this locally rare roof style might be. Most comments were mildly favorable, but the outcome of this experiment in cultural diffusion will take some years to be known.

Thatching

The several sorts of thatch used near Chamelco are listed in order of decreasing durability in Table 28. In terms of frequency of

FIGURE 10

DETAILS OF RIDGEPOLE THATCHING



use, *šax uc?axl* is most used; maize leaves are used only by men who are too poor or ill to do a lasting job, or for temporary repairs; only the wealthiest Indians have taken up the apparently recent introduction of *tam* sedge; and *aq*, the oldest but most labor-expensive type, is practically unused now except for our house in Koxila. Other localities have other choices of thatching materials: *tun k?im*, another sedge, is used despite its low-durability in the upland *aldea* Čamisun; *boloc,* a spike rush, was noticed by my informant when he was in Purulha?, some 23 km. southeast of Chamelco.[10]

The technique for use of large leaves like those of maize and sugarcane is essentially as shown for the ridgepole chain *(xalpaqimbil k?im*) in Figure 10, just a folding of ligules over the thatching rods (*saq če?*, white wood). All of the sedges and *aq* leaves must be tied into bundles and lashed in place as shown in Figure 11, a tedious job but one which pays dividends in durability. However, if a man has not put in the most durable sorts of *oke*č there is no advantage in making a roof which will outlast the walls. The accounting summary in Table 29 shows that thatching with *aq* together with collecting the thatch took up as many man-days as did constructing the frame and planking the walls. These days, only curious gringos can afford that profligate use of labor or cash.

Thatching of the roof peak is done with *šax uc?axl* (sugarcane leaves) in every case (refer to Figure 10). Bundles of about 4 kg.

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[10] Thatches used in the Western Highlands are listed in McBryde, 1947:140-147.

FIGURE 11

DETAIL OF GRASS THATCHING

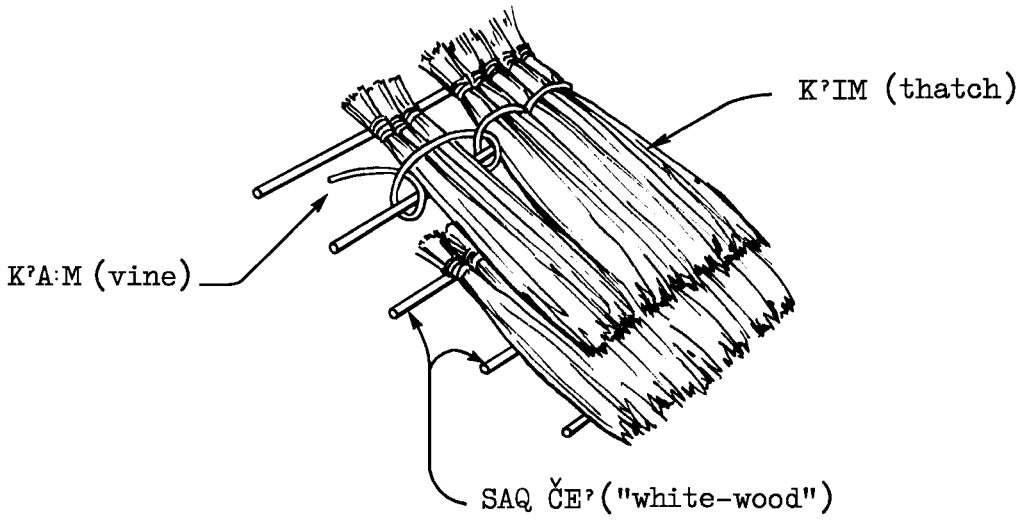
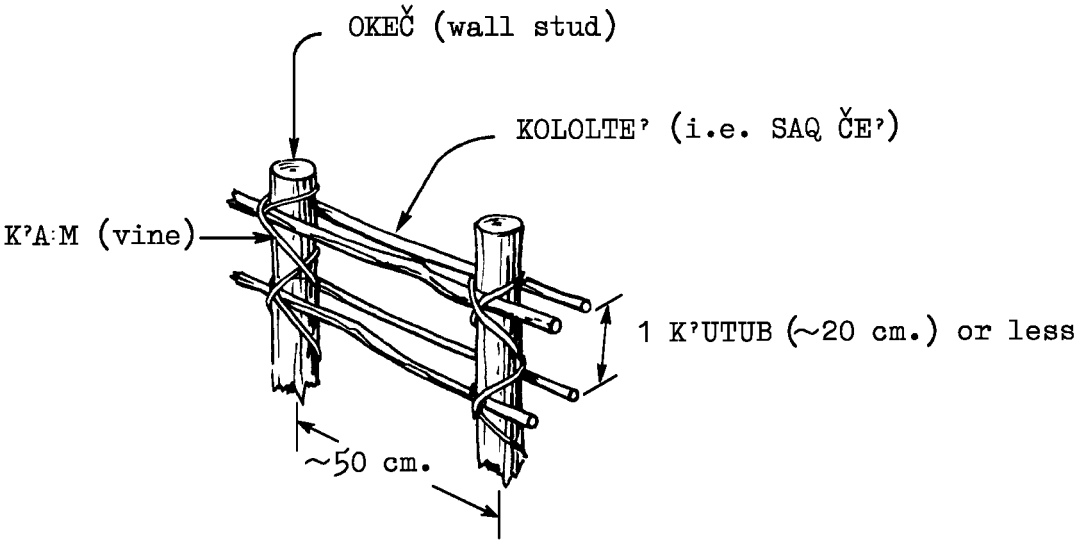


