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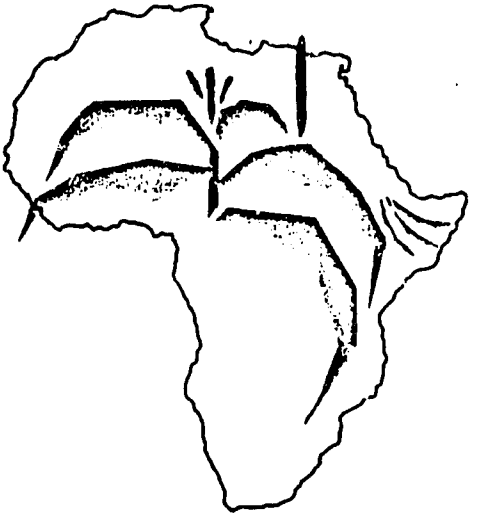
SAFGRAD

HOUSEHOLD COMPOSITION, RAINFALL, AND HOUSEHOLD LABOR TIME ALLOCATION FOR PLANTING AND WEEDING

SOME OBSERVATIONS AND RECOMMENDATIONS ON METHODOLOGY AND 1980 RESEARCH RESULTS

Nedogo, Central Upper, with Comparative Data from Zorgho, East-Central; Ouahigouya, North-West and Kaya, North.



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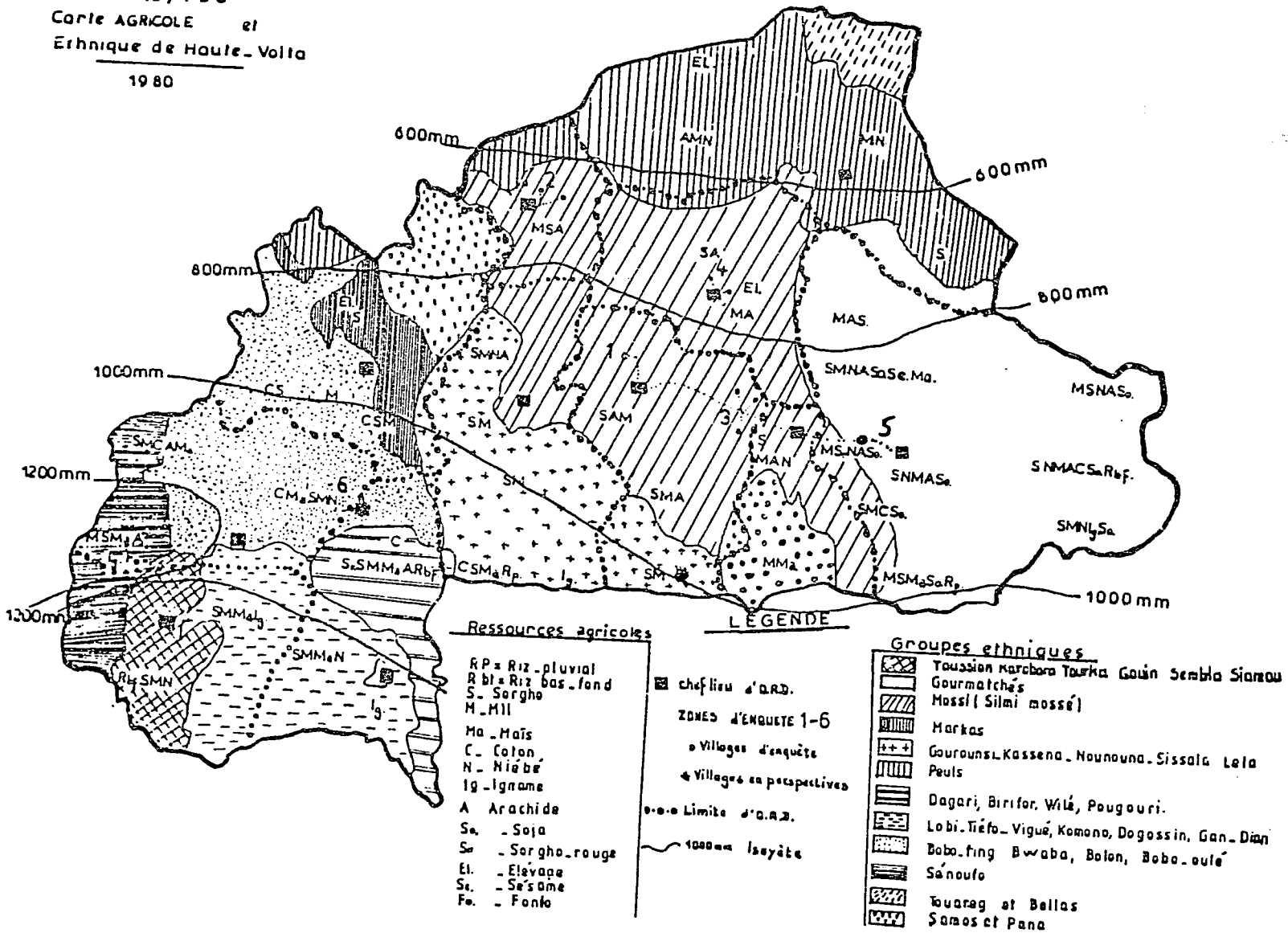
ETHNIC , AGRICULTURAL MAP

OF UPPER VOLTA

SAFGRAD / FSU

Carte AGRICOLE et Ethnique de Haute-Volta

1980



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* Figures were originally published in French. Translation of certain key terms are given here to aid English readers.

