

TANGAYE EVALUATION

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A FINAL EVALUATION OF THE SOCIAL IMPACT
OF THE TANGAYE (UPPER VOLTA) SOLAR-ENERGY DEMONSTRATION

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PREFACE

M (a frequent informant) asked how it is that anyone can know how to build a (photovoltaic-powered) station; why do only they know how to do that? If the explanation were written down or something, anyone or everyone could know how to make such things; but only they do. Is there a little "devil" (diabie - a reference to kinkirisi sprites) in the bush that told them how? Here at Tangaye there are people who have gree-grees who can kill or make someone ill twenty kilometers away using them. Perhaps those NASA people have something like that to know such extraordinary things!

I said that the Zaose ancestors believed the sun and God to be one, Nab'Ouende. He agreed, but added that he was skeptical of this, that to him the sun was fire and that he doubted that God would allow Himself to be "hung out there" as is the sun every day. I asked what the ancestors would have thought about the station's photovoltaic panels "catching" and transforming the sun into power. He said that the sun looks over all the earth, and sees everything. But there is nothing that lives that doesn't have its chief. The animals have man as theirs; men have chiefs, and there are greater chiefs than these. These great ones have the sun as chief. If the elders found men capturing the sun, then they would recognize them as God, for they were greater than the sun they knew as God ~~until then. But, he concluded, he thought that people from NASA must~~ have gree-grees to know such wonders.

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I. INTRODUCTION

A. PURPOSE AND SCOPE

The goal of the Solar Energy Demonstration at Tangaye, Upper Volta, is "to improve the quality of life and productivity for small farmers" (Meyer 1978). A project of the United States Agency for International Development (Rural Development Office, Ouagadougou Mission) in close collaboration with the National Aeronautics and Space Administration (Photovoltaic Development and Support Office, Lewis Research Center), its overall purpose is "to demonstrate, study and evaluate the potential for use of solar energy as (a) power source for common village tasks such as grain milling and water pumping" (*ibid.*), this within the wider conceptual context of a TAB Regional Project, "Studies of Energy Needs in the Food System" (No. 931-0234). Information on the background history, technical preparations and implementation are adequately described in a number of documents (e.g., Meyer 1978, NASA LeRC 1977), to which interested readers are invited to address their attention.

The Solar Energy Demonstration at Tangaye has received a great deal of outside interest and attention. Visitors to the site have been legion. The West African Economic Community has included it in a film on renewable energy projects. Photographs and descriptions have appeared or soon will, in a number of publications and the project has been the subject of papers delivered at conferences in the U.S., Japan, and elsewhere. Some American observers hold the demonstration in high esteem, and in part based upon its performance, have planned future projects for other sunny parts of the world. Others have had a more jaundiced view, referring to it as "a dog," with "something always going screwy!" In truth, the demonstration is probably less significant than some may have hoped; but it is certainly more so than others had feared.

The purpose of the following report is to determine the nature of the benefits of the demonstration for the peasant farmers of Tangaye. Specifically, following more general social and technical research in less-developed countries, it has been hoped that an input of energy from pumping water and grinding grain via a power system such as the present photovoltaic application, might ease the main time-and-energy-consuming chores of a woman's everyday life. Time and energy thus freed might be redirected to productive activities, and the welfare of women and their dependants thereby improved. The present research is directed to the identification of those benefiting from the solar installation, and to an analysis of whatever effects the use of station* facilities may have on the lives of rural farming families.**

The anthropological component of the Tangaye Solar Energy Demonstration has been divided into three parts: a six-month baseline study conducted in 1978 by Grace Hemmings of Yale University; a three-week mid-term social impact evaluation in October, 1979, by the present researcher; and a three-month final assessment over the summer of 1980. This latter culminated eight months' data collection by Voltaic assistants (from November 1979 till June 1980) following a research strategy of questionnaires devised by Hemmings.

To Ms. Hemmings go all honors for the creation of the questionnaires, and to the two research assistants (KOUELA Keyoure and LEGMA Jeanne-Marie) for their successful implementation; I share the blame (as the last person in an advisory capacity to have had an opportunity - in October 1979 - to alter the questionnaires)⁺ for defects in their form and application. Monday-morning quarterbacking is only useful if the lessons be applied the following Sunday; any criticism made here of Hemmings' baseline study or of

* "Station" is used to designate the buildings and location of the solar energy demonstration at Tangaye.

** The scope of work for the present contract is given in annex.

+ That, in the few days I was in Tangaye in October, I consciously chose to change the existing questionnaires as little as possible, so as not to confuse the research assistant who had worked with Hemmings throughout her study, and who would be responsible for teaching the new assistant to be named after my departure (see Roberts 1979:31), does not diminish my responsibility.

her questionnaires is presented to explain why at certain points comparative analysis was to prove impossible, and to allow future researchers to avoid similar pitfalls. Since the overall project focus is development research present and future, any findings that contribute to creating a more efficient methodology for future application should be considered a positive and constructive product of the project (Cf. Burrill and Popper 1978: II-5), even as they may describe shortcomings and disappointments concerning present goals. As Voltaire wisdom has it, "the knowing one fails, but the ignorant one does not fail" (Hall and Hall 1948:23).

B. PRESENTATION

In presenting the findings and analyses of the present social impact evaluation, a conscious effort has been made to digest and reduce the data as much as possible. The large carton solid with completed questionnaire forms that I found upon my arrival at Tangaye in June 1980, was first boiled down to intermediary sheets through preliminary sorting; then further still with various calculations and/or manipulations; and finally, graphs, charts and maps were produced. Far from some authors' seemingly-endless lists of raw numbers that cause all but the most dedicated readers to sigh, yawn, and quickly leaf past to the paper's conclusions; these figures allow both a ready comprehension and assessment of a major trend, and the opportunity for more detailed scrutiny for any who choose to examine the graphs more closely.

Concurrently, an attempt has been made to explain and describe the various aspects of the demonstration and its evaluation as succinctly as possible. The reader must recognize, however, that the terse, Cartesian phrasing of writers in some disciplines - which reads as smoothly as a set of mathematical equations - is not possible for social anthropologists; in fact, a point to be made in the present paper is that the subjects of this research cannot be contained, managed or measured as can some quantities, being the usually-

unpredictable, often-ornery, always-independent human beings they are. For a social anthropologist with a theoretical perspective such as my own, then, the unqualified declarative sentence (People do A and are B with a frequency of C because of D and E.) is a near impossibility.* Instead, as many factors as possible recognized to be at play in a given arena are identified, and a trend or impression of the sum of such parts presented. When discussing the thoughts and actions of human beings, one must always be aware of the total social context, since life is only neatly compartmentalized on paper, and the reductive writing process by definition produces an illusion of order that obviates vitality.**

C. ETHNOGRAPHIC BACKGROUND

Many general ethnographic points concerning the Zaose people of Tangaye have been made in previous papers (Hemmings 1978 and Roberts 1979); others will be as they prove relevant to the discussion below. Here it is apposite to reiterate that Tangaye is composed of sixteen hamlets,⁺ a clustering of some 2,927 people⁺⁺ over an area six to eight kilometers in diameter. The maps of Figure One and Figure Two serve to locate the hamlets in West Africa, Upper Volta, the Arrondissement and Canton of Diabo, and Tangaye village; the second figure indicates the distribution of population among the hamlets, according to Hemmings' census material (1978:12).

Tangaye is a "village" in that it has one chief, a conglomerate history, and is considered as such by the Voltaic government. It has few of the centralized features ordinarily

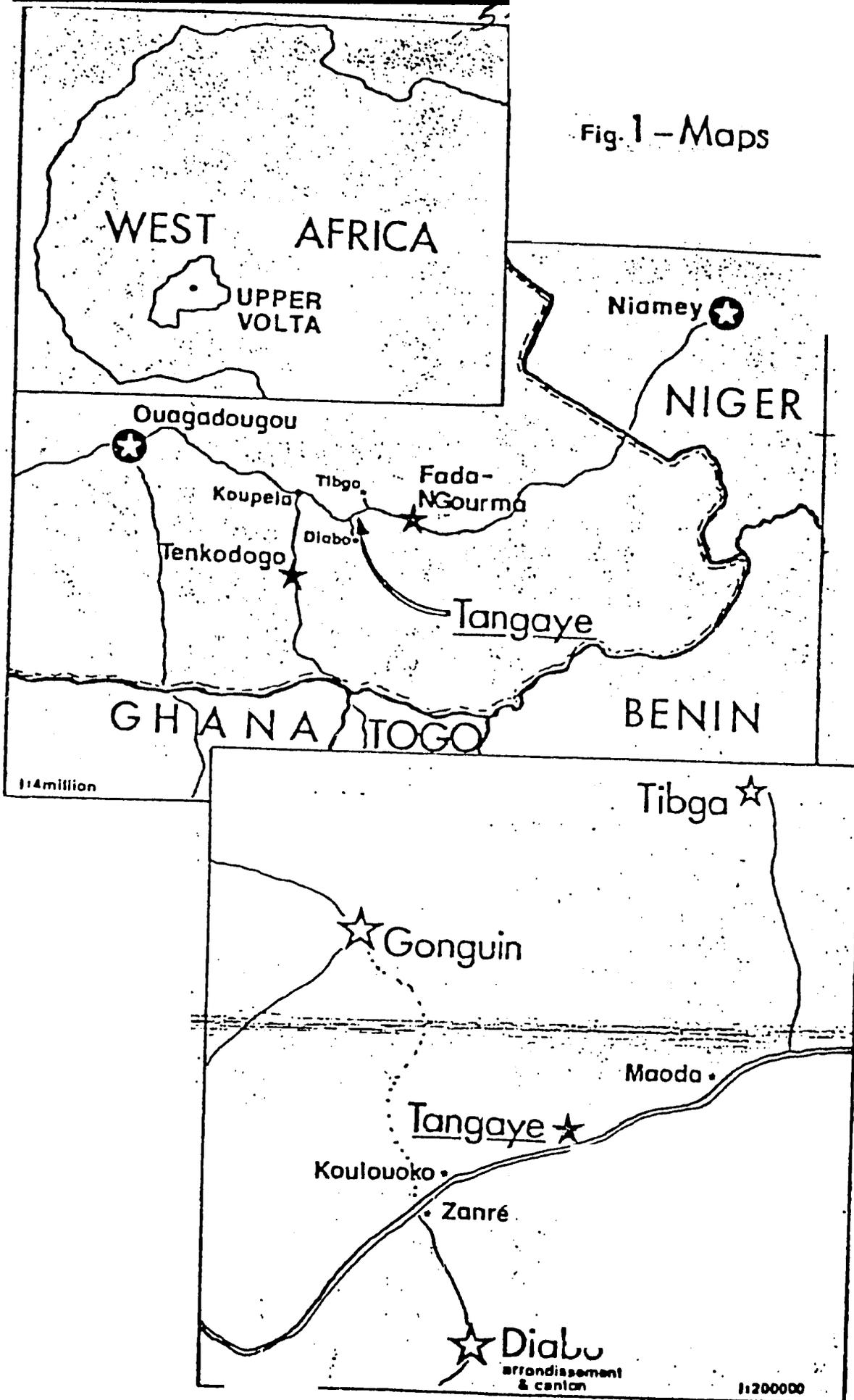
* Proponents of different schools of social thought vary in this ability; the reader will notice that this footnote is an example of the point being made above.

** Social issues are similar to those of modern physics in this regard; as Berkeley physicist Henry Stapp has recently paraphrased Einstein's theory of relativity, "The world appears 'not as a structure built out of indepently existing . . . entities, but rather as a web of relationships among elements whose meanings arise entirely from their relationship to the whole'" (Newsweek, 13 Aug 1979, p.46).

+ For more on Tangaye's hamlets, see Roberts 1979:38-39.

++ According to 1979 tax data from Diabo Arrondissement; there are about 32,000 in the Arrondissement as a whole.

Fig. 1 - Maps



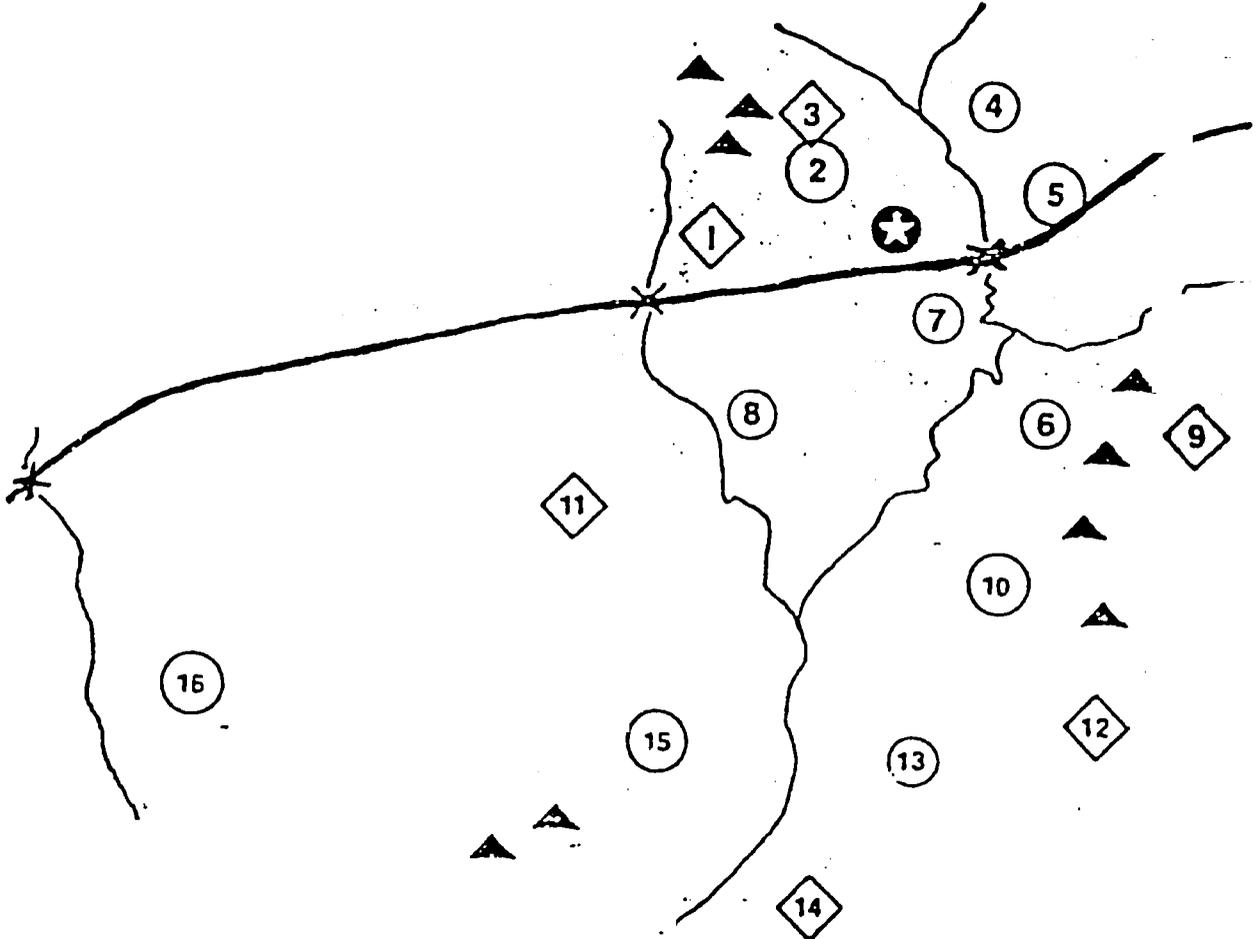


Fig. 2 - Hamlet Population

Scale 1:40,000 cm
◇ 184 - 221
○ 92 - 141
○ 36 - 66
▲ Rock Outcropping
Figures after Hemmings 1979:1;

II. WATER USE

A. IDENTIFYING STATION WATER USERS

The station water system has worked well from its inception in March 1979. Figure Three, compiled from information recorded weekly as a part of the station manager's data collection,* shows the curves of water quantity and hours of pumping per week for that period which concerns us most directly, from October 1979 till June of 1980. As one would expect, their zeniths are at the height of the dry season, in March-April. Then there is an average of about 113 m^3 of water pumped per week, or around 16 m^3 daily. In comparison: Hemmings' estimates for water drawing from the same well prior to installation of the solar pump (for February 21, May 10 and 18, and June 2, 1978) show that previously only a third of this amount - or much less - was withdrawn (1978: chart XIII-XVI). Other wells in the same area drawing from the same water table (notably those to the south just across that road, and to the north along the streambed) are used less now than before, through villagers' use of station water. It is probable that there is a balancing effect in terms of total drain of the table. Whether this is complete or not (i.e., whether or not the total amount withdrawn from the whole water table is roughly the same now as before) is beyond the author's information and competence to judge. What can be said is that during the dry season, roughly the same amount of water for personal uses per person per day is used now as was two years ago (~~see below~~). ~~Furthermore, in the summer of 1980 there were no visible effects of over-depletion of the water table during the previous dry season: The rains of August quickly brought the over-all water table to near surface level (literally, within six inches) in the slight depression where the station stands.**~~

* For a discussion of the station manager's role, see Roberts 1979: 17-18, and Section IV below.

** The area became quite a marsh in late August and early September. Water stood several inches deep in the wild grass and sorghum fields; seeped through the cement floor of my house and four feet up the walls by osmosis; threatened to overflow the latrine; and allowed a bumper crop of mosquitoes to breed. Contrapuntal toads and treefrogs sang their nocturnal fugue in appreciation of puddles made just for them, and Mycolog ointment became the order of the day.

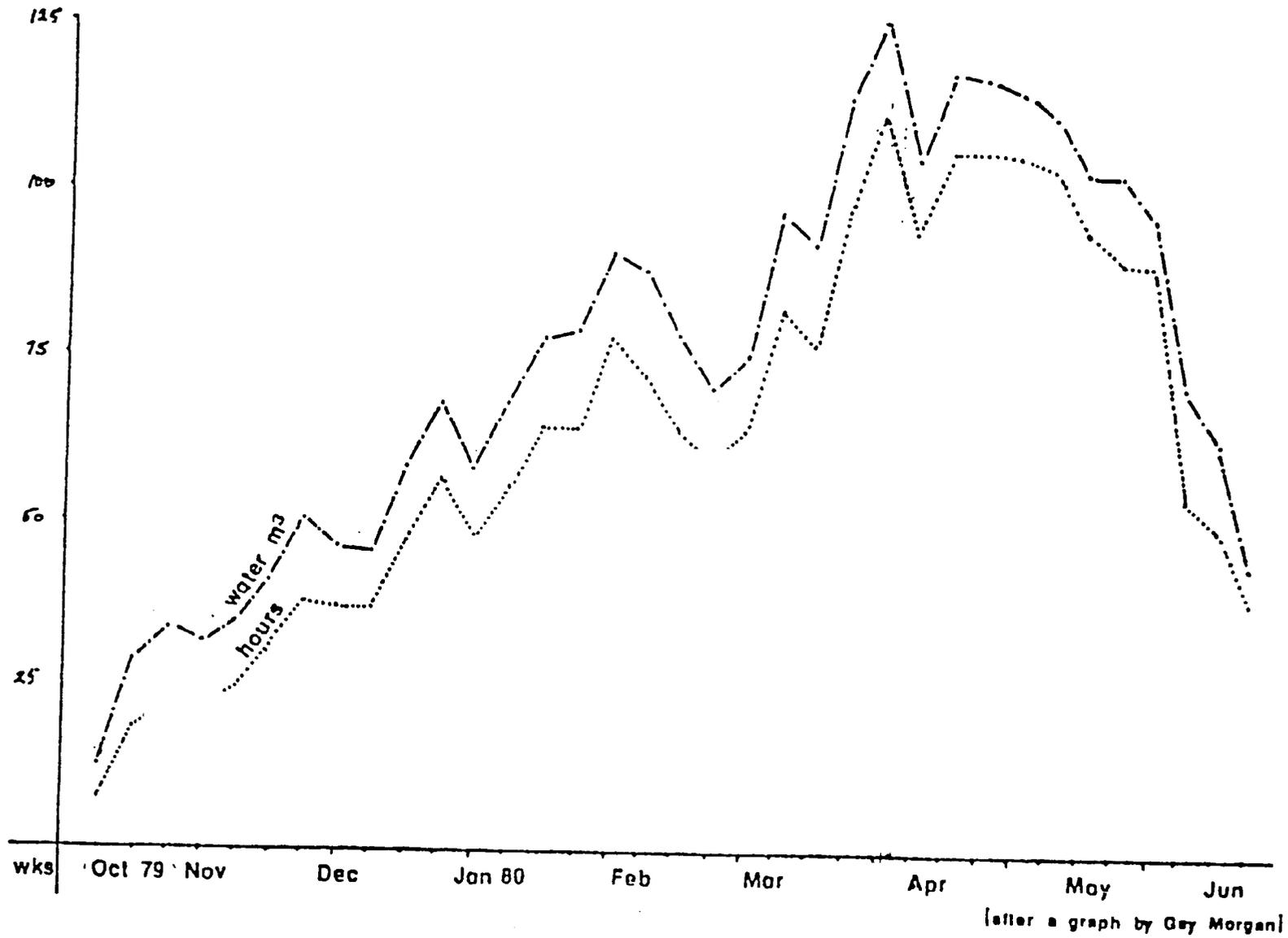


Fig. 3 - Station Water Quantities and Pump Hours

An analysis of station water use may be approached through two variables (viz., number of visits and quantities drawn, both per hamlet as units) and through a breakdown of uses by hamlet residents. Figure Four, based upon data collected roughly every week with a questionnaire devised during my October site visit,* reflects the same curve as Figure Three's, through the total number of visits to the station water system for these dates.**

To break down these same data according to the various hamlets of origin for those using station water, Figures Five and Six are presented. As the former dramatically shows, except during the peak months of the dry season, people of two hamlets (One and Two) make over ninety percent of all visits to the station well. Using a more inflated vertical scale, Figure Six completes Figure Five, indicating the origins and percentages for visits by persons from hamlets other than One and Two. Again, most hamlets are very weakly represented. During dry-season months, people of three (Five, Nine and Three, in order of use) comprise the major secondary users, with a few from others (Seven, Four, Eight) regularly, but more rarely coming.

Figure Seven, a map of Tangaye,⁺ makes sense of this. Primary station water users are those living in greatest proximity to the facility, while secondary ones live just beyond, but for the most part adjacent to these latter. Several hamlets are as close or closer than some of those of secondary users (Six, Ten, Eleven), but have important, all-season wells much nearer; and people employ the water of these instead. ~~Individuals from hamlets farthest from the station (Twelve through Sixteen) rarely, if ever use its water.~~ The distance is deemed too great, and women prefer to exploit whatever wells may be in their vicinity,⁺⁺ to making the arduous return journey carrying water.

* For examples of the questionnaires employed, see Roberts 1979:45-49.

** Two dates present difficulties throughout the analysis: March 26th, 1980, when the research assistant became ill and left the station without being able to find a replacement, and April 9th, when all work on the project was interrupted, the assistants requisitioned by Dr. David Sokal for a survey he conducted on the meningitis outbreak in the Tangaye area.

⁺ The original map (1:10,000) was paced and drawn by Pascal Leosso in November, 1979; the map mentioned by Hemmings (1978:18) was never made available to me.

⁺⁺ See Hemmings (1978: part VI) for a description of these other wells.

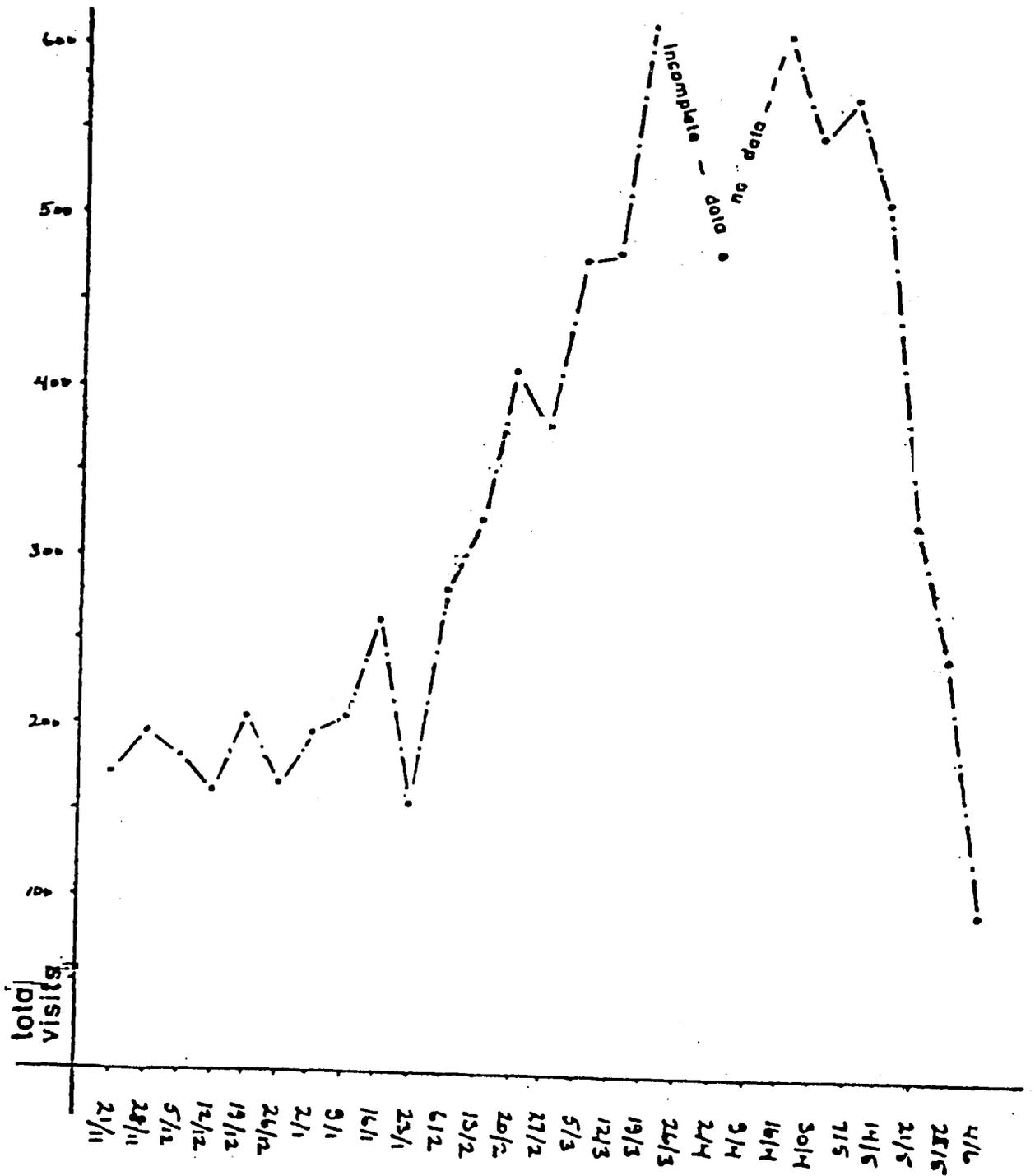
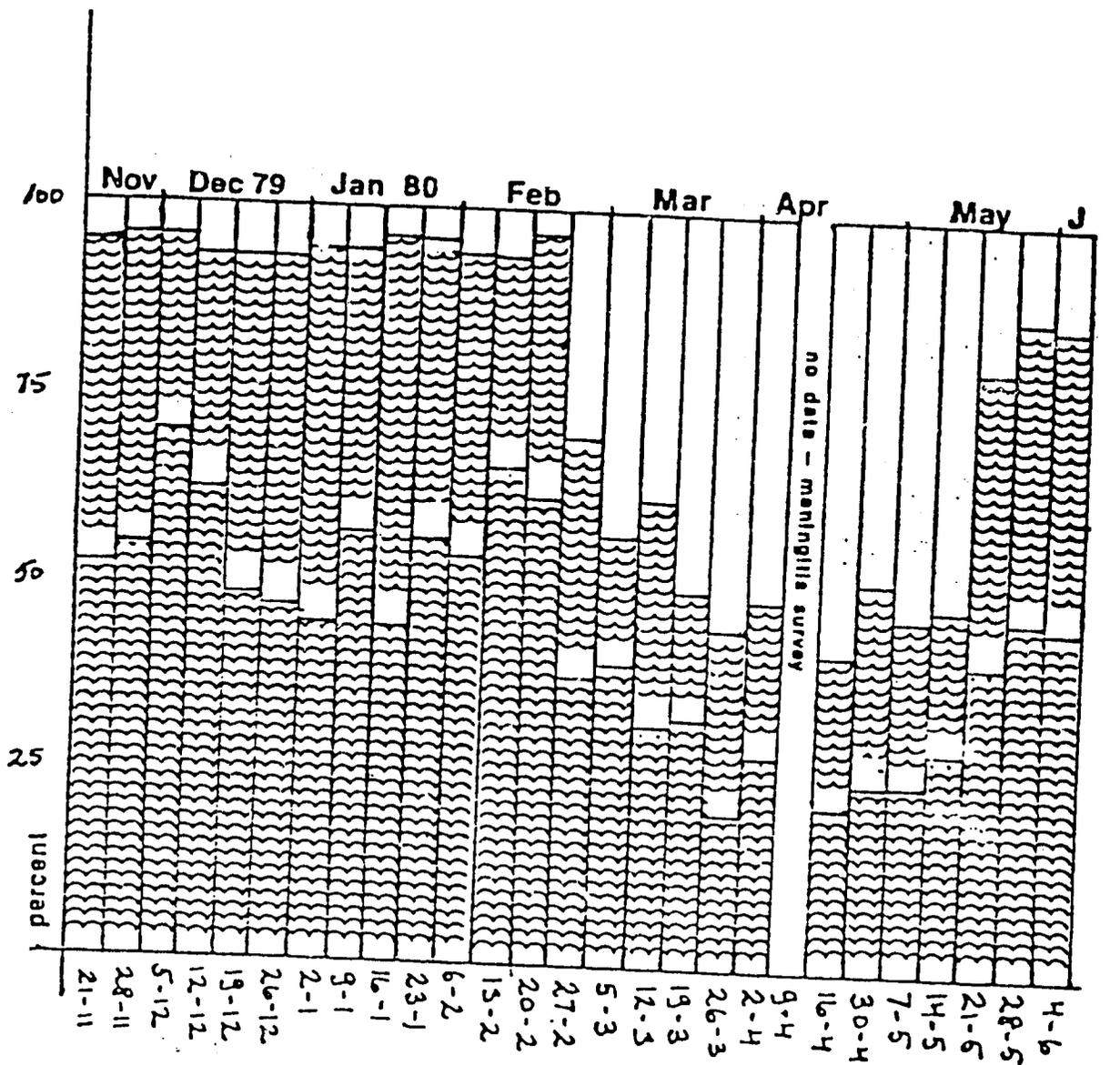


Fig. 4 - Dry-Season Station Water Use

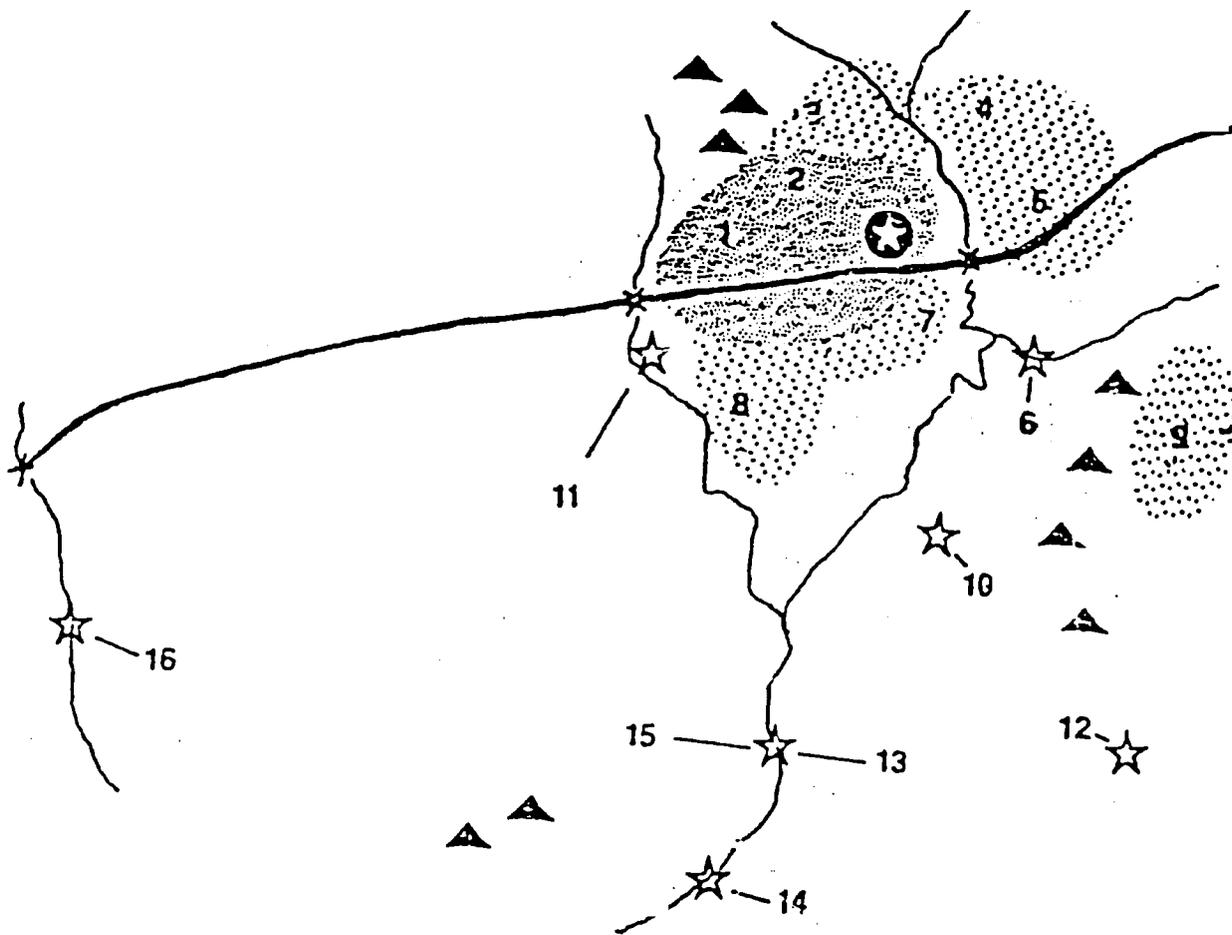


8674 total visits

~~~~~ hamlet #1

~~~~~ #2

Fig. 5 - Station Water-Use Percent



scale 1:40,000 cm

 Primary [wet & dry seasons]

 Secondary [dry only]

 Station Well

 All-Season Wells

Fig. 7 - Station Water Use

Proximity, then, determines station water use (Cf. Hemmings 1973:24; Roberts 1979:3-4).