FIGURE 12

DETAIL OF WATTLE-AND-DAUB WALL



ach are laid over the length of the ridgepole “chain” thatch and and held in place by long poles lashed down to three or four cross-pieces poking through the roof (*š-šukub očoč*, the home’s horns). At either end of the ridgepole an extra bundle (*š-ye li kabl*, the house’s tail) is placed, ligule ends out. Any gaps left by the lashing of the main thatch to the *šukub* are sealed by draping a last, loose bundle over them (*š-nat?bal ka:m*, vine’s binder).

Walls

The commonest sort of wall seen around Chamelco is made of un-finished pine planks nailed to the *okeč*, with few or no openings besides a doorway and the cracks between planks. On our house we took pains to true the edges of the planks to cut off drafts, but no Q?eqči? wife would permit her peepholes to be blocked off in this way. Planks for the walls are by far the most costly component of a house that has them, whether in cash or labor, but none of the al-ternatives are much more satisfactory or economical – or better suited to the climate. For details of plank-making, see pp. 224-228. The cheapest types of wall are made by tying together maize stalks (in which case it is called *pač k?im)* or split staves (called in that case *ku:k*); these are also the least proof against rain, drafts and thieves. Near newly-cleared forest, whole or split tree trunks or tree fern (*č?ut*) trunks are used in palisade fashion, much as lowland Q?eqči? houses use bamboo and other giant grass stems. The remaining technique, rarely used today, is wattle-and-daub (*k?ut ru*

kabl) (see Figure 12). This sort of wall has several drawbacks: *okeč* must be closely spaced and become difficult to replace when rotten, and it is slow work – about a week's task for three or four men. Nevertheless, *k?ut ru* and straight adobe construction are common in Tactíc, only 10 km. south of Chamelco.

Houses and Ecosystems

Traditional methods of housebuilding are universal knowledge among the Q?eqči? and materials are available at little cost to anyone who owns a hectare or so of land. A wide range of tree, vine, grass and sedge species will serve for each element in a house so that no one plant necessarily bears the brunt of all housebuilders' needs. A few part-time specialists build houses for widows and the wealthy for a cash price but at no great profit, given the materials and labor involved. The landless, of course, build at their patron's whim; as virtual serfs they have no choice.

A Q?eqči? house is closely meshed with the rest of the culture's traits and plays a part in the making of cycles of disease. The thatch roof houses rats and their freight of microbes; rats and mice take a steady toll of stored food and clothing, too. No part of a house is draft-proof so that in a climate which is cool and damp for most of the year arthritic and respiratory ailments become severe if they are contracted. An earth floor (and bare feet on it) would appear to favor disease and parasites, but it is so central to Q?eqči? housekeeping that change would be difficult to promote. A dirt floor is actually a low-cost, wall-to-wall sponge that absorbs all spilled

liquids and requires little care compared to wood or tile, the only available alternatives. If flooring were changed but housekeeping were not, Q?eqči? homes might be even less healthful than they are; if both could be changed, where would the volume of water needed for cleaning come from – and where would it go?