Temps de Semis = Planting Labor Time

Temps de Labour = Preplanting Cultivation

Temps de 1er Sarclage = First Cultivation after Planting

Temps de 2ème Sarclage = Second Cultivation after Planting

1.0. SAFGRAD FARMING SYSTEMS RESEARCH UNIT OBJECTIVES[1]

The Farming Systems Research Unit (FSU), within the SAFGRAD program, contributes to the identification and pre-extension of appropriate agricultural innovations to target groups of small farmers through increased knowledge of small farm agricultural systems in the semi-arid tropics of Africa. This is achieved through interdisciplinary social, economic, and agronomic studies conducted in interaction with farmer groups on their own land, off the agricultural research station. Principal objectives include:

a) analysis of small farm conditions on as regional a basis as possible, leading to the design and implementation experimentally of potential modifications (equipment, fertilizer, crop varieties, cultural practices) in the agricultural system which will be economically and socially feasible to a majority of farmers, improving their security and welfare;

b) recommendation of improved technical packages or extension proceedures which will be acceptable to large groups of farmers within select zones. Such recommendations must be within the capability of national extension services to implement;

c) training of host country personnel at various levels appropriate to farming systems research orientations (socio-economic research investigators, field trial personnel, data analysis technicians, mini-computer operators, professionals in agronomy, economics, and anthropology).

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[1] The Semi-Arid Food Grain Research and Development Program (SAFGRAD) is an Organization for African Unity, Scientific, Technical, and Research Commission project, funded by a number of international organizations. Twenty-five African countries are presently participating. The FSU is totally supported by USAID.

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A principal orientation of the Farming Systems Research Unit has been that a wealth of sound knowledge already exists among farmers concerning efficient management and use of their resources. Such knowledge includes, at both individual and collective levels, understanding of a changing environment and socio-economic positions. This understanding is based on long term, objective, usually accurate observation and experience. This knowledge, verbalized and transmitted in culturally determined contexts, gives rise to individual and group action in the various domains of human endeavor.

Improvement in agricultural production and quality of life can be realized when an appreciation for the frame of reference of a designated sub-group of farmers permits innovation to be built upon an already solid base of shared knowledge and experience. FSU/SAFGRAD works as partners with farmers and the concerned national agricultural extension personnel of the respective zones in which we work. Jointly we seek solutions to problems which are realistic, given major short and long term national, local, and family constraints. The benefits sought are, principally, for the subsistance farmers of the semi-arid zone and for a strengthened national extension service.

1.1. FSU Personnel and Professional Resources

The Farming Systems Research Unit personnel include an agronomist, agricultural economist, and anthropologist, several highly skilled Voltaics receiving on-the-job training prior to continuing higher degree studies in the United States, twelve full time field assistants, and office staff, including three mini-computer technicians. The FSU is backed administratively by small group at Purdue University in the United States. Purdue also has assigned on a part time basis the services of an on-campus technical coordinator (agricultural economist) with long term interest and experience in West African farming systems research.

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In Upper Volta, we are fortunate to be able to interact with a large number of professional people in different parts of the country representing a number of organizations (ICRISAT, IITA/SAFGRAD, IRAT, CFDT, World Bank ORSTOM). Dutch researchers, Dr. Broekhuyse of the Royal Tropical Institute conducts socio-economic research in the Kaya region using FSU/SAFGRAD questionnaire formats. Analysis is being done jointly. The newly established economics programm of ICRISAT shares many of our objectives, and we have been able to coordinate in some activities. The result has been some standardization of methodology, enabling greater extension of research results. Stronger links are being developed with other SAFGRAD technical personnel in Upper Volta and elsewhere. This is especially important in regard to the accelerated crop production officers (ACPO) whose work could be more closely orientated to pre-extension type farming systems research trials. Finally, a number of important links have developed during the past year with extension service personnel in various ORD's Upper Volta (Bobo, Fada, Ouagadougou, Zorgho).

1.2. Farming Systems Research

Even for the experienced observer, it still comes as a new and shocking realization each year to see just how dependent farmers are on events usually beyond their control. The irregularity of rainfall, limited availability of fertile soils, limited access to resources which could potentially improve their lot, financial poverty, poor health and nutrition... One cannot help but admire these people who manage as well as they do with their resources.

One must also understand that the people's limited resources make the introduction of highly productive intensive systems very difficult. The task of fitting new technologies into these farm systems is rendered complex by the number and nature of the resource limitations. A single

.../...

innovation, such as a new variety from a research institute has little chance of broad acceptance because of the variation in the production resource constraints from place to place and from one time period to another. New technologies must be developed which are specifically adaptable to various ecological and economic nitches both within the farm and within the different zones.

There are a growing number of researchers coming out of professional backgrounds in agronomy, economics, anthropology, human geography, etc... who have been gaining experience and expertise in farming systems type research. The manner in which a farming system is defined often varies greatly. A recent critical appraisal of such research differentiates two major approaches: upstream (basic, general research) and downstream (applied, specific research) (Gilbert, Norman, Winch, 1980). The former approach is most closely tied in with the research interests and mandates of research institutes and stations. Research on system changes is conceived by researchers on experimental stations to overcome constraints. The latter is more concerned with tailoring research needs to large sub-groups of farmers with whom most research is conducted. Research is conceived on the basis of on-farm studies. Systems changes to overcome constraints are tested on the farm. This latter characterizes FSU/SAFGRAD.

Within the so-called 'downstream" approach, there are those who essentially include all physical and social components having any particular bearing on agricultural production. Since one does not necessarily know before hand the major components and constraints of a system, all the components need to be investigated to some extent. Such investigation may be attempted through long term intensive research or a more limited reconnaissance survey. Professionally speaking, the former approach is more rigorous scientifically and personally satisfying; however it is very costly in terms of personnel and material resources, and results often take years to obtain. As such, it is inappropriate for FSU/SAFGRAD where such resources will never be widely available for member countries.