B. QUANTITIES PER USE CATEGORY

Still depending upon data collected with the station-based questionnaire, quantities per sort of use may be computed. A great deal of effort was devoted to collecting these data; assistants were to work in shifts of twenty-four successive hours,* recording the names of all users, their hamlets, the quantities drawn, and the uses to which the individuals stated they intended or could be observed to put the water. Pascal Leossogo, overseeing this, happily took the initiative early-on to determine the volume of containers people brought, and to write on the outside with housepaint the corresponding figure; during the summer of 1980, the numbers were still readily visible, bobbing along through the six-to-twelve foot sorghum upon the heads of water-seekers. Whether or not a container was altogether full, how much was spilled, and whether there were "sixteen" or "seventeen" liters taken, were natural factors making any such measure approximative; nevertheless, Leossogo's innovation brought an added accuracy to the estimation of quantities taken from the station.

Uses for water were broken down into ten categories for the most part corresponding to those of Hemmings (1978:31).** These were "household" (menage), "bathing," "laundry," "garden," "small animals," "large animals," "miscellaneous tasks," "beer-brewing," "house construction or repair," and "watering the F.J.A. gardens."† The first seven of these represent "personal" uses, in that they provide profit more or less equally to all members of a household, or all members of

* This proved unnecessary, and the method was modified. The rains of the summer of 1979 were heavier than those of 1978, it is said. Whereas women came at midnight or later to obtain station water during the driest months of 1979, they generally stopped coming by 9:30 or 10:00 PM this spring. Alternate sources of water were available longer and to more women this year than last.

** Hemmings' categories referred to water use within the compound and not at the station water source as do these; "drinking" was combined with "household" uses, while "bathing" was made separate from this last.

† F.J.A. = Formation de

the household can be expected to engage in the activity (e.g. bathing) with a roughly equal frequency.

The first category, "household," is water taken to the compound for cooking, drinking, washing dishes, bathing, giving to chickens or household animals, throwing on whatever "kitchen gardens" there might be, seeing to household jobs or minor repair, and the like. In other words, there is an overlap of this with those categories listed here second through seventh. These latter are, for the most part, uses to which water is put at the station itself. People go there to bathe and wash clothes; they drive their animals there and do various odd chores such as soaking fibers to make rope.

Figures Eight through Ten show the quantities of water used by people of three targeted hamlets. In Figure Eight for Hamlet One, averages are indicated both for all months of the study, and for those of the dry season when persons from Hamlets Five and Nine came as well (as in Figures Nine and Ten). By dividing these averages by Hemmings' census numbers for each hamlet, a very rough quantity of water per person during these months can be determined. The approximately 197 people* of Hamlet One would use about ten liters per person during the key dry-season months, then, and about nine overall. The 141 of Hamlet Five use about nine and a half liters apiece during the months of their station visits. The 215 of Hamlet Nine, many of whom continue to use closer, hand-dug wells (in which more water per user is available, given the decision of some to use station facilities) fetch only about three and a half liters of station water per person. The numbers for Hamlets One and Five correspond to Hemmings' estimate of nine to ten liters of water per person used during the dry season (1978:22).**

* These population figures are approximate, given arrivals and departures, births and deaths during the entire study period. Time did not permit another census of all of Tangaye, although this was done for the targeted hamlets.

** These same figures of Hemmings will be discussed further in Section II.D.

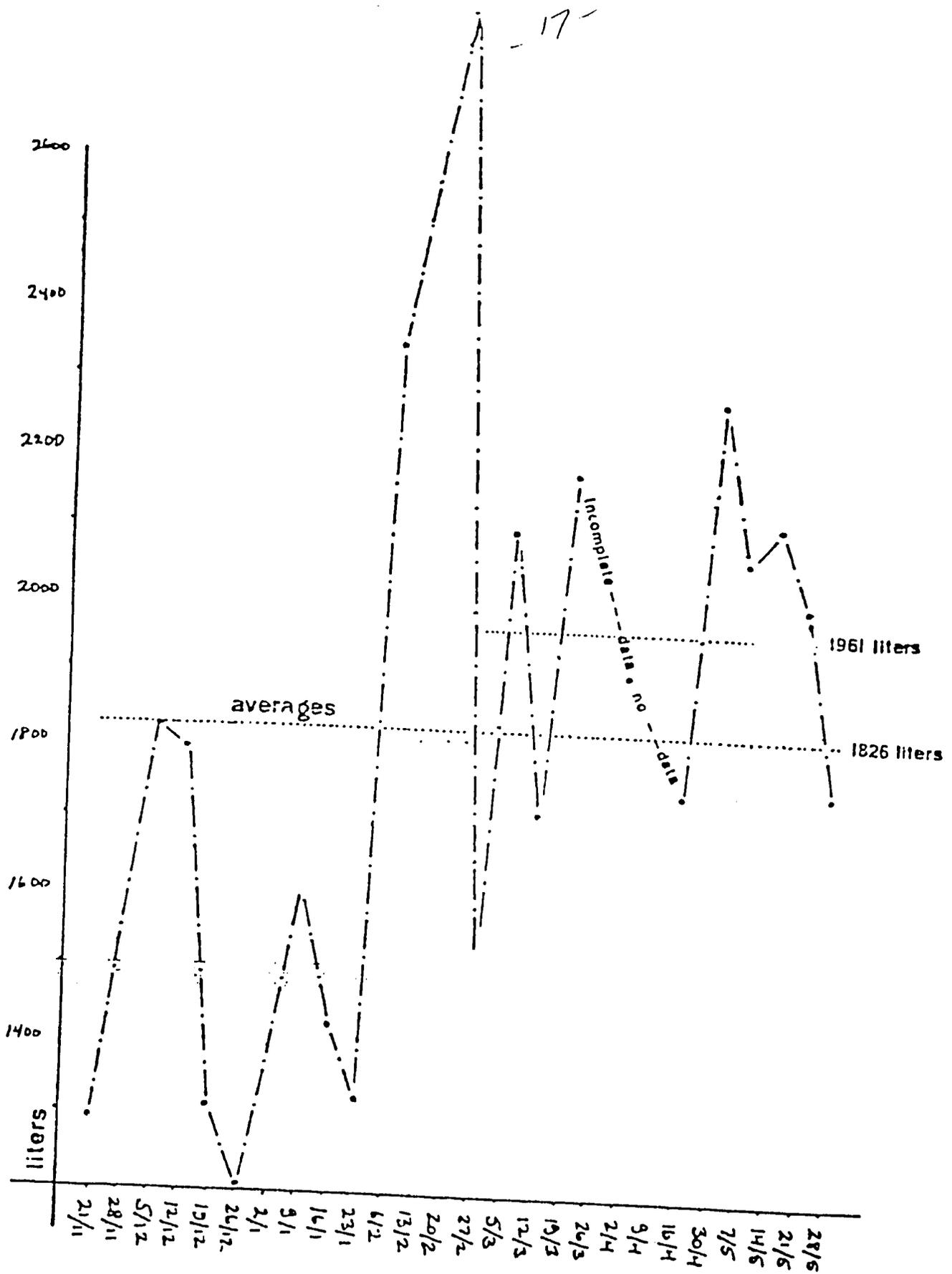


Fig. 8 - Hamlet no.1 Dry-Season Station Water Personal Uses At Home & At Station

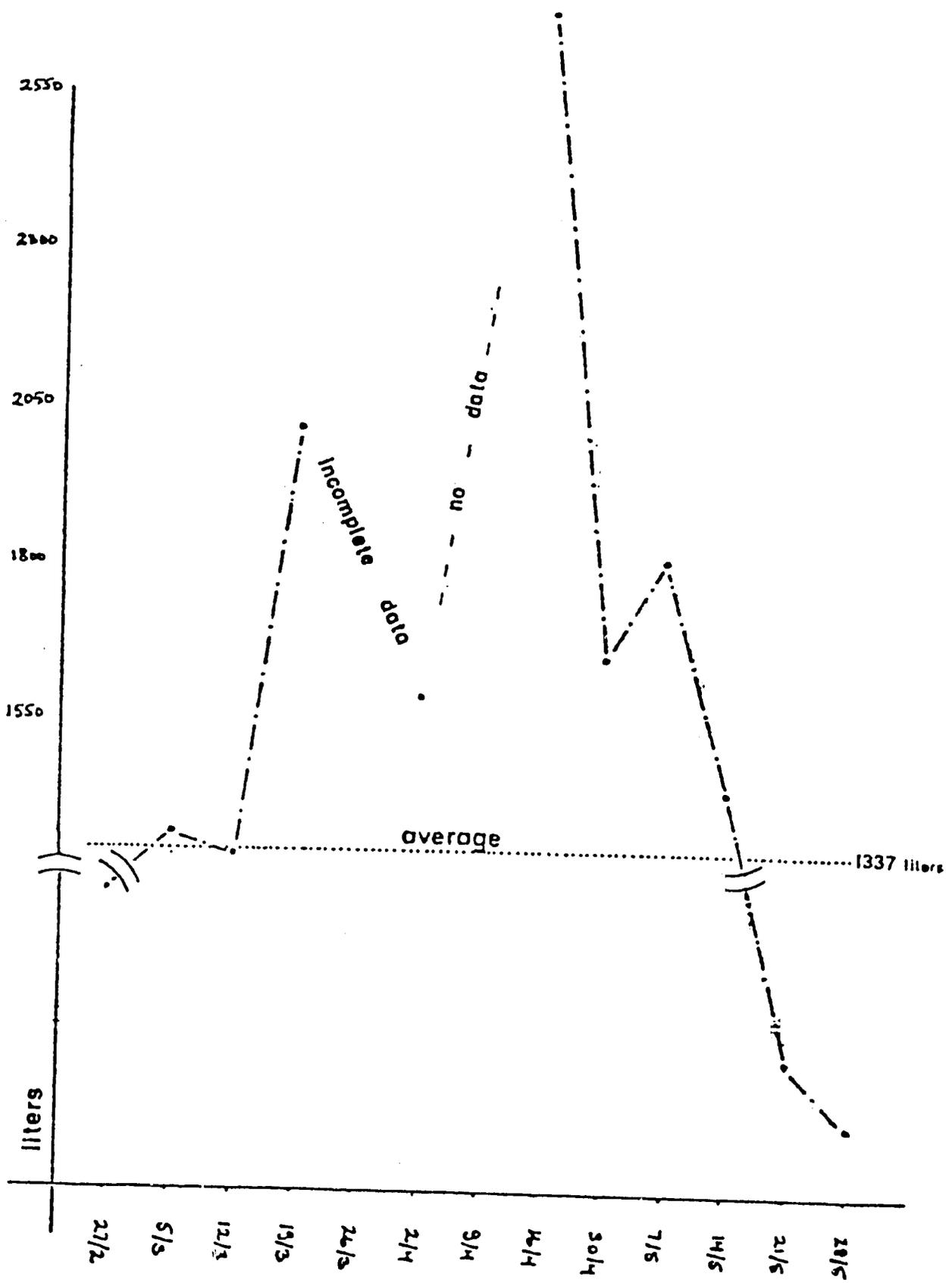


Fig.9 - Hamlet no.5 Dry-Season Station Water Personal Uses At Home & At Station

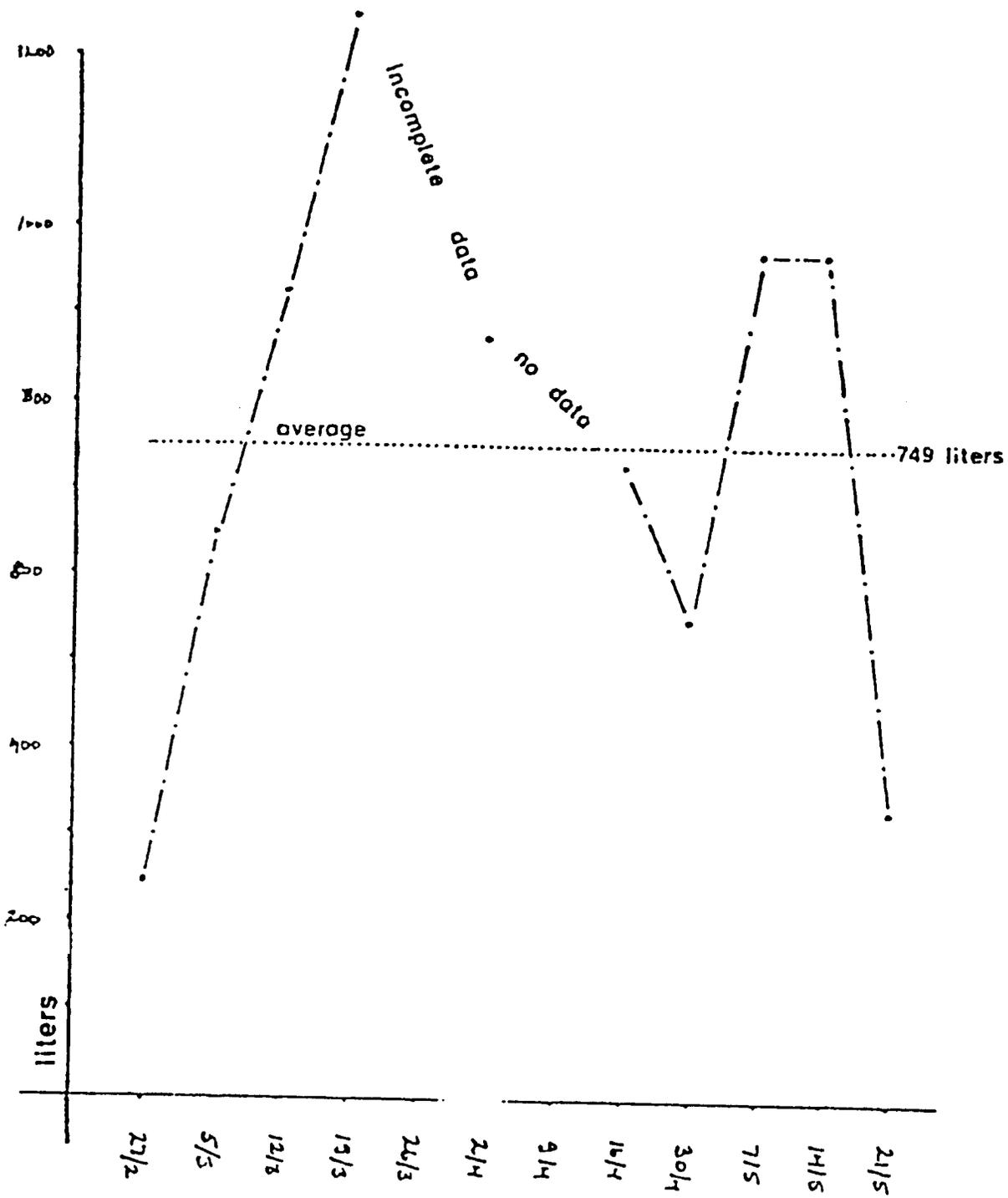


Fig.10 – Hamlet no.9 Dry-Season Station Water Personal Uses At Home & At Station

1. BATHING

More can be said about at-station water use, through the vehicle of Figures Eleven through Thirteen, and through observations made personally and by Pascal Leossogo.* Clearly, people from Hamlets One, Five and Nine enjoy bathing at the station. There to draw water for home use, to bring grain to the mill, or for any other good reason that may occur to them, they take a container of water off to the side and bathe themselves and often the youngsters accompanying them. The following passage recorded by Leossogo captures well the eloquence with which one old gentleman expressed his pleasure:

Pascal, lend me a bucket to bathe with. Really, here (at the station) it is easy to bathe, since there's always plenty of water. I've not bathed for three days, because at home (in Hamlet Eleven) after a long journey you're tired out, and to go to the streambed is not easy, it's dark and the bushes have frightening shapes at night! (Laughter). And in the compound, the women have only gotten water enough to cook with. If you want an argument with your wife, take some of her water to bathe yourself, and she'll tell you all your faults!! (More laughter). But here, the water itself makes you want to wash!

Another joked with Leossogo in the following manner:

Pascal: Hey, old friend, are you in such a hurry to bathe so you can see your little darling?

Old Man: Yes, you rascal, I have to be clean to please my wife, she insists on it. I no longer need someone to draw water for me, and it's fun to play with these little things (the short section of hose attached to the faucet - this a ribald reference). Now we're cleaner than those people in Dore (Hamlet Three), since we wash daily and some of them can go a whole week without doing so! My wife and children no longer need to beg to bathe! (Laughter).

Water carried long distances for bathing is a labor luxury few can afford or permit themselves frequently.

* Leossogo's notes were recorded at the time in a notebook maintained over the research months at my behest.

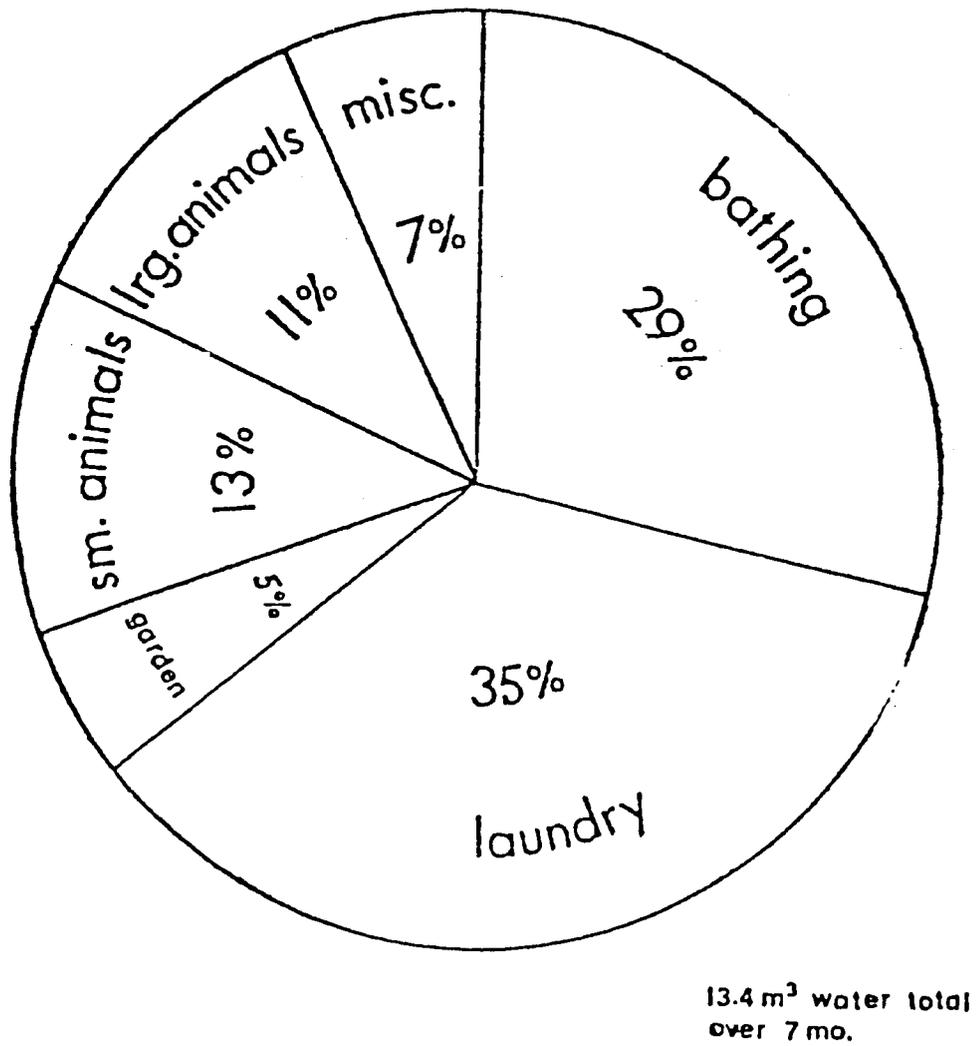
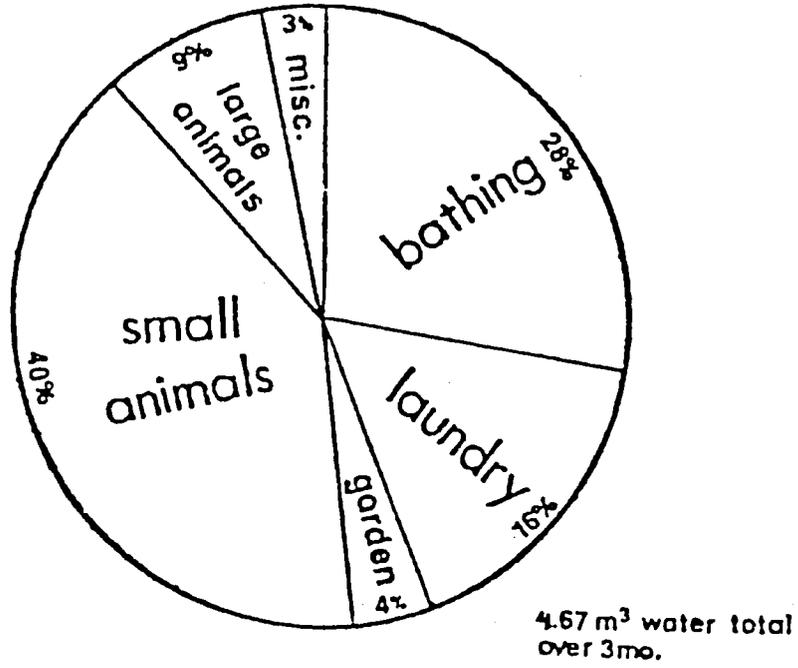
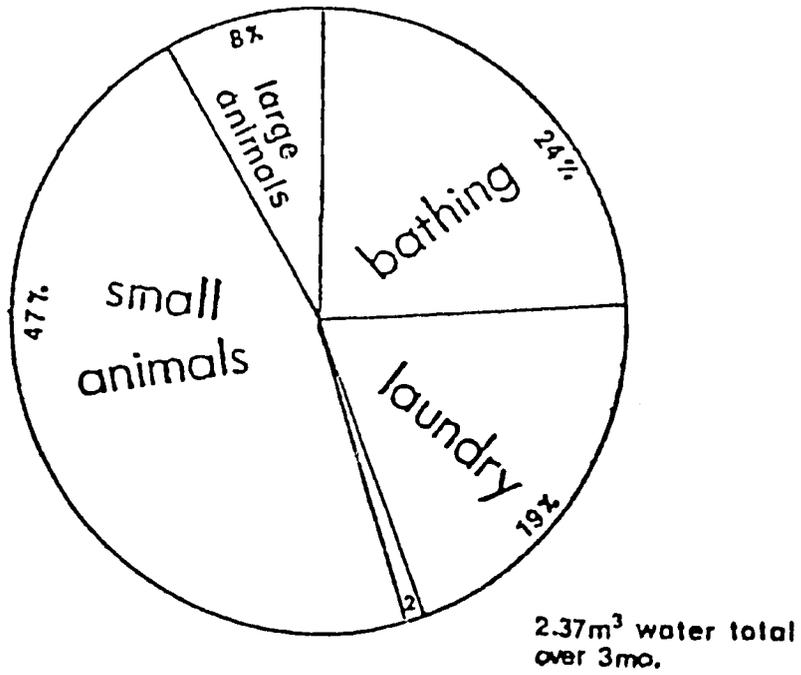


Fig. II - Hamlet no. 1
Dry-Season At-Station Water Use



Hamlet no.5



Hamlet no.9

Fig.12 – Dry-Season At-Station Water Use

When Figure Thirteen is consulted, it is clear that people depending upon other wells than that of the station do not use as large a proportion of water drawn there for bathing at the site.* In other words, as could be expected (Cf. Hemmings 1978:25), those using station water tend to bathe more frequently, and many of those not using the water for household tasks, still come there to bathe.

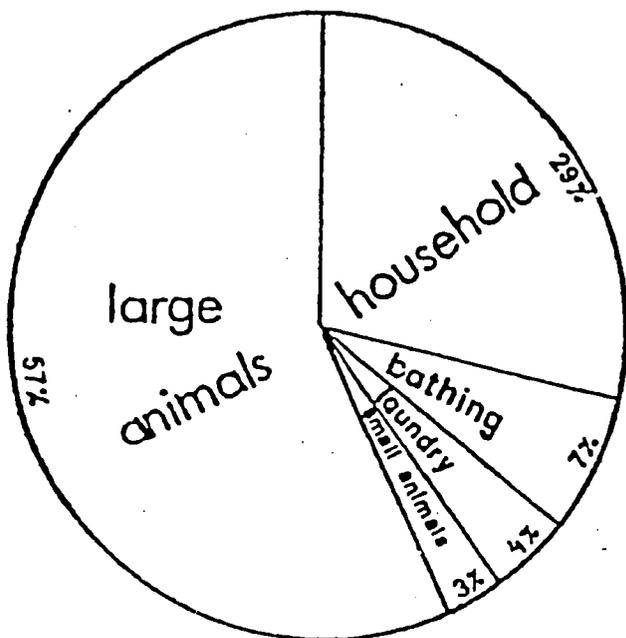
2. LAUNDRY

Washing clothes is another important at-station task in which it is easier to bring the activity to the water source, than it is to carry the water elsewhere for the activity. Pascal Leossogo's notebook contains a relevant passage showing his own flair for prose:

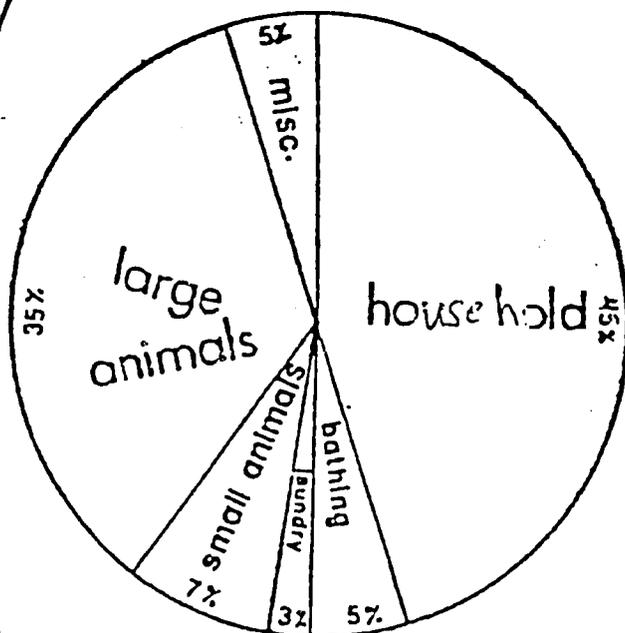
Ah yes, almost every day women, men, girls and boys come, sometimes from far away (Hamlets Eleven, Nine or Three being cited by name), to wash their clothes at the station. On the eve of holidays, the station becomes a veritable laundry (pressing in Franglais). From morning till evening, they are there basking in the fierce sun, their skins glistening; they wash all their clothes until the last rag. It's easy, it's good, it's warm (or friendly, chaleureux), it's agreeable to be among them. Children attracted by this friendly meeting seek dirty laundry at home to take part in the crowded laundry session. They wash clothes for the pleasure of it, because they want to, and not necessarily because the clothes are dirty. An old man told me I should ask them to do their washing farther from the station well, since they bring the last rag in the house to wash! (and are thus in the way).