The main ecological problems in housing relate to water and wastes. Springs and streams from which household supplies come are generally downslope from house sites. Since all outdoors is the out-house (but especially the zone closest to the house and a trail), heavy rains practically guarantee contamination of water supplies. Fortunately, the most direct cirquit is broken by the Q?eqči? custom of eating and drinking mainly boiled food, at or close to boiling hot. The association of disease and cold water seems to be empiric-ally if not scientifically appreciated, and is a cornerstone of folk medical diagnosis at least in the highlands. Q?eqči? from the slope north of San Pedro Carchá are regarded as wildly foolhardy for their custom of drinking whatever they have at whatever temperature, but water is admittedly harder to come by in that springless region and thirsty heat is unfortunately more prevalent there. Koxila itself formerly had a local custom forbidding washing of dishes or clothes directly in the *aldea's* stream, but this reportedly broke down when rumors made it out to be a municipal ordinance of Chamelco, the authority of which Koxila people refuse to acknowledge.

TABLE 29

ACCOUNTING SUMMARY FOR HOUSE CONSTRUCTION

Labor (man-days)

collect poles	11	
skid and bark poles	6	
platform and post holes	7.5	
collect thatch	13	
carry thatch	7	
collect misc. roof materials	2	
construct frame	15.5	
thatch roof	18.5	
prep. and place wall planks	19	
make doors	6	
	105.5	sub-total
wood floor, outhouse, etc.*	15	
	120.5	actual total

Material purchases (Quetzales)

thatch grass		
cutting rights to 7 cga. at 0.05 ea.	0.35	
24 cga. at 0.30 (from Caxaneb)	7.20	
2 cga. sugarcane leaves at 0.20	0.40	
lumber		
14 doz. planks (nominal 1"x10"'x99")	30.20	
	38.15	sub-total
14 floor joists (nominal 2"x4"X132")*	3.10	
	Q41.25	actual total

*costs not incurred in traditional house construction

Total materials (house of 10 varas length)

OKEČ (all CA?AX)	22
PIČK (mostly Q?ANAIŠ)	38
C?AMBA (mostly Q?ANAIŠ)	10
RE:BOL and Š-NAT?BAL C?AMBA (mostly OQOB)	6
SAQ ČE? (not tabulated)	
K?A:M (not tabulated)	
AQ thatch (in cga. of about 100 bundles of 1 lb. ea.)	29 cga. (134 bundles surplus)
ŠAX UC?AXL thatch (in cga. of 10 lb.)	4 cga.

..... Continued

TABLE 29 (Continued)

Cost summaries

Costs quoted for construction of 8-vara house

materials ..... Q 35.00
labor ..... 70.00 (housewright and one assistant)
time ..... 60 to 80 man-days

Costs estimated for construction of existing house**

materials ..... Q 28.25
labor ..... n/a
time ..... n/a

Costs incurred for 10-vara house in Koxila

materials ..... Q 38.15
labor ..... 52.75 (computed at Q 0.50 per man-day)
time ..... 105.5 man-days (10 Feb. to 17 May)

**

Q?eqči?	Spanish	Length	Quantity	Price	Total
OKEČ	*horcones*	3.5 varas	18	0.25	4.50
C?AMBA	*vigas*	5.5 varas	8	0.25	2.00
RE:BOL	*madres*	8.0 varas	2	0.20	0.40
Š-NAT?BAL C?AMBA	*sobremadres*	8.0 varas	3	0.20	0.60
PIČK	calzontes	5.5 varas	24	0.10	2.40
BE Č?O	*atravesados*	10.0 varas	4	0.10	0.40
SAQ ČE?	*varillas*	---	4 cga.	0.25	1.00
K?IM	*paja*	---	12 cga.	0.25	3.00
K?A:M	*bejucos*	---	1 cga.	0.75	0.75
C?ALAM ČE?	*tablas*	1"x10"x3 va.	6 doz.	2.20	13.20
					Q 28.25

As in our own economy, a house is the most expensive investment ever made by a majority of families. The mean net annual income of households in the Koxila economic census (Q140.00), compared to the costs of materials plus labor in Table 29, shows that the investment would be 65% of annual income. However, the useful life of a house is only ten or fifteen years, given materials of average quality, and even so replacement of thatch and several *oke*č must be done at about five or ten years. Considering this rather rapid depreciation, long-term expenditure on housing would be at least as great a part of the income of a Q?eqči? family as it is for middle-class families in a 'developed' economic context (except for the loan interest that burdens the latter).

