CHAPTER III

EARTH PHENOMENA

Weather

Alta Verapaz has a reputation for thirteen months of endless rain according to Guatemalans who live elsewhere, but this probably results from the impression given by fog, persistent cloud and drizzling rain. Violent showers as experienced in Guatemala City and on the South Coast deliver about as much water in a year but take up much less of the time. The total number of days with rain in 1969 in San Juan Chamelco was 250, and only in 105 of those was precipitation more than 10 mm. Out of 348 days when records were kept, during the period from December 8, 1968 to December 7, 1969, only 37% had cloud cover above 8/10 for more than half the daylight hours. In the same record, morning or evening ground fog was noted on 35% of the days, while morning or evening high fog (low stratus fog not in contact with the ground) was present 20% of the days (not including those days when ground fog blocked sight of it). Heavy smoke haze from field burning persisted from April 12 to May 11, broken only by six rainy days in that period. The season for thunder and lightning ran from mid-April to mid-October, in sequences of one to four days separated by gaps from a day to two weeks long.

The correspondence between precipitation data from the 1968-69 field season record and the 1953-57 span of data for Cobán is

shown in Figure 1 and Table 1.[1] A tropical disturbance on a track into Belize was responsible for the surplus rainfall in November, when streams rose to a thirty-year record level according to informants.

A detailed mythology of the causes of weather is not so prominent in Alta Verapaz as in Yucatán,[2] and the "chac" gods of Maya tradition appear to have become the *čokl* (clouds) or adjective *čak* (dry) of Q?eqči?. Rain is *hab*; drizzle is *musmus hab*. The sun itself is *saq?e* but daylight is *kutan*; darkness, whether night or artificial, is *k?oxyin* (or *a:k?ab*, now archaic). Lightning and thunder are lumped as *kaq*. There are two seasons: dry (*saq?ehil*, Sp. *verano*) and wet (*hapbal q?e*, Sp. *invierno*; cf. *š-q?ehil*: its alotted time). However, three temperature ranges are acknowledged: *kehil č?oč?* (Sp. *tierra fría*), *q?isnal č?oč?* (Sp. *tierra templada*), and tiqwal *č?oč?* (Sp. *tierra caliente*).[3] Outside of Alta Verapaz and the Q?eq-či? language region proper there is also a term for hot, dry places like Salamá and Jalapa: *k?imal č?oč?* (cf. *k?im*: thatch, grass). The arrival of rain is literally phrased *š-čal li hab*, but ironic exchange is often made with the words for a clearing sky, *š-yama li kutan*. Heavily overcast days when the hilltops are obscured in cloud

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[1] Compiled from Observatório Nacional data and published in Whetten, 1961: 5. Whetten's English units have been converted to metric units.

[2] Redfield & Villa Rojas, 1962: 115-116; Morley, 1946: 196-197; Thompson, 1954: 227-230.

[3] Sedat, 1955: 124, 95, 147.