This touches an important aspect of water-drawing that will be discussed at greater length below: the social. The importance of washing clothes as an at-station activity, compared to its lack thereof at other wells, is shown in Figures Eleven through Thirteen.

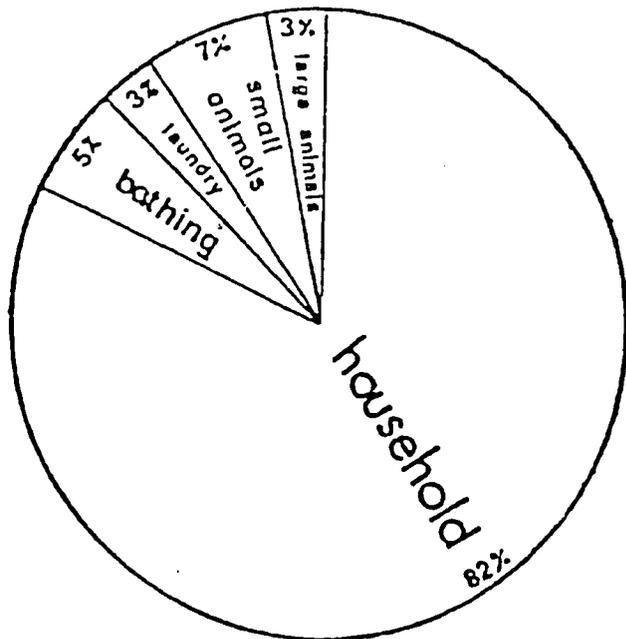
* Even when percentages are calculated without the category "household," the resulting figure for bathing is only three points higher for the wells of Hamlets Ten and Eleven, while that of Hamlet Twelve remains the same. This data was gathered using Hemmings' questionnaire, "Well Use."



Hamlet 10



Hamlet 11



Hamlet 12

Fig.13- Dry-Season
Wellside Water Use
Beyond Secondary Sphere

One can surmise, then, for cleanliness and for fellowship, people using station water may wash their clothes more often than do those depending upon other wells; and people not using station water for household purposes, may come there nonetheless to do their laundry.

3. GARDEN

This category refers to water drawn for kitchen gardens or, occasionally, for fruit trees. The charts reveal that relatively little station water is specifically drawn for this purpose (and none at all is from other wells). The importance of kitchen gardens was over-emphasized in the October report (Roberts 1979: 8-9); impressions then were influenced by the literature on Mossi groups of the Plateau and elsewhere (e.g., Skinner 1964, Hammond 1966). While women do grow tomatoes and chili peppers in protected areas around the straw fencing of their yards, this is a late rainy-season activity; water once-used is probably thrown onto such patches to prolong the plants' lives as far into the dry season as possible. Okra is grown in the cornfields, as are vegetable leaves. In the hollows near streambeds (bas-fonds in French) are protected gardens, yet here too, usually only manioc and perhaps a few yams, chilis and "African tomatoes" (a solanaceous fruit halfway between a tomato and an eggplant) will be grown. Vegetable gardening, then, does not seem to have the significance among the Zaose that it may among neighboring peoples.

~~SMALL ANIMALS~~

Small domestic animals - sheep and goats - are tended in flocks by youngsters during the dry season; and often, at least the adults are tethered during the rainy, to prevent unwanted incursions into gardens and fields. The same youngsters then go to help their parents in agricultural work. At times children too young to be of any significant assistance in the fields, are sent to tend the animals in the wet season as well, particularly if there are both many children and many animals in the family. It is often boys who drive the flocks toward watering places, either the shallow wells in the streambed, or

later in the dry season, to wells where water is drawn for the animals.

A comparison of the graphs of Figures Eleven and Twelve indicates that of station water used by inhabitants of the three hamlets, a greater percentage is given to small animals by persons of outlying hamlets than is by those from Hamlet One, whose compounds lie closest to the station. This does not mean that more animals are possessed by the former, or that more water per animal is consumed; but simply that an easy and logical way to procure water for the flock is to bring the animals to the source, in this case the station faucets. Those living about the station use more water from its tank, and may carry water the short distance to where animals are penned. In Figure Thirteen, it is clear that relatively little water is drawn from wells for small animals in comparison to that given large ones. An explanation might be that the easily-driven sheep and goats are often brought to the station source, where the water need not be drawn, and where the gathering of friends and relatives makes the place one of constant merriment. Other people exploit the sandy streambed (a water source less well defined than wells) for animals of this sort.

5. LARGE ANIMALS

In Figures Eleven and Twelve, the category "large animals" is restricted to each hamlet's share of the sixty or so donkeys and the several horses of Tangaye. Cattle were brought to the station during the months of plentiful water, but Leossogo decided they required too much water and that their arrival in the confines of the station yard was too disruptive, to allow their being served beyond November of 1979. Donkeys and horses are easily - and singly - ridden by men or boys to the station to be watered, on their way to or from other labor or the compound in the evening. In Figure Thirteen, on the other hand, cattle are included and account for the largest percentage of total water, since three cubic meters or more may be drawn daily from a single hand-dug well for this need.*

* On cattle water needs in Tangaye, see Hemmings 1978:22-25.

Some of the major cattle wells are those just to the north of the station, or the ones of Hamlets Ten and Eleven (Figure Thirteen). Women now use station water who may have secretly drawn water from wells in the absence of the herders who had dug them. Running conflicts between women and herders used to result (Hemmings 1978:20). It is the impression of informants that there is less social discord of this sort with a reduction in competition among those obtaining water - for household needs or for cattle - in the vicinity of the station. Disputes were again reported, however, in outlying hamlets; we were told that women stealthily drew water in the dead of night when cattle wells are unwatched. This practice was doubly lamented, since the serpent "children" of the well-inhabiting earth spirits may be encountered accidentally, with grievous result.

A final word about the watering of large animals may be added here. In the mid-term assessment (Roberts 1979:11), the question was raised as to whether the easy availability of station water might not attract cattle-herders to exploit this resource, which in turn might prove detrimental to the water table and to the delicate dry-season ecosystem. By banning use of the station water for cattle, this matter was ostensibly solved. A secondary issue remains in the possibility that freeing cattle wells around the station for unique use by herders, may prove individually beneficial (more water per beast), lead to a growth in herds (more born, less dying from dry-season rigors), and finally bring about an over-taxing of the ecosystem after all.

A cattle survey was conducted - no easy endeavor in early September when one can hardly find one's path through the marshy valley and among the twelve-foot sorghum stalks, let alone small herds of cattle (averaging seventeen head) deliberately kept out of sight in the scrub beyond cultivated lands. Their owners camping beside distant fields are equally difficult to contact. Twenty-three of twenty-six herds were counted or their numbers reported. The 336 head at the end of 1979 were increased to 408 in September 1980, an apparent increase of twenty-one percent. Both figures are in the neighborhood of the four hundred estimated by Hemmings (1979:9), especially if adjusted with the

fifty-one hypothetically in herds not counted (three times the seventeen head per herd average). Births appear the same (forty-six in 1979, forty-three so far in 1980), while deaths were halved (fifty-nine in 1979, twenty-three in 1980). Seventeen were sold and fourteen butchered in 1979, while only one has been sold and four butchered this year; two were purchased in 1979, six in 1980. It must be recognized that these may be inaccurate figures however; the research assistant was told by one man that he had only five head, while the former then observed his herd and counted eighteen. Fears of taxation preclude honesty (Cf. Hemmings 1978:9).

Conditions do seem more favorable for cattle this year than last. It is too soon to know whether there are any trends here of longer term than this, however, since other factors are undoubtedly more important than has been the presence of the station over the past year and a half. An epizootic of what was probably anthrax (characterized by black, spongy meat) struck in 1979; three-score died, and others were sold as quickly as possible.* Furthermore, the rains of the 1979 wet season (available in the dry of 1980) were more substantial than were those of 1978. The rains of 1980, too, have been abundant, and there has been no anthrax at Tangaye; perhaps this will be another good year for cattle.

6. MISCELLANEOUS TASKS

This final sub-category of personal water uses is composed of such chores as the soaking of fiber for rope-making, of straw for fence-weaving, and the like. Since the quality of the water has little influence upon such (i.e., it can be perfectly fetid and still serve the purpose adequately), it is likely that rather than walking to the station to fetch water or than carrying heavy supplies there, many choose to use water remaining in the wells or other sources already dried down, contaminated by debris, and deemed unfit for other consumption. Also within this category are other infrequent tasks such

* It is not that people are unaware of the dangers of this murrain. It is well remembered that in the late 1940s a French veterinarian had Tangaye cattle slaughtered and buried because of the same disease; village inhabitants are said to have exhumed the carcasses, to have eaten the meat, and to have nearly all died as a consequence.

as the making of shea butter, which, as an in-compound activity, might but for its relative insignificance, been included elsewhere.

7. HOUSE CONSTRUCTION

Illustrated in Figure Fourteen (with "waves" in the lower portion of the bar graph) are the quantities of water used by Hamlet One residents for house construction on the survey days. This activity shows a seasonal curve. Data for Hamlets Five and Nine, — not shown here, also produce similar curves, but with much less significant figures, again due to the fact that water to be mixed with earth for brick- or mortar-making need not be clean or otherwise of the quality desired for other household uses. Given the considerable quantities of water required in house-building and the necessity to make bricks as close as possible to the construction site, men will opt for whatever water is nearest.

Leossogo has recorded the complaints of people living in more distant hamlets, that those around the station are spoiled by the ease with which they can procure water for building. He also noted the various circumstances of house construction in the hamlets around the station, the number of bricks made, and the provenance of the water used. Many of those people depending upon station water for household uses exploited such wells as that at the foot of Pi'Mongo, the rocky outcropping to the north of the station, for building needs.

Reasons for building range from a desire to replace a house crumbling from past years' rains; a need to house a son back from working in Abidjan; a need for more sleeping space for children growing up within the compound; the taking over and rebuilding of a compound by an adult son at the death of his father; a decision made by father and son that the latter should create a new compound so that each can profit from the added space and the near fields manured by domestic animals; a need to replace a house hastily made of straw fencing, ith one of mud bricks; a decision to move a compound from a place marshy in the in the wet season, to one remaining dry throughout the year; and the like. None of these is capricious, or in any way out of the ordinary.

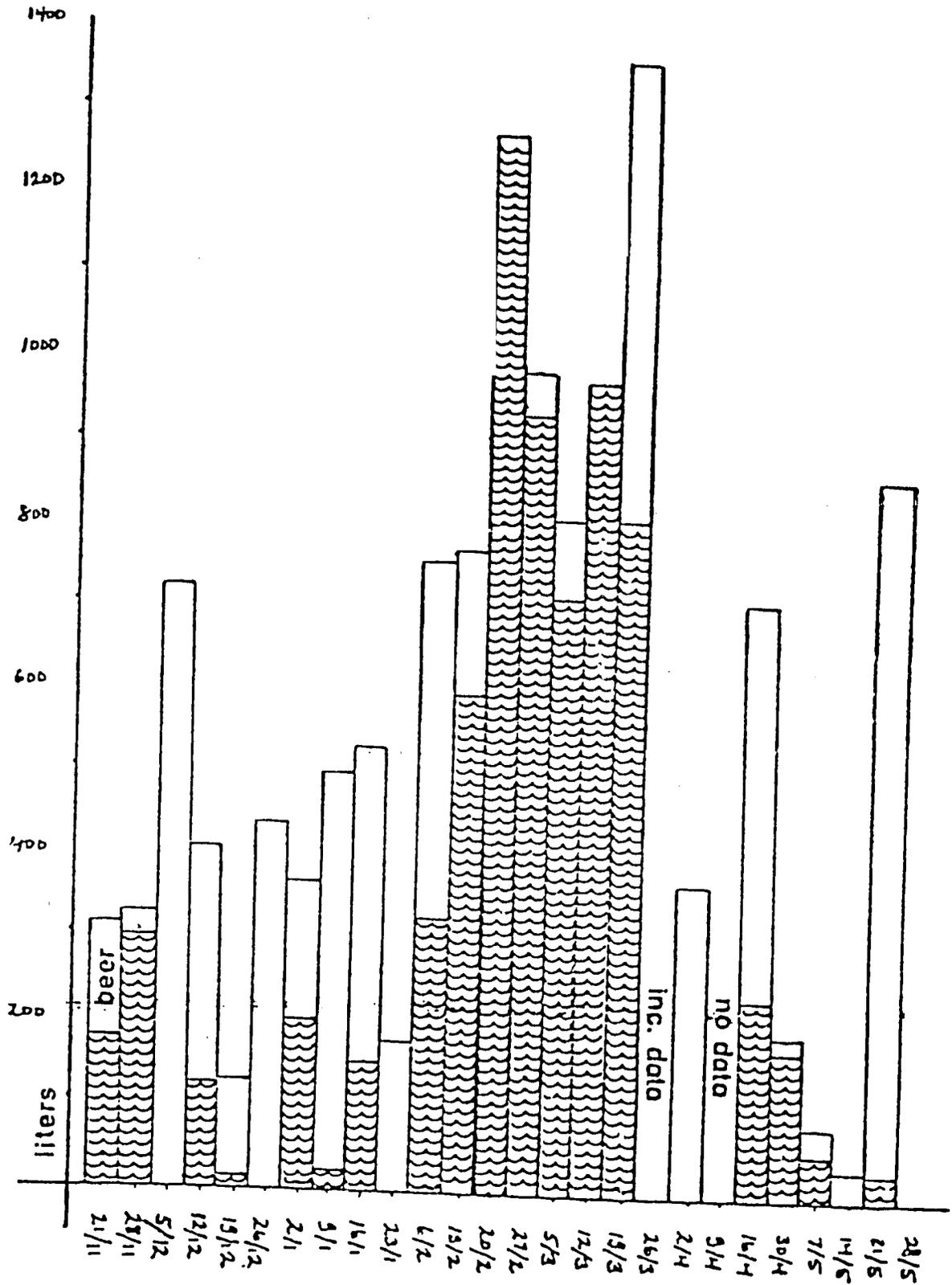


Fig.14 - Hamlet no.1 Dry-Season Station Water Construction and Beer

On the other hand, it is easier for people in hamlets surrounding the station to procure water for building, either from the station itself, or from wells less-used nowadays by women preferring the station faucets. A decision to build, then, is facilitated in direct proportion to this ease of water-drawing. It is likely - but a trend possibly identified only over a number of years - that the hamlets around the station will receive more house construction than those where obtaining water during the dry-season building months never ceases to present problems.*

8. BEER-BREWING

Figure Fourteen also indicates (with the clear, upper portion of the bar graph) amounts of water drawn for brewing dolo beer on the survey days. Whereas house construction shows a seasonal curve, beer-making does not: The beverage is always popular!** That substantial quantities of water were drawn for brewing on the observation days does not mean a great number of women were engaged in this ac The process requires large quantities of water, sometimes several hundred liters over the course of eight or nine days' brewing.⁺ More will be written about beer-making in Section III.D.3, on the uses of time freed by exploiting station resources.

C. A FURTHER WORD ON OTHER WELLS

Figure Thirteen, mentioned above, illustrates the breakdown of water-use at three different wells - very different indeed, one from the other. Looking back to Figure Six, inhabitants of Hamlets Ten and

* The lack of probability that any - or at least many - will choose to move from outlying hamlets to within the vicinity of the station because of such convenience, is discussed at length in Roberts 1979:36-39.

** Certain activities for which beer is regularly prepared, such as agricultural work parties, are seasonal.

⁺ Thirty-six hours are needed to soak the sorghum, that is then allowed to germinate over another full day and a half. The sprouted grain is dried for three days thereafter, then stone-ground and soaked for a few hours before cooking for a first three hours; it is then allowed to cool overnight. It is filtered of its sediment the next morning, and cooked all day, then allowed to cool an hour or so; yeast is added and it is allowed to ferment overnight. The beer is then ready next morning.

Eleven regularly - if infrequently - use station water, while those of Twelve rarely if ever do. The well of this latter hamlet is one of the few in Tangaye to be improved (deepened and cemented), in this case by an agency called Freres des Hommes, in 1978 (Hemmings 1978:18). It is dependable throughout the year, serves the sort of purposes and is used in much the same way as is the station source; that is, primarily for household needs. The wells in Hamlets Ten and Eleven, on the other hand, are hand-dug and are maintained by cattle herders who use them to water their animals. In such areas, as Hemmings has described well (ibid.: 20-21), women must use both their backs and their wiles to obtain sufficient water during the driest months, at whatever place and time possible and/or necessary. Well-side activities are much reduced under such conditions (as they appear to be at the Hamlet Twelve well, where the need for household water is too great to allow such luxury). The possibility for self-indulgence at the station must increase in direct proportion.

With the installation of the station water system and the subsequent development of its use patterns, one might wonder if certain wells, the less convenient, less adequate and more dangerous (due to slippery banks and cave-ins) might not be abandoned. This does not seem to be the case, although some, such as the nexus of wells in the eroded gully to the north of the station, do show something of this. (as was mentioned in passing above). While women from Hamlets Two and Three used ~~these, in the past, now the shallow wells have been more~~ or less left to the cattle herders disallowed from station use. Each well has a rim built up with laterite and reinforced with crude staves; below and outside the lip is a channel leading to a shallow pan built of laterite. This latter scabbly substance becomes so sun-baked as to hold the water poured into the pans for the cattle to drink. Such wells may have become more specialized in their uses, but have not been abandoned.*

* The one well which has been abandoned is one across the road from the station, in which an epileptic woman drowned one night last winter. Once an all-season well, it has been filled in with earth and debris, partly from chagrin, partly from fear of her rancorous ghost.

A questionnaire was devised by Hemmings for gathering information on the use of these wells. While it provides spaces for describing water-use (and I added one for quantity of water drawn), it unfortunately has none for noting the hamlet or compound identity of the users. It is therefore impossible to discuss further who it may be that seeks water at these other wells,* except to state the obvious: People who do not use station water, must go to whatever other wells there are. Beyond the spheres of primary and secondary station water use (Figure Seven), patterns studied by Hemmings in 1978 have had little reason to be changed, except as outlined above (i.e., shepherds coming to the station, people bathing there, and the like).

D. WATER USE IN THE COMPOUND

While the above has been fairly straightforward, the matter of water use within the compound is more nettlesome. In order to determine whether patterns of use and quantity might change in the families of those using the station as opposed to those who do not, Hemmings created a questionnaire called "Water Use in the Compound." On the form, every time someone within the compound under observation used water, his/her sex and age, the source of the water, the season, the activity or purpose to which the water would be put, the quantity taken, and the "time" (temps) would be recorded. I made no changes in this questionnaire during my visit in October 1979, although overall I did request that assistants remain in the compound a full twenty-four hours to record activities (specifically water fetching and use) prior to or outside of the hours covered by Hemmings in her baseline study.** A number of problems were to nullify the usefulness of this questionnaire.

* Similarly, in Hemmings' detailed observation charts (1978:73-77), no mention is made of what is being observed - that is, which well, in which hamlet; whereas her figures allow one to know the percentage breakdown of sex and age of those fetching water and the time of day they do this, no comparison with the same well from later data is possible.

** Hemmings mentions that a women's water procurement schedule was discussed in a preliminary report (1978:22); unfortunately, I was never able to consult this valuable document.

1. TIME SPENT AND/OR SAVED FETCHING WATER

The first problem concerns the entry "time." An issue the significance of which outdistances the particular research project at Tangaye is whether or not time women spend seeking water - long hours per trip, during the dry season - might not be saved by providing more readily-available water, such as that of the station. Presumably, this time might then be spent in other productive pursuits. Hemmings included an entry on her "Water Use in the Compound" questionnaire for "time," in the hope that a one-variable comparison would be possible between women using the station water system, and those relying upon ordinary wells. The complicating factor was in part her choice of the word temps to elicit such information. While on a different questionnaire, she included the phrase "temps commence - fini consommation" ("time begin - ended [sic] consumption") indicating more clearly her desire for information on time span, here she wrote only "temps." This French word connotes either duration or moment; the research assistants - whose French is not perfect - interpreted the term in a restricted sense of the latter choice. The hour people went to get water was recorded, without noting the corresponding hour the task was completed, necessary to determine how long the task took to accomplish. An honest error on everyone's part, to be sure; but one obviating all possibility of determining differences in time spent obtaining water from various sources.

The other questionnaire composed by Hemmings, "Division of Labor," might have provided data on duration of activities, water-fetching included. Sadly, it has a similar defect. While the various hours of the day are given space on the questionnaire form within which the assistant would note all activities, no idea of length of time spent on them can be obtained. If it is indicated, for instance, that at nine, ten and eleven A.M. a woman sought water; does this mean she was gone on the one trip from 9:00 till 11:59 A.M. (three full hours), or from 9:59 till 11:01 A.M. (one hour), or did she make three separate trips of short duration, once each hour? After months

of questionnaire work, an assistant can hardly be expected to recall what he meant on that particular occasion.

Nothing but the obvious can be stated, then: The function of time versus distance traveled may be computed, to determine what time is saved or lost by people going to the station instead of to other sources farther or nearer. In terms of energy spent in carrying water, conservation is a product of proximity; Hemmings has estimated distances from hamlets to nearest wells and to the station, and presents a comparison of these (1978:83-84). As noted above, for most household uses anyway, women allow proximity to take precedence over all other factors, all things being equal. It is not possible to determine from data at hand how long it takes to draw water once at its source.

Again about time spent and/or saved in water-fetching, one must beware of attempting to determine such by assuming that the sole purpose of "water-fetching" is fetching water. Two seemingly anomalous findings from the station water-use survey allow an understanding of what is meant here. When going over the questionnaire forms I noticed that frequently there would be a long run of women from one hamlet at the station taps, to be followed by an unbroken run of women from another hamlet, before any from the first returned. What proves to be a related observation is that as is shown in Figures Five and Six, significant numbers of people from Hamlets Nine and Five very suddenly (first noted on our survey day of 27 February 1980) began using station water. Untrustingly and unfairly, I assumed at first that these were both functions of a lack of dedication by the research assistants, since both could be explained by their not paying attention to what they were doing, and writing down and repeating any hamlet number in the first case, and not noticing the more gradual swing to station water use in the second. This unwarranted assumption was happily corrected by a realization of the social nature of water-fetching.

In the first case, women taking the walk to the station wait for their hamlet fellows with whom they enjoy joking and gossiping along the way. Once all are ready and have left, if they encounter "strangers"

(as they call them) from other hamlets already in possession of the taps and space more generally, they often retire till these others leave, to return thereafter. Obtaining water, then, for women in particular (since a child might be sent for a small quantity if needed quickly), is not the only reason for going with a pot on one's head to the station. On the way, the prospect of talk and laughter presents itself; once there, one can bathe or wash laundry, and joke further, both with one's companions and others who may be passing by; the return, too, is made the more agreeable in company.

This in turn explains why women from outlying hamlets decided so suddenly, it seems, to come to the station: not so much because the remaining water nearest home vanished (although it was clearly becoming in short supply), but that finally enough women agreed that the long walk would be more worthwhile - together - then continuing to seek what little was left locally. Water-fetching, then, is not merely a pragmatic or functional task; women do not rush about like automatons seeking water as quickly as possible so as to get on to the next productive chore (thus providing the researcher with the laboratory situation necessary to accurately measure change in time spent). Even if time is saved in not having to go so far or to wait so long beside a hand-dug well for the slowly-dripping water to fill one's vessel (in itself a not-altogether-unpleasant task, for the same social reasons); it may be that more time is spent socializing, bathing, and doing the like, to use up that time saved, perhaps quite unconsciously. The water source ~~then, is an important social focal point;~~

2. WATER-USE BREAKDOWN

The next problem concerns the quantities used for various household tasks (cooking, drinking, washing dishes, and the like). Bemmings' questionnaire "Food Preparation Morning/Evening" directed assistants to note quantities of water used in the various stages of cooking, which they did with great precision. Unto themselves, these data are irrelevant to the overall problem, since if certain limits of not-enough and too-much water are exceeded, the dish changes in

definition. A tô polenta is no longer one if it has so little water that the flour is not moistened thoroughly, for mixing and cooking properly; or if it has so much as to become a watery gruel, which has a name of its own (beñre). Differences in quantities of water used in cooking (disregarding such personal or seasonal preferences as for more- or less-firm tô), then, are a function only of differences in quantities of food, the raw available for preparation, and the cooked produced from it.

Moreover, it became clear once we had completed initial sorting and computations, that something was sorely amiss. When a certain number of people of all ages, sizes and labor capacities were found to drink an average of thirteen liters of waters a day, the difficulty was undeniable. Alerted, other anomalies were detected. Upon questioning the assistants about the manner in which they had conducted their in-compound surveys, the explanation was simple, and bespeaks not only the defects of this particular questionnaire, but of a methodology highly dependent upon untrained, unwatched research assistants' use of questionnaires in the first place.

Water, as we all know, is transparent, formless and odorless; it is impossible to recognize one lot of it from another, except by its container. When assistants saw someone bringing a twenty-liter bucket of water to the compound, they would ask for what it was to be used, and duly record the answer ("twenty liters for X"). When, some time later, an individual would appear with a ten-liter calabash of water saying he was going to drink it, this too would be recorded. Later still, when a child came around with a five-liter bowl of water to give to her mother to soak beans, this would be noted, as it would when a two-liter dish was set down for the sheep to drink. Many compounds are large places, the interior yard a complicated jumble of granaries great and small; chicken coops; mammoth over-turned pots; platforms of various sizes, heights and sorts; a shade tree or two; sometimes a central, open-sided grinding hut; and all the other paraphernalia of an active, largely outdoor life in many stages of use and disuse. One person, no matter how astute an observer, can hardly see and know all that

happens there. The various quantities of water described above might well be different, but were they different water? Was not some of the water ("ten liters for drinking," for instance) not sipped and set aside, the remainder to be picked up at another moment by another soul for another use? The same water was recorded any number of times, as it was divided up and sometimes reused for different tasks by people all too familiar with the pains of obtaining more of the precious stuff to use it frivolously. While the person did drink of the ten liters, then, he certainly did not drink all of them although his act was recorded as if he had.

This accounts for our finding that people were able to drink an average of "thirteen liters" of water a day without becoming bloated! It also invalidates any estimates of quantities of water used for various activities within the compound. Since the questionnaire devised by Hemmings appears to be the one she herself used for her baseline analysis, one wonders as to the importance of this same source of error in her findings as well; unfortunately, she neither discusses, nor indeed mentions, the possibility of error.*

The above leads to several other sticky points. Earlier, when discussing the rough estimate of water used per individuals from Hamlets One and Five, it was said that the nine-to-ten-liter figure for a dry-season average corresponded nicely with Hemmings' own finding on page twenty-two of her report. On page sixty-four, however, rather than nine-to-ten liters, she states ~~without explanation of the change~~ that the dry-season average is ten liters per person; on page sixty-seven, this becomes twelve liters per person; and on page seventy-two, a more elaborated list of figures is presented, with a range of averages for the season (absurdly carried to centiliters) of from 3.93 to 12.59 liters per person. No explanation is offered for why these figures vary so, or for why it is important to know that they do. Before such choices, one may select the figure that best corroborates his own findings, as I did above. Had I chosen some of her others (e.g., 12.59 liters per

* Instead, we are given the assurance that "the study contains accurate information on all aspects of the systems of food preparation, water procurement, and distribution presently existing in the village" (1978: 1 - my emphasis).

person), I would have been faced with the dilemma of explaining why people who have become entirely dependent (or nearly so) upon station facilities seem to use less water now than they did before this source was so readily available. Or a figure might have been chosen to "prove" the assertion that more water is now used for bathing and laundering than was before or is now by non-station water users. In the face of such unfortunate confusion, no comparison is possible.

A related point on Hemmings' page sixty-six is that the author states that while the dry-season average in-compound water consumption is twelve liters per person, in the wet this drops to six liters. The hasty reader might erroneously conclude that people drink more water when less is available (an error even more easily made in reading her Chart V on the following page); fortunately, Hemmings adds on page sixty-six that "it must be remembered that the figures above relate to in-household consumption. During the rainy season, many water consuming activities . . . occur outside of the household near fields." Because much farming is done miles from the compound, rather than commuting daily, people frequently choose to sleep in shelters beside their fields during peak agricultural work periods; a man with several wives will rotate their work schedules, one caring for and guarding the compound while others work in the fields. Hemmings' wet-season -compound figure, then, bespeaks a place/activity relation, and says nothing to quantify water used by people, no matter where, during these days when it is readily available, when people are thirsty from arduous labor and dirty from the same.*

E. CONCLUDING IMPRESSIONS

If it is not possible to draw neat comparisons of time spent drawing water before and after implementation of the station system,

* The research assistant who worked on all phases of the project, Hemmings' as well as my own (KOUELA Keyoure), told me she did indeed send an observer to the fields to note water consumption there as well; Hemmings fails to mention this in her report, and one is left to infer that she did not take into account any resulting information. She does note that people bathe more frequently in the wet than in the dry season (1978:28).

and to quantify use of water in the compound to the degree that change in patterns might be identified for analysis; it is possible to outline some concluding impressions of the overall social impact of the solar-powered water facility.

We know who uses station water and who does not (Figures Four and Five), and how this is a function of proximity (Figure Six). We have some idea of how much water is used per person and how it is used, this at the station where those fetching it were questioned and could be observed. We know with what frequency and pleasure people come to bathe and wash clothes at the facility, and that any rise in either activity can only increase dignity and physical well-being. We know that even households too far from the station to use its water in everyday chores if any other is available, still profit by bathing, washing their clothes or watering their small animals there; in turn, this decreases pressure on other, nearer resources. At least some of the hand-dug wells in the station's vicinity, once used by women and cattle-herders, are now abandoned to the latter, making more water available to them and decreasing whatever social tension may have existed from previous competition. We know that house construction is facilitated directly for individuals using station water to make bricks and mortar, indirectly for those using wells no longer exploited with such frequency by women for household needs. It may be that in years to come, a small factor like the station water system may allow easier growth of nearby compounds and hamlets, than is possible in those more distant where water for building is at a premium. Finally, we know that there is more to "water-fetching" than fetching water, that this one activity intersects and overlaps many others the "productive" quality of which may not be readily apparent.

