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MID-TERM EVALUATION: SOCIAL IMPACT,
TANGAYE SOLAR ENERGY DEMONSTRATION.

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MID-TERM EVALUATION: SOCIAL IMPACT,
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I. Objective and Scope of Work:

According to Personal Services Contract No. AID/afr-C-1602,

"The purpose of the consultation is to (a) familiarize the consultant with the socio-cultural, economic and technical dimensions of the Tangaye solar pump/grinder project so as to enable him, during his consultation, to formulate the design and methodology for the evaluation of the project over the period of 2-3 years; (b) identify the categories of data which need to be gathered over the period of the evaluation and to recommend procedures, including the preparation of survey instruments or questionnaires, for the gathering of such data. The data to be gathered will lend itself to being analyzed and interpreted by the consultant when he returns for a longer period in the summer of 1980."

Three substantive questions were posed as well, to direct and focus both the mid-term evaluation and the work to follow. The present report will be tripartite, addressed to (a) the substantive questions and tentative impressions or answers; (b) methods by which information pertaining to these subjects will be gathered in the interim between the present, mid-term evaluation, and the longer on-site study in 1980; (c) and other questions raised in previous reports, memoranda, and evaluations, or by persons contacted at The NASA Lewis Research Center, The USAID Africa Bureau and Ouagandougou Mission, or elsewhere in the course of the present study.

II. Substantive Questions:

A. "Reallocation of women's time made possible by the solar installation:
 (a) What changes occur in the time required for collecting water and grinding grain as a result of the solar installation and (b) What alternative uses are made of the time saved?"

Of the three substantive questions formulated by the African Bureau, this has been described as the most important or fundamental to the overall project. The water pump, reservoir and spigots have worked well during the approximately 9 months they have been in service (since March, 1979), and their effects upon the community of Tangaye can already be observed. The mill, on the other hand, has been beset by a number of technical problems, and has only provided spotty service during this same time; its effects cannot be measured now, but can be predicted hypothetically, and will be studied closely in the future.

1. The Water System:

Hemmings (1978) has described in detail the wells, both "traditional" and "improved", which pre-existed the station* water system, and the manner in which water was procured and employed. The station facilities began effective use in March, 1979, at the beginning of the most difficult months of the dry season; water resources are sorely taxed then, and most of the shallow, hand-dug wells go dry. As recorded in the "Tangay Record"**, water use at the station was very heavy from the start. Early in March, it was written that "much water is used; some women go

*"Station" will be used to refer to the solar-energy complex at Tangaye, including the water system, mill, buildings, and array.

**This journal, kept by Pascal Leossogo, Assistant de Gestion at the station, contains a wealth of valuable data and impressions of both the author and the villagers of Tangaye concerning the station.

elsewhere rather than waiting for water from the [station] pump" (7 March 1979); water was taken by so many and in such quantities that not enough was immediately available, especially in the early evening (12 March 1979). Yet villagers who had dug shallow wells in the past, soon ceased doing so (at least at the places cited - Pilili, Wobegain and Dore); instead, "the whole village" of Tangaye began using water from "the well of Mr. Larry Dominessy" - i.e., that of the station (16 March 1979). People came during the night seeking water, and made bricks or beer by moonlight (ibid.). Those wishing to obtain water at this time of year have "always" had to withdraw it from their wells around the clock; as we were told, women and young people would go great distances in the dead of night, and they do this now too, to visit the station. But before, despite this great expenditure of time and energy, water supplies were never sufficient, and sheep and other animals died of thirst every year; now at the station there is sufficient water, and many expressed their heartfelt thanks for this.*

This is not to say that during those periods when sources of water other than that of the station are available, this last will necessarily be chosen: the contrary is often the case. For those living far from the station, this distance, quite naturally, is the factor taking precedence over any others. In late October when the present field study was effected, the water table was nearly at ground level; marshy places had only just begun to dry up, and there were still disconnected pools of

*There was some complaining that even the station pump was not adequate, at a groupement meeting on 27 March 1979. More wells in the major hamlets (or quartiers) were requested then, and I too was asked for others in October 1979; this bespeaks some lack of understanding by the villagers of the definition of the present experiment.

water standing stagnant in the streambeds. With very little effort, a shallow dipping place could be scooped in the sand, which would fill immediately. Women were observed making use of such places, so close to home with respect to the station several kilometers away.

Long baths were taken adjacent to the pump of the station; buckets being filled at the taps were allowed to overflow, unwatched for minutes; and water was sent into the cattle trough, whence it was allowed to flow out through a hole practiced in the cement wall to irrigate the tomato patch maintained by the station personnel (this to be discussed again below). As reported by Pascal Leossogo, the de-facto station manager*, women may pass the station on their ways to the streambed beyond, where preferred drinking water is sought. In effect, I was surprised by the small numbers using the pump.

This raises the issue of relative water quality, as perceived by Tangaye villagers. As mentioned briefly by Hemmings, water from streams is felt to be better-tasting and more-healthy (1978:29). My own informants used such words as "sweet" to describe stream water, as opposed to the "salty" water of wells such as that of the station. Their "saltiness" means thirst is not slaked by their water as it is from that of streams. While farming, a single drink of this last is satisfying, it is said, while with well water one wants to drink, and work cannot proceed apace as a result. Stream water is felt to be good because it is moving (this carries away filth, I was told) and because it is "white" (ko mperga). As several French-speaking informants noted, since drinking water is only taken from dipping places scooped in the sand beside the

*See the section on management, below.

stream, it is "filtered" and thus healthy. Wells, on the other hand, are said to collect dead toads and other detritus.

On a walk up the streambed, the opposed qualities of water in the pools of what had been the watercourse, and that in the dipping places, were pointed out to me. The stagnant pools are adrift with algae, whitish with dissolved clay and soap scum, and alive with flitting minnows and waterbugs. Sheep and cattle tracks and droppings cover the sand bars. Despite these reasons for preferring water which is, indeed, "filtered" of such obvious debris, the more subtle qualities of stream water which make it so desirable and auspicious are difficult to detect.

Such oppositions as moving vs. non-moving water, "sweet" vs. "salty", "white" vs. non-white, must have culturally-derived explanations, keying into local religion and cosmology here as they do elsewhere in Africa. "White", in particular, is a category vastly transcending the mere color as we might define it. White flour-water is offered as libations to the ancestral spirits, and with many years of such practice, the up-turned pots upon shrines are stained with its color. Here, as with so many African societies, this bespeaks a balance with the spirits and with the cosmos, this is "good" or auspiciousness. There are probably other, similar reasons for villagers considering such water "better"; these will be studied in future, with an eye to possible extension work by ORD or public-health agents.

To return to the original question, with regard to the station under water system, more readily-apparent than changes in the time required to draw water are those concerning water use during the dry season. During the wet season, if women still travel to streambeds even though the station may be closer for some, then time saved is not significant.

During the dry, people still have to wait for water or seek it at might even though the station be used; time saved then may not be as important a factor to measure and analyze as is quantity used.

2. The Mill:

As all concerned with the Tangaye project will know, the solar-powered mill has not functioned with regularity, due to technical difficulties. Actual changes in the allocation of time cannot be measured at present, but expectations of both villagers and researchers in this regard may be discussed here and explored in future, as regular milling service becomes available.

It was striking to me to note that during the three days when milling was to be done during my brief stay at Tangaye, the machinery sat idle most of the time. Investigating this fact led to some interesting observations concerning the manner in which the mill has operated til now. There were major problems with the first mill, some easily-corrected as when the burr plates were not properly aligned as mounted ("Tangay Record" 9 March 1979); such unanticipated difficulties could only be dealt with on a trial-and-error basis, and it would be hoped that this technical side of the overall experiment will be viewed positively, as indicative of field-application problems which, now identified, may later be avoided.

Troubles with the burr plates and adjusting screw led to complaints from village women that their grain was not being ground finely enough. Some brought their husbands to the stations, who apparently argued that Pascal Leossogo, the de-facto station manager, was the one who "did not want to make their flour fine enough" (ibid.:21 March 1979). This, occurring so early in the project, bespeaks management problems to

be discussed below; but also indicates that the mill had, from the start, been integrated into community thought to the degree that when things went wrong, a scapegoat was sought. This presupposes a "correct" way of milling that villagers expected demanded.