FIGURE 1

WEATHER DATA FOR SAN JUAN CHAMELCO, 1969

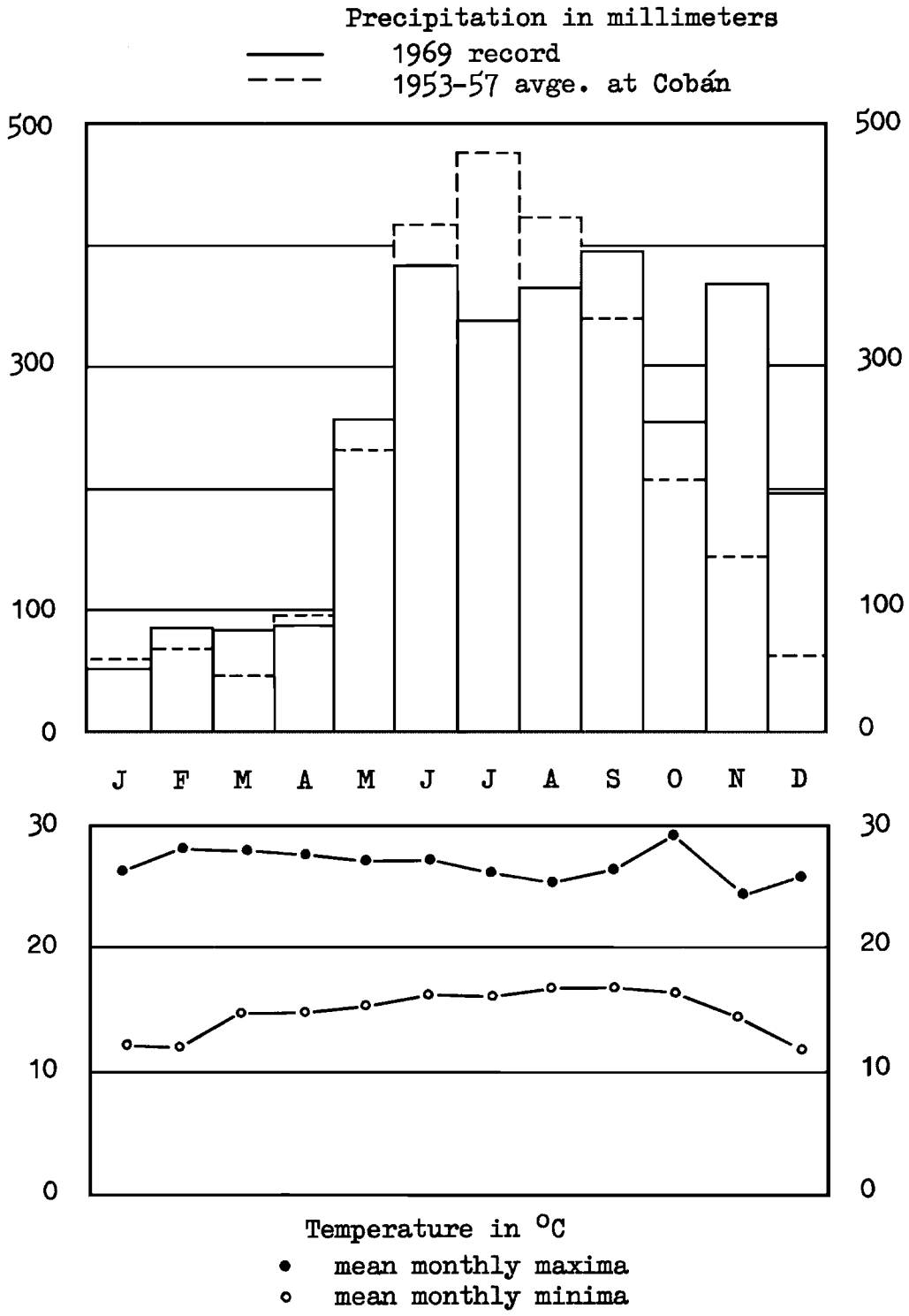

TABLE 1

WEATHER DATA

	1968-69 field record[1]			1953-57 Cobán averages[2]
month	precip. (mm.)	temp. min.	max. (°C)	precip. (mm.)
Dec.[3]	199	10.3	26.8	--
Jan.	53	12.2	26.4	58
Feb.	87	12.1	28.6	69
Mar.	85	15.1[4]	28.1	48
Apr.	88	15.0	28.0	97
May	258	15.5	27.2	232
June	385	16.2	27.3	417
July	339	16.1	26.4	478
Aug.	366	17.0[5]	25.7[6]	424
Sep.	399	17.0	26.6	338
Oct.	254	16.4	29.6	208
Nov.	371	14.4	24.2	142
Dec.[7]	--	12.4	25.6	64
Year	2,884	14.6	27.0	2,580

[1] Precip. record taken with whiskey bottle and funnel cut from plastic bleach bottle, calibrated with hypodermic syringe; temp. records taken with alcohol max./min. thermometer.

[2] See text, fn. p. 2.

[3] Based on 19 days record.

[4] Based on 30 days record.

[5] Based on 21 days record.

[6] Based on 20 days record.