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On the other hand, there are other farming system reeearchers who would limit their attention to the crop production techniques of a group, and the critical factors affecting these techniques. Survey procedures used to accomplish these tasks range from detailed often complex intensive questionnaires administered on a weekly basis to either a purposely stratified or statistically random sub-sample in a village, to more rapid general orientation type questions with a group of farmers in relevant villages of a zone. Recent research conducted by Purdue University and Michigan State University teams would characterize the former, while CYMMIT's efforts in East Africa typify the latter. Often both approaches are used to some extent.

1.3. FSU/SAFGRAD Methodology

FSU/SAFGRAD has evolved a methodology of its own which combines experience gained through the involvement of a number of individuals in intensive socio-economic surveys, (Norman 1980, Lassiter 1981, Swanson 1979, Gilbert et al 1980, Hildebrand 1976) with CYMMIT's use of reconnaissance surveys (Collinson et al 1978), Briefly, the major stages we recommend for implementing farming systems research in semi-arid zones would be as follows:

a) Preliminary Delineation of Homogenous Zones

Using secondary data, map out for a country what may provisionally be considered to be homogenous zones, in which small farmers could be said to practice, more or less, similar farming systems. Any zone can be expected to include a number of ecological nitches. The extent and relative importance of similar nitches across zones can be a basis for zonification.

b) Reconnaissance Surveys

Using this preliminary orientation, conduct a reconnaissance type survey within those zones which seem potentially feasible for further study, and which show greatest potential for successfully

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influencing the greatest number of farmers. Eventually, such surveys ideally should be conducted in all the zones of a country to provide the groundwork for future work. Initially this might not be possible. When a reconnaissance survey is completed, results may signal the presence of major differences which would necessitate redefinition of the zone. On the other hand, the survey may support the earlier definition of the zone. The limits of this zone need to be identified.

In the reconnaissance survey, we attempt to identify, as quickly and qualitatively as possible, the principal means whereby agricultural productivity could be increased taking into consideration agronomic, economic, and social constraints characteristic of these zones. The questionnaire used (FSU/SAFGRAD Document Nº 3, May 1980) includes both open and closed questions on a wide range of topics (nature of household, crop and variety lists with specific questions asked about each, cropping patterns, labor use, farm inputs, outputs, new technology, land use and ownership patterns, livestock, savings and credit, consumption). Interviews are conducted by a professional and interdisciplinary group. Three or four villages per zone are selected with the aid of the region's agricultural extension personnel.

Each questionnaire pack is passed one time per village, taking 10 to 12 hours, sometimes longer. This means several different groups of farmers are usually involved, and the process takes about two days per village. Experience has shown that farmers are interested in the questions and usually answer quite willingly. Surveys in the rainy season are an inconvenience to farmers because of length of time required. The major part of the questionnaire format would be better passed during the dry season months, with a visit to the villages during the prior rainy season to visit fields and see crop associations and arrangements in place.

.../...

Reconnaissance surveys should be the basis upon which village sites are selected for further, more intensive research and field trials on farmer's fields.

Given FSU/SAFGRAD's present resource constraints, we are limited to the number of zones in which we can maintain long-term research (probably 5-6 zones). However, given the nature of the one-pass, 3-4 week reconnaissance survey per zone, we could be more flexible as to the number of zones which could be covered, assuming we would not be responsible to follow up with further research. The FSU has already been approached by a number of groups, asking for our participation in aiding their people conduct such surveys in order to provide a base for their own more intensive work.

For the immediate future, reconnaissance surveys might constitute the nature of FSU participation in SAFGRAD member countries. It could become the basis upon which SAFGRAD accellerated crop production officers could be helped in focusing field trial activities appropriate to specific zones. This officer would be a member of the survey team.

c) Detailed, Long Term Socio-economic Survey

Village sites are selected for greater descriptive, quantitative, long term research. During the first year, a socio-economic survey is conducted, with perhaps some controlled field trials on farmer's fields. Such trials would only be possible if the research team involved felt they had the means of designing a trial which could potentially be useful in the zone concerned.

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The intensiveness of the first year survey in any new village is a subject of much debate. It is our opinion that the researcher should not expect to get much more than general household social data along with agricultural production date (list of all fields cultivated by all members of household, list of all crops found on all these fields with information over the year on the planting time, weeding time, harvest time, utilized by various household members). A research assistant with 10 households averaging 10-13 persons is certain to be fully occupied. Study the first year should include rainfall data, field measurement, classification of soils and major production categories (categories which combine distance, soil, fertility, topographic positioning, crop). Market information should be sought. Some household inventories might be possible towards the end of the year. More sensitive information on household transactions (sales, purchases, credit, loans, gifts), certain types of inventories (livestock, cereals in storage, cash), and time consuming tasks such as detailing all the activities of a number of households through the agricultural season should be left to the second year of study when household members have gained greater confidence in the interviewer and his stated intention for requesting such information. The field assistant will by the second year also have become familar with the basic rythem of daily life through the year and less apt to omit important details.

Because the length of the interview is often a critical factor in determining the quality of the data (assuming good interviewers and well-phrased and relevant questions), a weekly interview should not take more than an hour, to an hour and a half, of a farmer's time. Since it is already difficult enough to find a farmer for once-a-week interviews, twice-a-week interviews are seen as unfeasible. The importance of recording accurate labor time data on a day-to-day basis for various activities makes anything longer than weekly interviews too arbitrary.