There are a few other minor points to mention. Truckers and busdrivers hauling freight or passengers along the major road passing through Tangaye, occasionally stop to drink and cool their engines with station water. A few villagers receive some benefit from this in commissioning friendly drivers to make purchases or to do other errands in cities beyond, and transport itself is more readily available.*

* This will be a short-lived benefit; see Section IV.C below.

Similarly, residents draw pleasure and esteem from the notoriety of the station, and the many Voltaic and European visitors it attracts; the chief of Tangaye lists this as one of the accomplishments of his reign, something for which he will be remembered through association. In general, the only complaint voiced about the station water facility is from those living too far from it to profit as directly as frequently as those closer. Those using it constantly are very pleased to have it at hand, for obvious pragmatic as well as less-evident social reasons, and for the distinctions it allows one to draw with one's neighbors (e.g., the jocular comment that "we" are cleaner than "they"!).

III. MILL USE

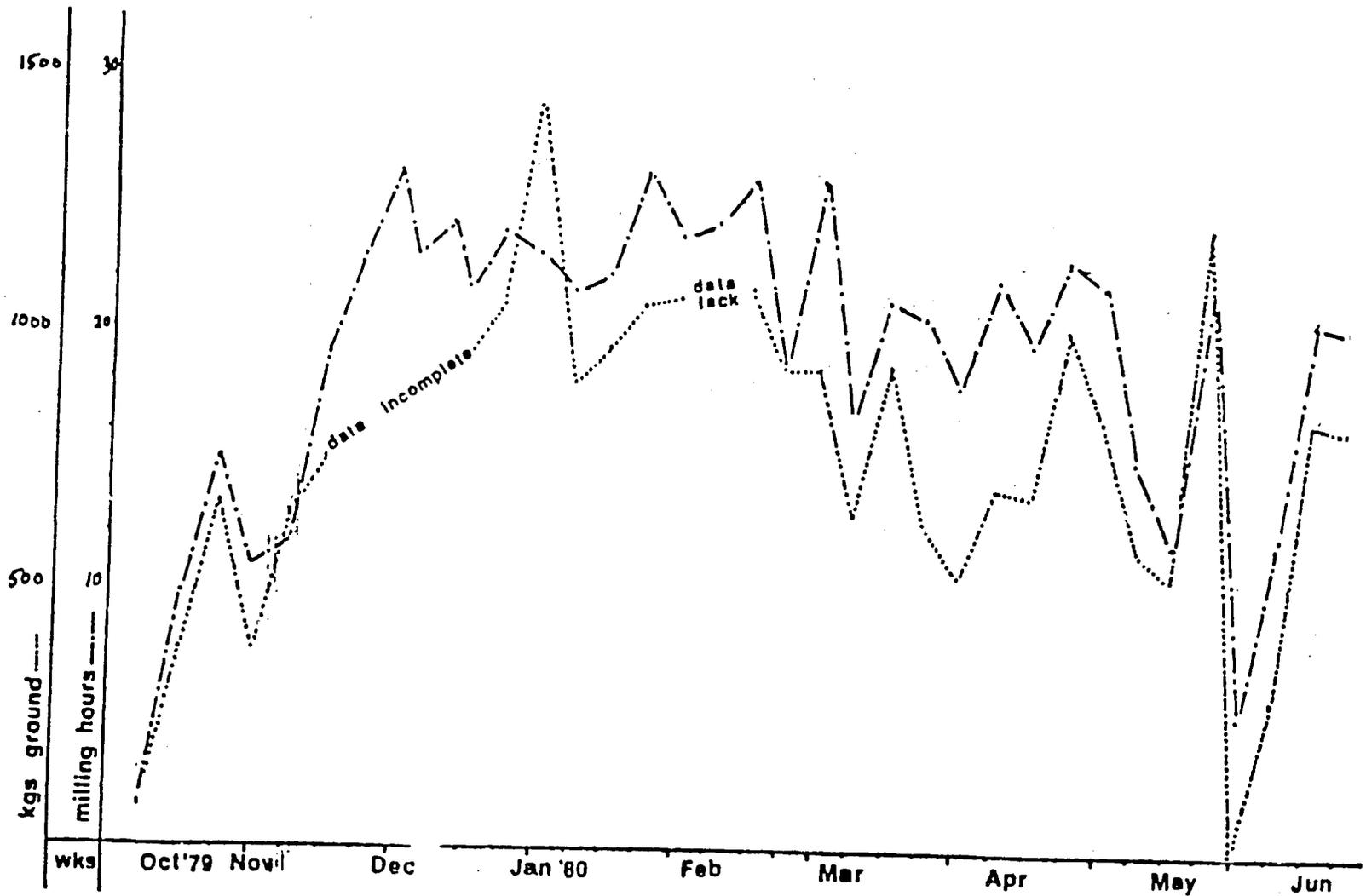
A. IDENTIFYING STATION MILL USERS

The ups and downs of the station mill's functioning during the dry season of 1979-80 are shown in Figure Fifteen. For the most part, the modifications in the mill machinery and in the schedule for milling (described in Roberts 1979) have allowed successful use of the facility throughout this period. In May 1980, technical difficulties with batteries and with photovoltaic cells caused a radical reduction in mill service. There was a nagging problem with some of the modules open-circuiting at a critical temperature, thus reducing electricity-production; in early September, 1980, new, improved panels were installed to replace faulty ones.

Figure Sixteen indicates through data from four targeted hamlets* the seasonal curve in mill use from the inception of the facility, when was recorded the first flush of enthusiasm as milling was offered free of charge and many were anxious to try its services; through the lean summer months, when agricultural activity is at its peak and many remained camped beside distant fields; to the dry season when milling was again a popular alternative to the daily labor of pounding and stone-grinding grain by hand. All four hamlets show the same sort of roller-coaster curve over the sixteen months, with the obvious difference in degree of use of the mill.

The distribution of mill use - and hence of this important aspect of station benefit - is dramatically evident in Figure Seventeen. The residents of Hamlet One, whose curve in Figure Sixteen far outdistances in terms of number of visits, those of the other hamlets portrayed, is seen in Figure Seventeen to make a full thirty percent of all visits to the mill; as such, Hamlet One is in a set of its own, with no other members. These figures are only to be considered relative, and not absolute, however. One possibly substantial source of error is that sometimes women from more distant hamlets carry grain

* Data variously presented in Figures Sixteen through Twenty-Six are drawn from the notebooks kept at the mill in which all customers, their hamlet of origin, and other information is recorded at each milling.



[after a graph by Gay Morgan]

Fig. 15 - Mill Hours & Quantities

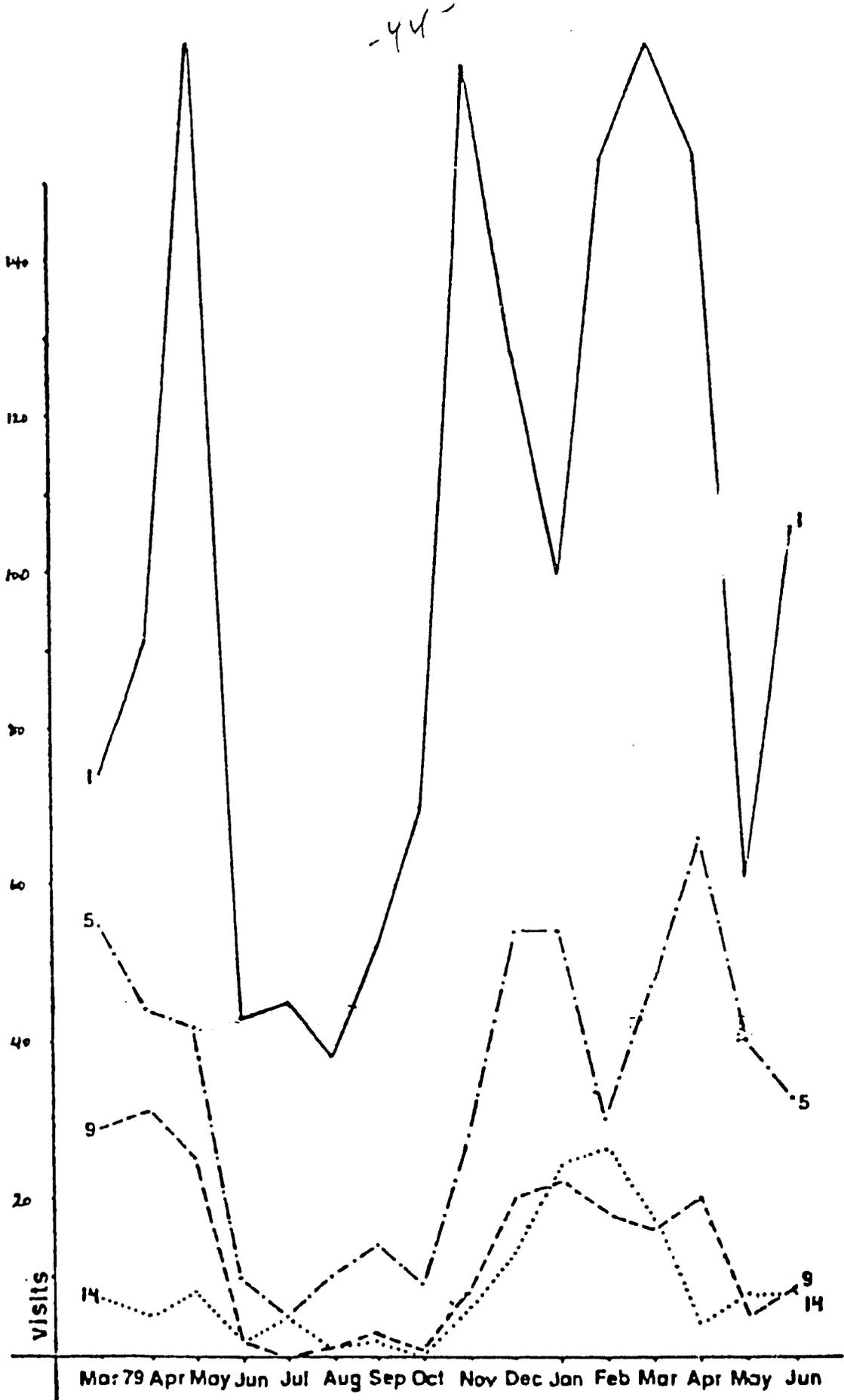
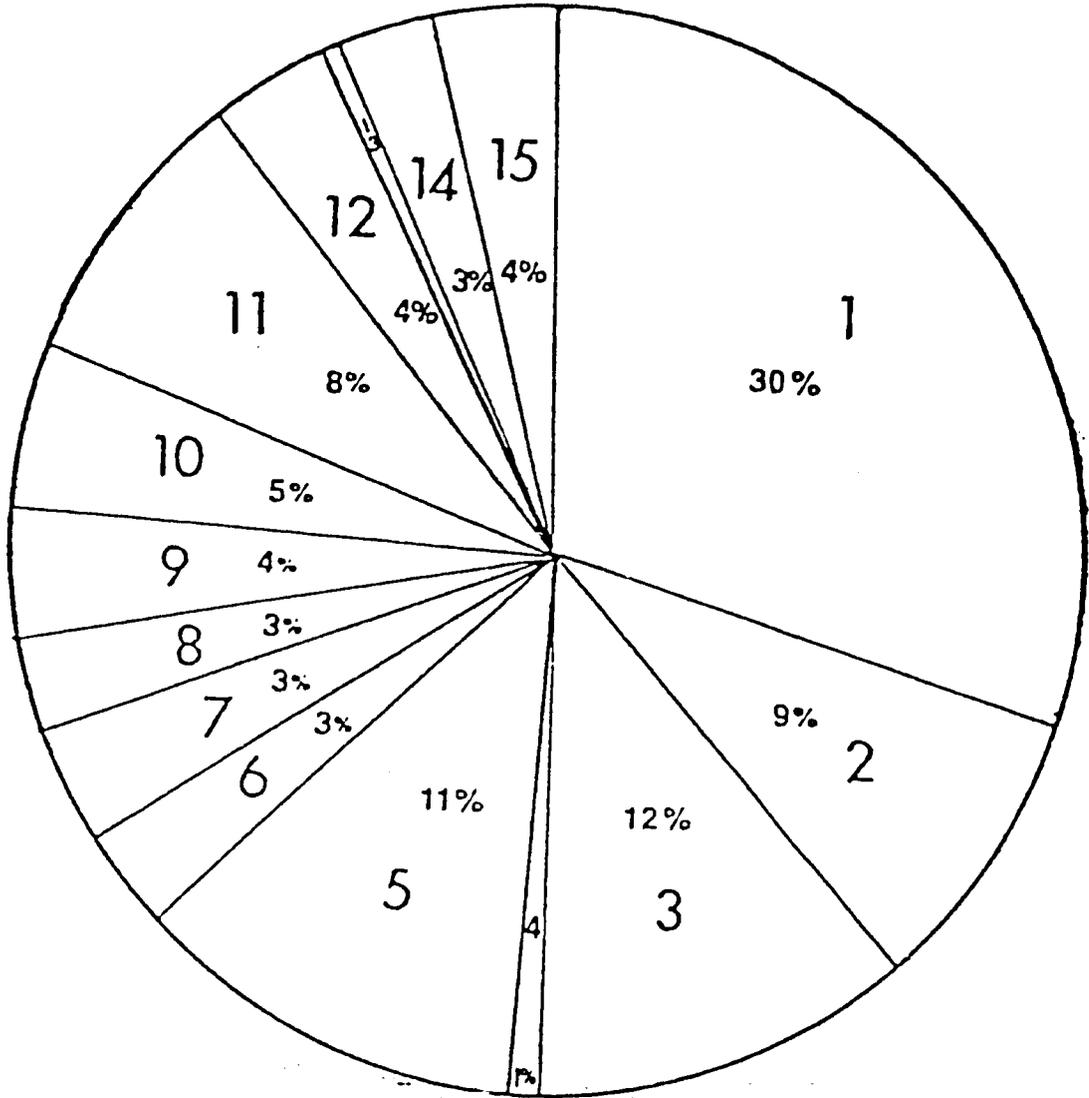


Fig. 16 - Seasonal Mill Use by Hamlet



6,519 total visits

Fig.17 - Mill Use
Percentage Per Hamlet

to the mill, discover a long line of people already waiting to be served, and so deposit their load at the home of a kinswoman or acquaintance in nearby Hamlet One. If, later on, a child from there obligingly carries the grain to the mill, it may be recorded as from the child's household in Hamlet One, and not from the owner's in the distant hamlet. An effort was made to correct this when the grain was accepted for milling and the information recorded; nevertheless, it is impossible to determine how many cases were not noticed, and were thus misrecorded.* While it is probable, then, that Hamlet One residents do use the mill more than their peers in other hamlets, perhaps to a significantly greater degree; the absolute percentage of all visits for Hamlet One is not as high as thirty percent, nor are those of the others as low as some are presented.

In order to avoid the error as much as possible, the analysis below will concentrate more on Hamlet Five than on Hamlet One, while a separate subsection (III.C.2) is added to discuss the unusual nature of Hamlet One a bit further. Hamlet Five is near enough to the station so that women need not deposit their grain with friends living closer, yet far enough so that others from farther still would not be likely to deposit grain with them.

There are four hamlets (Two, Three, Five and Eleven) whose inhabitants use the mill a fair amount of the time, each representing from eight to twelve percent of total visits. These and the people of Hamlet One comprise the category of primary users, while those labeled secondary are from Hamlets Six through Ten, Twelve, Fourteen and Fifteen, the people of each of which made three to five percent

* One indication of the magnitude of the error can be found in data generated from Hemmings' "Food Preparation" questionnaire; only thirteen of fifty-some grain-based dishes were prepared from mill-ground flour in the Hamlet One households observed, whereas from the hamlet percentage of visits, one would expect the figure to be a good deal higher. Those compounds observed did not happen to be the ones using the mill the most of Hamlet One residents, but the error is evident nonetheless. I have seen women who supposedly use the mill almost without exception, pounding grain in a mortar.

of total visits. As is clear from Figure Eighteen, one of the factors corresponding to the difference between these two is that of proximity: Primary users are those living closest to the station, while secondary ones reside beyond, to the south of the road. Hamlet Sixteen is so far from the station that its inhabitants live closer to the mills of Zaire and Diabo, and so may use them instead. While station water use is probably influenced by little but proximity, however, mill use is more complicated, more factors being at play because services must be purchased.

The hamlets chosen for further scrutiny (One, Five, Nine and Fourteen) were so on the basis of distance from the station, and their each having more or less the same number of residents. In effect, the station is located within Hamlet One; Five is down the road to the east; Nine is of a medium distance, located in the flatlands beyond a chain of rocky outcroppings; and Fourteen is as far from the station as any hamlet whose inhabitants use the mill at all.

The odd Figures from Nineteen to Twenty-Five show the breakdown of mill use within each of the chosen hamlets according to commensal units;* while the even from Twenty to Twenty-Six indicate the percentage that the number of visits made by each unit's members represents vis-a-vis the two hundred fifty-two total milling days since inception of the service. Two points are immediately evident (and "leap to the eyes" - sautent aux yeux, as is said in French): There is a factor of proximity at play, since the number of important users grows as one approaches the station (from Hamlet Fourteen to Nine to Five to One); and the definition of what an important user might be changes as well, as the percentages of visits show. The factor of proximity is one easily understood, even though complicated by social as well as physical distance. Those living far from the road may well be more conservative, more "country" or bucolic than those along the road; these latter, perhaps Christians living around the Catholic chapel in Hamlet Five, or the more cosmopolitan near the chief's center of social activity in Hamlet One who have a generally higher income level from

* This term will be explained in the next section.

| | 74 | 91 | 170 | 43 | 45 | 38 | 52 | 70 | 165 | 128 | 100 | 153 | 168 | 154 | 61 | 106 | TOTALS |
|-----|------------|------------|----------|-----------|-----------|-------------|----------------|--------------|---------------|---------------|--------------|---------------|------------|------------|---------|-----------|--------|
| 1A | 12 | 9 | 10 | 7 | 2 | 4 | 6 | 5 | 20 | 16 | 11 | 16 | 13 | 13 | 2 | 13 | 158 |
| 1B | | | 7 | | 2 | 1 | | 5 | 9 | 7 | 5 | 3 | 4 | 5 | 5 | 4 | 57 |
| 2 | 1 | 3 | 3 | | | | 1 | 2 | 3 | 1 | | 2 | 1 | 4 | 1 | 3 | 25 |
| 3 | 4 | 10 | 18 | 5 | 2 | 3 | 3 | 8 | 15 | 11 | 9 | 12 | 9 | 8 | 3 | 5 | 125 |
| 4A | 2 | 1 | 3 | 3 | 2 | 1 | | 2 | 5 | 2 | 4 | 4 | 1 | 5 | 2 | 1 | 38 |
| 4B | 1 | 3 | 6 | 2 | 1 | | 2 | 1 | 7 | 2 | 5 | 4 | 6 | 2 | 2 | 1 | 45 |
| 5 | 2 | 4 | 10 | | 3 | 2 | 2 | 1 | 2 | 6 | 2 | 3 | 7 | 4 | | 3 | 51 |
| 6 | | 2 | 4 | 3 | | | 1 | | 1 | 2 | | 1 | 6 | 5 | 1 | 2 | 28 |
| 7 | 3 | 2 | 8 | 2 | 4 | 2 | 2 | 5 | 5 | 3 | 5 | 5 | 6 | 6 | 3 | 8 | 63 |
| 8 | | 3 | 5 | 1 | 1 | 2 | 2 | | 5 | 2 | 1 | 4 | 1 | 4 | 1 | 2 | 34 |
| 9A | | 2 | 3 | 1 | | 2 | 1 | 2 | 3 | 3 | 2 | 4 | 3 | 7 | 2 | 1 | 36 |
| 9B | | 1 | 1 | 1 | | | 2 | 1 | 5 | 2 | | | | | | | 13 |
| 10A | 1 | 6 | 6 | 1 | | 2 | 2 | 3 | 9 | 2 | 6 | 7 | 10 | 10 | 2 | 5 | 72 |
| 10B | 2 | 2 | 2 | | | 4 | 1 | 1 | | 3 | 3 | 4 | 4 | 8 | 2 | 6 | 42 |
| 10C | 1 | 1 | 7 | | 1 | 1 | | 3 | 6 | 6 | 8 | 3 | 6 | 2 | | 4 | 49 |
| 10D | 2 | 2 | 4 | 1 | 2 | | 1 | 1 | 3 | 2 | | | 4 | 4 | 1 | 2 | 29 |
| 10E | 1 | 1 | 4 | | | 2 | 3 | 2 | 5 | 2 | 1 | 3 | 3 | 1 | | 2 | 30 |
| 11 | | 1 | 2 | 1 | | | | 1 | | | | 1 | 3 | 1 | 1 | 1 | 12 |
| 12A | | | 3 | | | | | | | | | | | | | | 3 |
| 12B | 1 | | 1 | | | 2 | 1 | 5 | 3 | 2 | 4 | 6 | 3 | 4 | | 1 | 33 |
| 13A | 1 | 1 | 3 | | | | 2 | 1 | 1 | 3 | 1 | 2 | 6 | | | 1 | 22 |
| 13B | 2 | 1 | 2 | | | | | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | 23 |
| 14 | 11 | 5 | 15 | 3 | 6 | 4 | 4 | 6 | 11 | 7 | 6 | 8 | 16 | 9 | 3 | 4 | 118 |
| 15A | 6 | 5 | 5 | 1 | 1 | | | 1 | 10 | 5 | 10 | 11 | 8 | 7 | 4 | 6 | 80 |
| 15B | 1 | 3 | 2 | 2 | 1 | | | 2 | 6 | 2 | 6 | 4 | 5 | 8 | 5 | 2 | 49 |
| 16 | | | 2 | | 1 | | 1 | 1 | 1 | 4 | 1 | 2 | 2 | | 1 | 2 | 18 |
| 17A | 1 | 2 | 2 | | | | | 1 | 5 | 5 | 6 | 10 | 3 | 5 | 4 | 5 | 49 |
| 17B | 2 | 1 | 4 | | | | | | 1 | 4 | 3 | 6 | 10 | 5 | 1 | | 37 |
| 18 | 2 | 2 | 2 | | | | | 1 | 3 | 2 | 1 | 4 | 1 | 1 | 1 | 3 | 23 |
| 19 | 3 | 1 | 9 | 3 | 1 | | 2 | 1 | 5 | 7 | 8 | 7 | 4 | 7 | 3 | 3 | 64 |
| 20 | 8 | 9 | 9 | 5 | 8 | | 7 | 6 | 13 | 11 | 12 | 6 | 14 | 15 | 8 | 13 | 144 |
| 21 | 4 | 8 | 7 | 1 | 7 | 6 | 6 | | 1 | 3 | 8 | 8 | 7 | 2 | 3 | 2 | 73 |
| | | | | | | | | | | | | | | | | | 1649 |
| | Visits | | | | | | | | | | | | | | | | |
| | March (20) | April (27) | May (30) | June (10) | July (13) | August (18) | September (10) | October (10) | November (17) | December (18) | January (17) | February (16) | March (16) | April (14) | May (8) | June (15) | |

Fig. 19--Mill-Use Breakdown, Hamlet no.1

Fig. 20 - Hamlet 1 Mill Use, % per 252 Millings

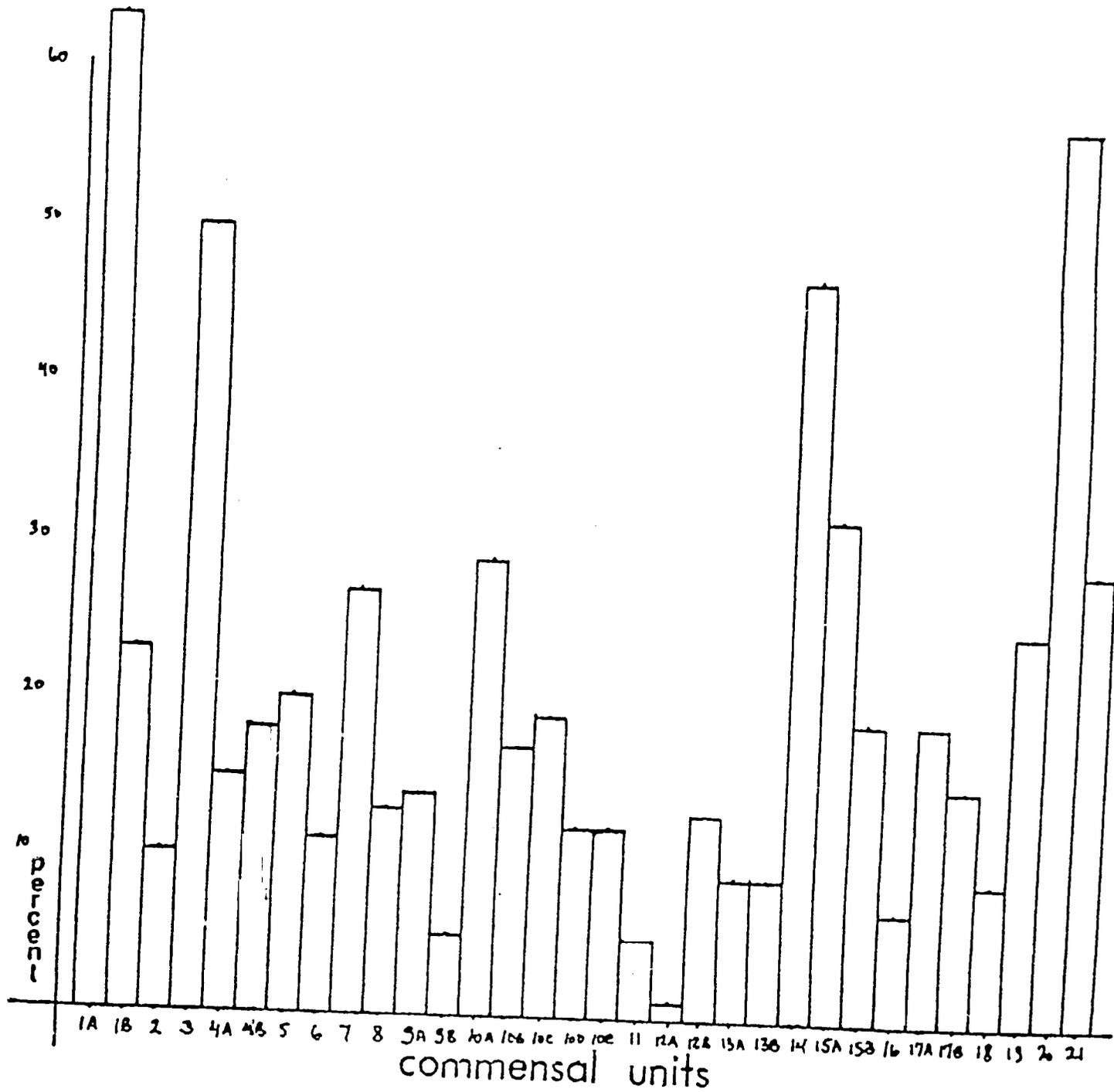


Fig.21 - Mill-Use Breakdown, Hamlet no.5

| | | 55 | 44 | 42 | 10 | 5 | 10 | 14 | 9 | 28 | 54 | 54 | 30 | 47 | 66 | 40 | 33 | TOTALS |
|-----------------|-----|----|----|----|----|---|----|----|---|----|----|----|----|----|----|----|----|--------|
| commensal units | 1A | | 1 | 1 | | | | | 1 | | | 3 | 1 | 2 | 4 | 2 | 2 | 17 |
| | 1B | 6 | 3 | 4 | | | | | 1 | 1 | 1 | 6 | 1 | 2 | 11 | 1 | 2 | 38 |
| | 1C | 2 | 3 | | | | | | | | | 3 | 1 | 3 | 6 | 2 | 2 | 22 |
| | 1D | 5 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 3 | 7 | 4 | 2 | 4 | 7 | | 3 | 47 |
| | 1E | | | | | | | | | | | | | | | | | 0 |
| | 1F | 3 | 3 | 2 | | | 1 | 1 | | | | | | | 2 | 1 | 2 | 15 |
| | 2 | 4 | 1 | 2 | 1 | | | 2 | 1 | 2 | 5 | 5 | 3 | 5 | 6 | | 1 | 38 |
| | 3 | | 1 | | | | | | | | 3 | | | | 1 | | 1 | 7 |
| | 4 | 1 | | 2 | | | | | 1 | | | 1 | | | 2 | 2 | | 9 |
| | 5 | | | | | | | | | 1 | | 2 | | 1 | 2 | 3 | 1 | 10 |
| | 6 | 3 | 4 | 4 | | | | 1 | | 2 | 3 | 4 | 3 | 2 | 2 | 3 | 1 | 32 |
| | 7 | | | | | | | | | | | | | | | | | 0 |
| | 8 | 4 | 3 | 3 | 1 | | 1 | 2 | 1 | 5 | 4 | 6 | 6 | 4 | 3 | 3 | | 46 |
| | 9 | 5 | 2 | 3 | 2 | 1 | | 1 | 1 | | 3 | 5 | 2 | 2 | 2 | | 3 | 32 |
| | 10 | 2 | 2 | 1 | 1 | | | | | | 2 | 3 | 1 | 1 | | 3 | 1 | 17 |
| | 11A | 1 | | | | | | | | | 1 | 1 | 1 | | 4 | | | 8 |
| | 11B | | 1 | | | | | | | | | | | 1 | | | | 2 |
| | 12 | 2 | | | | | | | | | | | | | | | | 2 |
| | 13A | 2 | 3 | 3 | | 1 | | | | 3 | 5 | 3 | 2 | 3 | 4 | 4 | 2 | 35 |
| | 13B | 2 | 3 | | | 1 | 1 | | 1 | | 3 | | 1 | 2 | 1 | 4 | 3 | 22 |
| 14 | 2 | 3 | 1 | | | | 1 | | 2 | 3 | | 1 | 1 | | 1 | 1 | 16 | |
| 15 | 1 | 1 | 2 | 4 | | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 2 | 2 | 2 | | 24 | |
| 16 | 1 | 5 | 2 | | 1 | 2 | 2 | | 2 | 3 | 2 | 1 | 3 | 3 | 4 | 1 | 32 | |
| 17 | 6 | 1 | 2 | | | | | | 3 | 3 | 1 | 1 | 1 | | | 1 | 20 | |
| 18 | 2 | 2 | 1 | | | 2 | | | 2 | 4 | 5 | 1 | 4 | 2 | 3 | 2 | 30 | |
| 19 | | | 4 | | | | | | | | | | 2 | 1 | | | 8 | |
| 20 | | | 2 | | | | | | | | | | 2 | 1 | 1 | 3 | 12 | |
| | | | | | | | | | | | | | | | | | | 541 |