Other problems with the mill or the solar installation more generally, further interrupted service. Nevertheless, even with the recognized faults of the first mill, optimism remained high and many women brought grain to be ground, their numbers so substantial that some invariably had to wait til the next day for their flour to be made (since the mill could only be run a certain number of hours per day, according to power available from the solar array). Those left over til the next day were the first to be served, and apparantly no major problems were incurred in that regard.

The mill machinery was then changed, as a consequence of AID/NASA decisions concerning more appropriate technology. The new mill, of greater horsepower, can be run during fewer hours than the old, but can grind more grain more quickly and efficiently. It was decided by the station groupement that the 20 hours grinding possible per week would be divided among four days per week. The installation of the new mill brought the old throngs of women; but now those who could not be satisfied the day their grain was brought, could not receive service til two days later. This was a cause of some irritation, I was told, since women could not wait so long for flour they intended to use for immediate consumption. Some went to the mill 5km. away from the mill altogether, so it is said, fearing that they will have to wait an unacceptably-long time. This, and the fact that the time-consuming bean harvest occurs in late October, were offered as reasons for the under-use of the mill which I so readily perceived.

It seems probable that the latter factor-- the bean harvest and the pleasure people take in eating new beans (which require no grinding) - accounts in large measure for the slackening in use. Reverend and Mrs. Coad, American Southern Baptist missionaries regularly visiting Tang-ye, similarly complained that their adult-literacy classes were being poorly attended these days because of this. But the local perception of the problem, linked as it is to the past shortcomings of the mill at first installed, is still worthy of note. Larry Dominessy (AID-Ouaga), when I told him of this, said that the villagers themselves had decided how the twenty possible hours would be divided during the week, and that changing this so that services might be rendered daily - if for fewer hours - was as simple as deciding to do so. Again, this raises a question best discussed in the context of management, as below. With regard to the first question, it is clear that women expect the mill to save them time and energy, and are dissatisfied when it does not.

3. Possible Uses of Freed Time:

Although it is too soon to be able to observe any significant changes in time available to women as occasioned by the station's pump and mill, some possible uses of whatever free time does become available, may be suggested here. These will be studied closely during the next phase of the present research.

Writers such as Skinner and Hammond have stressed the important role that 'kitchen' gardens (or "near" gardens, as an informant called them, as opposed to the field farther from living quarters) play in the lives of Mossi men and women. It is likely that such kitchen gardens will profit from time freed by milling or water retrieval from the station.

Such gardens are carefully fertilized with a combination of loam brought from other sources and of animal droppings. They are surrounded with thorn fences and hedges, to keep out domestic animals; and are watered daily with water already used for cooking or washing (Hammond 1966:42). It is probable that those living closest to the station will use its water to maintain their kitchen gardens through the dry season.

The maintenance of kitchen gardens is an individual enterprise, according to Hammond (ibid.:45). As Mr. Harouna Kouela, son of the chief of Tangaye* told me, even when women are very busy, they always find a few minutes to be spent in their gardens. It is there that vegetables are for the meals she prepares for her family; but as importantly, a small surplus or cash crop of peanuts or cotton is also always grown, that she have something to sell in the market.

Skinner has written, "to the Mossi, a market is more than a place where one goes to buy and sell, even though everyone who goes tries to do some of both" (1968:264). As Manguin observed shortly after the turn of the century, so is it still true that "every self-respecting Mossi - man or woman, child or elder - must go to market at least once in a while, where it only to look . . . and to be looked at, if he can put on some handsome clother" (in Skinner 1968:270). The market is a place for socializing, flirting or pursuing love affairs, and for drinking beer even a small market such as Tangaye's, emits a bubbling

*I had the great good fortune of meeting Mr. Kouela in Ouagadougou on 15 October; he is the Voltaic Representative to the Arab countries, and is normally based at Cairo. His success in national politics cannot be ignored when considering local-level politics concerning his father's powers and prerogatives, in comparison to those of other village chiefs.

of laughter and talk which can be heard half a mile away. More time, freed by station resources, then, may mean more work in kitchen gardens, which in turn provides more of a reason for attending Tangaye market, or for traveling to the others held in nearby villages on other days.

Another strong possibility for extra-time use is the production of more dolo or millet beer. Beer-making is a long process, usually requiring a great deal of work to prepare the flour, gather the water and firewood, and do the actual cooking. As Harouna Kouela noted, the mill and pump facilities may cut quite dramatically the time needed to make beer. Not only might time be freed by having flour for food-use ground at the mill (thus allowing for other activities such as beer-making to be pursued), but beer-making itself would be easier and a more attractive use of time. Most dolo is consumed in the hamlets amongst kinsmen and friends; some is brought to market. Again, more beer means more reason to come to market, where more merry socializing may transpire.*

There are other uses to which this time may be put, and their successful expansion will depend upon the initiative taken by the various extension agents involved at Tangaye. There are adult-literacy classes and public-health demonstrations held by the missionaries visiting from Tenkadogo and Diabo. The EORD sponsors a variety of groupements, may inject optimism into the community, reinforcing the efforts of other, related causes.

*Other possible effects are an increased use of firewood for dolo-making (and the problems that raises concerning this resource); increased alcoholism, and social conflict as its result.

B. "Equity results of the solar installation: (a) Who has access to the new pumping and milling services and (b) How are the earnings from the mill being distributed?

This appears to be a question easily answered. Everyone may use the well (by Voltaic law), and any with money can bring grain to be ground. While the capacity of the station is insufficient to satisfy all people at once, it can accommodate villagers coming in the staggered fashion that money-availability dictates. It will be a principle aspect of future research to determine who does and does not use the mill, and any patterns for such use, this through data being collected by mill, and any patterns for such use, this through data being collected by mill personnel and through directed interviews.

Of great importance in this regard is the matter of cattle-herding and related water-use. During the wet season, when farming is at its peak, cattle are kept pastured far from the fields, and smaller domestic animals are tied or penned. During the dry, cattle are brought back toward the hamlets, and are allowed to graze in the closer gardens no longer in use. As explained to me, the more distant fields can be allowed to become fallow when fatigued, but the near or kitchen gardens are as permanent as are the dwellings they surround. By allowing cattle to graze or be kept in them, it is hoped that they will be manured and revitalized.*

With the increased availability of water from the station well, it may be that more cattle will be kept in the vicinity of the station. This might unbalance the delicate dry-season ecosystem,

*Manure is also used in such dry-season pursuits as house-building, basket-sealing, etc.

through over-grazing, an untoward lowering of the water table, and the erosion and other effects that result. This, then, is a matter which must be investigated closely.

The second part of this question, concerning how the mill earnings are distributed, should be seen in the context of the station management. In effect, some 40,000 F have been collected, I was told, but there are no records being kept more closely. The station manager began the project by writing down the amounts received, but this was done on slips of paper which now appear lost. The station groupement instructed him to stop doing this, as they felt it was not necessary or useful. He ceased, but they later rescinded their decision, and he recommenced, but again only using scraps of paper. I have asked him to use a permanent book for this, so that I can be apprized of monies made and later disbursed.

The two uses of money earned by the mill;* which were cited, were 15,000 F for payment to the masons working on the building adjacent to that of the mill; and during my presence, 4,500 F for the purchase of dolo millet beer and bottled soft drinks (these for Muslims). This last was on the occasion of a groupement - organized work party cleaning around the station, removing the now-dried, wet-season weeds and grasses. The raising of work parties in exchange for beer is a traditional practice. The community may be said to have benefited from these expenditures, in that their common resource - the station - was improved.

*This is where the station manager lives and where there is a small room which I shall use as an office. I have been informed that its ultimate purpose is to serve as a warehouse; villagers are to have the power to decide if some other function is more appropriate.

C. "Institutional context: How have the villagers organized to manage the system and what has been the experience of the management institution in operating, maintaining and repairing the system?"