However, from an ecosystem point of view the costs associated with a Q?eqči? house are infinitely smaller than those occasioned by the construction of even a $20,000 tract home. All materials used in construction are vegetable (or unbaked clay), all waste materials are used for fuel or decay to humus, and no extra heat or other byproduct loads are imposed elsewhere in preparing construction materials. Only the imported steel machetes, axes, saws and hammers represent smoke, slag, acids and heat – mostly off in the Ruhr.

Woodcutting

Apart from clearing fields for cultivation, perhaps the greatest impact of a Q?eqči? population on their forest habitat results from the need for firewood in the kitchen. While the drain would be several orders of magnitude greater if charcoal were the traditional

fuel – as it is in other parts of Middle America – still it is considerable.

My major informant's wife estimated that her household used from four to seven *iq?* (Sp.: *cargas*) of wood per week, with a mode of five. Ordinarily this volume was purchased from a professional woodcutter at from 15¢ to 25¢ per carga of 45 kg. (100 lbs.) nominal weight, the lower price for pine and the top for oak. *Oqob* wood at 20¢ per load probably constituted the main part of actual consumption, and at the mean price. The approximate monthly cost of firewood would thus be Q5.OO and the amount 1,134 kg. (2,500 lbs.). While extrapolation from estimates like this is not to be relied on, in this case no week-by-week data were collected and the calculated Q52.00 and 11,794 kg. (26,000 lbs.) per house per year cannot be improved upon. For use with the census data in Chapter XIII, the figure of Q10.00 and 2,897 kg. (5,000 lbs.) per adult (or equivalent) per year was derived from the above, corrected to the equivalent of five adults in my informant's family.

As a minor constituent in the "utilities" bill for heat and light one might also enter the cost of 4¢ nightly (Q14.60 per year) for the kerosine used to run two elementary lamps, since an equal sum or its energy equivalent would have been spent on candles or pitch pine slivers (*q?ol čax*, gum *pine),* formerly the main sources of illumination in the home and on the trail. For details of candlemaking see Chapter XI.

Labor and cash costs of collecting firewood were verified by spending a day at this task. Two *oqob* trees were purchased at 25¢ each in forested land close to Chamelco, land belonging to a Q?eqči? who presumably makes a fair income from this source as it is the workplace of one or more woodcutters nearly every day of the year.

Felling, limbing, cutting in cords and stacking were all done in 7½ man-hours by two men, a boy, and myself working from 0730 to 1000. Cording was done to the length of an axe-handle, which is deliberately made one *vara* long. Our two trees reduced to fourteen logs over 20 cm. diameter, thirty-six logs 10 to 20 cm. diameter, twenty logs under 5 cm. diameter, and two *cargas* of branches. A total of fourteen man-trips (two ways) or approximately twice the labor expended on cutting, was required to take the wood from forest to town house, a distance of 1.5 km. Splitting the large logs to firewood took an undetermined additional time, but this part of the job is in any case more strenuous than time-consuming. If one allows a full 45.4 kg. per carga, then an input of 21½ man-hours gave 635.6 kg. (1,400 lbs.) of wood: 30 kg. per man-hour or about one man-day for a week's supply of firewood. This accords fairly well with the figures for wood fuel for lime-making (see Table 36, Chapter XII).

The various trees suitable for firewood are listed in Table 30, with the first three providing the bulk of consumption and listed in order of decreasing quality and cost. The remainder is in approximate order of quality; many varieties in the first part of the list are superior to cax but less used because less abundant. Table 30

TABLE 30

TREES SUITABLE FOR FIREWOOD AND CARPENTRY

Principal varieties

XI (Q?AN or RAŠ)
OQOB
ČAX

Minor varieties

PATA
SEPRES
KIK?EL XI
Č?AMAČ? (incl. Š-Č?AMAČ? AX OU)
IŠIM ČE?
SAQAC?UM
SEMEM
ČO:ČOKL
ČUNAK TE? (lowland)
Č?ALIB
ISMIRA?
C?UNEX ČE?
Q?ANPARAWAY
K?AP K?U
K?OX
ŠO?OT
SUB
Q?OL ČE?
O
MAYTE?
Q?ANAIŠ
O:NK ČE?