Visits
 June (15)
 May (8)
 April (14)
 March (16)
 February (16)
 January (17)
 December (18)
 November (17)
 October (10)
 September (10)
 August (13)
 July (13)
 June (10)
 May (30)
 April (27)
 March (20)

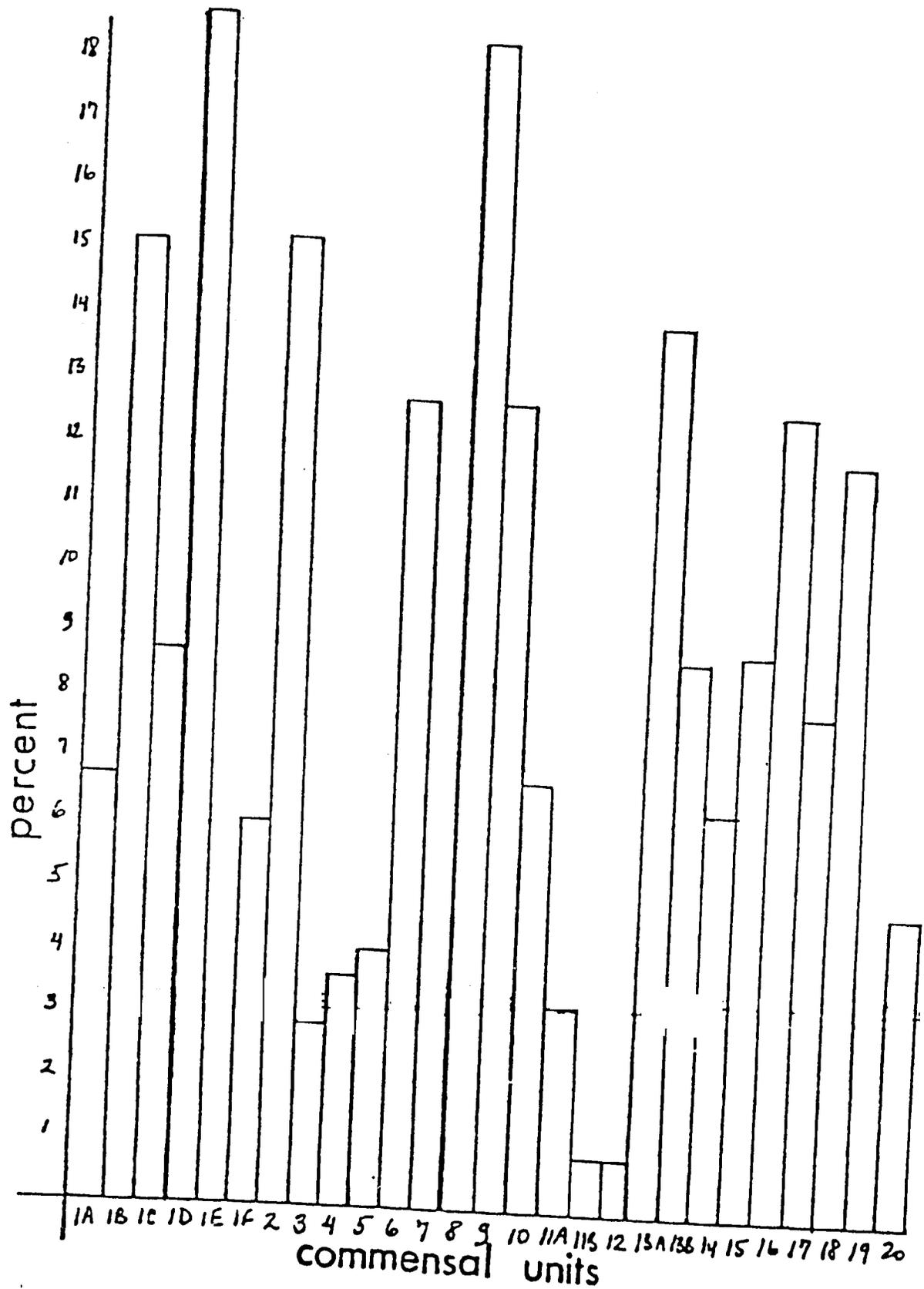


Fig.22 - Hamlet 5 Mill Use, % per 252 Millings

Fig.23 - Mill-Use Breakdown, Hamlet no.9

| Commensal units | 29 | 31 | 25 | 2 | 0 | 1 | 3 | 1 | 8 | 20 | 22 | 18 | 16 | 20 | 5 | 9 | TOTALS |
|-----------------|------------|------------|----------|-----------|-----------|-------------|----------------|--------------|---------------|---------------|--------------|---------------|------------|------------|---------|-----------|--------|
| | 3 | 2 | 4 | | | | | | | | 1 | 1 | | 1 | | | |
| 1A | 3 | 2 | 4 | | | | | | | | 1 | 1 | | 1 | | | 12 |
| 1B | 1 | | | | | | 1 | | | | | 2 | 2 | 2 | 1 | 1 | 10 |
| 2A | | 1 | 1 | | | | | | 1 | | | 1 | | | | | 4 |
| 2B | 2 | 2 | 4 | | | | | | | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 18 |
| 2C | 1 | | | | | | | | | | 1 | 2 | 1 | | | | 5 |
| 3A | | | | | | | | | | | | | | | | | 0 |
| 3B | 1 | | | | | | | | | 1 | | | | 1 | | | 3 |
| 3C | 1 | 2 | | | | | | | | | | | | 1 | | | 4 |
| 3D | 1 | 2 | | | | | | | | 2 | 1 | | | 1 | | | 7 |
| 3E | 4 | 2 | 3 | | | | | | | 1 | | 1 | 2 | 1 | | 1 | 15 |
| 4A | 1 | | | | | | | | | 2 | 7 | | 1 | | | | 11 |
| 4B | 1 | 1 | 2 | 1 | | | | | | | 2 | 1 | | | | 1 | 9 |
| 5 | | 1 | | | | | | | | 1 | 1 | 1 | | | | | 4 |
| 6A | | | | | | | | | | 1 | 1 | | | | | | 3 |
| 6B | 1 | | | | | | | | | | 1 | | 1 | | | | 3 |
| 7 | 1 | | 2 | | | | | | | | | | 1 | | | | 3 |
| 8 | | 1 | | | | | | | | | | | | 1 | | | 4 |
| 9 | 3 | 8 | 5 | | | 1 | 1 | | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 4 | 30 |
| 10 | 2 | 2 | | 1 | | | | | | | 1 | | | | | | 6 |
| 11A | | | | | | | | | 2 | 1 | | 1 | | | | | 4 |
| 11B | 1 | | | | | | | | | | | 1 | | | | | 2 |
| 11C | | 2 | 1 | | | 1 | 1 | 4 | 4 | 1 | 1 | 1 | 3 | | | | 20 |
| 12A | | 2 | 1 | | | | | | 3 | 2 | | 1 | 1 | | | | 10 |
| 12B | 2 | 2 | 1 | | | | | | | | 1 | 1 | 3 | | | 1 | 11 |
| 13 | 2 | 1 | 1 | | | | | | | 1 | 1 | 3 | 2 | 1 | | | 12 |
| | | | | | | | | | | | | | | | | | 209 |
| | March (20) | April (27) | May (30) | June (10) | July (13) | August (18) | September (10) | October (10) | November (17) | December (18) | January (17) | February (16) | March (16) | April (14) | May (8) | June (15) | |

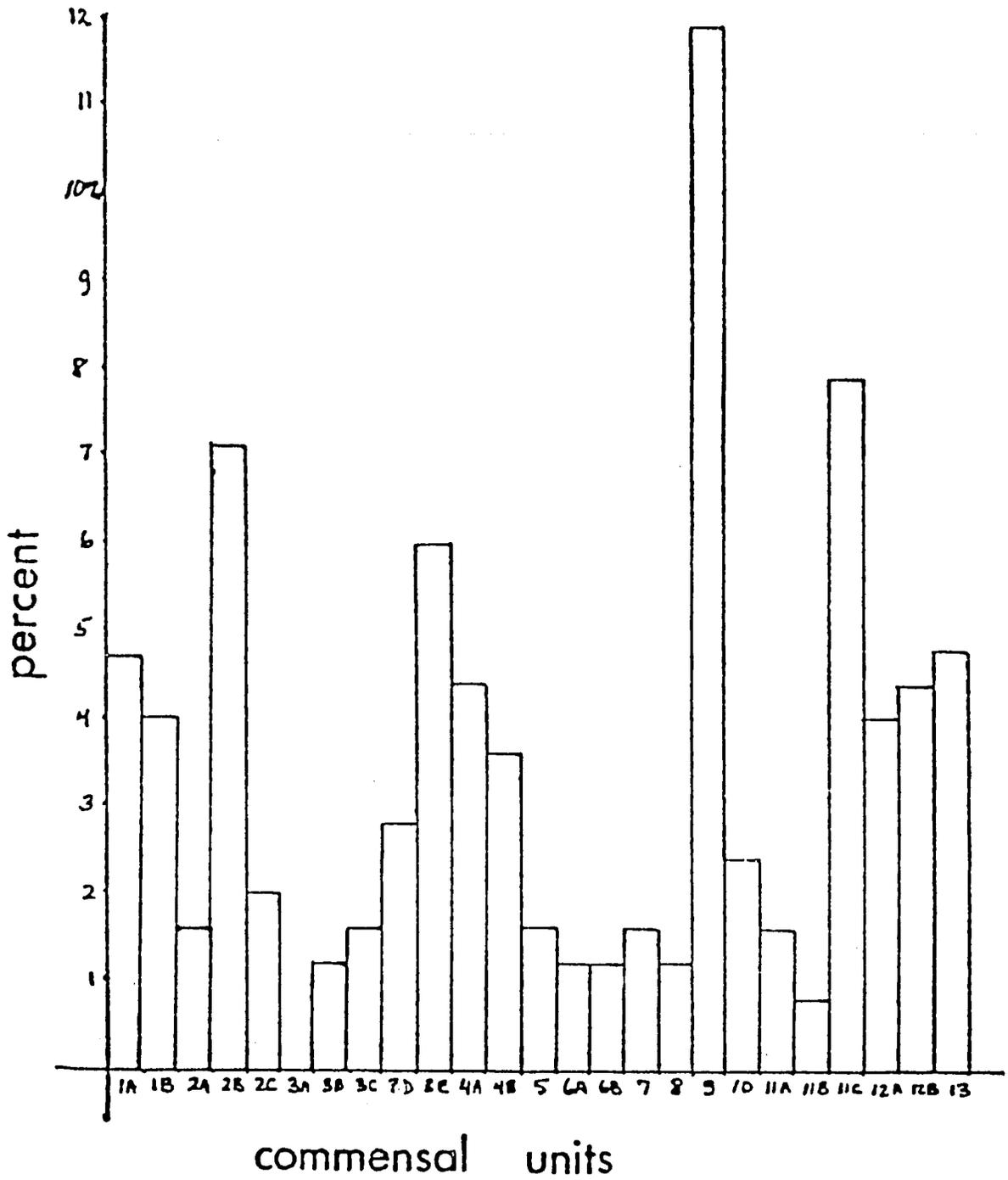


Fig. 24 - Hamlet 9 Mill Use, % per 252 Millings

Fig.25 - Mill-Use Breakdown, Hamlet no.14

| Commensal units | 7 | 5 | 8 | 2 | 6 | 1 | 2 | 0 | 6 | 13 | 24 | 26 | 17 | 4 | 8 | 8 | TOTALS |
|-----------------|------------|------------|----------|-----------|-----------|-------------|----------------|--------------|---------------|---------------|--------------|---------------|------------|------------|---------|-----------|--------|
| | 7 | 5 | 8 | 2 | 6 | 1 | 2 | 0 | 6 | 13 | 24 | 26 | 17 | 4 | 8 | 8 | |
| 1A | | 1 | | | | | | | | 2 | | 1 | 1 | | | 1 | 6 |
| 1B | | | | | | 1 | | | | | | | 1 | | | 1 | 3 |
| 2A | | 1 | 1 | | | | | | | | 1 | 1 | | | | 1 | 5 |
| 2B | | | | | | | | | | | 2 | | 1 | | 1 | | 4 |
| 3A | | | 2 | | 2 | | | | | 3 | 3 | 2 | 1 | | | 1 | 14 |
| 3B | | | | | | | | | | | | 1 | 1 | | | | 2 |
| 4 | 2 | 1 | 2 | 1 | 3 | | | | | | 9 | 6 | 4 | 2 | 3 | 2 | 36 |
| 5 | 3 | | 1 | | | | | | 1 | 4 | 2 | 3 | 3 | 2 | | | 19 |
| 6 | | 1 | | | | | 1 | | 1 | 2 | 1 | | 1 | | 2 | 1 | 10 |
| 7 | | | | | | | | | | | | | | | | | 0 |
| 8 | | | | | | | | | 2 | 1 | 1 | 2 | 1 | | 1 | 1 | 9 |
| 9 | | | | | | | | | | 1 | 3 | 2 | | | | | 6 |
| 10A | 1 | | 2 | 1 | | | 1 | | | | 1 | 5 | | | | | 11 |
| 10B | | | | | | | | | | | | | | | | | 0 |
| 11A | 1 | 1 | | | | | | | | | | | | | | | 2 |
| 11B | | | | | | | | | | | | | 1 | | | | 1 |
| 12A | | | | | | | | | 2 | | | 2 | | | 1 | | 5 |
| 12B | | | | | | | | | | 1 | 1 | | 2 | | | | 4 |
| 12c | | | | | | | | | | | | | | | | | 0 |
| 12d | | | | | | | | | | 1 | | | 1 | | | | 2 |
| | | | | | | | | | | | | | | | | | 139 |
| | Visits | | | | | | | | | | | | | | | | |
| | March (20) | April (27) | May (30) | June (10) | July (13) | August (13) | September (10) | October (10) | November (17) | December (18) | January (17) | February (16) | March (16) | April (14) | May (8) | June (15) | |

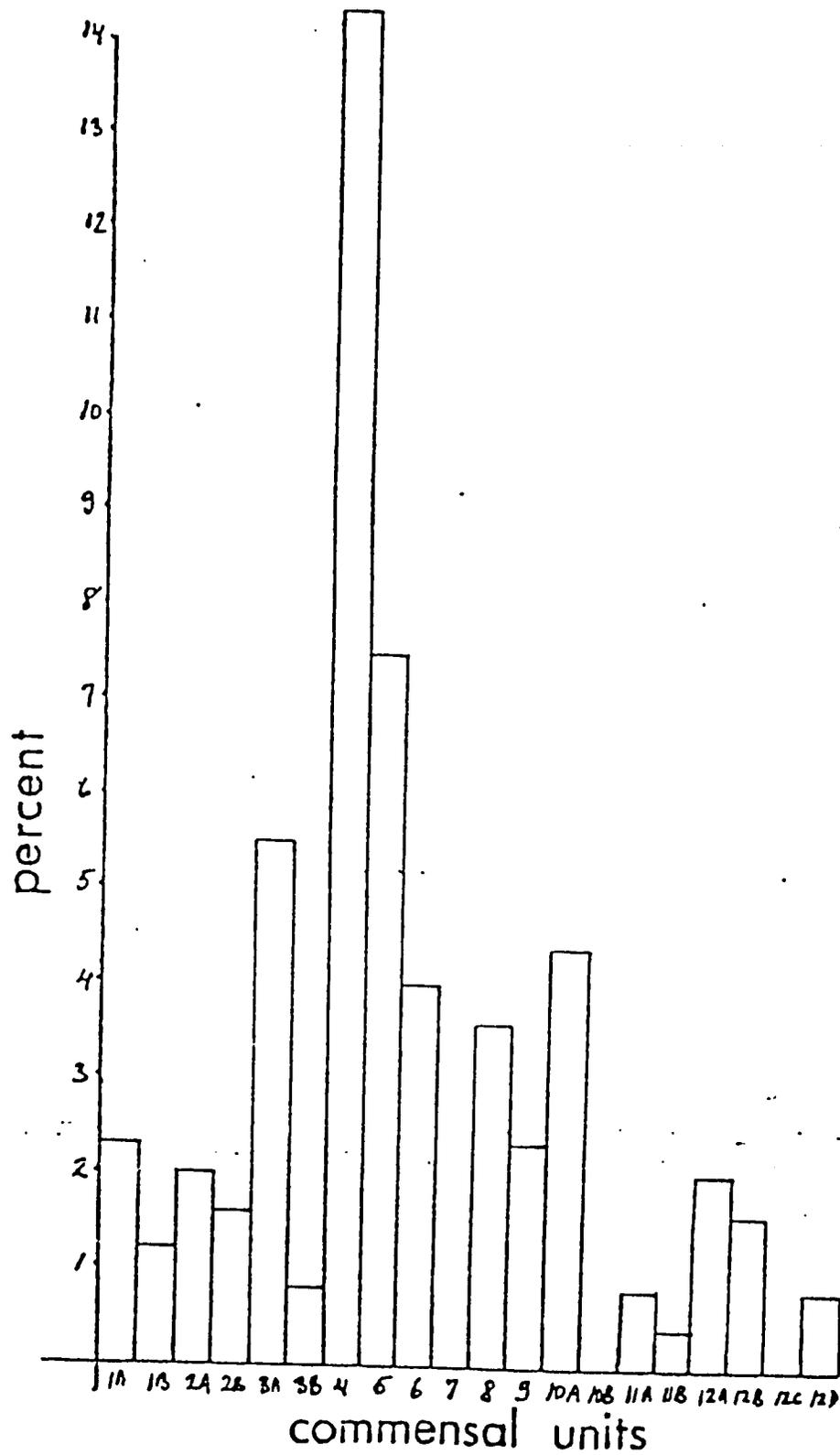


Fig.26 - Hamlet 14 Mill Use, % per 252 Millings

soldiers' pensions, contact with the chief, and the like, may seek "modern" service such as milling for philosophical as well as pragmatic reasons.

More interesting sociologically is the fact that within each hamlet, and even within each compound, individuals use the mill at widely different frequencies. No one is coerced or required to use the mill, nor is anyone prevented from doing so by any outside force or rule. Some may see using the mill as simply too frivolous a way to spend cash better saved for some choice purchase. While there can be no expectation of one-to-one correspondance (or anything approaching it) between some factor and mill use, there are interesting aspects of women's lives which seem to contribute to or coincide with a decision to use the mill that some and not others make.

Zaose women or the girls who help them do almost all cooking in the household, and it is they who decide whether or not to use the mill. It is they who must supply the cash to pay for these services, on most occasions.* Why some and not others do this, then, requires a better understanding of elements of the social organization of the Zaose people inhabiting Tangaye,** and what the various financial resources of women may be.

B. RELEVANT ELEMENTS OF ZAOSE SOCIAL ORGANIZATION

The Zaose of Tangaye observe patrilineal descent. Inheritance and succession pass from brother to brother and from father to son; ~~many of the people linked thus by consanguineal ("blood") relations,~~ and so of the same lineage, live in the same village (e.g., Tangaye, where many are related to the chief - the lineage head - and share his name, KOUELA). Depending upon the caprices of history, closest kin

* Exceptions are when a man has funereal responsibilities or wishes to have a work party help in his fields; then he will sometimes give money for milling, as well as a good share of the grain from his own supplies.

** While in her baseline study, Hemmings presents an outline of the political organization of Tangaye (the hierarchy of titles and chiefs, plus a sketch of political history), she explains nothing of social organization except as it may be inferred from her discussion of various water- and food-preparation-related activities.

within the lineage tend to form a hamlet. The Zaose are patri- and virilocal, that is, sons live with fathers (patrilocally) and wives come to live with their husbands (virilocally), in a compound. When the father dies, brothers tend to remain living in the same compound, the eldest among them succeeding the deceased father as family head. This residence group grows as sons of the brothers marry and bring their wives to live there. As adequate space becomes a problem, sons or brothers may hive off to create compounds of their own, most often adjacent to or at least close to that they are leaving; intrafamilial disputes sometimes accelerate this process radically.

To the inhabitants of the greater compound, or of several compounds perhaps physically separated but still bound by close and amical consanguineal bonds, can be applied the well-known term, "extended family." An extended family has as its organizational principle the rules of descent which unite the brothers and their sons; but another important form of bond - the affinal or one of marriage - is also present. Children of course have mothers as well as fathers with whom they live, and the adult brothers around whom the compound is organized have sisters- and daughters-in-law. Albeit observing patrilineal descent, children within the compound have other, outside bonds upon which to depend in certain circumstances - that is, those of their mothers' own patrilineages (their mothers' fathers, mothers' brothers, and their families). An extended family, then, has many sorts of overlapping bonds within and without it. While the patrilineage ~~is a permanent identity, traced through one's genealogy to the original~~ ancestors and eventually to the mythical first human beings, the extended family is a constellation of living individuals, changing through time.* Many activities in all domains of life we as outside observers tend to see as separate (the religious, political and economic, for instance) are undertaken by individuals working together within the extended family. Personal benefits from co-operation among the

* Professor Niara Sudarkasa, my colleague in the Center for Afroamerican and African Studies of the University of Michigan, sent a draft of her paper "Towards a Clarification of Indigenous African Family Structure. . ." (1980) to me in Tangaye; it proved helpful in thinking through this section of the present paper, and my thanks are extended to her.

members of an extended family increase in direct proportion to the size of the residence group.

Within the extended family there is another significant division: that we call the commensal unit - those who eat together. While this often corresponds to what some would call the "nuclear family" (a man, his wife and children), as often it does not, and the term is best avoided (Cf. Sudarkasa 1980). Many Zaose men are polygamous, and their several wives usually form the work force of a commensal unit; but brothers may eat together, and their wives then join, alternating or sharing cooking responsibilities. Others as well - aged mothers, cousins, or outsiders - may eat with this core. It is this commensal unit (hereafter written "C.U.") that is the focus of attention of the mill survey, since it is at this level that women pool their labors and resources as they co-operate in everyday life.

As a more concrete illustration of the complexities of the constitution of an extended family and its commensal units, an example is best presented. Compound Three of Hamlet Nine is a large group, but not unusually so. Figure Twenty-Seven is a schematic representation of the ^{consanguineal} and affinal bonds uniting these people, while the following is its explanation:*

There were five brothers, of whom only the youngest (himself now an octogenarian), the present family head (EGO), survives. His own wives are dead, and he inherited the young, third wife of the fourth brother (Br4W13); they, with her two children by the fourth brother (Br4So, Br4Da), form Commensal Unit 3A. The son of the first brother (Br1So), his two wives (Br1SoW11, Br1SoW12) and their young son (Br1SoW12So) form C.U. 3B. The second brother's widow (Br2W1) lives with her son (Br2So), his wife (Br2SoW1) and their four children (Br2SoSo1, etc.) as C.U. 3C. The son of the third brother (Br3So), himself a widower, lives with his four children (Br3SoSo1, etc.) as C.U. 3E. The first wife of the fourth brother (Br4W11)

* The usual genealogical conventions have been followed: Triangles are males, circles females; those crossed out are deceased, those striped absent. Horizontal lines over figures and vertical ones indicate consanguineal bonds, while horizontal lines under figures indicate marriage; polygamous marriages are indicated in order of wives when feasible.

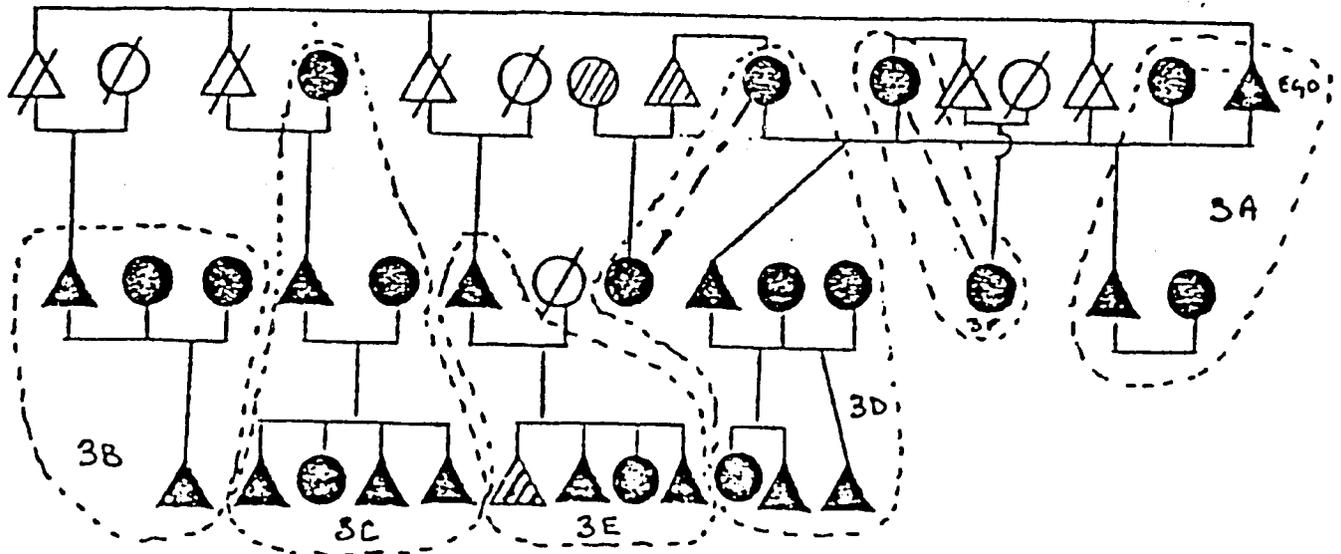


Fig. 27 - Hamlet 9, Compound 3

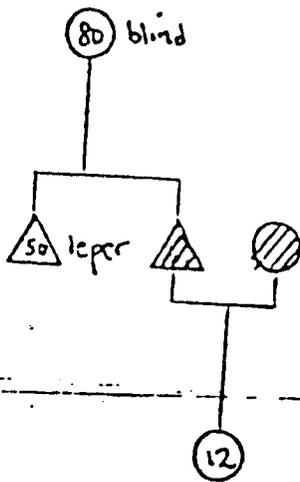
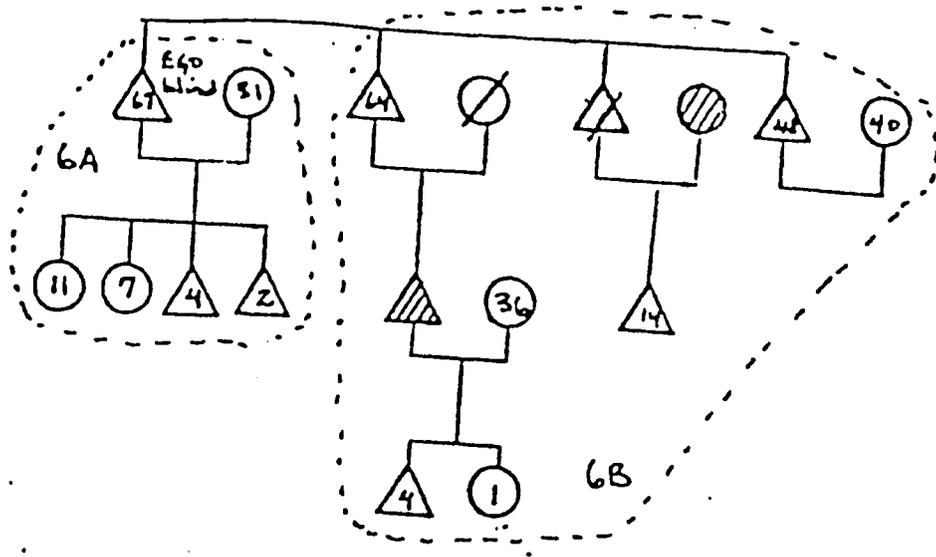
lives with a daughter of her brother (Br4Wi1BrDa) who cares for her; they live with her son (Br4Wi1So), his two wives (Br4Wi1SoW11, Br4Wi1SoW12), and their three children (Br4Wi1SoW11Da, Br4Wi1SoW11So; Br4Wi1SoW12So) as C.U. 3D. The second wife of the fourth brother (Br4Wi2) lives with her deceased brother's daughter (Br4Wi2BrDa), who cares for her; they are C.U. 3F.

That all these people live in a single compound attests to the cohesive force of Zaose consanguineal bonds. There are spiritual and practical reasons for this. The family head makes offerings for the extended family to the ancestors, and serves as intermediary between them and his living dependants.* Most important to our concerns here, living in larger groups brings mutual benefits to all.

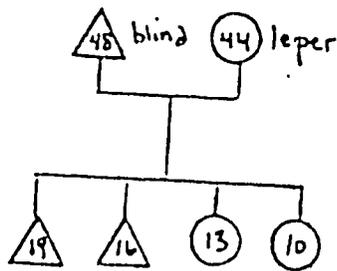
When one looks first to those individuals of commensal units rarely or ever using the mill, it becomes sadly obvious that these are among the most unfortunate of all the village's inhabitants. In Figure Twenty-Eight are presented schematically the people of three small compounds, none of whom have used the mill more than three or four times (that is, less than two percent of all millings). Compound Six has two commensal units; the family head is aged and blind, and only one of the children of his young wife is old enough to lend her assistance in cooking and farming. The other commensal unit is presided over by the also-elderly younger brother of the family head, a widower; the labor force here, too, is very restricted, and little surplus available to provide cash for mill use. Tiny Compound Seven consists of a man with leprosy, his aged and blind mother, and his young niece who cooks and cares for them. Compound Eight is inhabited by a blind man, his leprous wife, and their four teenaged children. These small groups have none of the possibilities for mutual support that individuals suffering these same afflictions or these same circumstances might enjoy in larger extended families.**

* See Hemmings 1978:10; and for comparative Mossi material, Skinner 1964: Ch. II, Ch. VIII.

** Leprosy is still greatly feared and lepers avoided; it is not clear whether these individuals were put out of larger residence groups because of the affliction, or not.



#7



#8

Fig. 28 - Hamlet 9, Compounds 6, 7 & 8

In larger extended families, there is a good deal of mutual support and assistance, both of a physical and of a spiritual sort. But once again, the commensal unit is where co-operation is the most consistent and purposeful. Looking back to Figures Twenty-Seven and Twenty-Four portraying the variation in mill use among the commensal units of Compound Three (Hamlet Nine), one may assume that within the extended family, different principles govern the financial possibilities of each unit according to its constitution.* Commensal Unit 3A consists of a young woman, her aged husband, and her young children. Her husband can no longer farm, and she must provide all food from her fields; presumably she has little surplus to sell for the cash necessary to use the mill often. C.U. 3B is more difficult to explain, as one would expect the wives to have sufficient resources to use the mill more than they do. In C.U. 3C, the elderly mother's fields are worked by her daughter-in-law, and as a dependant, the younger woman also stone-grinds the flour prepared. The women of C.U. 3D use the mill with a frequency average for their hamlet; the old woman is within the unit, but no longer dominates the younger women's activities; infirm, she cares for a young niece. The last commensal units, 3E and 3F, show opposite tendencies from somewhat similar circumstances. The widower of 3E contributes more to everyday family maintenance than a married man ordinarily would, and it is from his financial resources which comes the money to pay for milling. The old widow of 3F has only a young niece to care for her; because she is not included in a larger unit as one might expect, it is probable that she has an unpleasant disposition and is supported, but at a distance.