The manner in which the mill co-operative was to be created and structured, has been the subject of some debate among those involved in the earlier stages of project planning. Hemmings reviews both her own proposals, and those advanced by other interested parties. Basically the contention centers about two points: (a) to what extent is the management to be assumed by a totally grassroots, community-based organization; and (b) what is to be the relative participation of men and women? Hemmings, in particular, felt that because women would most profit from grain-grinding and water-drawing at the station, it should be they who formed the management group; an educative process would be begun, whereby local women would learn the skills necessary for rudimentary maintenance and management. This was not the policy adopted.

It was decided instead that this co-operative would be formed from the fourteen existing already in Tangaye, which were created earlier by ORD agents looking to agricultural issues. Thomas Stickley, AID Credit Advisor for the EORD Integrated Rural Development Project, and based at Fada, had visited Tangaye previously in the course of his own work with co-operatives, and he assisted in organizing this one for the new station. A meeting was called at Tangaye of the existing groupements, and the chief of Tangaye; the proposal was made that each existing co-operative would choose one of its members to become a part of the new groupement.

As an AID agent has described it, upon learning that he would not be allowed to decide who would govern the new group, the chief "stomped out of the meeting", infuriated. AID and NASA personnel had

been visiting the village for two years or more previous to this meeting, and the chief had always been consulted about the evolution of the project. He quite possibly felt he would be put in direct charge of the facility, hence his anger when he was not.

There is some reason to doubt this assessment, as other co-operatives had been created by the EORD without the chief's having their control. Even if he had been given the opportunity, following traditional procedure, the chief would not have assumed direct responsibility for the station, but would have delegated the authority to another. As Skinner has noted, "one of the basic assumptions of the Mossi is that everything must have a 'chief', "that this is the way that social life is organized (1968:266). Just as there is a market chief designated to see to that aspect of the community, so might there have been someone named to oversee the station. This is, of course, idle speculation, since the co-operative was created as a function of the greater tendency to wrest political power from the traditional chiefs.

It may be that it was the manner in which the procedure was followed, instead of the content of the procedure itself, which was the source of irritation. Local informants, including the current president of the groupement, stress the fact that the chief is content with the new co-operative, as it is led by those with whom he has worked in the past on cotton, soybean and other projects for which organizations were formed (although this may be an ex post facto explanation). Quite clearly, two years' worth of expectations, based upon personal and cordial contact between the chief and the American agents, were altered or unfulfilled. This must raise serious questions concerning the coordination of AID/NASA and EORD agents, and of both of these with local villagers, in

the first formulation of projects, as well as in their final implementation and maintenance.

Suffice it to say, AID personnel acted to reintegrate the chief into the project, and relations between him and the groupement appear constructive. The chief has called meetings of the community at which people were exhorted to maintain the propriety of the station in general and the water installation more particularly, so that food residues and soap scum would not accumulate. He also asked that water not be wasted even though more was now available through the station facility, this only shortly after its inception ("Tangay Record" 27 March 1979). The chief was invited to the groupement meeting called that I explain my presence and project. When it was said that he would not attend because a grandchild was mortally ill, one of my two folding chairs was saved for him anyway at the behest of the co-operative president whom I had invited to occupy it. When he did come after all, he first inspected the work of the groupement party which had spent the morning cleaning around the station, then came to the meeting to address his thanks for the work and hopes that such cooperation, for the good of all, would continue.

The chief seems somewhat reticent with regard to co-operative activities, at least when AID personnel are present. He soon left the meeting mentioned above, distracted by the illness which later that day claimed the life of his grandchild. He declined an offer to watch the movies presented by the AID/ORD audio-visual group from Fada. In the past, he has found other obligations (e.g. The overseeing of a vaccination campaign) to require his attentions when he has been invited to

personally participate in meetings. He is very aware of the nuances of the present political situation, in which hereditary chiefs such as he are now to be elected, and in which development efforts are to be placed in the hands of ORD-organized co-operatives. It is my feeling that he has opted for a low-visibility role in situations where groupement activities are concerned or when upper-echelon ORD or other agents are involved. This is not to say that he is not still the moving force behind any organized activity in Tangaye. As the chef du groupement, the head of the station co-operative, said at the meeting I attended, if the people of Tangaye loved their chief, they would continue to keep the station clean and to assist people like me who came to work there. In this way, their children and grandchildren would continue to receive such benefits as they were now enjoying from the station. A Mossi chief is referred to as "the father of his people"; clearly, the station has not interfered with this relationship through the person of this particularly charismatic chief. Indeed, by allowing "his people" - the co-operative members - to run things in his absence, he underscores both his magnanimity and this more overarching authority.

The other issue is the relative participation of women. Of the fourteen original groupements, seven were male, seven female; the members of the station co-operative, then, were to be evenly divided as to sex. This in itself is an unusual circumstance, as demonstrated by the fact that previous co-operatives were strictly segregated as to sex and by the sort of participation women have had in the project to date. In effect, I saw no women at any of the functions I attended. None took part in the clean-up, or in the groupement meeting afterward. None works on a regular basis at the mill, although this was not

originally the case. At first, a female member was to assist in the collection of mill fees, but her withdrawal was explained by informants in the same fashion in which it was said that women do not work with the mill machinery: it is felt that the millers and others regularly within the building should not have women beside them, that this might lead to sexual misadventure. At the same time, in response to my question as to why women could not run the machinery and have men be on the outside, it was said that women do not operate or have knowledge of machines, that this is the way it should be.* The station manager said that occasionally the head of the women's contingent of the mill groupement will assist him in the mill tasks, when she happens to be present and a regular male worker is absent. On one of the days I was there, this occurred, the lady taking the initiative to help the manager when all the millers were away.

The last issue in regard to management concerns the manner in which local people - men or women - were trained to accomplish the various tasks of station maintenance. In effect, a decision was made by AID personnel to hire a young man (Leossogo Pascal) as an assistant de gestion; he has become the de-facto station manager. A Mossi whose family lives around Koupela, Leossogo lived most of his twenty years and was educated in Abidjan; he has a B.E.P.C. diploma (indicating completion of the first cycle of secondary school). He is a bright fellow, and is capable of running the station, repairing minor breakdowns, and keeping the various record. He has established a good rapport with the chief and the people

*Granted, in the few days I had, I did not have an opportunity to interview women concerning this point.

of Tangaye, and uses his status as an outsider to joke with them about matters which might otherwise cause tensions (as when he makes some decisions about mill management). He takes the initiative to coax women to use the station water rather than that from nearby streams, and otherwise acts as an "extension agent at large", assisting the Catholic sisters with baby-weighing, helping the schoolmaster by teaching gym, distributing Voltaic army conscription notices, and the like. Being a dynamic person, then, he is helpful both to the project and to the community.

The success he has had does not obviate the need for considering the issue of how such a program should be managed, whether by an "outsider" such as Leossogo* or by persons entirely from within the community. The former option will be most suitable when someone with the positive personality traits of Leossogo is found for the position.

The case of an EORD agricultural extension agent in Tangaye is a contrast: also a stranger to the community, local people feel he spends most of his time and effort in strutting around like a young cock (the image used) for the benefit of the ladies, and in traveling to places other than the one to which he is assigned; they feel he does little for the community itself. He and Leossogo are the same age (around twenty) and Leossogo has the better education. The arrogance of some educated young Africans transplanted in the course of governmental duties to communities other than their own (where kinship responsibilities and other

*Leossogo is a Mossi from an area not too far from Tangaye; but he is not a part of the community structure, and so assumes an outsider's status and privileges. Blame for shortcomings can be assigned him by villagers without their seeking solutions from their own capacities.

constraints may control such impulses) is by no means a uniquely Voltaic problem; for projects in Upper Volta to be successful, it is even so a matter that should be given careful consideration, if the villagers are to receive fullest benefit.