[7] Based on 7 days record.

are called *muhmu ru* (cf. *muh*: shadow). Days of steady rain are *kut-ankil hab*; since vines and twine are known to slacken in hot weather and tighten in cold, work with either material is avoided in cold and rain. House construction is especially compromised by lashing with cold vines. Additional terms are provided in Table 2.

Weather is prognosticated on three bases: by analogy from the first twelve days to the months of the year, by attributes of fixed dates, and by natural indicators. The first system is called *caba-ñuelas* in Spanish and is paralleled by folk beliefs in places as far distant as Chile and Mongolia.[8] The second basis relies on persistent weather characteristics associated with Saints' days and deals mainly with winds. Maize-toppling gales are expected on the sixth of September when Cahabón has its fiesta (*sa? š-nimq?e li qana? či k?axbom na-nume? li iq*); Saint Matthew's day, September 21, shows the ill temper of this saint (*mas xosq? San Mate:y*). The former was precisely fulfilled in 1969, while the second wind was three days late. The third type of prediction depends on nearly universal folk correlations. For example, bad weather follows when chickens crow in the evening and all animals are restless. If a dry, dead limb falls without obvious cause, dry weather is forecast; if a leafy branch, wet weather. The extremely bad turn of weather around November 16, which radio reports tied in with a nearby hurricane center ("Hattie"), was attributed to a contemporaneous suicide in Bárrio San Luís.

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[8] personal communication, Father Stephen Haeserijn.

TABLE 2

TERMS RELATING TO ATMOSPHERIC & CELESTIAL PHENOMENA*

SAQ?E	sun
PO	moon, month (deified as *qana?*, our mother)
YO: Š-TIUBAL RIB LI SAQ?E	eclipse (“the sun is biting itself”)
ČAIM	star
BUC? ČAIM	comet
KAQ ČAIM	morning star
ACAM KE	frost (“cold-salt”)
S-ČU KE	dew (“cold’s urine”)
K?AXOB	droplets of rainwater adhering to leaves
SAQBAČ	hail
HAB	rain
MUSMUS HAB	drizzle
NA-T?ULBAK	to pour (rain)
POC?OC?NAK	to patter (rain)
C?UQC?EB	rainwater collected from roof runoff (cf. *c?uqul,* drip)
IQ?	wind
RAŠ IQ?	dry wind (“green wind”)
KAQ SUT IQ?	dust devil, whirlwind
MIŠPIRIŠ, SALEK?	afternoon (1 to 3 PM)
Š-K?OXYIN AX UČ	a period just before dawn when the sky seems to darken slightly
RELEB SAQ?E	east (“where the sun comes out”)
ROKEB SAQ?E	west (“where the sun goes in”)
RELEB IQ?	north (“where the wind comes out”)
ROKEB IQ’	south (“where the wind goes in”)
ČOŠA	heaven

*Documented in Sedat, 1955.

Procedures for modifying weather are few. The only certain one involves setting fire to the slopes of Cerro Cojaj (*š-k?at li cu:l qawa? koxax*), thirty kilometers northeast of Cobán, in order to break a drought.

A curious augury is attached to the sun seen through falling rain: *š-yola xun yuk* – "a brocket deer has been born." Rainbows, which also appear in the above circumstances, are termed *šo:kik?ab*, *k?a:mla*, or *kaqla*.

Landforms

The highlands of Alta Verapaz Department are made up of impure limestone formations with occasional exposures of shale; on these a reasonably complete suite of karst landforms has developed. A Short vocabulary of terms relating to these is provided in Table 3.

The overall relationship of the Q?eqči? to their landscape is, or was, emphatically religious. Mountain ridges are deified and anthropomorphised to the point where they are said to gather for consultation, and even today their names are called up in the course of prayer.[9] Obligations are felt when attacking the god-land to make milpa (cf. Ch. VI, p. 90), and caverns are the temples where these obligations are kept.

In purely practical terms, Q?eqči? cultivate doline and valley floors by preference since these have soils which support perennial

[9] Carter, 1969: 71-73. The list varies with locality and individuals; *Icamna'*, *Koxax*, and *Šukaneb* are among the most prominent. See also Burkitt, 1920.