A look at another large compound's family organization is apposite. In Hamlet Five, Compound One is larger than any other, and the prestige of its head is derived from the Tangaye chiefship having been held by his own father, next-to-the-last predecessor of the current chief. Most of the six commensal units are large, as is clear from Figure Twenty-Nine. Both the family head (EGO) and his next-younger

* Again, this is overlooking such factors as an individual's choice not to use the mill out of a feeling that it is frivolous to spend cash in that way, and the like.

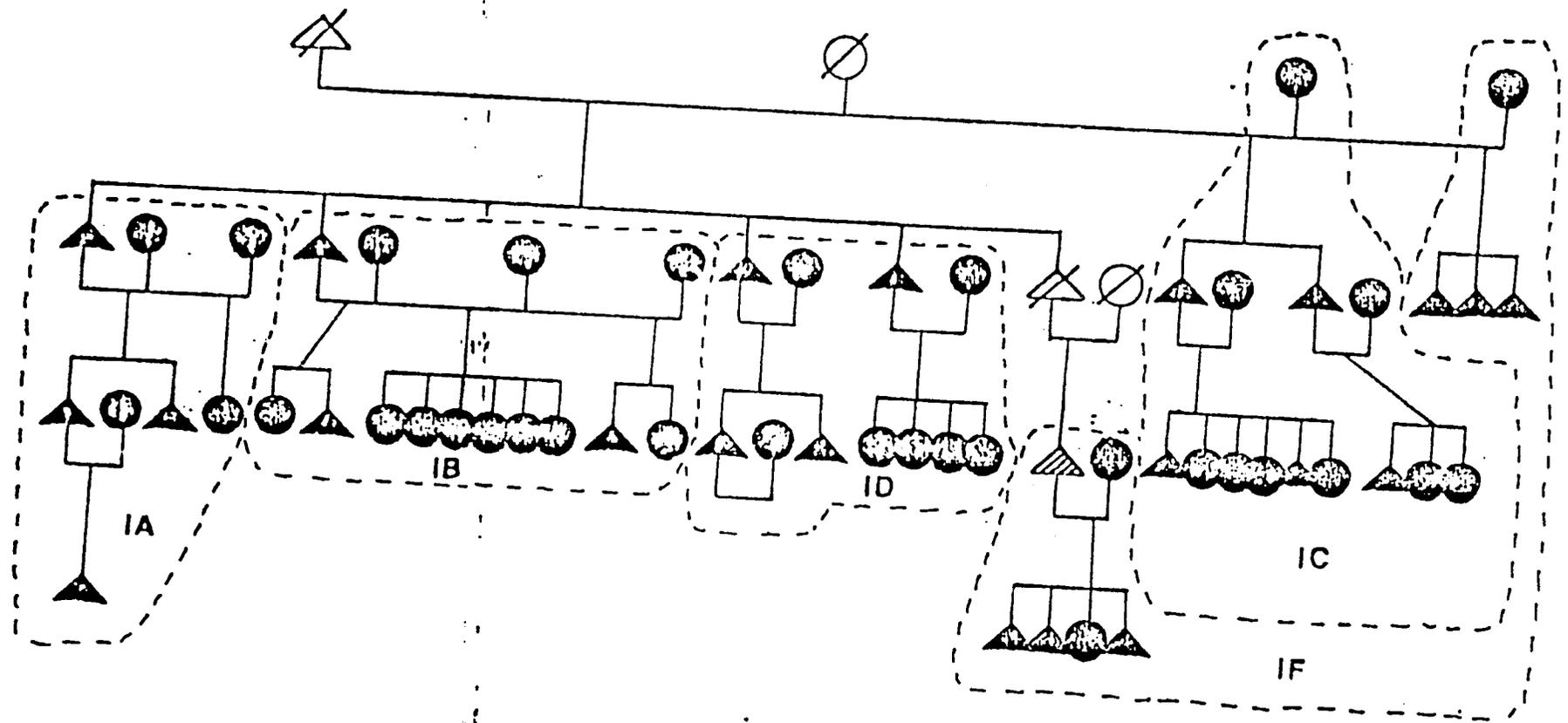


Fig. 29 - HAMLET 5, COMPOUND 1

brother are polygamous. In C.U. 1C and C.U. 1D, two brothers, their wives and children all eat together. The couple of C.U. 1E moved to the Ivory Coast soon after research began, while the husband in 1F, Tangaye's baker, has recently joined a Canadian team installing telecommunications stations across Upper Volta. From Figure Twenty-Two, it is clear that women of 1B and 1D, in particular, use the mill quite frequently (fifteen and almost nineteen percent of all millings, respectively), while those of C.U. 1A and C.U. 1C also use the services with a frequency average or better for their hamlet. One explanation goes some way to account for all of these cases.

While the wealth of these women permitting them to use the mill will be discussed more explicitly in the next section, one general principle can be mentioned here: When a man is monogamous, he has only a single wife upon whom to focus his attentions and gifts, and, importantly, the food grown in his own fields. Zaose men and women maintain separate fields. On all days but Friday* (and Sunday if they are Christians), a wife will work from dawn till around 9 A.M. in her own fields, then go to farm her husband's till late afternoon, when she will return to her own for a last hour or so if possible. She then returns to home or camp to prepare the evening meal (if it should be her turn to do so, and not a co-wife's or another woman's). A polygamous husband alternates between or among his wives as to with whom he eats; he may or may not give of his grain for the meal, but he will expect to be fed. While women in monogamous marriages can expect all the grain and meat and other foods her husband will give anyone for in-compound consumption, those who have co-wives must maintain larger fields themselves to compensate for the smaller portion of the husband's grain each will receive.**

* Fridays are inauspicious, as it is felt that the avenging ghosts of rancorous ancestors, killed by sorcery or other evil circumstance, are out and about then; should one go to his fields on Friday, he may hear them calling, or see a deceased kinsman or a chimera. These spirits and the day Friday are synonymous (arzuma); their existence may be linked to Islamic ideas, or, more probably, to Zaose ideas about Islamic ideas.

** Although their extra work means his fields are larger than a monogamous man's, the rule appears to be that such a man has more resources at his disposition (for housing costs and personal expenses) and not that he distributes more food to his wives.

While co-wives do not ordinarily farm in each other's fields except when a special work-party is called, there are tendencies of brothers or other kinsmen to marry into the same lineage or family; and sometimes a man may marry more than once into the same household (the case of a man in Tangaye married to three full sisters being well-known). This serves to increase co-operation among the women. As Sudarkasa (1980) notes, a Eurocentric view of polygamous marriage (at the same time a male-centric one, we would add) is that the wives are destined to squabble with one another as they compete for their husband's attentions. While there are difficulties inherent to this as to any situation in which people live in close proximity, more often than not wives co-ordinate efforts and activities to their mutual benefit and enjoyment. There is also a feeling that each must work diligently and provide for her children as well as do her co-wives; this is a form of competition, but need not be an inharmonious one.

The somewhat paradoxical conclusion from all of this is that women in polygamous marriages within large extended families may draw more support, and yet be forced to be more independent than their monogamous peers. The result is often larger fields per woman, and thus as a commensal unit, more labor and more surplus which may be translated financially into more opportunity to use the mill.

Put even more explicitly, there seems a correlation between large extended families and relatively greater mill use; and one between polygamy and higher mill use as well. Again, it must be stressed that these are at best tendencies, and not empirically-demonstrable one-to-one correlations; in the next section, other attributes of the extended family will be seen to act against mill use. Because of defects in the "Division of Labor" and other questionnaires, amount of time spent in various activities cannot be computed; as a consequence, economies of scale (in which positive variation in hours per person per activity can be seen a function of an increase in the number of productive members in the labor unit) cannot be determined.*

* For an application of this approach, see Shapiro 1978:7-8.

Statements more general are possible, however. Of those commensal units in Hamlets Five, Nine and Fourteen using the mill eight percent or more of all milling days,* thirteen are in extended families, five not; eleven have polygamous marriages, seven not. Of all polygamous marriages in Hamlet Five, six are in households using the mill eight or more percent of all visits, only two below this figure. By no means conclusive, but suggestive all the same.**

C. WOMEN'S WEALTH

1. SOURCES OF WEALTH AND MILLING

In attempting to determine what aspects of women's wealth might be correlated with mill use, one that immediately came to mind was just as quickly rejected: labor migration to neighboring countries. It is much more difficult to find an adult male who has not been off working somewhere than to find one who has; and many wives accompany their husbands. While experience with mills in urban settings or in rural ones of the more developed coastal countries may well teach women the benefits of their use, because men do not usually pay for milling but are the ones drawing the salaries, there seems little use for this purpose of money earned abroad and brought back to Tangaye. In effect, a casual survey of commensal units finds individuals who have recently worked elsewhere in as many cases of high as of low mill use. Rather, those leaving Tangaye in labor migration do so to be able to make the first, major purchases of a young man's adult life: galvanized roofing for a house; a bicycle or perhaps a mo-ped; a plow or donkey cart; cattle; a sewing machine, a large radio or cassette recorder; or especially flashy clothes. Such possessions affirm a man's independence and maturity; they bear little relation to mill use by wives or other related women.

Instead, to understand and hope to quantify women's wealth, one must first know something of the means of production to which a

* Eight percent of all millings is the average for Hamlet Five women.

** It must be recalled that milling is done with women's money; that polygamous marriage from a man's point of view reflects his wealth (ability to pay repeated bridewealths), does not have the same sense from a woman's.

woman has access: her fields. Zaose women often have a good deal of independence within a set of relatively rigidly-defined, dependant roles (e.g., marriage, co-wife hierarchy, age seniority among women). They maintain their own fields, and most grain they bring to the mill is from them, as is the cash to pay for the service of women's own earning.

To gauge what variation there might be in women's wealth, we measured the fields of all women in Hamlet Five. Undertaken in late August, this task proved exceedingly difficult as the sorghum was already well taller than the researchers, complicating field definition and sighting to take bearings. Paths were muddy and closed by tall grass bent heavy with moisture. Nevertheless, the results are not without interest.

Fields are usually of two sorts: a large one planted with a grain crop and beans, and a smaller one (the ratio is usually about 4:1) with peanuts and/or chickpeas (pois de terre). The latter are more explicitly planted for market, and their measure might be a better way to judge women's potential resources; however, grain crops are often interplanted with peanuts and chickpeas as well, so that separating them out is impossible (or too rigorous a task for the present study). All area cultivated by women has been combined, then, regardless of crop.

A few women have no fields of their own, others only very small ones; above the average there are industrious souls who have vast plantations of more than a hectare (i.e., of two to three acres). Since there are sometimes several women in a commensal group (co-wives, mother and daughter-in-law, sisters-in-law, and the like) who share cooking responsibilities and whose use of the mill can be considered as by a single unit; their fields may be joined and an average taken per woman of that commensal unit. Surface cultivated per woman per commensal unit in turn can be compared with the percentage of all milling days that women of that commensal unit have used the station facility. A ratio results of surface cultivated per woman, per percentage point

of mill use. The breakdown of these factors for the commensal units of Hamlet Five is presented in Figure Thirty, while in Thirty-One, the ratios are plotted on a graph.

There is no clearcut one-to-one correspondance of factors. There is a cluster of twelve of the twenty figures for which an average (689 square meters of cultivated field per woman per percentage point of mill use) can be calculated.* Figures not in the cluster can be compared with those that are, and an understanding sought of why such differences exist. Within the cluster, there is a rough correspondance between size of field and mill use. Based upon the relative amount of produce available from smaller or larger fields, a judgment can be made as well upon what possessing large fields has to say about a woman's initiative more generally, initiative which may be applied to other money-making activities (preparing foodstuffs for market, spinning cotton thread, brewing, potting and the like).

It is instructive to consider those cases which do not appear in the cluster.** Most of these seven of the total twenty women have large fields, and one would expect them to use the mill more than they do. One (and another whose figure of 370 square meters per percentage point of mill use is the lowest of the cluster) uses the mill more than one would expect, given the insignificance of cultivated surface. Two of the seven cases (C.U.4, C.U.12) are non-extended families without polygamous marriage; and a third (C.U.11A), although in an extended family, is like the other two - a woman alone, without other help at home.†

* If the lowest and the highest of these figures not be included, the average remains very nearly the same.

** When studying social process, the exceptions to rules often provide a best glimpse of the dynamics of the society, their very difference putting into perspective the sameness of the others.

† All three of the husbands in these commensal units are weavers; although this is a dry-season activity, there is a possibility that such men, deriving their wealth elsewhere, need not cultivate such large personal fields. Their wives might need to maintain larger fields as a consequence. This remains speculation, as time did not permit measuring the husbands' fields in question.

Fig. 30 - HAMLET 5, FIELDS IN CULTIVATION AND MILL USE

| Commensal
Unit / No.
of Women | Percent
of Mill
Use | Cultivated
Surface
Per Woman | Surface
Per Point
Percentage |
|-------------------------------------|---------------------------|------------------------------------|------------------------------------|
| 1A /2 | 6.5% | 4604m ² | 708 m ² /% |
| 1B /3 | 15 | 7562 | 504 |
| 1C /2 | 8.5 | 5768 | 679 |
| 1D /2 | 18.5 | 12395 | 670 |
| 1E /1 | gone to Ivory Coast | | |
| 1F /1 | 6 | not farming this year | |
| 2 /1 | 15 | 8879 | 592 |
| 3 /1 | 2.5 | none | |
| 4 /1 | 3.5 | 6930 | 1826* |
| 5 /1 | 4 | 3444 | 861 |
| 6 /1 | 13 | left for Ivory Coast | |
| 7 /1 | sick and died | | |
| 8 /1 | 18 | 6724 | 374 |
| 9 /4 | 12.5 | 8990 | 719 |
| 10 /3 | 6.5 | 5751 | 885 |
| 11A/1 | 3 | 16805 | 5602* |
| 11B/1 | 1 | 3222 | 3222* |
| 12 /1 | 1 | 1605 | 1605* |
| 13A/1 | 14.5 | 2583 | 178 * |
| 13B/2 | 9 | 7509 | 834 |
| 14 /1 | 6.5 | 8499 | 1308* |
| 15 /2 | 9 | 14005 | 1556* |
| 16 /1 | 13 | 13891 | 1069 |
| 17 /1 | 8 | none | |
| 18 /1 | 12 | 4440 | 370 |
| 19 /1 | 3 | left for Ivory Coast | |
| 20 /1 | 4.5 | 12750 | 2833* |

* case out
of cluster

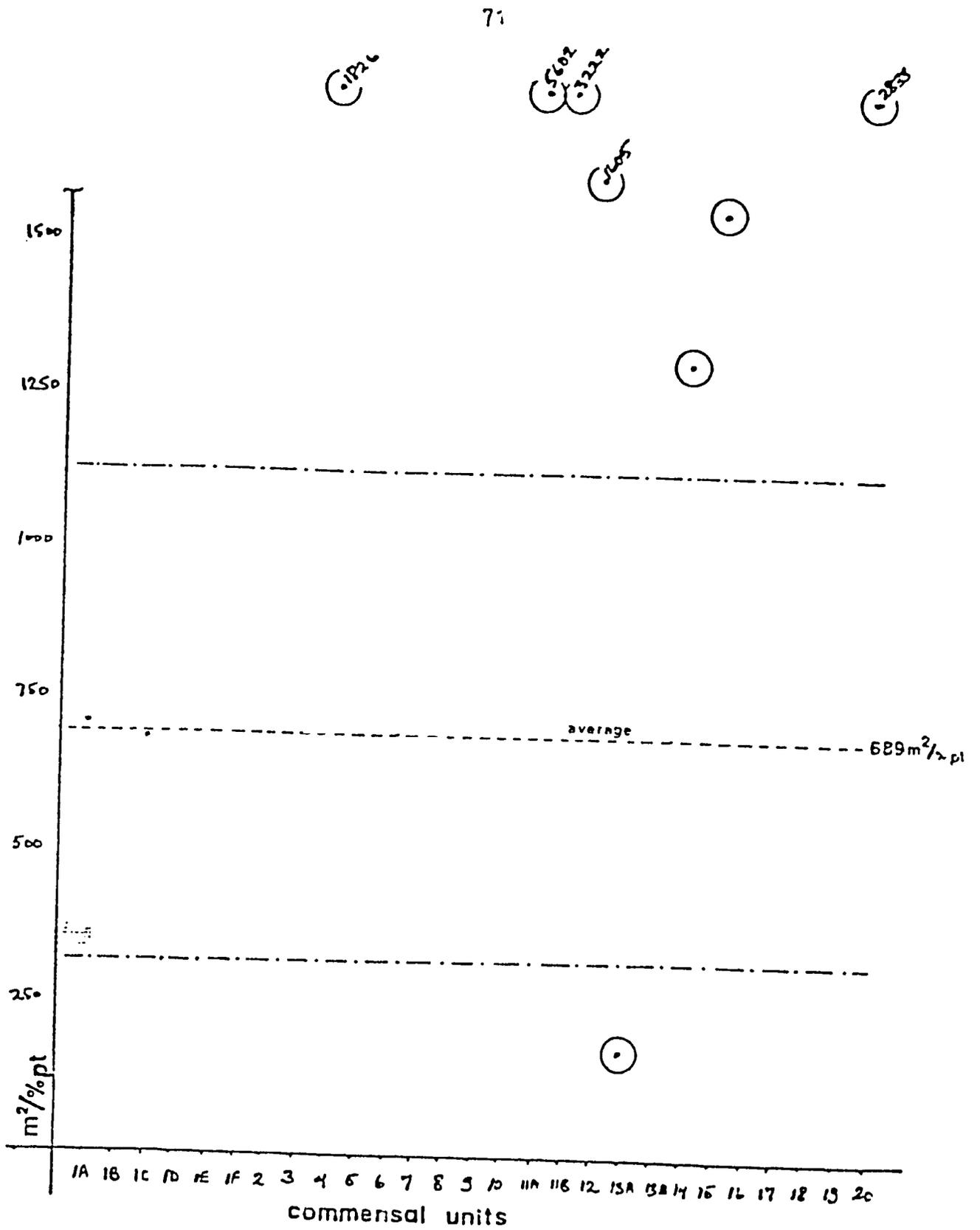


Fig.31 - HAMLET 5, CULTIVATION:MILL-USE RATIOS

The main reason for exercising caution in making statements about correlations such as those between mill use and being in extended families or polygamous marriages, is that these institutions are so multi-faceted as to give the appearance of sometimes "sawing both ways": There are characteristics of the extended family among the Zaose which permit an understanding of why some women do not use the mill often. One case of those who do not is that of a polygamous marriage as well.

Three of the remaining cases (C.U.s 11A, 15, 20) have elderly women assisted by two or four able-bodied, dependant women* to help out in such chores as flour-preparation. The senior women are still firmly in charge of their households, and their fields are tilled in large part by these same dependant women, to whom is conferred the gamut of household-upkeep duties. Because sufficient labor is available, the wives need no longer work in their husbands' fields, but may tend to their own, exclusively. Such elderly women may pay their own taxes and no longer ask for or recieve grain from their husbands. Instead, they employ produce from their own large fields tilled by their own dependants (with an occasional work party financed by son-in-laws). It is the dependency of these younger women that makes them different from those discussed in Section III.B, who are independent because of larger extended families and polygamous marriages (and who do not have a late-middle-aged or early-elderly mother-in-law to obey). It is the age of the co-wives in C.U. 15, coupled with the dependency of the younger women, that is significant.

The remaining case (C.U. 14) is more of an anomaly, as there are four young-to-middle-aged women working together, but only using the mill for six and a half percent of all milling days. Perhaps here, too, there is so much help available for stone-grinding that it seems best to save the money for something other than milling.

* These are the daughter-in-law of a deceased co-wife and the same deceased co-wife's seventeen-year-old daughter in C.U. 11A; the eighteen-year-old daughter and three daughters-in-law of the two elderly co-wives of C.U. 15; and the daughter-in-law and twenty-year-old granddaughter in C.U. 20.

The case of the women of C.U. 13A using the mill more than one would expect, given her relatively small fields, is not difficult to explain. She and the woman whose figure is the weakest of the cluster (C.U. 18) are the two great beer-brewers of the hamlet. The woman of C.U. 18 also makes bean cakes to sell in the markets of Tangaye and adjacent Maoda, and is of such slight build ("no one is skinnier than she!") as to be deemed physically unsuited for intensive farming. Some women who make beer with regularity, such as the monogamous wife of C.U. 2, also have good-sized fields; they use the surplus from their own harvests. Others such as the two in question, have established credit with other women still, and borrow grain to make beer, for reimbursement (probably in beer as well as money) once it is sold. The mill-ground flour is not used in the brewing itself, since sprouted sorghum is damp, and must be stone-ground before setting the mash to ferment; but use of the mill does permit women to direct their attention more whole-heartedly to the time-consuming task of beer-making;* and brewers have the wherewithal to consider the ensuing cost a part of their overhead.

2. THE UNUSUAL NATURE OF HAMLET ONE

It was stated above that the mill-use figures for Hamlet One are undoubtedly inflated, to a degree difficult to determine. Nonetheless, there are certain readily-identified attributes that make the hamlet's resident women unusual with regard to those of the rest of Tangaye, and which assist in their greater-than-average use of the mill. Proximity is certainly the most obvious factor influencing mill-use frequency; it is most convenient for those living closest to use the mill most, simply because they have a short distance to carry the grain.

Commensal Unit 1A, whose five co-wives apparently use the mill more than any other women in Tangaye (see Figure Twenty), is that of KOUELA Noktanga Issa, village chief. He and his first wife are in their seventies, their children adult; two sons are well-placed in the Voltaic government, and regularly send important sums to their

* A footnote on page thirty-one explains the process of brewing.

parents (both mother and father) for their support. The chief's five wives maintain large fields, able as they are to summon a large labor force and to finance well-attended work parties. In the same compound, C.U. 1B is that of the chief's younger brother's son, who shares in the general ease of chiefly privilege and prerogative.*

A disproportionate number of the other women of Hamlet One who use the mill most frequently (those of C.U.s 5, 10A, 10E, 14, 20) are beer brewers, the most important and most consistent of the village. Those of C.U. 19, while not making beer, do germinate large quantities of sorghum which they sell to the brewers. This then represents a hamlet-wide industry, and the concentration of brewers allows mutual advantages. They, in turn, produce their product there where the demand is greatest. The chief receives many guests, and is the center of political and of much of social activity in the village. He often commissions beer for his guests and will send some to kinsmen or affines where there is a funeral or other ceremony of note; the frequent work parties that he and his wives can summon to maintain their fields also require large quantities of beer to animate the labors. Similarly, significant amounts are purchased by those drawn to the chief for various reasons throughout the year. Especially in the dry season, some one of the renowned brewers has dolo for sale in Hamlet One nearly every day. Beer-drinking and sociability are synonymous, and brewing is an integral part of the vibrant economy about the chief that sets Hamlet One apart from the others.**

* The other Hamlet One Family heads are also related to the chief (as are many people in Tangaye), but probably only profit indirectly, through proximity to the beer-making and other activities of the hamlet. There are two clusters of compounds (C.3-8, C.10-13) in which all are closely related to one another, but too distantly to the chief to remember with ease the exact connection; another (C.16-19) are the chief's FaFaWi2So and the latter's close kinsmen. There is a FaBr (C.2); a (classificatory?) FaFaWi?So (C.9); a FaFaSo (C.14) and a kinsman too distant to remember (C.15). All live in the hamlet because it is the place of their ancestors; preceding chiefs lived elsewhere, in Hamlets Thirteen and Five.

** Other women's high use of the mill may be due to factors discussed above. Those of C.U.s Three and Seven are polygamously married, and in the former, the husband is the best tailor in Tangaye; knowing him, research assistants guess he gives money to his wives to have grain milled. The husband of C.U. 15A is a weaver, and may contribute to milling, but this is less certain (see footnote on page 69).

3. ALTERNATIVE USES FOR THE SAME WEALTH

In the scope of work for the present contract, the hypothetical question is raised as to what women might have done with money spent at the mill, had they chosen to do something else with it. One must first consider how much money women do spend on mill services. The relatively unimportant sums spent by most women on infrequent mill use might be used for minor purchases - an extra beancake or handful of peanuts to be eaten while gossiping at market, or the like. Some of the more significant amounts spent by other women are considered part of larger processes (brewing or preparing for work parties), and may be considered legitimate overhead. Other women might have spent the same money on larger items, clothing probably being of the first importance.

D. TIME AND MILLING

1. UNDERLYING ASSUMPTIONS

The assumption behind the present social research component of the Tangaye Solar Energy Demonstration and, indeed, behind the greater conceptual context of which it is a part (viz. "Energy Needs in the Food System") is that the tedious, dulling chore of daily flour preparation - long hours of pounding and/or stone-grinding - is a use of time better spent on other productive activities. If a milling service can be provided, then such time may be freed; a significant part of the present research mandate is to determine who saves how much time, and what they then do with it. There are several difficulties with such an assumption, best stated at the outset.

The most sophisticated measures of the "opportunity cost of labor" for activities such as water-fetching or grain-grinding, that is, for attaching a value to time, can be "approximated by the marginal productivity of labor now used in directly productive activities."* One uses a Cobb-Douglas production function, and with a further computation a marginal value product of labor may be obtained.

* This method is well demonstrated in Shapiro 1978; my thanks to Dr. Shapiro for making this paper available to me.

With a value thus attached to time, non-directly-productive activities (that do not aid the process of earning) can be assessed; if, as in Shapiro's Tanzanian study, an hour is "worth" thirty-some Tanzanian cents to rural farmers, then however-many hours may be spent stone-grinding grain, for instance, may be assigned a value as well. Positive changes introduced to the economy through development projects can be identified through a decrease in value units dedicated to activities not deemed "directly productive." While this may be a valid method of measuring the effects of defined inputs (e.g., the services of a mill), it depends upon there being some "directly productive activity" to which others may be compared; in Shapiro's study, this is cotton-farming, with a market value readily attached to amount harvested by men and women. Tangaye residents have no cash crop of the sort, nor is any measure available, through the present research or the on-going extension work of the Eastern O.R.D., of grain production (some of which is sold, most consumed, but all "directly productive").* There is no anchor, then, for comparative value-assessment of time and labor spent on activities such as those of concern here.

Taking another tack, the "tedious" nature of such work as grain preparation, may be examined. It takes several hours to produce the flour consumed daily (see Hemmings 1978:38, 65), hard work for the muscles of arms and back. However, many women alone in a commensal unit grind enough to provide flour for the next two days; as one said, this is the same amount of time mill-ground flour usually lasts (as determined by the amount brought to the mill). Furthermore, except in those commensal units where a woman is alone, without co-wife, teenaged daughter, sister-in-law, mother-in-law or other female companion; women share these chores, either working together on a given occasion, or alternating from meal to meal and from day to day. The false impression that all women engage in this work every day should be

* Hemmings does present a table of quantities in kilograms of crops produced and sold, based on Tangaye villagers' estimates (1978:32). Since, according to the same author, only one or two percent of the major cereal crops are sold (and so might be weighed or quantified by bulk), it is difficult to know how accurate such figures may be. My own feeling is that villagers have no reason ordinarily to think of amounts harvested in terms of kilograms, and so these figures may be highly speculative.

avoided, then.* Instead, any given woman may grind flour every other day, every fourth day (two women alternating, each producing enough for two days), or conceivably even less often than that.

A point similar to that concerning "water fetching" may be made in this context as well. One late afternoon in June, 1980, I heard a young woman singing in the compound behind my house. I was told that often the moment of stone-grinding, especially in early evening when all are back at the compound after the day's labors, is used by women to make social commentary through song. In a society observing strict segregation of sexual roles in many circumstances; among people who speak a derivative of Moré, the language of the Mossi people in which a husband automatically uses the familiar, singular second-person personal pronoun ("thou") when speaking to his wife, while she always employs the formal, plural form ("you") to address her husband; in a culture where common courtesy dictates that a woman curtsy or kneel when serving her husband or another man; a wife's proper self-presentation is to be retiring and silent. Should she have opinions of her own to offer or complaints to make, there are few opportunities for any but the elderly (and most crotchety) women to express themselves. Singing while stone-grinding is one, the other the moment of planting; this latter, too, is an occasion when a wife's active labor is more crucial than is her silence.

As a husband waits for his dinner, he and the others listen to the woman's song; so do any living in compounds nearby or passing on the path. An offender is likely to mend his ways in the face of such pressure, which may vary in its degree of subtlety, sarcasm and explicitness. Young women may also comment upon senior co-wives, whom they are expected to obey and respect; girls may complain of not seeing their lovers at that day's market, or of not having any to begin with, all the boys available being "as ugly as the vultures come to clean up filth," as one ballad had it, all the handsome ones having gone off to seek their fortunes in the Ivory Coast. Alas! Women

* Hemmings' figures for "average percentage of daily time devoted to . . . cooking" (1978:65) appear predicated upon such a mistaken assumption, although she notes earlier (pp. 35-36) that women do take turns cooking. Comparison with her figures is not fruitful if one realizes that total cooking time is shared by an undetermined number of individuals.

joining together to accomplish the task may gossip or joke, thus prolonging the time taken. The purpose of "flour preparation" is not limited to preparing flour, then.

Yet another consideration concerns women's attitudes toward work in the first place, or men's either, for that matter. In any society, some individuals are more industrious than others. On different occasions the same person will be more or less industrious due to health or sickness of self or dependants, good news or bad from loved ones afar, general happiness or depression, and the host of elements making everyone's life different from moment to moment. In hoping to recognize and evaluate the benefits from a solar installation upon which many well-meaning souls in Upper Volta and the States have expended money, time, energy and hope, one must be careful not to approach the people receiving the benefits as less than the individuals they are. In other words, as was noted with regard to water-fetching, these are not automatons ruthlessly dedicated to saving time to be immediately applied to other tasks, the products of which we all will recognize as fruitful. As the well-known Zaose proverb has it, "heartly laughter is better than a chicken thigh" (Guerin 1959:16; Hall and Hall 1948:25); intangible often outweigh tangible profits.