Clearly, the solar-energy project has been fortunate in having someone like Leossogo, but more thinking on this matter is required before a decision is made concerning the implementation of similar projects. As I was told, "many of the responsibilities he has assumed have resulted from the technical difficulties we have had with the system. As project funding ends in July, 1980, his role will have to be absorbed by the groupement." The insecurity Leossogo feels concerning his future is detrimental to his performance. I was told of no plans to replace him by training co-operative members. It may be that the original plan, to train local people for both the tasks they now do at Tangaye, and the ones Leossogo assumes, would be a more positive alternative (although perhaps more time-consuming and thus less efficient according to AID and/or ORD schedules).

As things stand, then, a groupement has been formed to manage the station, and a de-facto station manager named to see to everyday upkeep. The president of the co-operative is a man in his early 60s who has been particularly active over the years with regard to other co-operative projects introduced to the community. "A decade" (or more) ago he was one of the first to work with a European agent or administrator who was to introduce improved cotton varieties to Tangaye; the first crop did well, but was never purchased by the European or the agency he represented as had been promised. Despite such setbacks, the president continued to support the effort, and by some years later, the program

was doing well. So more recently, when another European came to introduce improved soybean-growing, it was he and two others who had all worked on the cotton project who were selected to help. The man is, then, an established leader in such endeavors; when officers were to be chosen for the station co-operative, he was elected by the others as the eldest and wisest among them.

The president shares the same name as the chief, that is, Kouela; he calls himself the chief's "little brother", explaining that he and the chief had a common great-great-great-grandfather (FaFaFaFaFa), but different great-great-great-grandmothers (FaFaFaFaMo).^{*} He holds that his was the senior wife, but that he accedes to the chief's status and so calls himself "little brother" instead of "elder brother" as he rightfully might. It is he who brings suggestions concerning the station to the chief's attention. In the case of the need to clean the summer's weeds from around the installation, for instance, he mentioned this to the chief and then during a meeting being held by the chief and his elders to discuss another topic^{**}, the chief said that this must be done, and so publically instructed the station co-operative president to see to the specifics. The matter of how much of the station funds should be spent for beer to "encourage" the work party was also broached with the chief, but he said that the groupement could decide that themselves.

The co-operative president, then, may be seen as the liaison between the co-operative (and the wider circles of para-statal organization such

^{*}Such geneological depth of recall is unusual in Africa, and was not but will be checked against actual genealogies.

^{**}The meeting in question concerned the "maternity clinic that is to be build for us by AID".

as EORD that touch it) and the chief (and, hence, traditional socio-political organization). Hemmings' statement that "it may be difficult to create a co-operative outside the family structures" (1978:53) is not a valid issue in a community where all appear (at least after this first, brief encounter of mine) closely knit through kinship, fictive kinship, affinal, residential/friendship or other sorts of bonds. The present co-operative, then, is a subset of this overarching web which is Tangaye (i.e., the community is not only the physical count of those living there, but is the recognition of common identity, through the chief's central person).

There is another faction of the groupement perhaps more influential in the making of everyday or longer-term decisions than is the co-operative president: the group of the two millers and the cashier. It is they, along with the station manager, who have the most intimate contact with and responsibilities concerning the station's functioning, and they were apparently influential in the decisions concerning the price to be charge for milling. This itself is a story worthy of mention.

When the mill went into operation, service was provided gratis while NASA personnel trained the millers. When it was decided that a fee would be levied, some complained that their fellows had received free milling, while they had not. Larry Dominessy and Gay Morgan were present when this grumbling came to a head, and they were asked to make a decision as to who would and who would not receive free grinding; they wisely suggested that the co-operative was created to make just such decisions, and that they would remain within the mill building, working on technical matters, while a groupement meeting could be held.

It was decided that all co-operative members would be given one free milling, and then all would pay the price they established; those who had not yet received their turn would now, but those who had gotten free grinding already would not again.

The price for grinding, fixed by the groupement, would be fifteen francs per four liters, a price significantly lower than the twenty-five francs charged by private millers in the region. A motion to apply differential prices (more for corn-grinding than for millet) was discussed "for two days", decided too needlessly - complicated, and defeated. There was instead a compensating move to increase the base price to twenty francs; but there were so many complaints that the first mill was not grinding grain fine enough that the price was kept at fifteen francs to encourage greater participation. With the installation of the new mill, the price was increased to twenty francs, and there is now talk of bringing it to a parity with other millers, at twenty-five francs. All these decisions were made by the groupement.

A similar matter was that of the salaries to be paid those working at the mill. It was decided by the co-operative that 1,500F would be paid monthly to the two millers and the cashier (the station manager is paid 25,000F/month by AID). There was at first a commissaire aux comptes, a comptroller, who also was chosen (according to ORD guidelines, it would appear) to work while the mill functioned. But the groupement decided that this person "did nothing good" and so would not be paid. The individual in question quit in a huff, and has not been replaced.* Nor have any salaries been paid to the others, although it is not altogether clear why this is so.

*His not being paid may have been a function of other, non-station-centered, local-level politics. It will be interesting to explore such cases further.

The answer probably lies in the fact that groupement members are not sure what to do with the money accumulating in the common account. I was told that they do feel it to be their money, for the use by the co-operative for the benefit of the community; but that there is also a general fear of the ORD, and that their choice of expenditures might be deemed improper and the leaders punished as a consequence. Several NASA and AID personnel indicated to me that they felt the profits would or should be kept to fund repairs or the eventual replacement of the mill, should the experiment be terminated. Since both AID and NASA agents have been so active in maintaining the station equipment through its first, difficult months, it is little wonder that this sort of long-range thinking has not been necessary or possible by groupement leaders.

Given the alacrity with which the co-operative was formed, and the fact that an outsider (the station manager) is paid to oversee the everyday maintenance, it is likely that Tangaye villagers are not aware that this is to be an experiment with a termination of support from AID/NASA at some point.* When I asked at the groupement meeting I attended, what would be done if the station were to break down completely, or if the equipment were taken away (a question I was specifically requested make by an AID agent), the co-operative president's response was eloquent. He said that in endeavors of this

*I myself am not sure what the time frame for the project is to be, since different NASA and AID personnel gave me different answers to this question, from a gloomy 'it will be taken out as soon as the experiment is finished, in another ten months,' to optimistic 'this thing, once we get the bugs out, should work forever, with minor adjustments by us'.

sort, the people of Tangaye should help the AID agents such as myself, because it is like two boys climbing a tree: the first mounts on the other's back, but then he must pull the other up from and to the branches above (this in itself an interesting commentary on imperialism). He continued that "we don't know how this thing works, but they do; and even if it doesn't work and they take it away, we still have these buildings here which other villages don't have. We should feel fortunate for that, and not be ungrateful, since we would only suffer should they decide to move to another village after judging us uncooperative."

As for maintenance of the station's equipment, the station manager oversees the cleaning of the panels and the buildings, and is the only one with access to these (although the millers have keys to the mill proper). He sees to the water in the batteries and watches the meters. Other elementary tasks are accomplished by AID personnel. A light was fixed and the hammers of the mill switched to prevent excessive wear. I was told by mill personnel that "we know how to do" the latter. In this particular case, instructions had not been given by AID personnel as to how the hammers were to be rotated. Larry Dominessy had requested that no one attempt such an intervention without his or Gay Morgan's supervision; they would come and provide information on the correct procedure, as they have done with "all of the equipment which requires maintenance.

"Because of unforeseen difficulties, NASA and AID agents have had to make many trips to Tangaye. It is admitted by these well-meaning persons that there may indeed be individuals in the community capable of taking a first initiative to accomplish maintenance tasks (e.g. rotating the hammers); but this observer's feeling is that precisely

because there have been so many major mishaps, there may be some overcompensation concerning the possibility of minor ones. A preliminary training session for co-operative members, over some days or weeks as necessary, might release these same agents from so frequent intervention. The management and maintenance of the station are a part of its overall, experimental nature; had it been constructed in the States, then American overseeing would have been simple. The demonstration parameters should include the factor of Voltaic initiative and enthusiasm when at all possible, if projects such as this are to be viable without constant American supervision. The matters of condescension and paternalism are very tricky to define situationally; we must all stand back at times and let others make their own mistakes.