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What this means in terms of the questions asked is that questions must be carefully stratified; which ones must be asked once a week, which ones less often, which ones on a daily basis (during a weekly interview). Certain questions might be sufficiently answered by recall after an activity has been totally completed (i.e. how many days did it take to weed field, or how many times was it weeded during the year). Estimates of labor time per field, no matter what the frequency, must be complemented with a certain number of stopwatch timed observations of farmer performance of these activities (followed by the observer measuring the area upon which the activity was performed). One must also consider splitting the sample of farmers and obtaining greater detail and information on different subject areas for different groups. One must maintain some basic data in common, however, in order to permit comparison among the farmers of the entire group. It is important that the questionnaire format be set up in such a way as to be directly transferable to micro-computer for analysis (see labor time questionnaire and code sheet).

d) Experimental Trials

During the first year, and in all subsequent years of research in a laboratory village, a number of trials will need to be placed which require a degree of control beyond the farmer's capability. Such trials are basically an extension of the types of trials placed on an agricultural research station. Here, trial proceedures and controls match as much as possible those of the station trials, though the trials themselves are usually less complex. Though they may be located "on a part of farmer's fields", they can not be viewed as farmer field trials, per se. Our experience has been that farmers often consider these plots, even though on their own land, as our (FSU) plots. Such plots, even though perhaps planted, weeded, and harvested by the farmer, are usually planted; weeded, and harvested later than those he considers "his own". Because of this lack of real attention by the farmer, the plots often do less

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well than they might other-wise do. A common solution is to have an agricultural research assistant oversee the plots, and try to get the farmer to perform the necessary operations on a timely basis (or the assistant does it himself). Such trials are important because they do test out station material on a more localized basis. Fertility trials associated with such plots give useful information.

e) Pre-Extension Trials

The trials described above should not be confused, however, with the trials a farming systems research team should be conducting after the first year of survey work. These latter trials, which we are calling pre-extension trials are the result of the interdisciplinary team's synthesis of the relevent available data for the farming system of the zone. This team will design a trial, using available technology and information and material (crop varieties) from the research station, that seem to articulate appropriately within the farming system of the farmers of a particular zone. One does not change a farming system outright; one can only, little by little, change components of an existing system. These little changes added over time may evolve into what may be a new system.

FSU/SAFGRAD is in a position to make some initial recommendations of what we think might be socially, economically, and agriculturally appropriate for a number of zones (Zorgho, Nedego, and zones in Fada region, Ouahigouya). Our production level field trials become, in effect, pre-extension trials to demonstrate to ourselves and participating farmers of the village the appropriateness and relevance of the technology. If we can not demonstrate this to our own farmers in the laboratory villages, we should not expect the government extension

.../...

service to do any better. One would have to seriously question the usefulness and ultimate value of such research.

What does need to be emphasized is that the design of improved systems for a zone does not take place through agricultural experiment station trials, but at the local laboratory village level. Attempts to follow the former approach in most extension/station efforts across Africa have met with little benefits to the masses of farmers. The station must have the ability to carry out basic, general research for a number of controlled factors (planting dates, depths, soil fertility/land preparation/crop responses, etc.), and to test out varieties and conduct breeding programs. Such a station can not test out technologies appropriate for zones where not only soil types differ, but rainfall patterns, topographic patterns, local socio-economic constraints, infrastructure, etc. are all different. The laboratory village trials are at the level where they interact with functioning farming systems. Such trials are specific and applied in nature.

Because the local government extension service is ultimately responsible for extending any new development coming from a site to the zone as a whole, it is necessary that close ties be developed with this group by the farming systems research team.

2.0. BASIC CONCEPTS AND DEFINITIONS

Because the structure of the household or family group changes so much from one region to another, and because the understanding to this structure is so important in knowing the manner in which the household uses its combined resources, we have attempted do define the use of this and other such concepts which have been encountered in the zones of research during the past year. Because these zones were all found upon the Mossi plateau does not mean that the region as a whole shares similar orientations to social structure. While broad generalizations are possible, we have had to be sensitive to regional variation.

2.1. The Compound

In a broad sense, we are defining the compound to refer, in a physical sense, to a group of mud brick and grass thatched huts enclosed by a wall of mud, or grain stalks, or posts, or all of these. Within the interior of this group of huts is often found a number of mud silos for threshed cereals. A compound is separated from another compound by considerable space. The result is that a Mossi village is a group of scattered compounds[2] many of the occupents of which are inter-related by clan. Within the compound, one may encounter one or more household units (husband, wives, children , and other kin). The head of the compound is generally the oldest of the household heads of that compound.

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2 In the non-Mossi Bobo-Dioulasso or Dedougou regions, the compound is separated by mud walls in extremely compact villages.

2.2. The Household Production Unit

A household is represented by a group of people who generally live together (in one or more units), work together on the household's major cereal fields, and eat together (share a common kitchen). One finds more variation in this latter attribute than among the others from region to region. The Mossi will include in their households many members who have migrated; some have been gone for many years. In our Nedogo sample 75% of the households had an average of 3-4 members living elsewhere.

Generally speaking, the household includes the head of the household (the husband), his wife or wives, their children, families of married sons, other relatives (parents of household head, or his sisters or brothers and their families). Children of kinsmen are sometimes adopted into the household, sometimes friends of the family live for periods of time with it. For purposes of analysis, it is necessary to distinguish household members actually residing in the compound from those who don't. One further needs to identify those who actually work and those who are too young, old or infirm to do so. Once this has been determined, it is possible to calculate the number of man-units[3] available to the household.

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[3] One adult man equals one man unit, a woman 75% of one man unit, children under 15 and old people over 60-65 are 50% of one man unit. Depending on specific cases, these ratios are clearly biased. However they provide a standard means to average out labor availability over la large sample of households.