Tool handles

AQA?AL
KAQU:T
OQOB
YUŠ
SIB ČE?
RASOČ
KENAQ ČE?
ČI:N

Statuary and musical instruments

R-O MAŠ	ČAKALTE?
Q?AN ČE?	C?INTE?
SANKI ČE?	SUC?UL
KENAQ ČE?	SUCUX

also lists woods used for other purposes besides fire. Woodcutting is a chore that may also be a profession, but documentation of cash earned or spent on firewood was not attempted in the field site and consumption itself was synthesized by calculation from the figure mentioned on pages 220-221.

Lumbering

One alternative occupation for Q?eqči? men is lumbering. At all slack seasons the rasping of two-man saws can be heard in stands of pine So cm. diameter at breast height or better; fortunately, the rapid growth of pine and the slow working of handsaws preserve some semblance of balance between wood production and consumption. Unfortunately, since the sawyers are independent operators who supply a variety of purchasers there is no way to compile statistics (or even a confident estimate) of average annual timber harvest.

To judge from a single case, mean annual volume increase is on the order of .047 m^3 per year per tree (60 years to 2.83 m^3 volume); airphoto interpretation of the stand mentioned below gave a count of 40 pine trees per hectare (16 per acre) which, at an average tree height estimated at 20 m. (70 ft.), would give a stand volume of about 100 m^3 per ha. (1,430 $ft.^3$ per A.). Crown closure on the plot is highly variable but averages about 15%, so that this stand volume compares quite closely with that for Douglas-fir in the U.S. Pacific Northwest having comparable characteristics.[11]

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[11] (Avery, 1966: 33, Table 6).

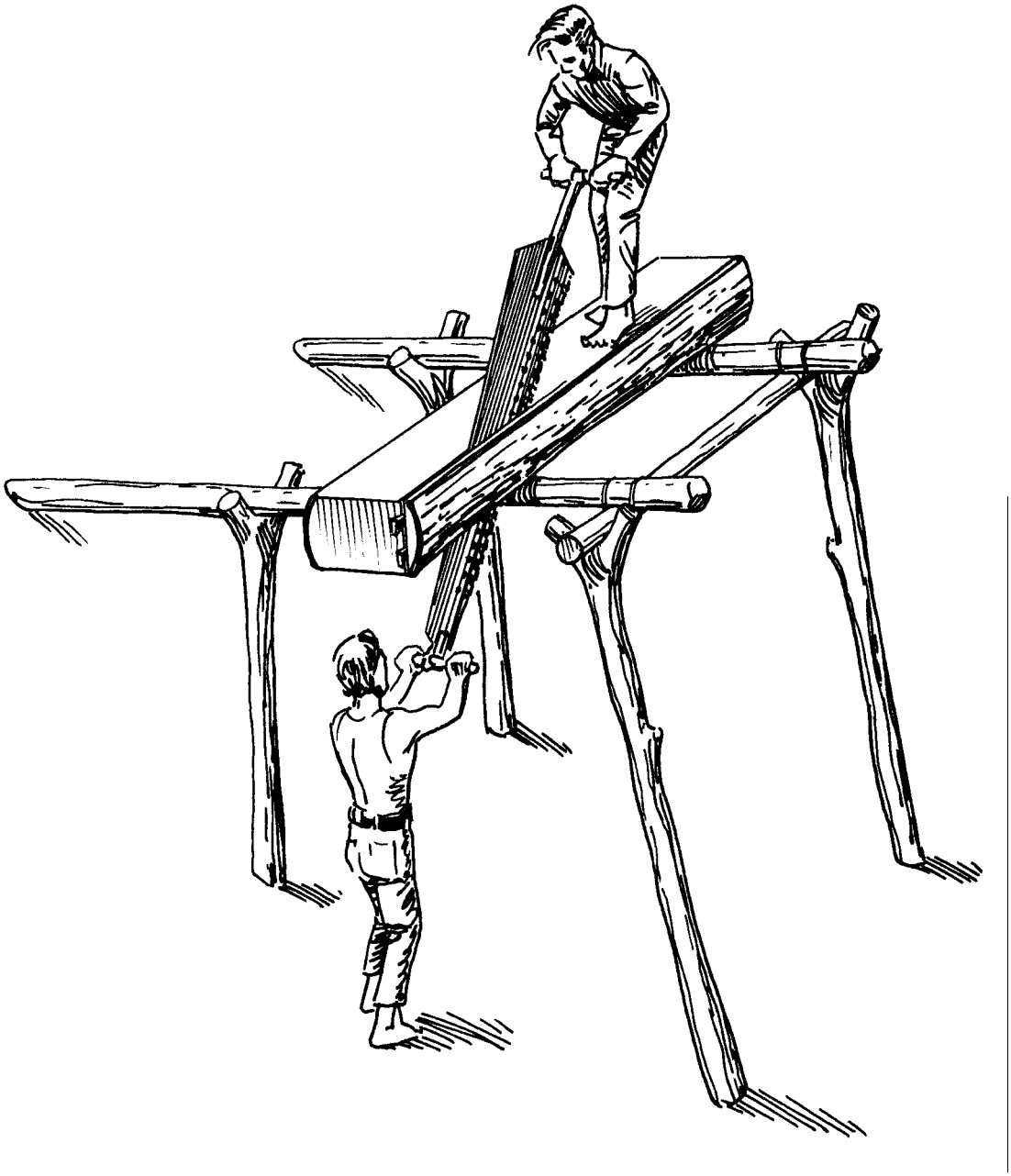
Two Ladinoized Indians in Chamelco act as contract buyers for much of the pine lumber and make a good living at it, to judge by their homes. So far this opportunity seems not to have been pre-empted by Ladinos; their ideal would be the proprietorship of a complete saw-mill like “Aserradero Boquicar” on the Coban-Chamelco road.