TABLE 3

TERMS RELATING TO LANDFORMS*

CU:L	mountain or ridge
TAQ?A	valley or down-slope
CULTAQ?A	pre-Christian term for God
HI:K	earthquake
R-OČOČ PEK	cave
T-UX	drip in cave
XOXOWEL	rivulet, rill
ŠA:L, LO:B	canyon or gulch
Š-ŠALA? CU:L	pass
Š-ŠALA? HA?	stream junction
Š-KOREČ Č?OČ?	curled crust of cracked mud
SEMS LI Č?OČ?	cracks in clay
K?OT AMOČ	mossy, wet clay where springs are adjacent to trail (“frog excrement”)
Š-BA:L CU:L	shade from a mountain
KAQ?NAB	sea, lake
PALAU	ocean
KUMB	well
K?ANHA? Š-SA:B HA?	sinkhole
SIWAN	abyss, large and steep-walled sinkhole due to cave collapse
Č?OČ?	soil
K?ANT?ILOY	river pebble
PUMPU:KIL HA?	stagnant water
SAQO:NAK	cliff (of white limestone)
TAČ?TO	level (adj. applied to land)
TAQSI:NK	up-slope, climb, grade
UQ?UL	landslide
NIMHA?	river
Č?INAHA?	rivulet, creek
MUKBIHA?	subterranean river
KUBSI:NK	down-slope, descend or descent

*Documented in Sedat, 1955.

cropping, and have since at least the 1770s.[6] However, at present the combination of gross population increase and alienation of superior land by Ladinos and others has led to cultivation of all but the highest, coldest ridge crests. Access by wheeled vehicle is difficult throughout the Guatemalan highlands, but especially so in karst country. Footpaths are still the only routes connecting the majority of settlements, along valleys and ridges where these are the shortest line for a given route, but just as often going straight up and down slope with minimal concession to the need for switchbacks. Trails which were once parts of the route to Guatemala City, though replaced by a road which itself is in process of replacement by a modern highway, remain as broad and deeply entrenched lines on the landscape. However, the erosion may be due more to bovine hooves than to human feet.

Springs abound in the higher parts of the region, though there are places where the underground drainage is so deep that drinking water is at a premium. Most streams have plenty of turbulent reaches, whether below ground or above, so that aeration maintains their purity and waterborne diseases are no threat despite popular innocence of sanitation.

Soils and Minerals

The pedology and geology of highland Alta Verapaz are complicated by the presence of volcanic ash in pockets, by changes in vegetation

[6] According to description in Cortés y Larráz, 1958, Vol. 2: 11.

and climate through the Pleistocene and Recent,[7] by tectonic deformation, and by Karst landforming processes. Yet the diversity of rock, soil and subsoil types is greater still along the southern margin of the limestone highlands where old, metamorphosed and mineralized rocks are exposed.[8] International science and technology have only begun to tackle the details of Nature in its tropical aspect; the Q?eqči? and other long-time inhabitants have simplified their complex habitat by pure empiricism: having discovered what will and what will not work for their purposes and technology, they ignore (or mystify) all the rest.

Soils and Topography

For all the complexity of subsoil minerals which will be discussed below, the topsoils around Chamelco seem to differ only according to slope. The large variety of soil-related terms given practical and even scientific meaning in a lowland context[9] has very little use in the highlands, though the terms themselves are included in highlanders' vocabularies. Unfortunately, the facilities available for soil study and the time allocated to it in this study were minimal in comparison to the above-cited work. However, enough information was collected to confirm the statement that local soils

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[7] On vegetation see Tsukada and Deevey, 1967; on soil indicators of paleoclimate in Central America see Durr and Klinge, 1962.

[8] I.e. the kind of territory dealt with by the Q?eqči? of Chichipate in the Polochíc Valley as reported in Carter, 1969.

[9] Carter, 1969: 21-31.

are no more complex than the list of words used to describe them in Q?eqči?.