2.3. Crops

It was important initially to understand the types of crops farmers were cultivating in our zones of research. In order to do this we had to learn local terms for specific crops and what farmers called the places these were grown. Some lexical variation was apparent between zones. Despite this, semantic variation was minimal. In fact, the general orientation towards crop ownership is very similar, not only across the Mossi plateau, but including the whole eastern (Gourmantché) zone as well[4].

Though all the crops cultivated in each of our zones were identified, below I have listed only those which are of major importance in terms of consumption and sales. This is not to minimize in any way the important role many other crops play. The list below includes concepts from other zones in which FSU/SAFGRAD will soon be working, to illustrate semantic changes.

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4 The author's original deeper insight into Gourmantché culture and activities helped to discern patterns in Mossi culture and practice which might otherwise have been missed or minimized. His involvement in farming systems research began as part of an integrated rural development project in the eastern part of Upper Volta. There for almost three years (1977-1979) he assisted, along with a Michigan State University team of economists, an intensive socio-economic survey of some 370 Gourmantaché households. This experience was preceeded by 15 years of experience in the region.

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TABLE 1: PRINCIPAL CROPS OF UPPER VOLTA IN ENGLISH, FRENCH, MORE, BWAMO, DIOULA, GOURMANTCHE

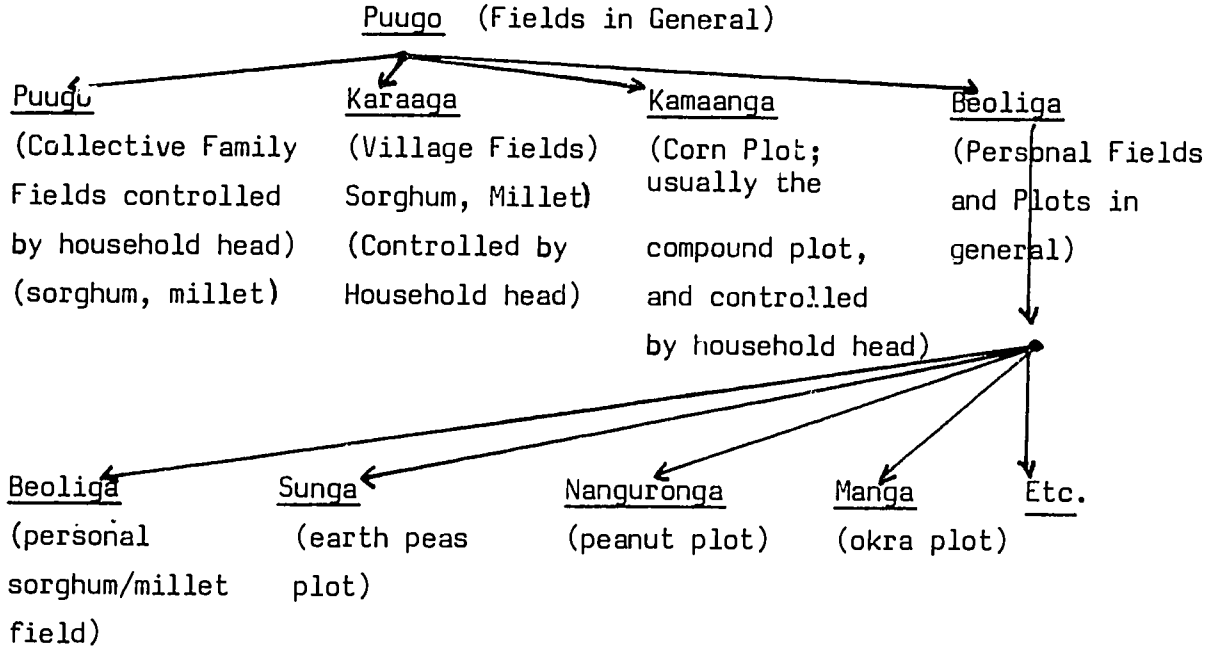
English	French	Moré	Bwamo	Dioula	Gourmantché
Crops	Cultures	Koodo	X	Seené	Kpaandi
Cereals	Céréales	X	Dyo	Souman	X
Sorghum, Millet	Sorgho, Petit mil	X	X	X	Di
Sorghum	Sorgho	X	?	Bimbiri	Biadi
Red Sorghum	Sorgho Rouge	Kazieega,Karaaga	Sibiyo, Sio	Bimbiri-woulé	X
White sorghum	Sorgho Blanc	Baninga	Weeni	Bimbiri-gué	X
Millet	Petit mil	X	Daa	Nyon	X
Early Millet*	Petit mil actif*	X	X		Niadi
Late Millet	Petit mil tardif	Kasui	Mino-daa		Di-yua
Rice	Riz	Mui	X		Muuli
Corn	Maïs	Kamaana	Bara	Kaba,Masanyo	Kokoda
Peanuts, Earth-Pea	Arachide, pois de terre	X	X	X	Tiina
Peanuts	Arachide	Nanguri,sunkaam	Duuna	Tigé	Tiin-namaga
Earth Peas	Pois de terre	Suuma	Yogkuio	Tigé-negguru	Tiin-piena
Roselle	Oseille	Bitto	Vani	Dâ	Goandi
Sesame	Sésame	Siili- siini	Laag ko	Beene	Iheg
Cowpeas	Niébé	Benga	Wiya	Sosso	Tuuna
Cotton	Coton	Lam-do, Goarga	Yense	Kori	Kunkundi

* non-photosensitive.

2.4. Fields and Plots

Mossi conceptualization of fields and plots is illustrated below. The concepts are similar across the Mossi plateau (with only some lexical variation), and resemble Gourmantché categories as well, with only slight modification. The major terms below, Beoliga and Puugo, have both general and restrictive meanings. Within these categories one can isolate the major production areas which any agronomic research must deal for these people: the compound plot, (corn); the village field (sorghum and/or millet); the bush fields (sorghum or millet); the small individual plots (sorghum, millet, peanuts, sesame, okra, cotton etc.) The inter-relationships between these categories represent the dynamics of Mossi agriculture.