A license to cut trees is required by the Forestry Agency of the Guatemalan Government, but collection of fees is delegated to the Municipal Treasurer in Chamelco: 50¢ per tree plus 10¢ for official *papel sellado* on which to apply and 25¢ in tax stamps. A freelance sawyer ostensibly must pay Q1.35 for two trees written up on the same paper – but many do not, and those who have a regular buyer or *patrón* let him handle matters through his connections in the *Municipalidad*. Clearly there is little reason to rely on official statistics regarding even the number of trees felled in the Municipality’s territory.

One case study was documented through interviewing two sawyers at their workplace in the southeast corner of *Aldea* Cojila. The land belongs to a resident of Barrio San Luis in Chamelco, a man who was formerly a pedlar in the Sebol area. He plans to clear this hectare plot for planting next year (1970) after fifty or sixty years since it was last used for milpa. Trees are personally “delivered” (*q?ax-tesi:nk*, Sp. *entregár*) by the landowner, who sets the price according to size and quality of each tree. A typical price would be Q1.50 for 28 varas (23.5 m. or 77 ft.) of useful length comprising eight logs of 3 varas and a butt log of 4 varas. Some ten to twelve

FIGURE 13

SAW FRAME CONSTRUCTION



pairs of sawyers are at work in this grove, but only four or so on any one day.

Two men with five-pound axes can fell a tree in an hour and, using just the axes, square and cut off working logs in the remainder of a day. An hour at the end of the day will suffice to build a saw-frame (Sp. *tapesco*) as drawn in Figure 13. Next day a log is rolled and levered onto the frame and cutting guidelines marked on the end and top with a snap line of maguey twine loaded with soot or charcoal. The first several logs are usually made into planks (Sp. *tablas*) dimensioned 3/4" X 10" (2 cm. X 25.4 cm.), thirteen to eighteen of these per log depending on diameter. The butt log is ordinarily cut into studs (Sp. *reglas*) or 2" X 4" (5 cm. X 10 cm.) lumber, from twenty-four to forty-eight to a log. For details of dimensions, quantities, and values see Table 31.