The Karst topography of Alta Verapaz does not include much area in gentle slopes: low-lying areas are flat or nearly so, and the rest goes up or down at 200 or better. While there is a dissected upland surface lying about 400 meters above the general level of valley floors it, too, is made up of flats and hollows interrupted by steep ridges and knobs. As a result the soils on slopes are typically thin (4 to 6 cm.) rendzinas overlying solution-fluted limestone or dolomite. When exposed by cultivation they erode and dry out very easily so that only a complete fool would fail to conclude that one season under maize must be compensated by four or more years' fallow. The only alternative, and one coming into wider and wider use, is selective clearing in favor of a grass sod for pasturing cattle.

The soils of the doline and stream valley floors seem to need no more fallowing than the two or three months between harvest and the next year's clearing, yet the topsoils themselves are scarcely thicker (20 cm. at the very best) than those on slopes and their chemical characteristics are equally similar. Evaluation of pH and principal nutrients by simple color-test kits was confirmed by a sample processed in the laboratories of the International Soil Testing Project operated by the *Ministerio de Agricultura* with assistance from North American soil scientists. The results are shown in Table 4, and the most noteworthy differences between

TABLE 4

SOIL TEST DATA

Site	pH	N	P	K	units
Koxila (lab. test)	6.5	16	4.3	140	ppm
Koxila (kit tests) 1.	6.8	D	D	A	(Sudbury Co. scale)
2.	7.2	C	C	B	(Sudbury Co. scale)
3.	7.0	D	B-	B	(Sudbury Co. scale)
Čaxaneb (kit test)	6.6	C	D-	A-	(Sudbury Co. scale)

Note: Koxila test locations were as follows: (1) foot of slope, in or near maize test plot 1; (2) break in slope, in or near maize plot 5; (3) on slope. Čaxaneb site is all level.

samples from level and sloping sites is the greater supply of phosphorous in the latter. pH has no more than the usual range about neutrality for mid-latitude soils with comparable rainfall and vegetation; potassium is uniformly abundant; nitrogen is available but low; and phosphorous is outstandingly scarce. The latter soil deficiency is common knowledge among commercial cultivators in the

Departamento (even the stores stock fertilizers with high P and low K content) and indeed appears in Chichipate soils as well.[10]

The main criterion of quality from a Q?eqči? point of view is the induration of the surface soil: if it is compacted (*kau ru*, by nature hard) then all cultivation operations will be more laborious and maize roots will have a hard time penetrating to a healthy distance from the plant, but if it is friable (*q?un ru*, by nature soft) then all is well. Though some level-lying soils are very clayey and therefore *kau*, the best guess these days is that land goes from *q?un* to *kau* when put to pasture and trampled by cattle. That, for example, is what my informant said about the condition of the land which he purchased in *Aldea* Chajaneb. Soil color is not nearly so diagnostic of potential for good milpa, though the range of colors is identical with that described by Carter.[11] In the highlands a soil with any color other than black or a dark brown is probably so thin, whether by nature or abuse, that subsoil materials are showing through. A Q?eqči? may cultivate such soils because he has no others, but he will not expect more than a mediocre harvest.

A German pedologist working in El Salvador but visiting Guatemala made the following comments on highland soils in Central America. The young, black soils found nearly everywhere were developed under forest cover and are at present degrading rapidly under frequent cultivation. The brown soils which are found in association with

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[10] Carter, 1969: Table 6, pp. 27-29.

[11] Carter, 1969: 21-22.

brown tuffs and buried by present soils are pseudo-gleys.[12] Dark red paleosols which lie even more deeply buried have been studied by a paleontological laboratory in Hannover and appear to date from the end of the Pleistocene. Mineralogical tests showed no alumina in their clays, indicating development under a tropical wet-and-dry climate more severe than exists at present.[13]

Minerals and Geology

Fortunately for this study the first in the series of geological maps to be prepared by the German Geological Mission to Guatemala was the Cobán quadrangle. Field work was completed in 1968 and the following description of structure and tentative identification of mineral specimens is based on conversation with the geologist responsible, Dr. Sigurd Paulsen.

The upper Cobán formation underlies Cobán and Carchá; it is distinguished from the lower Cobán formation, which makes up the ridges surrounding San Juan Chamelco, mainly by differences in foram fossil contents. The contact is exposed along an east-west line approximating the northern *Municipio* boundary of Chamelco. Underlying the Cobán formations and outcropping to the south is the Todos Santos formation, made up of conglomerates, shales and sandstones of Jurassic or very early Cretaceous age rather than the full Cretaceous

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[12] Association of these with a population maximum in Classic Maya time is attractive but purely speculative.