TAXONOMY I.: A MOSSI CLASSIFICATION OF FIELDS AND PLOTS



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All the fields and plots of the members of the resident household became a principal focus for FSU/SAFGRAD research. All non-agricultural activity of all these members had to be combined along with the agricultural activity on the land to reach an understanding to the resources and constraints placed on the household production units of each zone.

Farmers were asked, on a weekly basis, the labor time spent by various members of the household in different activities on all the fields and plots of that household. Our initial expectation was that the results of this data would be somewhat over estimated, but analysis reveals that the data obtained seem to be reasonable given the man-units available. Nedego farmers (Zone 1) never spent more than 6 hours a day on a weekly average in agricultural activity, while for Zorgho (Zone 3) farmers, the maximum was 5 hours a day on a weekly average. This illustrates that labor time in itself is not a limiting factor. More will be said on this later.

For purposes of identifying the location and nature of different types of production activities, we were forced to arrive at some common understanding of what a field unit was. Despite the fact that many exceptions to the definition arose, generally speaking a field unit came to represent a parcel of land under the control of one person, though actually worked upon by one or more people of the household group. A field unit also corresponds to one sole crop or one association of crops. Border crops, though not strictly associated crops, are listed as associated crops (i.e. roselle).

2.5. Rainfall Patterns

Farmers accept each year's rainfall pattern as from the will of God, though potentially influenced by human social events. Farmers, for any particular region, have evolved strategies on how to proceed, step

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by step, through an agricultural season. These strategies, out of necessity, must provide flexibility for both the unpredictable (rainfall, sickness and death, insect plague, wind and hail, etc.) as well as the predictable (resources in soil, labor equipment, cultural preferences, etc..).

In outlining farmer strategies, one begins by thinking of some of the external parameters, recognized by farmers, influencing behavior in agricultural related enterprises. Farmers are profondly influenced by rainfall patterns. Both quantity and spacing/timing of such rains prove significant. Five major rainfall patterns are noted below, each of which can be expected to influence production in different and often longlasting ways. For any particular agro-climatic zone, we can expect the actual average annual onset and termination of rainfall to vary. Between villages and even within the village and the dispersed fields within a farm great variation can be evidenced. Between a zone of average annual rainfall of 1000 mm and 555 mm., up to a month difference can be seen. From east to west, across most of the central portion of Upper Volta, the dates given below should correspond fairly closely.

TABLE 2: RAINFALL PATTERNS

1. The Best	: Rainfall permitting planting to begin mid-May to June 1. About one good rain a week in June. Julyabout same as June, increasing into August, the month with most frequent and abundant rain. Several good rains in September, tapering off in early October.
2. Average +	: Rainfall permitting planting to begin mid-May to June 1, but followed by inadequate rainfall in late June and early July, requiring major replanting. Rest of season is adequate until end of season (early October).
3. Average -	: Rainfall permitting planting to begin mid-May to June 1. About one goodrain a week in June andJuly. Rainfall inadequate during months of August or September.
4. Average -	: Late arrival of rains, permitting planting to begin about mid-June to July or later. Rains adequate after this time, sometimes ending in early October, sometimes lasting longer.
5. The Worst	: Late arrival of rains, permitting planting to begin about mid-June to July 1. inadequate rain in either months of August or September, terminating completely in early October.

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3.0. ZONE 1 : OUAGADOUGOU

To achieve its goals, FSU/SAFGRAD has set up a number of laboratory villages where farmers and scientists can work together on relevant problems and where results may be compared over a number of years. Early in 1979, agronomist Paul Christensen initiated FSU/SAFGRAD involvement in Upper Volta farming systems research. One of the first sites selected was a region representing the central Mossi plateau with annual rainfall between 700-800 mm/year. Soils are generally thin and infertile and have drainage problems because of laterite and hardpan just under the surface. Shifting cultivation, practiced in some parts of Upper Volta, has here given away under population pressure to a more permanent and precarious form of agriculture. Local bush vegetation, where it exists, is dominated by the presence of shea and locust bean trees - a reminder that even here the bush consists mainly of fallow or abandoned agricultural land.

The purpose of the discussion which follows is to report a series of observations and recommendations based on continuing SAFGRAD research in a number of zones in Upper Volta. The scope of the report is limited principally to discussion of household composition, rainfall, and household labor time allocation for planting and weeding. Discussion will center on Zone 1 villages on the Central Upper Volta Mossi plateau, near Ouagadougou. Data from Zones 2, 3, and 4 villages, representing Ouahigouya, Zorgho, and Kaya, will be brought in on a comparitive basis. Where relevant, data from work in the Eastern (Fada) zone of the country will be included as well. These zones as a whole represent perhaps as much as 70% of the cultivated land surface and population of the country.

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3.1. Nedogo

The site selected within the agricultural zone around Ouagadougou was Nedogo, located some 30 kilometers from the capital. It is also about 18 kilometers from the regional agricultural research station of Kamboinse, where FSU/SAFGRAD headquarters are located. Nedogo, located some 12 kilometers off the all-weather Ouagadougou-Kongounssi dirt road, is the administrative center for a number of villages. Ten years average rainfall for the district is 707 mm/year[5].

The cash economy of the area, though not specialized, is fairly strong. Red sorghum, peanuts, some cotton, sesame, roselle, shea nuts, and small animals such as goats, sheep, and chickens provide regular, though limited, cash flows into most households. Most of the households posses a major source of wealth in their heads of cattle, which are kept away from the village most of the year by the Fulani herdsmen. Most households also have resources of cash and goods coming in as gifts from members working in Ouagadougou or outside the country (Ivory Coast, Ghana). Small local markets are dominated by those in Ouagadougou, towards which most surplus moves.