III. Methodology for Interim and Future Research:

The manner in which the preliminary study (Hemmings 1978) was conducted influences not only what is to be done in the follow-ups, but what must be done to exploit to the fullest the data already collected, and what can be done due to impressions and expectations created by the preliminary researcher. This means that some discussion of the first study, its data and the means by which they were collected, must be integrated into the present review, to understand the parameters and constraints by which future work may proceed. This is to say that the first study is a matter of history, and should be considered objectively as such, despite personal feelings, pro and con, that may exist on the parts of various agency members concerning the manner in which the preliminary study was conducted. My own role is that of a reporter; I would hope that some of the apathy, distrust, and sarcasm directed at

development anthropology in general, and at me as the next anthropologist on this project which I encountered when embarking upon this study, the consequence of past experiences on the parts of development agents, will dissipate as professionalism is again brought to the fore.

The first study was directed toward an understanding of time-allotment, water-use, and other factors which might change as a consequence of the installation of the present solar-energy complex. This was to be the base-line study, against which comparison might be made once the station had functioned for some time. The greatest emphasis was laid upon the use of questionnaires, filled out by Voltaic assistants and assessed by the researcher; even interviews, such as with mill owners (Hemmings 1978:41-50), were conducted by unaccompanied Voltaic assistants, according to these latter with whom I spoke. No discussion of possible sources of bias. was presented in Hemmings' report.

More sets of the same questionnaires were made available to me upon my arrival in Ouagadougou, and the hiring of two assistants who had worked with the preliminary researcher was being arranged, that they pursue the same chores to which they had become accustomed in working with Hemmings. One of the two was a 19-year-old resident of Tangaye, the son of the groupement president. The other was a woman who, I soon learned, had not worked at Tangaye at all, as I had been led to believe, but who had worked on another, different research project of Ms. Hemmings, being undertaken concurrently with her work at Tangaye. This latter declined the offer to participate in the on-going research. Another assistant will be sought from the community of Tangaye by Gay Morgan. Because I will be absent from the project for the next six months. It is important that the assistants chosen be involved with the community and thus with

the project in various ways other than only being hired by AID: if, as is the case with the one assistant, the person is the son of the cooperative president, then he will owe allegiance to more than a vague presence in Ouagadougou which sends occasional visitors and monthly salaries, or to an even vaguer person somewhere in America. He will thus feel greater responsibility to fulfilling his functions correctly.

The successful use of questionnaires is based upon the implicit belief that those filling them out are doing so in good faith. In discussing here what I learned in Tangaye about how the procedure was pursued in the past, I must enter into the realm of unproven allegations which, whether true or not, nonetheless color or reflect the local-level perception of what such work is about. There exists some resentment as to the manner in which the preliminary study was conducted. The anthropologist was never resident in Tangaye; every other week she would come in mid-morning from Fada,* review the previous day's questionnaires, and leave in mid-afternoon. In the meantime, assistants were expected to stay in the compounds they were observing, from 5 A.M. til after nightfall, without leaving. Naturally enough, Hemmings wanted a complete record of time-use, and required steady observation; what cannot be proven, but which is at least the popular understanding, is that her assistants were instructed not to leave to eat or to otherwise interrupt their work, and that she became angry with them when she found they did. All this is to say that I was told that indeed, without her knowledge, the assistants often left the compounds to eat or to see to other needs. They felt that she ate alone, when she wished, and fled the inconvenience

*The off weeks were spent at Kouri, working on other, non-related research.

of living in Tangaye which she considered "the bush". They felt no remorse in breaking her rules. This then, is a serious source of bias, and one which must be addressed if the same sort of data collection is to be pursued in this interim period, in order to seek continuity with the first study.

At the same time, Hemmings herself reports that concerning water-use during the dry season, much water is brought to the compounds before dawn. In order to measure water brought to and used in the compound, then, these nocturnal activities must be taken into account. I have proposed that the questionnaires concerning time-allotment and water-use be filled out over a two-day period, the assistant spending the night at the compound to be studied. I have specifically instructed that the matter of food be arranged in advance, either through the assistant's bringing his own, his having it brought, or his having it prepared there. After two days at work, the third day would be free. Knowing that liberties were taken with Hemmings' instructions when she was present every other week to look into what was happening, I have no illusions as to what may happen during my six-month absence. Gay Morgan of AID-Ouagadougou will periodically collect forms and attempt to rectify errors or accidents. Nonetheless, it is likely that only gross impressions will be gained from this experience, and not qualified statistics.

There are a number of other problems in this regard. Several NASA/AID people have expressed their doubts that this particular project is of sufficient magnitude to change the time-allotment of women in ways that can be measured, through questionnaires or otherwise. Clearly, those women who only use the mill occasionally, will only have an equally

occasional hour or two free; as someone said, perhaps they will sit under a tree or talk to friends. Only those women who use it regularly, or perhaps only those who always do, will have their lives changed. Are these the women that Hemmings happened to have interviewed, and who will be interviewed again now? Fortunately, a record is being kept of mill use; it should be possible to establish a rough curve of mill use, and then to direct questions to those making most frequent use of the facility. This will be done upon my return.

More generally, the use of questionnaires at all may be examined. In their report on "Evaluation Planning for the Tangaye Solar Energy Demonstration" (1978), Burrill and Popper review some of difficulties inherent to this and suggest an alternative, viz., "the use of 'oral histories'". This is "a retrospective semi-structured interview. While there is no pretense of detecting changes at a micro-level, e.g., minutes or hours reallocated, it does tend to produce fairly high quality macro data" (*ibid.*:III-8, III-9). They cite Working by Studs Terkel as an example of this approach; what a pity that they are not familiar with the fact that the last eighty years or so of social and cultural anthropology, especially as developed in Africa, had depended upon lengthy interviews and participant observation, i.e. "oral histories". One needs only the most rudimentary knowledge of the works of Evans-Pritchard, Fortes, Richards, Turner, and many, many others, to know the value and uses of such a basic approach. Questionnaires do have their place in short-term studies of this sort, if one can determine what questions are most relevant. But unaccompanied by personally-conducted, directed interviews and participant observation, any resulting study will be devoid of the recognition of local factors of importance: one must be careful not to try

to force multi-shaped pegs into preconceived round holes. While we are interested in how a solar-energy demonstration such as this might function in any Sahelian village, Tangaye is a specific place; directed interviews by a resident anthropologist will reveal particular details, while questionnaires will provide generalities, against which such diacritical data will take form. For the sake of continuity with the previous study, questionnaires will be used; but they will be buttressed by three months' genuine fieldwork.

Five questionnaires were prepared by Hemmings, and left for future use. One of these, "utilisation du moulin à moteur" ("use of the motorized mill") or a variation thereon, will be employed upon my return, when a rough, users' curve can be established from data collected during every milling session; interviews will be directed at women at both extremes of the curve (those who use the mill rarely, and those who use it most), with the greatest emphasis being given to those between.

A second questionnaire, "utilisation des puits" ("the use of wells"), will be used in this interim period, with an added question concerning approximate quantity taken. This latter will then correlate with the use to which the water is to be put. Another questionnaire will be prepared, to be directed specifically at the station water system. Because of the heavy use that the system receives, several persons being able to draw water concurrently, it will be difficult to administer this questionnaire. When use is heaviest people are required to come to the facility during the night. A complete coverage, then, will require twenty-four hours of observation. I have asked that the station manager oversee this data collection, but that he be aided by the two other assistants. They will be able to divide the time, and work two or three

at once if the number of water-users calls for this, more intense attention. Once a week, the station water facility will be observed for an entire day. The manager and assistants will have to use their own judgment as to how the duties should be divided; counsel should be given by Gay Morgan if this does not function correctly.

There are three questionnaires prepared by Hemmings for use in compounds. The first of these, "preparation de nourriture matin/soir" should have questions added concerning the food being prepared: was the mill used for grinding this grain? How often does the woman/women use the mill? The assistants have been instructed to employ the backs of the forms to record any commentary offered by compound residents, or any observations they themselves might have, concerning food preparation, dissatisfaction with the station facilities, and the like. The other two questionnaires, "division de travail" ("division of labor") and "utilisation de l'eau dans la concession" ("the use of water in the compound."), may be used as prepared.