Once the saw is about 30 cm. (12") into a cut, wedges are driven in at top and bottom and the cut carried on until it reaches the *tapesco*. All cuts are taken to this point, then the log is moved to the other end of the frame – or the frame is re-built under the sawed end – and work continues within the frame (**a**-at-a-time system) or is completed (½-at-a-time system). A team expects to finish one log a day whether cutting planks or two-by-fours. Work begins with the tip or middle logs, however, “because the last log is hard wood”. A saw frame is built or re-built for each tree that is felled and sometimes for each log. Work in the rain is frequently faced: it requires re-marking the kerf lines with a pencil or crayon.

The saws in general use are German imports carried by *Almacén* "El Gallo" in Cobán. Until the imposition of a 30% surcharge in early 1969 the six-foot saw cost Q10.75 and the seven-footer Q12.75, but both prices were raised by Q2.00. For this sort of investment, however, one gets a tool which may last up to forty years. Rarely is the purchaser the man to wear a saw out. They are provided with perforations in the blade which can be shaped into a new set of teeth as the old deteriorate with sharpening and breakage. The saw used by my informants was twelve years old and had gone through only one of six sets of teeth. A tooth-setting tool comes with each saw as does the upper handle, but the lower one must be made up and the hole in the setting tool must be re-shaped. Teeth are filed sharp for each workday and re-set after a month of use, and a bottle of kerosine is always necessary to free the saw when pine pitch jams it in the cut.

In the event that two men agree to work but neither has a saw, they may rent one from an idle sawyer at 20¢ a day. Proceeds from sale of lumber are always split evenly between workers even when one of them owns the saw, since "without a *compañero* the saw would be of no use."

The tools and techniques of lumber production by Q?eqči? Indians are plainly imported from Europe and probably date from the late 19th Century era of coffee fincas owned by Germans and Englishmen, though perhaps lumbering skills go back to church construction immediately following the Conquest. In any case this activity has developed into a folk craft and a solid source of income, free from direct

TABLE 31

ACCOUNTING SUMMARY FOR LUMBER

Specimen tree:

log #	length (m.)	product	value (Q)	labor cost (m-d)
1	2.5	8 reglas	1.00	**b**
2	2.5	12 tablas	2.20	2
3	2.5	13 tablas	2.38	2
4	2.5	14 tablas	2.56	2
5	3.4	24 reglas	3.00	2
			total 11.14	

Felling, squaring and frame construction: 2

Headload delivery (2 trips/doz., 2 man-trips/day): 6

total 16 **b**

Debits:

Cutting license (approx.): .70

Rights to tree 1.50

total 2.20

Net cash: Q8.94

Net return: 8.94/16.67 = Q0.54/man-day

Standard prices:

Dimensions (in.)	Q / doz.
3/4x10x99	2.20
1x10x99	2.40
2x4x 99	1.50
2x4x132	2.60
(3x5:	15¢ per running 33")

supervision by Ladinos and free of the drains on time, health and wages which are exacted by migratory labor. It is a functional equivalent to work in maguey or lime and offers income from a day's work comparable to that gained in the elder occupations (see Table 31, Table 33 in Chapter X, and Table 36 in Chapter XII).

Pine is not the only tree taken for lumber by the Q?eqči?, merely the most common. Other trees which are at least described in dictionaries as good saw timber (Sp. *buena madera*) are listed in Table 32.

Carpentry

With easily worked pine lumber at hand some lumbermen graduate to simple carpentry and a few become salaried carpenters, commuting from *aldea* homes to jobs in Chamelco and even Cobán. For the majority, however, carpentry is a slack-time occupation in which benches, tables, cabinets for holy images ("escaparates"), beds, and even musical instruments are fabricated to meet local demand or to be tumplined to town.[12] Benches and stools sell for a Quetzál or so, tables for three to five Quetzales, and bigger but less frequently demanded articles like beds, cabinets and instruments from five Quetzales up to more than one hundred for a marimba.

TABLE 32

TREES SUITABLE FOR LUMBER

Highland	Lowland	
CAX	AKUTE?	SUC?UL
KAQ?UT	AC?AM TE?	SUCUX
K?ANSIN	BOXL	YAU
Q?AN ČE?	K?AN SAN	
HUH	PEMEČ TE?	

[12] Cf. Goubaud C., 1944: 134.