The villages of Nedogo and neighboring Zibako were surveyed late in 1979 in order to select a sample of households which might be more intensively studied during the 1980 agricultural season[6]. Zibako, the older of the two villages, possesses a market which opens every third day throughout the year. Residents of the area say that Nedego came into existence many generations ago with the arrival of some

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5 The average rainfall lines per year across our map represent averages of 20-30 years ago. During the past decade, rains have been poorer, so that one might drop the lines half an inch across most of the country.

6 Results from field trials for the 1979 and 1980 seasons are recorded by Dr. Christensen in FSU/SAFGRAD document N° 6.

families from the region of Zorgho, the location of another research site. These early families borrowed land from the residents of Zibako, and in time grew and became elegible for a chief (who would have been under the authority of the Zibako chief). During colonial times, the village chief of Zibako had to supply his quota of men for the forced labor gangs. The chief is said to have sent the men of Nedogo, rather than his own people, which resulted in greater contact with the outside world by the men of Nedogo. This contact is said to have been the determining factor of the government eventually selecting Nedogo over Zibako as its administrative center for the area.

3.2. General Statistics of Nedogo Site

3.2.1. Household Structure

Fifty-eight geographically widely scattered compounds were identified in Nedogo (and Zibako). After a preliminary survey, these were found to be composed of a total of 208 household units. Using this base of 208 households, a number of observations were made.

In a patrilineal society such as the Mossi, household and compound heads can be expected to be older men, the average for Nedogo being 53 years of age.[7] Compounds are generally quite large, consisting of more than one household unit, our average for the site being 3.6 households per compound.

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[7] This age average is fairly consistant across the Mossi plateau. Among the Gourmantché in the East, the average age was 45 years, reflecting the fact that married sons create their own compounds more frequently than among the Mossi.

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Ethnically, the site was homogenous. All but one of the household heads were born in the area and all but one was Mossi. Within our sub-sample of 30 households, only 5% were non-Mossi, and of these 3% were of inter-married Mossi-Fulani. Major clan names are Ouédraogo, Zongo.

Among the 208 household heads:

8% had no wives at all (old, and had died)
38% had 1 wife
28% had 2 wives
16% had 3 wives
10% had 4 wives

This leads to the fact that a major share of the labor force within the household does come from the women, despite the fact that the household head controls the use of the major portion of the household produce. Though household women, as a group perform more agricultural labor than household men, on a per person basis, the men worked longer hours in such activity.

In terms of religious orientations, the area is heterogenous. Of the 208 households surveyed,

38% stated they were animist
35% were Moslem
27% Catholic Christian.

The high incidence of the latter is probably due to the presence of a major Catholic mission outreach in Pabré, 10 kilometers away. Religious persuasion does seem to have some corralation with the farming systems of the respective farmers. Moslem households tended to be the biggest and wealthiest in terms of land, possessions, members; Christian ones the smallest and poorest.

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3.2.2. Crops and Agricultural Extension

Among the crops grown in the region, millet is clearly the most important as a source of food; 79% of farmers listed it as the most important and 62% of all labor time spent in planting by household members was with millet. Red and white sorghum both fall into second place, representing another 16% of total planting time. Roselle was listed by 34% of farmers as third in importance. Roselle is used as a base for the sauces eaten with the cereal meals and is present to some degree as a border crop in almost all fields. On an in-country basis, it competes with the newly introduced crop, soybeans, for the same nitch (ecologically and as a food). Over half of the farmers stated that they had no cash crops. For those who did select a crop, peanuts ranked first, roselle second, and cotton third.

Agricultural extension programs through the ORD's sub-sector at Boussé have had little impact on the villages. According to the sub-sector records, the number of agents have diminished over the past 15 years. Before being finally abandoned completely, the area of Nedogo was covered by agents who were responsible for some 159 households each (over 2000 people), a situation which was clearly unlikely to produce good results. All this is not to say that the farmers of the area have not been open to outside innovation. Largely on their own account, they have adopted the donkey plow so that they presently have reached a point in which some 43% of the farmers use donkey traction, and have developed a standard system for its use.

3.2.3. The Survey Sample of 30 Households

Socio-economic data were obtained dur .ıg the 1980 agricultural season from 30 households, using the services of two field assistants and one supervisor. These households were randomly selected from the list of 208 households earlier surveyed. Among the sample of 30 households for which most of our work over the past year has been involved, we have learned that the average household includes about 15 persons with the following sort of breakdown:

Household Heads	7%
Wives of Household Heads	15%
Sons of Household Heads	29%
Daughters of Household Heads	20%
Children of Sons	8%
Wives of Sons	6%
Brothers of Household Heads	6%
Others (other kinsmen)	9%

Not all of them, however, are present. Some are working in Ouagadougou, others are outside the country. The home compound still claims them for their own however (including the children of these family members living away). They still pay their yearly taxes. The home family group still hopes they'll come home some day. The members living away often do return for a visit.

The make-up of the average household clearly indicates the cohesive nature of the Mossi family which is known to act in a more collective way than some other groups. The household size among the Gourmantché of the eastern part of the country, for example, is much smaller, at an average of about 8 persons per household (but there is little migration).

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Nedogo men, upon marriage, do not frequently establish new households, as is often the case, among the more individualistically minded Gourmantché.

Among the 392 people represented in the 30 households of our survey,

49% were male
51% female,

and 62% were single (children, widower, widow)
35% married
3% divorced.