To reiterate, only minor changes have been proposed at this point, that the questionnaires retain the basic form with which the one assistant became accustomed during his five-month project with Hemmings. He will be responsible for teaching the other assistant. There will undoubtedly be difficulties, which as of now are unforeseen. Were I to be present, I would do some of the questionnaire work myself, or would accompany the assistants, and work with them to improve the forms and methods as we went along. This will not be possible til I return in late spring; in the meantime, it is hoped that whatever problems will be solved by Ms. Morgan and the assistants. This is a large responsibility for assistants who are only about twenty years old. The questionnaires

will not be considered as a primary source of information as was the case in the preliminary study, but will only serve to give a more generalized picture of community life and whatever changes may be occurring due to the station's presence, a backdrop for the directed fieldwork to be undertaken upon my return.

The sample use for the questionnaires will be that employed by Hemmings. As she does not explain by what criteria these households were chosen, no judgment is possible at this time concerning their being representative. Hemmings felt that for the protection of her informants, the names of those questioned should be deleted from her report. This is an issue to which all researchers are required to address themselves; before Federal research grants (e.g. from NSF or NIMH) can be made available, for instance, a signed statement must be on file outlining the researcher's recognition of responsibility in this regard, and his intended measures to insure proper respect and protection of informants. This does not mean that names cannot be kept and made available upon request, particularly when a follow-up study is required. Ms. Hemmings kindly offered to make available to me data in her possession not presented in her written study; the fact that the names of her sampled households were not a hand was an inconvenience rectified by the on-site assistant's reconstituting from memory the list of those studied.

Aside from this sample, I have asked that particular attention be paid to a single compound, that of Issa, the groupement treasurer. His hamlet, which I visited, is about 2+ km. from the station; he depends upon more proximate water sources til the height of the dry season, when last year his people went to the station for water. This seems to be a good place for a closer, case study then; the fact that

Issa is a member of the groupement should facilitate contacts with the assistants. I have asked that once a week, an assistant visit his compound. This may, in the long run, prove an inconvenience or bother to Issa, and some sort of compensatory gift of food may be in order; or the focus may have to be shifted elsewhere. It is requested that Ms. Morgan be aware of these possibilities, for it is she, in conjunction with the assistants, who will have to decide what measures may be most appropriate.

Instructions have also been left with the station manager, that he pay especial attention to several issues of interest. He is to record these in the station journal, or in another, private notebook which should only be made available to me. It is after all, of importance to know what sorts of impressions or problems arise concerning matters the assistants do not feel comfortable in recounting to the AID personnel with whom they must relate as salaried employees. The AID agents are requested to consider such work objectively, and not as a slight or a threat to their own integrity.

Areas of particular concern which will be monitored by the station manager include (a) brick-making at or near the station, or using large quantities of station water; (b) firewood use, if greatly increased quantities are to be employed for beer-making, itself a process perhaps facilitated by the station; (c) intensive use of the station by cattle-herders, either resident or transient; (d) declining use of the station, if any, and reasons for it; (e) any conflicts, dissatisfaction, or other commentary concerning the station's resources and management. Each of these areas of interest presents its own problems of data collection; I do not expect any regular reporting (as with questionnaires) on these topics, but rather have requested that the manager be apprized

of their importance to me, and that he record any incidents or commentaries he might have in their regard. This will serve mainly as a memory device. I shall be able to review his notes, then ask questions about specific entries, and thus elicit fuller explanations. Dates for incidents will be recorded, and I can then investigate these through directed interviews.

IV. Other Questions of Interest:

A number of other questions have been posed in the reports, memoranda, or evaluations already completed; or by persons contacted at NASA-Lewis RC, USAID Africa Bureau and Ouagadougou Mission; or elsewhere in the course of the present study. Some of these may be discussed here, with preliminary findings which will be pursued further in future.

A. Replicability of Project:

Some have said that an aim of the present research should be to investigate the possibility of replicating the station facilities elsewhere in Upper Volta or in West Africa. Others have said that this is not an issue here. The following thoughts have occurred to me in this regard.

One AID agent, while explaining how Tangaye was chosen as the site for the present experiment, stressed that the village had appeared especially "disciplined": that people had immediately offered assistance in accomplishing assigned tasks. "Discipline" depends upon either a common understanding of possible benefits, and a common desire to assist in attaining defined goals; or upon established authority, by which

efforts may be organized and directed. The chief at Tangaye is a charismatic fellow; in office since around 1957, he has been able to cope successfully with the varying political forces through the last years of colonialism, the transition to independent rule, and the establishment of Voltaic national political identity. He has had the foresight, contrary to the warnings of his peers, I was told, to seek education for his sons; they now hold influence in the national government, and his own status must benefit.* He is also a traditional healer of local repute. American Southern Baptist missionaries who have worked at Tangaye regularly over the past five years, and who are based at Tenkodogo, describe the Tangaye chief as the most dynamic and powerful of his hierarchical status whom they know in the general region.

Hemmings indicates that the chief personally sponsored the H.E.R. well which has become that of the station, footing the costs of food and lodging incurred by the well-builders. As she notes, this gives him some legitimate cause to consider the well as "his", although custom and law dictate that all may use it (1978:20). The importance of the well and its improvement, now obvious to all passing on the Ouga-Fada road who notice the buildings and large red reservoir, must underscore the chief's own powers and ambitions.

French (1977) has written that in general, rather than the chief, "some more development-oriented unit capable of administering

*There is an on-going debate as to where the improved road from Koupela to Fada will pass; one course passes north of Tangaye, thus isolating it from the benefits its present position on the road affords. That the chief of Tangaye, and that from Diabo, were granted an audience by President Lamizana to discuss this matter, bespeaks the unusual status of the former.

local development projects should be chosen" to oversee projects such as that at Tangaye. As has been discussed above, the AID/EORD personnel to initiated the creation of the station groupement acted according to such reasoning, which is supported by more general national policy with regard to the ORD's. We have discussed the re-establishment of political balance that ensued. Important here is the fact that a fundamental contradiction exists between choosing a site because its people are "disciplined", and then specifically placing the management in the hands of those supposedly unrelated to the traditional authority assuring the desired "discipline". The chief of Tangaye is indeed an unusual man, and has contributed significantly, in ways not readily discerned, to whatever success the station has had. Does this mean that in seeking to replicate the facility in other parts of Upper Volta or West Africa, only those sites where "discipline" reigns are to be considered? Whole regions of the country (e.g. that of the FoulBe to the northeast of Ouagadougou) are inhabited by people observing forms of social organization different from that of the relatively-strictly hierarchical Mossi. In other words, their villages would not be "disciplined" in the same manner as is Tangaye. Are they to be passed over? This is an issue of fundamental importance, which has been considered in implementing energy projects elsewhere in West Africa where ethnic diversity is more the rule than it is in Upper Volta (see Steedman et al. 1979, on Senegal); it must not be overlooked in the present context.

B. Social Change Occasioned by the Station Presence:

NASA Lewis RC personnel first brought to my attention the fact that since the station has been established, a Southern Baptist

church has been built in the vicinity, and someone has constructed a tin-roofed house. We discussed whether this might mean that the station would become the center of a nascent town, thus precipitating a change of status for Tangaye from being a village (i.e., without permanent stores or other facilities usually associated with a town center). Were this the case, the social ramifications would indeed be interesting to study; I pursued this topic with particular attention.

Reverend Norman Coad, a Southern Baptist missionary who regularly visits Tangaye from his base at Tenkodogo, was contacted. The church now standing close to the station has been planned for some time; the Tangaye congregation would build the mud-brick walls, and Reverend Coad would supply and build the tin roof. The choice of location for the church, however, was decided by the chief; it was said that he had specifically chosen a place near the station, for this, in his estimation, will be a center for social services and activities. The two EORD extension agents resident in Tangaye also live nearby, and the Tangaye market is similarly fairly close. Now at the Baptist church, adult-literacy classes, public health demonstrations, dry-season food distribution, and the like are held. In this regard, then, the station has become a center of activity of related sorts.