[13] This confirms the interpretation of lateritic paleosols as made by the geologist who mapped the Cobán quadrangle; see also Sherman, Walker and Ikawa, 1968.

of the Cobán formations. Its northernmost exposures are in the lower slopes of the Chichén-Campat and Xucaneb Valleys. The basement complex for the whole region is the Chochál formation of Permian limestones and dolomites, while the next younger formation is the Campur, which makes up the high-level surface in the northwestern corner of the quadrangle. In cross-section San Juan Chamelco can be seen to lie on the flank of a shallow syncline. The slope of rising beds increases to the south, where older rocks are exposed, and the whole structure is broken by a system of parallel, east-west faults in a zone between Chimox and Campat. The crest of a complementary anticline coincides with the crest of Cerro Rochá (*r-oq ha?*, leg or foot of the water), between Xucaneb and the *Cabecera Municipál* to the south, Tactíc.

The descriptions and identifications which make up Table 5 are those given by Dr. Paulsen and based on his personal acquaintance with the locality of San Juan Chamelco, which was his field base for work in the southern part of the Cobán quadrangle. X-ray diffraction testing of samples in the laboratories of the Geology Department of the University of Saskatchewan was used to confirm or revise Dr. Paulsen’s guess as to predominance of dolomite vs. limestone, a distinction which he insisted should be established only in this fashion.

Q?eqči? uses for hard-rock minerals include only lime-making and divination. The suitability of recognized rock types for roasting to lime is indicated in Table 5; the stones (*k?eibal*) used by diviners

or fortune-tellers (*ax k?e*, the thrower) were seen only once by my informant and from his description might include chips of quartz,

TABLE 5

VOCABULARY OF ROCK TYPES*

Q?eqči?	Description
KAQIPEK ..... (red rock)	Brecciated limestone of the Cobán fm.; red color may also be caused by long, slow heating of other limestones when used as hearthstones *k?ub*, Sp. *tenamaste*, a set of three boulders on which pots rest)
KAUILPEK ..... (hard rock)	Pseudo-brecciated (i.e. recrystallized) dolomitic limestone; will not roast to proper lime
ME:LB ..... (--)	Two types: the one from *Aldea* Chisanic is weathered shale from the Todos Santos fm. while the one from *Aldea* Chamil is a greenish marl found intercalated in the Cobán fm. and also in the lower tunnels of the Cakipec mine
MURMURILPEK ... (crushed rock)	Clayey dolomite with calcite veining; very poor lime
MERO Q?EQIPEK . (half-black r.)	Bituminous, pseudo-brecciated dolomite; may or may not make usable lime and tends to remain gray even after roasting
Q?UNIL Q?EQIPEK (soft black rock)	Coarse-grained bituminous dolomite; the principal rock type used for making lime, perhaps superior on account of its petrochemical content
Q?ANIPEK ..... (yellow rock)	Medium-grained limestone containing foram fossils; medium gray color when fresh but becomes dirty yellow when roasted for lime, hence name
Q?UNIL Q?ANIPEK (soft yellow rock)	Brecciated and soluted limestone; just as poor as the above for making lime
Q?ANIBA:Š ..... (yellow --)	Impure recrystallized limestone, hence the color; unused

...Continued

TABLE 5 (Continued)

Q?eqči?	Description
SAWIBA:Š (white --)	Calcite, the recrystallized limestone filling cracks in country rock; crushed for temper in the pottery made at Chacalte?, 15 km. east of Carchá
XUŠ (--)	Seritsitic biotite schist (seritsite: mica weathered to a silvery appearance) from exposures of the Central American basement complex in the Sierra de Chuacús; formerly used for whetstones

Rock names without specimens for identification:

MAQ	Pumice; no use at present, and not found in A.V.
SAQ	Light-weight rock, perhaps another type of pumice
TOK?	Flint; formerly used in making fire but source not known now

*Documented in Sedat, 1955.