The nature of cooking is also worthy of note. Most Zaose meals consist of two elements: a starch base and a vegetable or meat sauce ("relish" in some ethnographies), prepared separately. The most common starch dish is tô - generically called boulé (from tô rounded form) in Francophonic Africa; it is a polenta or solid paste of flour and water. There are several stages in its preparation, the most labor-expensive being the pounding and stone-grinding of cereal to obtain flour. As do cooks and "eaters" everywhere, Zaose expect the tô to be ready and still hot when the sauce to accompany it is; in other words, several dishes are prepared concurrently. The sauces contain no flour and so are not directly related to or influenced by mill use. They do require time and effort to prepare, which must

be included in estimates of total cooking time.* Using the mill does not save or free this time; and it is my impression, based on too few cases to quantify, that in the dry season when time is not at a premium, women using the mill may spend more time preparing more elaborate or more sorts of sauces. The total cooking time, then, may be balanced by this and the social factors mentioned above; if so, little or no cooking time is saved or freed. The time may be used differently, but still for cooking. Time saved over and above total cooking time, then, may not amount to as much as might be presumed.

Another culinary fact cannot be overlooked: Only grain is milled. Many other dishes are prepared with whole rice or beans. Rice may be boiled with chili powder, onions if available, salt, sunbala**and shea butter;⁺ or with beans. These are both easy meals to prepare, and are consequently very popular, judging from the entries generated by Hemmings' questionnaire, "Food Preparation, Morning and Evening." Beans may be boiled with whole white sorghum (rather like hominy); they may be soaked, stone-ground while damp, and wrapped in "camel's foot" leaves for steaming; or for a "stretch" meal, they may be boiled with a little left-over flour. Pendo - flour sifted out from the mash as dolo beer is being brewed - makes a popular sort of tô; the energy has already been expended to make the beer, and it is a "bonus"; its sharp little taste of ferment varies the cuisine. In short, there are a battery of dishes that are popular, relatively easy, and which do not use milling; a woman's total cooking time includes that spent on these latter, as well as upon flour-based fare.

Last year (Fall, 1979), the harvest of beans was more successful than those of any other crops. In October, I was shown blighted sorghum that headed without making seed. People then had

* Those of Hemmings (1978:65) may not take this into consideration - no mention is made to lead one to assume that they do.

** Sunbala is an important local condiment made from fermented locust seeds or soy beans; its taste is not unlike that of soy sauce, and it is exported from Tangaye and environs as far as Niamey.

+ Shea butter is produced from the inner kernels of shea or karité fruit; it is sold in the Tangaye market by the local women who make it..

larger stocks of beans than they did of certain grains, this according to their statements and not to any objective measurement.* From the breakdown of the five hundred thirty meals observed by research assistants from November 1979 to June 1980, presented as Figure Thirty-Two, some idea of grain available is nonetheless possible.** Sixty percent of meals included flour, stone- or mill-ground; forty did not. Any discussion of the effects of mill use on women's allocation of time is only referring to sixty percent of dishes prepared during the period of the study, then.†

Finally, the fact that so many of these popular bean or rice recipes are chosen, among other reasons because they are easy to make (requiring only soaking and boiling) and are quick. does show a desire to save time and energy for other pursuits. To a degree (tempered by the above points), this is what mill use affords some women some of the time, as well.

2. TIME FREED BY MILL USE

To determine just how much time might be saved or freed by mill use, Hemmings devised a questionnaire entitled "Food Preparation, Morning and Evening" to be used by research assistants during their stays in the sample compounds. The preparation of all meals was to be observed, the time spans of the various tasks recorded. This they did with great dedication.

The great majority of women use the mill infrequently, as Figures Twenty-One to Twenty-Six illustrate. For example, for instance, the average number of visits to the mill during the research period per commensal unit was twenty, or eight percent of all millings. If one takes into consideration that only nine percent of all Hamlet

* No record of harvests is made by extension agents or others; see our footnote on page 76.

** Since quantities of grain sold, made into beer or otherwise disposed of in ways other than cooking do not figure here, this is not a measure of total percentages of staples harvested.

† Had the sorghum crop been better, the percentage of flour-based meals might have been higher; taking Hemmings' figures for 1978 crop production at face value, for instance, one would expect the ratio of flour-based to non-flour-based meals to be 4:1 instead of the 3:2 we found.

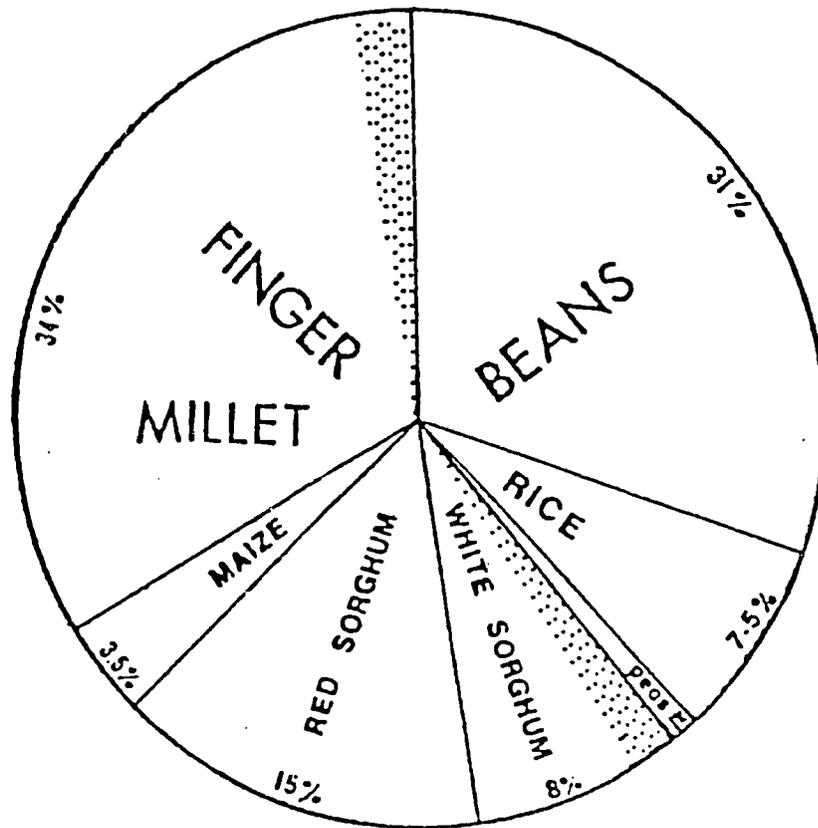


Fig.32 - MAJOR ELEMENT OF 530 MEALS

Five visits to the mill were made in the five summer months, this leaves an average of about eighteen visits per commensal unit over the eleven heaviest months observed. This boils down to one visit to the mill per commensal unit every twenty days or so; because this is an average, many women use the services even less frequently than this.

It was a matter of chance as to whether the particular day of the research assistant's visit to a targeted compound was one on which the women had availed themselves of the mill's services; in effect, this happened in the cases of thirty-six of the three hundred eighteen flour-based dishes observed prepared over eight months' time, about eleven percent of these latter, that is.* Representative, illustrative examples of these are presented in Section III.D.3.

The basic defect of Hemmings' "Division of Labor" questionnaire concerning duration of activities (see page 34, above) and this tiny sample from the "Food Preparation" survey obviate the possibility of closely comparing the number, nature and span of time spent by mill-using versus non-mill-using women. A different strategy would have been to identify at some midpoint in the project, those women who used the mill most, and then to concentrate observation upon their households.**

Despite the small sample generated by the questionnaire, an estimate of time saved can be made, with reservations to be explained. Hemmings' assertion, that preparing tô may take three or more hours (1978:65) from the first winnowing, sorting for pebbles, pounding and/or stone-grinding, and actual cooking, was borne out by the more recent data, the time varying according to the quantity to be prepared, how many were helping, how strong the women or girls were that day (due to health) and ordinarily (according to age and physique), how

* A complicating factor was that the second research assistant is the wife of Diabo's primary-school director; a well-dressed, sometimes over-bearing woman who drives her own motor scooter, her visits to the homes of more humble peasant ladies was not an occurrence deemed ordinary, but was an event. Leossogo was requested to specially mill flour for her visit on one occasion, since, as the housewife explained, one could not just prepare "any old thing" with such a distinguished guest; probably more than this one shared the sentiment and response.

** This problem was recognized earlier (Roberts 1979:29), but lack of time prevented action being taken to modify the research strategy.

experienced' the woman or girl is (knowing the time-saving tricks of the good cook in any culture), the nature of outside distractions and coincidental activities (joking, singing, nursing, etc.), any prior preparation of the elements, and the like. In other words, cooking is not done in Betty Crocker's Kitchen where all variables can be identified, quantified and/or held constant; any but a general statement is an absurdity.

Using the mill eliminates most of the labor (although the grain still must be winnowed and sorted, usually a fifteen-to-twenty-minute task); preparing a tô from mill-ground flour is a matter of boiling water and mixing in the flour, turning it till it is smooth and consistent. Time required for boiling water depends upon the heat of one's fire (and building the fire in the first place, if one is not ready) and the quantity of water in question. Once the pot is on the fire, no human energy need be spent till the mixing of the flour. The process usually takes at most half or three-quarters of an hour. This, then, is a significant saving of time in those circumstances when some or all of the above social or other sorts of factors (e.g. preparing elaborate sauces) are not at play.

Flour ground at the mill is most often of sufficient quantity to last two days or slightly longer.* Judging from our small sample, many women (in hamlets other than One) do not use their stock of it all at once, but intersperse meals prepared with mill-ground flour with rice or bean dishes, or with those made with ~~stone-ground flour~~. This last spreads out the pleasure of an easy time cooking, or, as one woman told us, it may prove useful when unexpected guests arrive or circumstances happen. This at once indicates women's awareness that mill use does free some time or at least make cooking easier; and introduces yet another difficulty to determining total time saved and what is done with it.

Figures Twenty-One, Twenty Three and Twenty-Five show how infrequently many women use the mill more than once or twice a month.

* One elderly lady said she used the mill weekly, and that eating alone, a milling lasted her all week. How long flour lasts depends upon how much is taken in the first place, and how much is used at a time; women appear to bring to the mill about the same amount they would stone-grind in a single session. - that is, enough for two days.

Some, such as those of Hamlet One, use it much more often, and for them - particularly since they are the same ones who also use station water - the solar energy demonstration has truly changed their lives. It cannot be over-emphasized how few are these fortunates; most only gain an hour or two's respite once or twice a month, some less often than that.

3. HOW FREED TIME MAY BE SPENT

To understand how time freed by mill use may be spent, it is best to ask when it is freed. As is clear from the total visits per month for each of the selected hamlets (Figures Nineteen through Twenty-Five, odd), these data reproduced in the curves of Figure Sixteen; the dry season (November through May) is when the mill is used most frequently. During the rainy-season months (June into October), many women cease using the mill altogether, and all use it far less than during the alternate season. The latter period, however, is when all are engaged in the most intense labors of the year: the various tasks accompanying the agricultural cycle. This is what may be defined most readily as directly-productive work.

For most women, the presence of the mill has done little to free time for increased attention to these all-important chores, since so few chose to use the mill then.* Food stocks are at their lowest just prior to the next harvest (just when they are needed most for the extra energy spent cultivating);** money is as well, since that from sales of crops or their processed products, earned after the last harvest, has been spent or must be saved to purchase any food necessary to get through to the next harvest. Such factors diminish women's ability to use the mill, even should they so wish.

* Exceptions will be mentioned below.

** This is sometimes aggravated by people's own poor planning. In June of 1980 members of one compound complained to an assistant of their lack of food; his ascerbic comment to me was that these same people had sold a good deal of grain after the previous fall's harvest, and had used the profits to buy rice and meat and other good things to eat; they suffered now as a consequence.

Their will to use the services may be lessened then, as well. Hemmings makes the interesting observation that women use less water in the preparation of their "millet cakes" (presumably tô polenta) in the rainy season (1978:28). This can be linked with a more recent finding, that women feel that tô made from finely-ground flour from the mill does not "stick to the ribs" as well as does that from coarser, stone-ground. People enjoy the feeling we would consider "heaviness" in the stomach when they have intense work ahead of them; less water and coarser flour provide this sensation (since the resulting polenta is harder to digest).* Even should they have the financial means, then, women may choose not to use the mill during the agricultural months, despite its time-saving quality.**

The result is that most time freed is so in the dry season, when for the Western observer it is a more complex affair to identify productive uses to which it is put. The matter of what is deemed "productive" must be re-examined.

Hemmings has described each season's major work characteristics (1978:14-17). Grossly categorized, the rainy season is almost wholly dedicated to agriculture (preparation of fields, planting, weeding, harvesting); as the Mossi proverb has it, "you don't argue about hoeing in the rainy season" (Hall and Hall 1948:22) - it must take precedence. Final chores (harvesting, threshing) may be completed in the early dry season. One often has the impression that "everything else" ~~is accomplished in the dry months from November through May: --~~ crafts, celebrations, visits to and from kinsmen and friends, trips to the big city.

From a certain perspective (as outlined in Shapiro's study mentioned in Section III.D.1), "directly-productive activities" may

* In turn, a related notion is that mill-ground flour makes better porridge for infants, because it is so fine and easily digested, and does not "cause" constipation.

** The mill machinery can be regulated to produce coarser or finer flour, but this has not been done to date; complaints about the first mill were that its flour was too coarse - the season must have been wrong! That millers do not take the initiative to change the fineness is a function of management difficulties to be discussed below.

be considered those that allow entry to the greater money economy through earnings, or those which are of fundamental necessity to sustenance. The very adjectival phrase "directly-productive" implies the existence of other activities which, in comparison, must be "indirectly-productive."* If the rainy season is a time dedicated to directly-productive chores, in the dry indirectly-productive ones abound.

Attaching a value judgment to these terms, deeming directly-productive somehow "better" than indirectly-productive activities from some moral perspective, should be avoided as non-productive ethnocentric interference. Early colonial and missionary personnel are often justly criticized in this regard; imposing their views, which were functions of their own cultural values and practices, they sought to decrease the indirectly-productive activities they considered "superstitious" or "heathen," and increase directly-productive labor, without recognizing the intricate inter-relations of the two.**

An example of the balance of dry-season, indirectly-productive activities, with rainy-season, directly productive ones, can be seen in the following. During the dry-season month of April, 1980 (when mill use was at its highest) a virulent strain of meningococcal meningitis struck Tangaye and a few surrounding areas.⁺ With more than a score of fatalities, much time - whether freed by mill use or not -

* "Non-productive" activities - the opposite of "productive" ones, are not implied by the qualifying phrase "directly-productive."

** This recognition is one of the keystones of social anthropology, cultural relativity and its correlates being assumptions underlying all theory and serious ethnography of this century.

⁺ Cases were also reported from adjacent Maoda, the towns of Bogande (NE of Tangaye) and Kantshari (near the Nigerien border). The last significant epidemic of meningitis in eastern Upper Volta was in 1979 in and around Diapaga. My thanks to Dr. David Kyelema of the public health service at Fada N'Gourma for this information. Dr. David Sokal, C.D.C. Epidemiologist, has prepared a report (1980) describing the Tangaye outbreak. Information on Zaose theories of causality of such illness were studied over this past summer, and may be expounded at a later date, in another context.

was spent in seeking traditional or other medical care, and for funerals and other mourning activities. Inversely, the unusual number of these ceremonies probably accounted for some of the intensity of mill use, the flour being prepared for funereal feasts. Such a use of time is an indirectly-productive one.

Funerals for all societies are essential moments when people are brought together in a recognition of their mutual bereavement and of the survivors' new balance and order resulting from the death. The funeral is a reaffirmation of the bonds and inter-responsibilities of social life that make all other activities, directly- or indirectly-productive, meaningful and possible. If the deceased is an adult male, for instance, his means of production (fields, tools, and material wealth) must be reallocated, his dependants (wives, children) redistributed, his roles (chief, priest, family head, husband, father) reassigned. The social vacuum created by his passing must be filled by other individuals, so that life may proceed, decisions be made, tasks be accomplished. The alternative is confusion, in which co-ordinated, directly-productive activity is, by definition, impossible. Other dry-season activities of greater regularity (e.g., feasts and celebrations, visits to and from kinsmen or affines, and the like) serve similarly to provide the structure allowing co-operation during the hectic months of intensive farming.

An impression of what the mill means to women, and a glimpse of what their lives are like, is best gained from the vignettes-presented below. They are reconstructed from data collected with Hemmings' "Division of Labor" and "Preparation of Food" questionnaires, and from free-form commentary written concurrently by the assistants, at my behest. Of the thirty-six times (of the five hundred thirty) when dishes were prepared with mill-ground flour, three per month are presented as representative. The following may be given as their résumé:

December - heavy work in fields with last of season's harvests; quick meals of mill-ground tô and beans prepared, the women spending entire day in fields.

- January - a) women use mill-ground flour for a fast meal after spending the day preparing beer; b) women resting all day or spinning cotton thread make mill-ground tô; c) a huge mill-ground tô is made for a threshing party.
- February - a) women rest, not feeling well, and make mill-ground tô; b) beer-brewers prepare their meals from mill-ground flour; c) women engaged in spinning thread cook a mill-ground tô.
- March - a) women off visiting all day prepare mill-ground tô; b) a woman doing nondiscript household chores cooks a mill-ground tô.
- April - a) a woman doing housework prepares mill-ground tô; b) a woman visiting elsewhere all day returns in late afternoon and cooks mill-ground tô.
- May - a) women doing household chores prepare mill-ground tô; b) a girl playing all day cooks a mill-ground tô; c) a woman planting in the morning cooks a quick lunch of mill-ground tô, then spends the afternoon preparing rice to sell at market later the same day.
- June - mill-ground flour is taken to the fields where people engaged in farming are camped.

In these few cases, women use the mill, sometimes with the explicit intention of saving time for other recognizable, directly-productive labor, sometimes for no other apparent reason than "to take it easy." The "household chores" in question are not sufficiently noteworthy for the assistants to have broken them down further into categories;* the tasks included are sweeping and arranging houses and compound yards, building and tending the cooking fire, talking with others in the family, and the like. When a woman uses mill-ground flour on a day when these are her major activities, one can surmise that she does so because she may not feel well, for the pleasure of the luxury this represents, perhaps for the status of conspicuous consumption; but certainly for no more tangible reasons than these. In other words, she "takes a breather." In effect, when asked the general question, "when do you use the mill?", women responded that

* This was despite the "Division of Labor" questionnaire having a total of twenty categories to choose from, counting those added to Hemmings' form by the assistants as they themselves recognized the need.

they do so when visitors come, when especially busy or when ill; their most common reason for not using it, they said, is lack of money, or a reluctance to wait the three days it often takes to get flour back because of the backlog of grain waiting to be milled.

4. OTHER CONSIDERATIONS

In the mid-term assessment (Roberts 1979:10), it was speculated that time freed by use of station facilities might well be spent making more dolo beer than had been done prior to the installation of the pump and mill. However, this past dry season there is said to have been less beer made than the year before. Because of the poor harvest of red sorghum (the grain used in brewing) this past year, its price has risen; without overtly raising the price of beer, brewers find it less profitable an activity. They are suspected of mixing more water in their beer these days, and are accused of serving slightly less at a time, or of using a slightly-smaller calabash to serve it to their clients. Drinkers the world over suspect bartenders of the same, and when times are tough, general resentment may manifest itself in this way. Whether or not the brewer/sellers do indulge in such petty trickery would be as difficult for the trained as it is for the untrained observer to determine.

It is also said that because there are too many women making beer, it often goes unsold for two or three days, till it spoils. Women state that while in the past, some made beer nearly every day (that is, ~~they usually had some in one of the various stages of~~ preparation or consumption) and could always reap a profit; that this has not been the case this past year. One man complained of having requested that his wives prepare beer for a family funeral - an important part of the overall ceremony. They had refused, saying surely there would be plenty of beer made by others which could be purchased (more easily than their having to brew it from scratch). Lo and behold, none was available, which angered him considerably. He was humiliated, as this bespoke his lack of command in his household,

and made him appear mean and avaricious to his fellow mourners. More generally, his case and the above discussion lead to the conclusion that while we have seen that brewers do avail themselves of milling services, that during this past year - perhaps due solely to the poor harvest of red sorghum, perhaps to wider financial malaise - the station's presence has not been associated with a rise in beer-making. This may change this next year, as the harvest looks to be an unusually good one.*

With regard to comparative analysis of activities other than brewing before and after the implementation of station facilities, consultants George Burrill and Roger Popper have made some interesting suggestions in their paper, "Evaluation Planning for the Tangaye Solar Energy Demonstration" (1978). Unfortunately, they did not have Hemmings' baseline study at hand when writing their own; while attempting to compensate for this by making many useful suggestions (e.g., those of their page III-8), a number of their "guesstimates" concerning aspirations for possible comparative analysis between the final and first phases cannot be realized. Comparison of the sort can only be predicated upon diachronic observation (e.g., maps of areas under cultivation, of distances to firewood sources, of compounds indicating numbers of houses and granaries, these to be drawn before and after implementation; market measures, to gain an idea of quantities of beer brewed and sold, handicraft production, and general participation by targeted women before and after; and the like). While their suggestions remain valid, then, they also remain for a future researcher to achieve, from start to finish. As the Zaose proverb has it, "the heel may hurry, but it will never get there before the toe" (Guerin 1959:16). Trying to reconstruct such data, hindsight-to, is doomed from the start. Questions such as "Do you do X now as much or more than you did one or two years ago?" elicit the vaguest of answers,

* Consultant entomologist Channing Fredrickson has made the interesting observation that this may be due to the earliness of the first rains (which began on 24 April this year) being followed by an especially dry May and June; first seeds planted died, but so did most insect and other crop pests. When the rains began in earnest, crops could flourish without the usual blights. My thanks for this personal communication.

subject to many outside factors.* A study depending heavily upon such information cannot transcend the realm of impressions, as this one does not at a number of junctures.

Another idea raised by Burrill and Popper is that "villagers need to know (share information about) what new uses they make of the time that has been freed as a result of the pump and mill in order to: a) define the best uses of their time, and b) stimulate further use of the mill" (1978: III-2). This valid suggestion is a matter for — extension work based upon the evaluation, and is not a function of the evaluation itself. Nonetheless, it highlights the problem of a lack of integration of rural development with regard to the Tangaye project.** No effort has been made by Eastern O.R.D., U.S.A.I.D. or any other agencies' personnel to provide something they define as useful for women to do with time it is assumed will be freed by station use. It is never too late to begin such a program, but co-operation and co-ordination are required, motivated by progressive thinking. With the current enthusiasm generated by the station project, women would in all likelihood be receptive to such efforts.†

* An individual's desire to appear successful may lead him to exaggerate a bit to prove that he is just that, for instance. Such can be instructive, if the observer has a sufficiently-profound understanding of local-level politics to know why a given person on a given occasion is or is not being straightforward.

** A related point, concerning the need to instruct people in the public-health benefits of using station water, was raised in Roberts 1979:3-6. One of the major ideas underlying Hemmings' propositions for implementation of the station management by its women's co-operative, was to be a more complete integration of agencies' inputs and resulting benefits.

† This becomes more difficult with the realization that all women do not profit equally, some not at all or much too little to measure, from the mill. Extension services directed toward those women who do profit would further underline the differences among women as to who does and who does not, who can and who cannot use the mill. A decision to approach the women who do use the mill is one determined by political philosophy.

E. CONCLUDING IMPRESSIONS

The following sketch can be drawn of a hypothetical woman using the mill frequently: if not one of the brewers or other women enjoying the special circumstances obtaining in Hamlet One in proximity to both the station and the chief, more often than not the woman will be in a polygamous marriage within a greater, closely-knit extended family (her husband's), in one of the hamlets closest to the station. She will have relatively large fields of her own, the greater their surface, the greater her participation in mill activities. Brewers in other hamlets may have small fields, but other resources allow them to use the mill often.

Most women of Tangaye do not use the mill frequently. While the resulting benefits may not be appreciable on the individual level, they are appreciated. Those unable to avail themselves of the service bemoan the poverty that prevents them from doing so.*

From the examples available, women can be expected to use time freed by mill use for tasks such as harvesting and threshing, traveling, thread-spinning, beer-brewing, or "just sitting around." Some use the mill when, for reasons of ill health, they do not feel up to the physically-demanding duty of flour preparation; others when large amounts of flour are suddenly required for funereal feast: or for work parties in a man or woman's fields. But as has been seen from a number of angles, judging the amount of time saved is a matter complicated by many different social factors. The best indications that women do perceive the mill as useful are their long lines awaiting service on milling days, and the serpent of containers brimming with grain left in the station building to be milled the next time around.**

* A Mossi proverb has it that "a lazy person's field is on top of a mountain; he sits and says 'a dry spell is killing me!'" (Hall and Hall 1948:26). In other words, an industrious farmer seeks out good land, despite any greater distance to it, and makes a go of it. Some women might be more industrious and thus have profits to use the mill more often; everyone is different, and some are simply not motivated sufficiently to do so.

** As an aside, it may be mentioned that the grain left in open containers over the day and two nights between millings, supports a very large, very fat population of rats in the mill building.

Were it not for the constraints of the mill's site and resultant capacity to serve a fixed number of women only, more would come to use its services. Mills (and solar-powered pumps) have been requested for other hamlets of Tangaye, repeatedly. Women continually complain of the wait - often of three days - they must endure to receive their flour. As was explained by one earnest individual, at a mill, one is supposed to get immediate or quick service, that is why one goes in the first place; women come seeking flour in a hurry to satisfy their husbands' hunger, and are angry when obliged to wait. My argument that the mill is what it is, everyone knows that a wait is almost inevitable, and so must take that into consideration; was rejected as not being what a mill is meant to be, by definition.

IV. STATION MANAGEMENT

A. THE EVOLUTION OF MANAGEMENT

The beginning and first six months of station management were described in the mid-term evaluation (Roberts 1979:13-25). There are four individuals or groups who are party to most decisions: Pascal Leossogo, the station manager;* Kouela Noktanga Issa, village chief; Kouela Neba, station co-operative president (and his fellow members); and the millers. Anyone with a sense for local-level politics will know that the situation is vastly more complicated than this, for Leossogo as an outsider has had to establish his own power base, and is the direct liaison with the functionaries of the Eastern O.R.D. and other agencies Voltaic and American; the chief has his counselors, interests and intrigues; the co-op members are scattered in the various hamlets and each represents different lobbies and personal interests; and the millers and cashier may be three or four men working together, but not necessarily three getting along with each other. There are also people unattached to any of these four in any official capacity, who nonetheless manage to influence station affairs. Here we shall consider first the simplified four-party view of how management works, then some of the issues of the past months will be presented, to allow the reader to savor what is happening in the community.

Many of the ideas and much of the initiative concerning station management have been generated by Pascal Leossogo. He is a young man with a dynamic spirit and social maturity outdistancing his twenty-one years. When he learns of or identifies a problem, he finds a solution, then typically goes to explain both - as a *fait accompli* - to the chief. He and the latter have become very close. In Leossogo's first months at Tangaye he felt - and was made to feel by villagers - quite insecure about his new responsibilities in a community unfamiliar to him. He approached the chief (himself an

* Leossogo is assistant de gestion at the station, ostensibly charged with regular data collection on equipment performance and use, and with overseeing the upkeep of the machinery and batteries. See Roberts 1979:17-18.

exceedingly warm, wise and wily old man) and said he considered himself as his dependant, as a "son."* The chief immediately summoned the fact that he had known Leossogo's own grandfather, once chief at Lezogotenga (twenty-two kilometers west of Tangaye on the Ouaga-Fada road); a bond was thereby established. As the months have passed, the chief, who was at first alienated from the project and only participated in decision-making covertly,** has come to trust Leossogo and to take upon himself ultimate responsibility for village participation. This does not mean that the principle of the co-operative has been discarded, but that the chief has taken more overtly the role he played all along, as its sponsor.

Once Leossogo has discussed his idea with the chief and has obtained his approval (with modifications made as the chief may see fit to propose - Leossogo is truly fond of the old man and is impressed by his wisdom, and justly so), Leossogo will call a meeting with the millers and another with the greater co-op, the order of the two depending upon the particular issue at hand. Again, there is discussion and some modification possible, but it is my impression that most responsibility for devising the plan of action has already been taken at this stage. While some subjects may be introduced in the other direction - from the millers or the co-op to Leossogo to the chief - most non-political ones pass as outlined.

It was my own feeling at the mid-term assessment and at the start of the present fieldwork that whereas Leossogo has been doing an excellent, commendable job of making management function, that this was in contradiction to my understanding of the basic assumption as outlined by Hemmings and others, that this was to be a village project. Villagers were to be trained to assume all management and maintenance responsibilities themselves; Hemmings felt that as this project was to assist women, it should be run by women. The manner

* I myself used this term with regard to the chief, who is "father" of all in Tangaye. The use of such fictive-kinship terms is a manner of decreasing social distance alien to some Westerners; rather than implying acquisitiveness or some other negative motivation as they suspect, it is the beginning of the definition of mutual responsibilities.

** These early difficulties are outlined in Roberts 1979:13-16).

in which these assumptions were disregarded as the co-operative was created and the station's life begun, are discussed elsewhere (Roberts 1979:13 and passim). In afterthought and as I have discussed the matter with Leossogo, I have come to alter my perspective, realizing that the position I now espouse is fraught with as many difficulties as has the previous one.

Placing a small-scale development project like the present solar-energy demonstration in a village means that automatically a new field is opened for old battles. A community coheres through tension: the positive sort of kinship and affinity, the negative of disputes and their resolution. Perhaps it takes an outsider like Leossogo to organize people on the different sort of plane that was desired for station management; not being a part of local-level politics (at least at first) may be a boon to such work, an advantage no local person could have.* On the other hand, one of Leossogo's first actions was to establish a bond with the village power base - the chief. Successful social management in such a situation does not mean rank imposition of ideas, but rather their insinuation, that they appear to come from within established ranks, but that they retain ^{the} cachet of "outsiderhood." Leossogo has proven very adept at this.

The obvious difficulty with this perspective is that there are not many Leossogo's in this world; one certainly cannot count on finding one just because a need exists. The ORD encadreur village extension agents are supposed to possess just such qualities and to fulfill such functions, and yet their uneven performance - even in my limited observation - attests to how hard it is to find a good man. There seems no ready solution to the dilemma of choosing between a totally grassroots organization versus the introduction of an organizer; this project has worked well with the latter, probably better than it could have with the former.**

* Most co-operatives in the area have never gotten started, have had disappointing results or have failed altogether, in Tangaye prior to this project and in other surrounding villages now - this according to such informants as the encadreurs in charge of them.

** The fear remains that unless we allow people to make their own mistakes and come to their own solutions to problems, we shall never escape a Eurocentric perspective.