The man who has moved and built a tin-roofed house near the station was also contacted. He explained that he is the son of the World War II veteran living northeast of the station, and was himself a Voltaic soldier for some time. A man of about forty years, his army service was extended due to the conflict between Mali and Upper Volta several years back, and it is only now that he has been able to make the move that he would have effected earlier in his life. Married sons

move out from but stay close to their fathers' compounds. This he has done. There has been some contention between his father and the chief, concerning their relative status; it is no coincidence that the son has moved close to the station, where he can still be close to his father but also be close to a recognized resource. His father's own improved, all-season well lies just the other side of the Ouga-Fada road from the station; it is to be suspected that by moving closer to the station, the son and his father wish to establish some identity with its prestige.

I discussed this topic with Mr. Harouna Kouela, the chief's son. He cited a number of reasons why he did not think that the station would become a center around which people move in from outlying hamlets. These in turn provide insight into the social organization of Tangaye, and the place that the station may occupy in its regard. He noted that each outlying hamlet is constituted by people related through kinship or affinal bonds. Each has its own interior organization, with a hamlet/family head and a variety of earth-spirit priests and the like. Were people to move together to a single center, there would no longer be the possibility of so many occupying the same sorts of leadership positions. These men desire to stay on equal footing, with many in the same, "horizontal" position; moving together would establish "vertical" hierarchy among them. Remaining separate, each office-holder may gain the attention of the chief with regard to various community matters; together, each would be more difficult to distinguish in this regard.

People live in hamlets to be close to their fields, both near and far. Through industry, a person can have a surplus to bring to market. Moving together would mean that near or kitchen gardens would

not be possible (as they are not in towns like Fada); there would be no room for the gardens which people so enjoy. The spread of hamlets also means that each will have its individual advantages: one will be closer to some adjacent market than in another, and so those individuals going there will have cause to pass through and stop there. Prestige is gained from this, and another hamlet in a different direction will have some similar but different benefit. When the chief wishes to contact people in adjacent villages, he calls upon his own men living in that hamlet closest to the other, to act as negotiators; they gain prestige and advantage because of this utility of theirs. At the same time, people do not want to be too close to the chief's scrutiny, as they would be, living in a center. Each hamlet has its own spirits, both of the land and of the ancestors buried there; each place has its own priests, another important, "horizontal" office. There are many reasons, then, for maintaining the present, far-flung nexus of hamlets. That the station may become the center social activities, will probably not alter this basic organization.

C. Integration of the Station into Community Life/ Alternative Uses of the Facilities:

There are a number of actions by Tangaye villagers and/or groupement members which indicate that the station is considered a feature of their community. Wash is hung to dry on the fence around the solar array. Women dry corn or sorghum on the cement porch of the mill building. The mill building is used for reunions such as that after the clean-up, when groupement members and their associates proved too numerous for the limited shade of the nearby mango tree, and some sat drinking beverages in the mill building. The station manager and

the two millers maintained a small rice paddy in the depression behind the reservoir, left from making the bricks for the buildings. The chef de travnx of the grouperment, the millers and their assistants, and the cashier have a large garden (tomatoes, peppers and a few sweet potatoes) just behind the water tank. They were watering it, when I observed them in late October, from watering cans and by letting the water flow into and out of the adjacent animal trough, to irrigate its one side.

D. Assimilation of Ideas Concerning Station Technology into Local Logic:

This sort of abstract topic requires some time to investigate, and will be pursued further in future. It would be interesting to know, for instance, whether any connection is made between the facts that the station is run by solar energy, and that the Mossi Supreme Being is supposedly associated with the sun (Tauxier 1924:30). A passage from the "Tangay Journal", written by the Mossi station manager in response to a minor crisis at the mill, reveals another facinating detail.

The "low voltage limit" and the "high voltage limit" lights had both lit, followed by some curious and alarming noises; the manager tried pushing buttons but "had the impression that the whole thing was going to burn up". After a whole day of this, the next morning the following was recorded :

7:30 A.M.: I pushed the "short circuit current" three times, for to my thinking, it had been pushed by someone who thus put the courant in short circuit (the mill and the pump worked momentarily). I pushed it three times, since the number three is odd, and three plus the one of the individual make four; four being an even number, this annuls the one of the individual. I did this because there is no "long circuit current" (22 March 1979).

40 a
~~40 a~~

Someone has written in the margin that the button in question is the "short-circuit test", and that the manager had not understood its function.

What is interesting here is that in order to change the position of the two-way switch which he perceived the test-button to be, the manager could have pushed it once and then achieved the same result. His resorting instead to a balance between "three" and "four" is a reference to one of the most fundamental principles of Mossi logic.

An elderly man who often sat with me in the shade of the mango tree behind the station, wore a bracelet with three nodules of iron on it; when I asked about it, he said that an ancestral spirit had instructed him to wear this for his well-being. A woman might have a similar bracelet, but hers would have four nodules. Both sorts were available for sale in the Fada market. Four cowries are used in one popular form of Mossi divination; they are tossed, and fall either heads or tails. The underside of cowries bears some resemblance to female pudenda, and is assigned this sexual symbolism elsewhere in West Africa.

The market at Tangaye is held every three days. Every three weeks, the market falls on a Friday, and is larger than usual, I was told. Zahan has reported that among Yatenga Mossi, there are seven three-day cycles of markets, which he explains as follows:

"The first of these numbers explains the cycle of the person (7 symbolized the complete person: male [to which the Mossi assign the number three] and female [to which they assign the number four]), the second that of the creation. . . . The seventh market signifies the most perfect equilibrium: the one which exists between the universe, mankind, and divinity" (in Skinner 1968:257).

Returning to the matter of the station buttons, the manager feels someone has interfered and has pushed a button, thus causing his problems. This was about the same time that he was being accused of not wanting to grind village women's flour fine enough. His own tension reflects that of the community concerning the novelty of the station. He wishes to redress this imbalance, that the machinery run harmoniously. The odd, "male" three will counteract the disruptive one of the individual; their combination will produce the even, balanced, "female" four.

E. Local Expectations Concerning the Station:

A statement by the president of the co-operative on the occasion of our groupement meeting, was cited above; he said that even though the mill might cease functioning, and would perhaps be taken away, this village still has the buildings which others do not, and that for this alone Tangaye residents should be grateful. The account was coupled with his indicating that no one at Tangaye knows how the machinery works, only that it (usually) does. It is clear, then, that a primary benefit of the installation, as local people perceive it, is their having been chosen, by whatever criteria, from among their fellows; the very buildings, seen by all who pass on the Ouaga-Fada road, proclaim the specialness of Tangaye, its chief and its people.

Other data discussed above indicate that people do, indeed, have expectations as to how the mill and pump should run correctly; when flour was not produced sufficiently fine, many were quick to complain vociferously. This is a healthy attitude, belying implicit participation in the project.

The chief's son, Mr. Harouna Kouela, said his father had told him the project was running well, and that he expects others to be

undertaken in his village. Others expressed their belief that the facilities and benefits would continue for future generations, if only the villagers maintain their humility and helpfulness toward the Americans. Meetings have been held to discuss the maternity clinic people seem to believe NASA/AID will provide for them. A decision should be made as to whether or not there is a possibility of this or other related projects being implemented in Tangaye in the near future. There does not appear to be a feeling among groupement members that all profits from the mill should be carefully saved, to purchase a diesel mill in the event that this one fails or is withdrawn; they do not appear to have received any counseling in this regard. Expectations have been created, then; AID or other extension agents should act accordingly, in guiding the villagers toward whatever self-support they may feel should be a part of this project.