limestone, or both. Twenty-five stones make a set; some are transparent (*ha?in la kutan*, this is your day, i.e. life), some are translucent or opaque (*čokl*, cloud; or *sib*, smoke), and others are fractured (*honon*, bumblebee; or *rašya:t*, bluebottle fly). Among the names applied to particular stones are *lol* (scarlet runner bean), *k:al* (milpa), *kok? ke:nq?* (little beans), *q?oq?* (*chilacayote*), *ik?oy* (squash), and even *dura:sn* (<Sp. *durazno*, peach). The stones are dipped in gin (*aguardiente*, *guaro*) and set out in lines to make a pattern in which the answers to questions are read, but the details of procedure were not remembered. They had been observed in 1950 or 1951 during unsuccessful attempts by my informant's family to find the cause of the illness that led to his elder brother's eventual death, and were carried out by an elderly man from *Aldea* Chioya?.

The majority of minerals for which the Q?eqči? have uses may be classed as subsoils, excepting poq which is properly a parent material though not a rock and not truly native to the places where it is now found. Dr. Paulsen was able to account for some of the non-crystalline mineral ,specimens and Dr. James Walker of the University of North Carolina, on leave with the Soil Testing Project mentioned above, was able to add comments based on my card-mounted profiles made of squares punched from cleaned field profiles. X-ray diffraction tests were made on these minerals, too, but in the laboratories of the Saskatchewan Soil Survey. Interpretation of the graphs was by Prof. Don Acton, who saw to it that every specimen was processed in two types of preparation. The resulting vocabulary of

mineral names, identifications and uses is given in Table 6; for further detail on handcraft uses refer to the appropriate chapters, below.

TABLE 6

VOCABULARY OF MINERAL TYPES

Q?eqčiʔ

(Š-) BONOL KUK (jug's paint)	Probably an ash-derived clay since found overlying SAQISAQLUM, and probably not related to KAQIC?OC? as described below, even though the term applies to it; a random powder specimen studied by x-ray diffraction included mica, quartz and kaolinite as the dominant minerals with some amphiboles also likely to be present. It is used as a pottery slip.
KAQIČ?OČ? ..... (red earth)	Certainly includes buried lateritic soils characteristic of sink basins north and west of Chamelco, though any red subsoil material fits the term. A random powder specimen shows dominance of kaolinite and quartz. Not used, and exposure indicates poor land for milpa.
MU?K / MUQ .... (--/--)	Probably represents vegetation carbonized after burial in volcanic ash and now found as inclusions in POQ. The diffraction specimen showed very little crystalline material and was primarily organic carbon. Formerly used as black paint on coffins of pine wood.
POQ ..... (cf. POQS: dust)	Fine volcanic ash, though the nearest likely source is 200 km. to the south and against prevailing winds. A random powder specimen shows uninterpretably weak patterns. Used for pottery temper and scouring powder.
Q?ANČ?OČ? ..... (yellow earth)	Probably a weathering product from POQ and colored by limonite, though a random powder specimen gave only weak patterns. Used for traction in hand-twisting twine.
Q?EQIČ?OČ? .... (black earth)	Probably limnic clays from ephemeral lakes in solu tion basins with blocked drainage. Contains considerable amounts of quartz and some iron oxides as well as kaolinite and mica. Mixed with SAQIC?OC? in one pottery style, and made into blowgun pellets.

...Continued

TABLE 6

VOCABULARY OF MINERAL TYPES (continued)

SAQIČ?OČ? / SAQLUM (white earth / ditto, archaic)	Probably a clay from weathered POQ. A random powder specimen suggests a dominance of mica with lesser amounts of quartz, kaolinite, and perhaps some gibbsite. Used in pottery in equal mix with Q?EQIČ?OČ?.
SE:B	General term for clay (SA:B refers to mud in general) but dark brown residue from weathered limestone and dolomite is the predominant clay in the highlands. An oriented specimen revealed micaceous mineral(s) as well as kaolinite, with smaller amounts of feldspar, quartz, goethite, boehmite and ilmenite plus a possibility of vermiculite and chlorite. Used for pottery.