1. SPECIAL-OCCASION MILLING / ORDER OF SERVICE

To best understand the nature of management, the issues involved, how decisions are made, and how the process is complicated by local-level politics, several ethnographic cases can be presented. The first concerns special-occasion milling and the order of service provided mill customers, discussed in early January, 1980, at a meeting of the station co-operative.* It was decided then that when there was a funeral, baptism or marriage feast, that a client should receive priority and have his/her grain milled immediately, even outside of ordinary hours, if electrical power and personnel are sufficient. Normal payment would be exacted, and the millers were exhorted to beware of women's fibs about such extraordinary needs: Only verified cases would be accepted.

This seems a businesslike recognition of a need arising from the social milieu, the exact sort of integration of the station into local life desired. The same issue has a somewhat stickier flip-side, however. The millers have been accused by clients of disregarding the general first-come, first-served rule, in favor of certain women and not others. This was discussed at a meeting held in late June, 1980, between Leossogo and the millers. The latter hotly denied the practice, but Leossogo said he knew they had acceded to pressure on occasion; just a few cases allow wags to expand the issue out of proportion, he told them. He cited the fact that whereas government functionaries receive preferential treatment elsewhere, being able to go to the head of the line at the Diabo dispensary, for instance; here the ORD agent, the FJA teacher and he (the three village functionaries) had to wait their turns like everyone else.

A miller then raised a related point, that his wife had been complaining that he did not put her grain ahead of the other women's; Leossogo reminded them that the co-op, in deciding the rules for the mill, had stipulated that even the millers must wait their turns. The millers retorted that now with the changes wrought by Independence

* Minutes were kept in a notebook at my behest by Leossogo.

(i.e., female enfranchisement), they can no longer oblige their wives, when they arrive home at 8 P.M. from the mill, to prepare food for them and their children if their grain has yet to be milled. Leossogo said that that is the way it must be, that the same women who have been complaining about preferential treatment allegedly being given their peers, are the ones who have been intimating that after he leaves the station,* there will be no more respect of the rule of order; instead - and the women consider this a change for the better, Pascal said - those close to the millers would be able to exert their privilege and have their grain ground out of order. This is the way it works at commercial mills, he said.

This in turn brought up the question of the chief's grain. The millers said that often women come with his grain saying that the millers are instructed to grind it immediately, out of order. This had gone on for some time, and there had been grumbling by other women. Leossogo went to the chief to discuss the practice, and the latter said that only once had he done this, that all the other times it was women using this trick to get their grain ground quickly. The chief had agreed that it was best to stop the practice altogether, unless a miller went to the chief and was told face-to-face to grind the grain. The chief pays for milling like everyone else, and his power to command immediate milling would be closely regulated thereafter, to prevent further abuse. Leossogo pointed to this as yet another reason for not allowing other women to pass before those in line in front of them, and added that such only arouses suspicions that the miller has a lover (since he does not even do this for his own wife), which would aggravate things at home even more.

2. MILLERS ALLEGEDLY STEALING GRAIN

At the same meeting with the millers in late June, Leossogo discussed the rumor, which he had heard from various quarters, that the millers have been stealing grain. The matter was brought to the chief's attention - who then contacted Leossogo - when a woman from

* Leossogo will leave Tangaye, with the end of the project mandate this fall, to assume another position with AID.

the adjacent village of Zanre could not have her grain milled the day she brought it and refused to leave it to be milled the next time; she had loudly proclaimed that she would not fall victim to the millers, since she knew that the amount of flour given back was not equal to that deposited.* Leossogo said that women cite the fact that the millers routinely take the machine apart to clean the screen and to remove a small number of kernels that have fallen to the bottom without being ground; this amount is what is "stolen" from the women. As the millers only clean the machine once or twice a milling day, only a tiny amount is taken from any given woman's grain, yet it is this, plus general suspicions, that has given rise to the rumor. The millers were angry about this impugning and said that women always say that about mills, and while it may be true of commercial ones, it was not at theirs. Leossogo told them they should clean the screen very publically, and explain to all observing exactly what is being done.

3. THE MILLERS' WORK SCHEDULE

Again at the meeting with the millers at the end of June, Leossogo raised the issue of their work schedule, noting that while there are three millers, there is only work for two on any given occasion; perhaps the third could take the day off to see to his fields, and they could alternate in this way. The millers rejected ~~this suggestion, saying that the third was needed to clean the solar array and around the mill buildings.~~ In the second week of September a meeting was held with Leossogo, the millers, and the station co-operative, at which the same issue was raised. The head miller was unable to see to the weeding of a sorghum field I visited, because of his duties, and it was in this context that the matter was raised. Later the same man was heard grumbling about the co-op members wanting them to take time off now that planting and weeding

* There is a long history of rivalry - sometimes bitter and sanguinary - between Tangaye and Zanre residents, beginning when an early Tangaye chief was captured and taken slave at Zanre. The woman's distrust is undoubtedly colored by this adversarial relationship.

seasons were through. Why were they saying this? Why were they trying to dispose of the millers in this way? And so it continues.

At this same meeting the related issue of millers' salaries had been raised. Leossogo had noted that the miller in question was a family head, and that the fifteen hundred francs (about \$7.50) a month was not enough to compensate for the fields he was not able to work. The co-op president (whom Leossogo had approached with the suggestion prior to the meeting), proposed that the miller's salary be raised by five hundred francs; all seemed well-disposed to this idea, when the cashier - the only non-Tangaye resident in the co-op and himself the subject of great controversy as a consequence - said that while the idea was a good one, that what was needed more was a frank and open co-operation among the millers. If this were obtained, then they could agree among themselves as to when each would receive some free time; as it was now, each was afraid that the others would steal something, or that he would be accused of doing so while not present. The truth comes out! The meeting broke up soon after, without time for a resolution of the matter, but the loud complaining of the millers hanging around the station the same evening ended in an argument between the head miller - the one for whose sake the matter had been raised in the first place - and Leossogo - the one who had been doing the politicking to get more money for the miller. Why was that "foreigner" (the cashier who lives in Koulouroko, about two miles down the road) accusing us of being thieves? Perhaps he is one, and that is why! Those who say only Tangaye people should be working at the station are correct, what will we do if he - the cashier - takes the day's receipts and flees to his village? Pascal countered that the miller was acting childishly, and by talking behind the other's back, when he had said nothing at the meeting, he was proving the other's plea for a more open co-operation an obvious necessity.

The matter was taken to the chief the next day, and the old man's suggestion was that the head miller's salary be doubled (to

three thousand francs, or fifteen dollars a month) and that the others alternate, each taking a full month off at a time. Leossogo privately suggested to me that they might "double" the other millers' salaries as well, paying them for two months at a time and giving them the impression that they were making more money overall, a ploy with little hope of success or chance of resolving the bickering.

4. PERSONNEL PROBLEMS AT THE MILL

For any readers who have not yet seized the magnitude and complexity of the local-level political arena of which the station is but one battlefield, the following should do the trick! There are several on-going problems with the constitution of mill personnel as it now stands; this one may stand as representative of the genre.

Originally, the millers were chosen by the station co-op from among its own members. One of the millers had an affair with the wife of the retired master sergeant living just behind the station. This latter - himself subject of intricate manoeuvres with the chief as monied, military-backed power confronts traditional - exerted pressure that the man leave his post as miller, since, as he said, he did not want to have to see him working at the station the first thing in the morning as he arose, and know that his wife went to get water at the very place where the man who had cuckolded him worked. ~~The miller retired, and arranged that a young man from his same hamlet take his place.~~ This worked well for a time, but then the new man decided to go to Ghana to seek his fortune; the co-op met and chose their own secretary to fill the position. In part this was because he is a serious worker and known to be a dedicated, no-nonsense person; and in part because he had worked as station accountant for six months when the mill had first opened, without salary. He has worked well in the position.

Not long ago, however, the young man returned from Ghana and presented himself to Leossogo one morning, pronouncing himself ready to resume his job as miller. The latter said that he had nothing

to do with such matters, that only the co-operative could decide who would fill the positions, and that they had chosen their secretary to replace him; he doubted that he could regain his old job. Leossogo consoled him by saying he would need the time for planting and weeding anyway. Several weeks later, Leossogo was contacted by the original miller (the one who had cuckolded the master sergeant) who is also sub-chief of his hamlet, and invited to a meeting people in the hamlet were to hold, since people there felt that Pascal's not allowing the young man to resume his position at the mill was a slight to their hamlet, which had had only this one worker at the station. Did this denial mean that people from their hamlet were not wanted at the station? Should they no longer feel welcome when they bring their grain there? The meeting was postponed as a work party was called by one of the village chief's counselors.

The final installment of the saga as I left it, was that the village chief was complaining repeatedly to Leossogo that he had not been informed that the original miller had retired from his position; it is his feeling that the original miller should regain his post, and that all will be settled if he does. This is a rather bald move on the chief's part against his adversary the master sergeant, since he knows full well that the reason why the man was pressured to step down in the first place was so that the sergeant might save face by not brushing shoulders with the one who had cuckolded him.

5. CHOICE OF BANKERS

The following case brings out a different aspect of management: the difficulty people have had in understanding what is and what is not their proper prerogative with regard to the station. Mill earnings have accumulated, and are kept by the treasurer, a man living in Hamlet Thirteen, far from the road. The need to bank this money is clear to all, not so much because they will thus earn interest, but

because the treasurer and all concerned are anxious about having several hundred dollars' worth of francs in one place in the village, where it might be stolen, destroyed by fire or termites, or whatever. There is concurrently an apprehension (mentioned in Roberts 1979:23) that since no one, even now, is altogether sure what they are supposed to do with mill earnings, they might decide upon an expenditure that an ORD agent or someone might later deem incorrect. The consequence has been confusion and apathy with regard to this matter.

In January the issue of who would become the co-operative's bankers, who would decide when deposits or withdrawals would be made from the station account, and who would be charged with taking the money to and from the bank at Fada N'Gourma, was discussed at several meetings of co-operative members. On the fourth of January, 1980, a tentative list of bankers was proposed; and the unanswered posed, "What should we do with the money we have earned?" as transcribed in Leossogo's minutes. On the eleventh of the same month, further discussion and a finalization of the choice of personnel was accomplished. Six people were chosen, three to decide deposits and withdrawals, three to make them by going to Fada N'Gourma. The first three are the village chief, the hamlet chiefs of Hamlets Ten and Twelve; they were selected because "they are elders (dovens) of the hamlets, they have no titles in the mill co-operative to date, and they regularly attend meetings." The second three are the retired master sergeant, and two other retired soldiers of lesser rank than he. The reasons for their selection are that "they are family heads; they regularly go to Fada N'Gourma to draw their trimestrial pensions; they participate in co-operatives, they have personal wealth (cattle, donkey carts, motorcycles, land holdings, and many wives) which would prevent them from any attempt at fraud or extortion; they have no titles in the mill co-operative as yet; they are fearless (ils n'ont pas froid aux yeux); and they are regularly at meetings."* Once these choices were made - based on an attempt to achieve an even spread of representatives from various village factions - nothing happened after.

* Again, these are minutes kept at my behest by Leossogo in a notebook.

Late in June, 1980, Larry Dominessy of the Ouagadougou AID Mission, and Bruno Bambara of the same office, came to Tangaye and held a meeting to discuss the ending of the Solar Energy Demonstration as an AID project, and its transfer to a Voltaic agency. Bambara, as interpreter, stated at the meeting that he had looked into the question of banking, and had found that two - and only two - persons were required to sign deposits and withdrawals at the Fada bank. Again, the matter remained there, and was again discussed on a visit to Tangaye from Gay Morgan of the same AID office, who in late August reiterated the need for two bankers.

Soon afterward, in a discussion of related issues with Leossogo, he mentioned that for the past six months they had been discussing the matter of banking, but that nothing had happened. AID had delayed anything being done, he said, since the various agents had said "we shall see," and so nothing had ever been done aside from repeated discussions. He said that had AID not impeded him in this way, he would have arranged this long ago. I then stepped out of my role as objective observer, and asked who at AID had said that they should not begin banking; Leossogo responded that Bambara and Morgan had both said only two were to bank, but then admitted that neither had said anything but this. It seems probable that since six were chosen by the co-operative along the lines of local-level politics, that when only two were "allowed" by AID personnel, this implied the need for negotiation that did not occur; it also belies a basic misunderstanding of who is to have responsibility for such matters. I took the liberty to explain that according to my own understanding, the co-operative, and not the AID personnel, were to have the power to make all decisions of the sort; I added that my own research program included the study of management assumed to be organized by the villagers for their needs as they themselves recognized them. Leossogo said that he had never understood this to be the case, that no one had ever stated this plainly, and had he known the banking issue would have been finalized long ago. He said that in mid September when we would both be in Ouagadougou, he would inquire at the AID office

to confirm the truth of what I was saying, and that banking could begin soon after, should this prove to be correct.

Different readers will interpret the above in different ways. While Tangaye villagers do migrate to the coastal states to seek salaried labor, and do participate in local marketing, they are far from being accustomed to a money economy to the extent that farmers producing a cash crop might be. Responsibility of the sort, entailing not only the correct handling and disbursement of funds, but contact with such alien institutions as the bank and other agencies perhaps, is frankly frightening; rural farmers without experience in such activities feel intimidated, and may be belittled by sophisticated urban-dwellers. The team to transport mill funds to and from the bank was specifically chosen because of the worldliness and self-confidence of the three (and particularly of the master sergeant, who may be less successful in affairs of the heart, but who has a real presence immediately felt). Leossogo's misunderstanding of the AID role in management reflects that of the community as a whole; as will be seen below, people feel uneasy and apprehensive about assuming responsibility for complex machinery and activities, being basically afraid to make embarrassing mistakes.

6. MAINTENANCE OF STATION EQUIPMENT

A difficulty related to the above concerns equipment upkeep. Leossogo and the millers have an established routine for cleaning the mill, washing the array, checking the level of battery acid, and the like. The hammers within the milling machine are rotated, and the pump has been fixed; Leossogo has dealt with the fact that the automatic shut-off for the pump does not always automatically shut off. Yet some of the smaller repairs have not been done. The case of the water faucets is illustrative. A type with a spring handle was installed, to prevent wastage: A person desiring water must depress the lever or button of the faucet, and the flow ceases with release of the same. Over the months, thousands of hands have fatigued the

springs, and they do not turn the water off any more. As the weight of the brass buttons is sufficient to depress the springs and keep the water flowing, Leossogo removed them; people now press the screw down. One has been taped over to prevent use at all, since even the removal of the button did not suffice to curb the leakage. I asked what Leossogo and/or the co-op members intended to do to fix the taps, and he said that when Gay Morgan came out to install new modules in the array, the matter would be broached. Morgan came, and informed Leossogo that the co-operative was to see to such repairs, purchasing whatever parts might be necessary from the accumulated funds from milling. This was a surprise, as it had been assumed that AID would see to such a matter, as they have done in the past. Leossogo said he would see to obtaining parts when in Ouagadougou to accompany me in my departure, but as of this writing nothing more has happened.

7. EXPANSION OF THE STATION

Ideas have been entertained at various times in the project period - both by American development agents and by Tangaye villagers as a consequence - for the expansion of the station. As one woman we interviewed stated, she is very satisfied with the mill, and from time to time has fine flour for preparing her meals; but they have no medicines to heal themselves or their children. She "prays to God for a dispensary for her children, since illness is such a problem" (this in June, after the meningitis outbreak of April). At the January eleventh meeting of the station co-operative, Leossogo's minutes record that "those present regret the (talk of) opening a bar (buvette) at the station, as they would have preferred a pharmacy which would be both more profitable and aimed at the (better) health of the population." Such an addition would have other benefits: "it would permit obtaining money (from outside the community) and would thus facilitate the construction of a dispensary in Tangaye. . . . It would facilitate buying medicines at Tangaye and there would be more talk of Tangaye in the Eastern Department." In other words,

this would increase their reputation, and thus their chances of receiving further positive attentions from government agencies.

There are two other issues to consider in order to put the above in its proper context. The first is that of available health-care. With the nationalization of all local facilities, the Catholic missionaries can no longer provide the assistance they did till recently (Cf. Hemmings 1978:9). Now all living about Diabo - Tangaye residents included - must depend upon the government dispensary; like many similar facilities throughout Africa, it is plagued by a lack of medicines. The popular feeling in Tangaye, that I heard repeatedly, was that the dispensary, its staff and services, are "worthless." The criticism became the more strident in August of 1980, when a nationwide strike closed the dispensary. Frustrated anger is the only reaction possible when villagers see their loved ones perish during such a state of seige between nurses and the central government, a conflict from which they only receive the most negative of effects. Healthcare-related disappointments are one member of a large set of unfulfilled promises (including schools, roads and the like).

The other issue is the attention AID has paid to Tangaye, through the solar-energy demonstration and related activities. While in more mundane relations with their government, villagers often feel neglected, the Prime Minister and a number of other dignitaries have visited them with regard to the station. Most important in terms of healthcare has been a fortuitous event at the end of March 1980. Gay Morgan happened to visit the village for reasons related to the station, and had the happy perspicacity to recognize that something was direly wrong: Villagers were dying abruptly of a mysterious ailment soon recognized to be meningococcal meningitis by the authorities Morgan alerted. David Sokal, an American medical doctor just arrived in Upper Volta for a project based at Bobo Dioulassou, took measures to diagnose the extent of the problem,* and with the assistance of Dr. David Kyelema of the health service at Fada N'Gourma, a vaccination program was instituted. The people of Tangaye may not have been equipped

* The outbreak is well discussed in Sokal 1980.

to recognize and deal with this medical problem, but they immediately appreciated this intervention on their behalf - by the same friendly souls who had brought them the station.

This series of events brought to life discussions held months earlier about the possible expansion of the solar power output to furnish electricity to a small maternity clinic in Tangaye. Coincidentally, work began on the house just behind the station built with AID funds and villagers' labor for me to inhabit during the length of my fieldwork. What would become of this fine, solid building once I was through with it? Perhaps this is to be the maternity clinic mentioned earlier, or perhaps it could be converted into a pharmacy or dispensary. Larry Dominessy informed the village chief that once my project was completed, it would be a community decision as to what use the house would be put. (with the stipulation that it not become the residence of a functionary, thus reducing the spread of its benefit to this sole individual's). At the meeting of Dominessy, Bambara and the people of Tangaye on the twenty-fifth of June to discuss the transmission of responsibility of the station from AID to a Voltaic agency, the chief raised the issue of the house. He said that the people of Tangaye are willing and able to pay for medicines, but there are none available;* he voiced the hope that the house could be converted to a dispensary. Women came throughout the three months I lived there, often from long distances having heard that I was there and assuming that I was the American doctor (Sokal) of whom they had heard so favorably. Dr. Kyelema stopped in one day, also mistaking me for Dr. Sokal, and expressed his hope that the house could be used in such a way. What remains now is for some one or agency to co-ordinate all these like desires and energies, to create a service so obviously needed.

8. "DEVELOPMENT BREEDS DEVELOPMENT"

The enthusiasm in Tangaye generated by the station's successes has led to several grassroots development projects, notably the "Caisse

* As there was no malaria suppressant available in Tangaye at the height of the mosquito season, I purchased pills which I gave to my cook to sell, instructing him not to divulge their provenance. He has done this before on his own, and is to keep the proceeds to buy more medicine.

de Tangaye" ('The Tangaye Fund') and Arbor Day at Tangaye. Whereas in surrounding villages the same size as Tangaye where there are also ORD extension agents, there are few if any active co-operatives, Tangaye presently boasts twenty-three. There are definite difficulties to overcome, but this spirit was harnessed by Leossogo (the eminence grise) and his two cohorts, the ORD encadreur and the FJA teacher in their planning for the Fund and for Arbor Day. The former has only barely begun, and is aimed at future micro-scale projects for the village, based on contributions from villagers; mill proceeds have not been employed here.

Some are reticent concerning the Tangaye Fund, since it represents the villagers' taking their own initiatives outside of the ordinary structure of the ORD; people in nearby settlements who have built schools in the hope of receiving a teacher if all was ready for one, have been rebuked by local administrators and assemblymen for not going through the proper channels. Such well-known examples cause others to hesitate. Arbor Day was a success, however difficult its preparations were to prove to be, and hopes are high that other projects by and for Tangaye residents will be realized.

Leossogo began talking about planting trees around the station in June; by the time I returned from several weeks in Gabon for another project, "Arbor Day" had been planned and scheduled for early August. Invitations were sent to Voltaic and AID dignitaries, and donations solicited; ~~63,000F*~~ -- was collected in all, with 14,000F. from AID and American Embassy donors. The ORD Sector Chief at Diabo was duly informed of the evolution of the project, and offered to see to getting the trees, some of which would be purchased, some obtained free of charge from government nurseries. Tangaye Arbor Day came and went without his keeping this promise, yet it was difficult for his hierarchical inferiors to take action circumventing him. Without any trees, Arbor Day was postponed and a feverish attempt made to contact Ouagadougou, that guests not come the day they

* Fifteen thousand francs was donated by the station co-operative from mill funds, and twenty-nine thousand was collected from the residents of Tangaye itself.

had been invited. A phonecall finally got through, but very late in the afternoon of the Monday before Tuesday's event; as most of the staff of the AID Rural Development Office were on vacation, Bruno Bambara had a truck already packed to come out the next morning both as the AID guest to Arbor Day, and to deliver photovoltaic modules arrived from the States. On he came; he was prevailed upon to allow his vehicle to be used to go after the long-sought trees, the gasoline for the trip to Fada N'Gourma and Tibga to be purchased with Arbor Day funds. The trees were gotten, and two days later the festivities held. While some of the money was spent on gasoline and trees, more was to buy cases of bottled beer and soda, a sheep to grill and macaroni, rice and sauce to go with it, for the ORD Sector Chief and other honored guests. Speeches were made, trees planted, food eaten and beer drunk; a good time was had by all.

The rains of late August and early September were especially heavy at Tangaye, and the area around the station became sodden. Water standing about and above the already-shocked saplings (most roots had been cut off, and no dirt kept around the remaining ones during the trip from nursery to Tangaye) caused the demise of many, especially the mangoes which had been purchased. The hardier (and gratis) eucalyptus, planted in remoter areas away from most public gaze, are said to be doing well. The outcome does not rest upon whether or not the trees planted flourish or perish, of course; the important point is that villagers, with a little help from their friends (and none from some who are now suspected of not being that), took the initiative to develop their own space. Bravo!

B. SPENDING MILL EARNINGS

Financial management by the station co-operative has been very conservative, as Figure Thirty-Three indicates. The difficulties of the first three months mentioned here (September through November,

Fig. 33 - MILL RECEIPTS AND DISBURSEMENTS

| Month | Receipts | Disbursements |
|------------------------|-----------------|---|
| Sept.-Nov. 1979 | 18,000F* | 4,500F beer for
work party
7,000 salaries |
| December 1979 | 26,205 | 5,500 salaries |
| January 1980 | 26,480 | 5,500 salaries |
| February | 21,500 | 5,500 salaries |
| March | 18,400 | 5,500 salaries
15,000 back-payment
of masons for
original
buildings |
| April | 18,000 | 5,500 salaries |
| May | 13,345 | 5,500 salaries |
| June | 15,500 | 5,500 salaries |
| July | 8,350 | 5,500 salaries |
| August | 6,990 | 5,500 salaries
15,000 contribution
to Arbor Day
2,500 paper supplies |
| September | - - | 5,500 salaries
500 contribution
to buy a football |
| TOTALS | 172,770F | 99,500F |
| PRESENT CAPITAL | 73,270F | |

* One dollar equals around two hundred francs CFA.

1979) were of a technical sort, and are discussed in the mid-term report. The remarkable surge in December was due to milling hours being extended, renewed interest due to the fineness of flour produced by the new mill machinery, threshing parties being held, and important religious holidays falling that month. The radical reductions in May and especially in July and August, were due to technical difficulties again. In May and again in July, the mill was closed for a week to allow the batteries to recharge; and in July and August nineteen of the photovoltaic modules were found to be open-circuiting. These last were replaced in late August.

The salaries include 1,000F monthly for the treasurer, and 1,500F each for the two active millers and the cashier. All other disbursements are straightforward as presented in Figure Thirty-Three. Salaries will soon be increased, as explained above.

C. THE FUTURE OF MANAGEMENT

Villagers feel apprehensive about the future of station management, as they face the turnover of responsibility for the demonstration from USAID to the Voltaic agency, Hydraulique et Equipement Rural, the H.E.R. They have many disappointments in their immediate past. In 1979, Tangaye was promised one of the AID-funded community centers of the Eastern ORD, and villagers were enthusiastic as they chose the one of the two possible layouts for the building, and ^{discussed} possibilities for its use with ORD staff. Nothing has happened since then, and over the summer the previous Sector Chief at Diabo said that AID had never funded the center as promised, while others said they had. The ORD womens' programs agent has not had a contract since last December; she has continued to visit Tangaye nonetheless, continuing her baby-weighing and women's-advice programs, without being paid to do so. Late in August word had it that she will be sent elsewhere, and no replacement appears expected. Healthcare and schooling problems have been mentioned above. The greatest blow of all has been the decision to make the new, paved

road from Ouagadougou to Fada N'Gourma pass to the north of Tangaye, isolating the villages along the southward bend that the old road took.

With all this as a backdrop, the fact that the one project they have received, that has brought them attention and benefits, is to be given over to the government that has not kept promises, makes people understandably anxious. This was very clear during the meeting of June 25th, 1980, when Larry Dominessy and Bruno Bambara came to explain the transfer to the chief and people of Tangaye. People are very proud of the station; the co-operative president said at the meeting that they were thankful, that this was the first such installation in all of Africa, and so everyone would look to Tangaye from now on; the chief, commenting upon Bambara's naturally soft voice (when interpreting for Dominessy or explaining various points in the Zaore dialect), said he was correct to speak in a low voice, as these were secrets that only concerned Tangaye residents, and need not be heard by others. He then said that he hoped that Dominessy would reconsider and not "abandon" them, that they do not know how to run the station and need his help. The station is like a bicycle given as a gift without a pump, one cannot travel far; so it is with the mill, they do not know how to repair it, and it will surely break down. As he poignantly concluded, "We don't even know how to stay healthy ourselves, how can we fix those machines?" He said he asked Mr. Larry and God to allow the relationship with AID to continue.

The matter of Pascal Leossogo being replaced by someone from the village was broached at the same meeting. One man (the master sergeant) said that Leossogo's knowledge was not simply a hat that could be taken off and given another to wear, but required slow and deliberate training to acquire.* The chief said that just as when someone helps you to bathe by pouring water over you, you yourself must do the scrubbing; so must they now assume responsibility for station management. Someone from the village would be chosen, and this would be done carefully, for if he, the chief, were to name the

* The master sergeant is the best candidate, in some people's mind, to replace Leossogo, since he has an aura of authority about him that he is not afraid to impose on others.

replacement, others would complain that they were being forced to accept the man (this a reference to earlier confusion as to the chief's participation in the project). An old man stood up and said he would replace Leossogo, and everyone laughed heartily. The chief continued that the person chosen would indeed need training, that like a father must teach his son how to weave cloth, this taking much time and patience; so did he hope that AID and Mr. Larry would carefully teach the person over the course of months in how to manage the station as has Leossogo.

Some time after this meeting, Leossogo was informed that the chief had indeed chosen someone to replace him: his own eldest son. As the old man explained, how could he name anyone else, when there was someone right there at home available? The man in question (unlike his brothers who have successful careers in Ouagadougou and abroad) has remained in Tangaye to assist his father; he strikes me as a singularly proud and sullen fellow. Gossip had it that when he became "boss" of the station, he would demand a salary of ten thousand francs a month. He would go to be trained in Ouagadougou, and then what else but a salary of this sort would keep him from going to Ghana or the Ivory Coast to seek work? Should he go, the station would collapse. As I left Tangaye on September 15th, the matter had yet to be resolved. Others predicted that when Leossogo - who is said to "work like an American, he doesn't sit back and rest!" - left Tangaye, the millers would fall to fighting amongst themselves, the station co-operative would dissolve in myriad squabbles and all progress would cease. While this is wildly exaggerated, it belies peoples apprehensions concerning the future. There was some jubilation as those who came to take me into Ouagadougou on my way back to the States, revealed that the people at the NASA Lewis Research Center would prolong their technical support at Tangaye for another two years.

B. FUTURE USES OF SAME OR RELATED DATA

Burrill and Popper have noted that "the data being collected can probably be put to more uses, and answer more questions, than the project will be able to utilize"; and "need to be looked at for further and wider applicability" (1978: A-6). Some issues not evident at the time of preparing the project scope of work, but nonetheless relevant to present research goals, have been discussed in the preceding text (e.g., relevant elements of Zaose social organization, and women's wealth). Others deemed more tangential may be the subject of future (as yet unsubsidized) writing by the present author; these could include the following: analysis of a local-level political struggle between detainers of traditional power (the village chief) and "modern" (the retired master sergeant), in which the presence of the solar station is an important element; an ethnographic and historical sketch of the Zaose of Tangaye and environs, a people to date undescribed in the published literature; Zaose concepts of illness and healthcare as they relate to the meningitis outbreak at Tangaye in the spring of 1980; a political history and ethnographic description of Zaose earth shrines - a subject of interest due to Fortes' important discussions of those of Northern Ghana and the lack of attention to these same by Skinner and other writers on the greater Mossi culture area; and the like.

The data from Hemmings' questionnaires has not been exhausted by the present paper. Specifically, there is interesting information on Zaose cooking (recipes, frequency of preparation, etc.) and on daily life in the targeted compounds of Tangaye, that might prove useful to a different research context. The control case of a single compound visited weekly (as opposed to the others, each of which received half a dozen visits or so over the eight months' research) could provide an especially detailed portrait of in-compound activities.

All raw and semi-processed information will be preserved at the Center for Afroamerican and African Studies of the University of Michigan (Ann Arbor, MI 48109). It will be made available by the present researcher upon written request, authorization by AID Ouagadougou, and according to arrangements at the requestor's expense.

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ANNEX: SCOPE OF WORK

The following is the scope of work for contract number AID-686-089-80, Larry J. Dominessy, Project Officer, AID Ouagadougou.

The impact study will include the following areas of interest:

1. Reallocation of women's time made available by the solar installation and changes in the time required for collecting water and grinding grain as a result of the solar installation.
2. Changes in the village's water consumption and usage pattern.
3. Equity results of the solar installation: a) who has access to the new water and milling services; b) use patterns; c) the sources of money used for milling; d) how mill earnings are used; and e) by whom?
4. Village mill management organization: description of mill management organization, and its evolution for operating, maintaining and repairing the photovoltaic system.

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Dr. Steven Reyna of REDSO-WA in Abidjan offered helpful suggestions several times, and other friends sent me papers in progress, the influence of which is cited in the text. Despite the generosity of these and many other persons who have lent a hand along the way, I alone am responsible for the written contents and all Figures of the present report.

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