F. Possible Competition Between the Station Mill and Those Privately-Owned:

Concern has been expressed as to whether the station facility is detrimental to pre-existing, privately-owned mills, or to local entrepreneurial spirit more generally (see French 1977). Because the mill has not functioned with regularity, this cannot be studied fully at this time. The mill at Zanre, at the crossroads of the Ouaga-Fada road and that leading to Diabo (about 5 Km from the station), was visited; the owner was away seeking a mechanic, as the mill had broken down several days earlier. I spoke with the miller, who said that business is booming, that many come from Tangaye as well as from other surrounding areas, and that there was no lack of clients. He noted that the station mill was so often out of commission that they at Zanre often had more business than they could easily handle. So far then, so good.

V. References Cited:

- Burrill, G., and R. Popper
1978 "Evaluation Planning for the Tangaye Solar Energy Demonstration". Practical Concepts Inc., for USAID/Upper Volta (contract AID/ta-C-1469).
- French, D.
1977 Memorandum: "Upper Volta Solar Demonstration Project". To John Blumgart, AFR/DR/SDP, dated December 1, 1977.
- Hammond, P.
1966 Yatenga: Technology in the Culture of a West African Kingdom. New York, The Free Press.
- Hemmings, G.
1978 "Base-Line Study for Socioeconomic Evaluation of Tangaye Solar Installation". USAID/Upper Volta (no document number available).
- Skinner, E.
1964 The Mossi of the Upper Volta: the Political Development of a Sudanese People. Stanford, Stanford University Press.
1968 "Trade and Market Among the Mossi People". P. Bohannon and G. Dalton (eds): Markets in Africa. Evanston, Northwestern University Press. 237-278.
- Steedman, C. et alia
1979 "Base-Line Study, Energy Use in Senegal" (approximate title). Center for Research in Economic Development, University of Michigan; for USAID, Africa Bureau.
- Tauxier, L.
1924 Nouvelles notes sur le Mossi et le Gourounsi. Paris, Emile Larose.

APPENDICES

ANNEX II: List of Responsibilities of station manager

I. Enregistrement des données relatives au moulin et à la pompe

A. Instructions

de 12:00 à 13:00 h.

Observer et enregistrer chaque jour les cotes des compteurs digitaux / ou à cadran. Pour les compteurs à cadran, la personne qui enregistre, doit interpréter les cotes lorsque l'aiguille se trouve entre deux chiffres.

Elle devra également remarquer et signaler les défaillances et anomalies éventuelles du système.

B. Collecte quotidienne des données

de 12:00 à 13:00 h.

- système générateur d'électricité: relever les 13 compteurs
- enregistrer la date, l'heure, la température et la couverture de nuages approximative

tous les dimanches, mardis, jeudis et vendredis (càd 4 jours par semaine)

- moulure: enregistrer la date, l'heure de la journée, membre d'une coopérative (oui/non), types de céréales, poids des céréales, nombre de passages dans le moulin, village d'origine du client, raison de sa venue (s'il vient d'un autre village).

de 12:00 à 13:00 h.

- utilisation de l'eau : enregistrer périodiquement la consommation d'eau.

II. Responsabilités de l'assistant de gestion du moulin

A. Aider à tenir le registre de comptabilité des opérations de moulure (recettes/dépenses)

B. Aider les gérants du moulin lorsqu'ils ont des problèmes de comptabilité pour tenir le registre.

III. Lavage des panneaux (une fois par semaine - le vendredi)

ANNEX II (cont'd)

- IV. Enregistrer le niveau d'eau des batteries et rouille, etc...
(vendredi)
- V. Enregistrer le short-circuit ampères et le open-circuit volts
des batteries.
(vendredi 13:00 à 13:30 h.)

ANNEX IV. Schedule of Activities for Mid-Term Evaluation.

- Oct. 9: Flew from Detroit to Cleveland; met with personnel at NASA Lewis Research Center, including William Bifano, Anthony Ratajczak and Louis Rosenblum, for briefing on project history and goals from NASA perspective.
- Oct. 10: Flew from Cleveland to Washington, met with John Blumbart and David French of the USAID Africa Bureau/Resource Development/Sahel, and with Grace Hemmings, anthropologist, for briefing on project and goals for mid-term evaluation.
- Met with Gordon McArthur and R. Lundgren, USAID Upper Volta Desk, for briefing on overall development program in Upper Volta, and place of the Tangaye project in same.
- Met with Samuel Boskin, USAID Energy Dept., and Project Manager for Tangaye Demonstration, for briefing and suggestions.
- Oct. 11: Met with David French, USAID Africa Bureau, for further discussion.
Flew from Washington to Abidjan, via New York.
- Oct. 12: Arrival Abidjan. Tried unsuccessfully to meet with Steven Reyna, REDSO anthropologist for West Africa (he away from Abidjan on duty).
- Oct. 13: Flew from Abidjan to Ouagadougou.
- Oct. 14: Met with Larry Dominessy and Gay Morgan of USAID Rural Development, to discuss generalities and preliminaries of study.
- Oct. 15: Met with Larry Dominessy and Samir Zoghby of USAID Rural Development, for briefing.
- Visited Centre Voltaic des Recherches Scientifiques to obtain bibliographies and demographic data.
- Met with Harouna Kouela, son of the chief of Tangaye, and Voltaic Representative to the Arab Countries, for discussion of village and solar demonstration.
- Oct. 16: Met with Marcel Poussi, Voltaic National Director of Scientific Research, for discussion of project aims.
- Met with Richard Swanson, anthropologist active with USAID in the general area of Tangaye, for discussion of project.

ANNEX IV. (Cont'd)

- Oct. 17: Met with Samir Zoghby, USAID Rural Development, for discussion of project.
Travel by road from Ouagadougou to Fada N'Gourma, with stops at Diabo, where we met with the Chef d'Arondissement and the representative of EORD, for courtesy calls; and at Tangaye to meet the station personnel.
- Oct. 18: Paid courtesy visit to M. Lompo, Director of EORD.
Traveled by road to Tangaye, where met with the chief and began interviews.
- Oct. 19: Addressed a meeting of the station groupement, explaining presence and aims. Attended a funeral at the chief's, and pursued interviews.
- Oct. 20: Spent the day in Tangaye, with interviews. Met personnel from the Catholic Mission at Diabo. Traveled in evening to Fada, where the night was spent.
- Oct. 21: Day spent in Fada.
Paid courtesy visit on USAID/MSU team-member Thomas Stickley.
- Oct. 22: Returned to Tangaye in A.M. Interviews.
- Oct. 23: Tangaye, interviews, hikes to outlying hamlets.
Met Reverend Normal Coad, American Southern Baptist missionary from Tenkodogo, who regularly visits Tangaye. Discussion of the history of church in Tangaye.
- Oct. 24: Tangaye, interviews, hikes to outlying hamlets.
- Oct. 25: Tangaye, interviews.
Left Tangaye in mid-afternoon, being picked up by Gay Morgan, USAID Rural Development; return to Ouagadougou.

Met with Thomas Franklin of PACT, and William Hereford of OXFAM, for discussion of development in Upper Volta and the Tangaye project more specifically.
- Oct. 26: Ouagadougou; day spent writing report.
- Oct. 27: Ouagadougou; day spent writing report.
- Oct. 28: Ouagadougou; day spent writing report, report completed.

ANNEX IV. (Cont'd)

Oct. 29: Ouagadougou; report submitted, discussions with Larry Dominessy and Samir Zoghby concerning it.

Oct. 30: Ouagadougou, meeting with Mssrs. Richard Meyer (Acting Mission Director, AID-Ouaga), M. Rugh (Assistant Program Officer), L. Eckersley (Comptroller), and L. Dominessy (Project Officer), for discussion of project report and of future designs for the Tangaye demonstration.

Leave by plane for Abidjan.

Oct. 31: Abidjan, meeting with Dr. Steven Reyna, social anthropologist with REDSO-WA, to discuss this project in the context of American development in West Africa.

Nov. 1: Meeting with Dr. Reyna to discuss further these same issues. A fortuitous meeting with Dr. Priscilla Reining, Project Director of the Office of International Science of the American Association for the Advancement of Science; discussion of the Tangaye project and others in West Africa.

Leave by plane for New York.

Nov. 2: Arrive Detroit.