Of all these people, about half considered themselves in one way or another active in agricultural activities - many of the rest too young, old, or infirm to contribute.

It is always difficult to assign a labor time value to different types and ages of people. The input that these different categories of people can give to different types of activities differs as well. A woman's contribution on an hour by hour basis in planting or harvesting, for instance, is proably equivalent to that of a man's, though in reality they frequently perform different tasks in these operations. This is frequently not the case in weeding. A woman also is often involved in other side activities during the time she spends on agricultural activities (preparing meals and bringing them to site of work, nursing children). Based on some precident (Memento de l'Agronome, p. 1274), we have decided to average out these tendencies in the following way. One hour of labor time data recorded by our field assistants in agricultural activity for women will be worth 75% of an adult man's time for the same period of time; a child under 15 years or a very old person will be 50% of a man's time.

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Using such calculations, we have learned that our sub-sample of households had an average of 4.5 "man-units" available per household, as compared to an available 6 persons of various age and sex categories who were actually present to work on fields per average household.

3.2.4. Nedogo Rainfall for 1980

Nedogo's 1979 season could be characterized by rainfall pattern 4 (p.18). Pattern 3 was evident during the 1980 season (680 mm). Though analysis of yield variations between crops for the two years was not possible, differences between the two years were quite evident. The millet harvest was fairly good in 1979 and very poor the following year. September drought in 1980 effected the millet during grain formation and development. Red sorghum was excellent in 1979 and fairly good in 1980, though grain seeds were clearly smaller in size than the previous year. Because red sorghum matures early, it was not effected in its seed formation period (as the millet was some weeks later) but in its seed development stages.

Rainfall at 680 mm in 1980 was about 100 mm lower than could have been expected on the average for this zone in past decades.[8] Rainfall has decreased during the last ten years, averaging 707 mm/year. The 1980 season will give Nedogo farmers barely enough for their own needs; little surplus is to be found. The rainfall data obtained from Nedogo last year is illustrated on the following page.

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8 A more intense cold season than normal (about 10°C/50°F) at the end of the 1980 season has led many farmers to note that this is a sign of a good rainy season for the 1981 season. This remains to be verified.

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TABLE 3:

INDICATEUR DU NIVEAU D'EAU DE L'ANNEE 1980

CONTROLE ET ENREGISTREMENT DE LA PLUVIOMETRIE JOURNALIEREMENT

Jour	Jan.	Févr.	Mars	Avr.	Mai	Juin	Juil.	Août	Sept.	Oct.	Nov.	Déc.
1									15			
2												
3						10			3			
4						16		55				
5								3		1		
6								33		15		
7						37	16	2				
8												
9												
10						46	9					
11						15						
12												
13						12	5	4				
14												
15												
16						5		13				
17							19					
18					5							
19					30			22				
20						18	15	14				
21									13			
22								50				
23							16					
24						12		40	7			
25						25		8				
26							8	10				
27												
28					18							
29								12				
30						23						
31												
TOTAL					53	150	148	275	38	16		
CUMULATIVE TOTAL					53	20	351	626	664	680		

3.3. The Sub-Sample of 20 Households

Among a further sub-sample of 20 households, for which our data were most complete for early analysis, the average number of fields per household was 13 (6.8 ha[9]). Of these, 5.8 fields (including the large family fields) were controlled by the household head, 6.6 fields (representing the small personal fields) were controlled by household women, and only 1 (also a personal field) was controlled by men of the household other than the household head. The average age of women owning their own fields was 32 years, while that of the other household men was 23 years. The former represented largely the wives of household head, the latter the sons of the household head.

3.3.1. Land Preparation

Several weeks before the expected beginning of the planting rains, Nedogo farmers spend some time cleaning up their principal grain fields. This was often done by the children of the household. Old grain stalks are gathered and burnt, often after being placed on remains of giant termite mounds. Unlike the rest of the field where millet will later ba planted, such spots are reserved for white sorghum. Sprouting stumps are also trimmed back during cleaning. The time spent by the household is never very great (a matter of a few hours) and it is not a constraining activity. Labor time for clean-up will not be included in the presentation of labor allocation patterns.

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[9] Characterizing a zone by the "average household" or"standard farm type" can lead to potentially misleading conclusions. There are always important differences to be found among households, and as our analysis proceeds, we will attempt to stratify our data along certain major considerations (wealth, size of household, distance and quality of soils cultivated, etc.). However, there is also clearly a place for understanding average trends in comprehending major differences between zones of a country.

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3.3.2. Planting

Farmers, within any particular region, know generally when the planting season should begin. Given adequate rain around this period fo time, households plant intensively. Across most of the central portion of Upper Volta, east to west, farmers place high priority in getting as much of their major cereal crops planted as early as possible. Given a good year, this will permit maximum yield from local crop varieties; it will permit greater diversity in crops cultivated and/or more land being cultivated, and it will permit earlier and better weeding. One indication that household labor resources are used to their fullest at this time is that during planting members almost never help other households. The household is less likely to exchange labor for planting than for any other production activity. All the villagers recognize the critical nature of this activity and none are willing to put it off by working on someone elses fields. Another, more direct, indication that household labor resources are used to their fullest during planting is that household members work longer days during planting than during any other crop production activity.

In our work-plan strategy last year, the FSU felt it was important that labor use time[10] for planting collected for each day. Weeding time was gathered on an weekly basis, although the day of initiation and of termination for each activity was noted.[11] Figures I and II illustrate rainfall in mm/day for most of the 1980 season, beginning from the 15 of May.[12] The labor use time in man-hours per day for the sum of all planting done by the average household is plotted on these same graphs. Replanting time is added to the daily planting time, and is evidenced by the double lines in Figure I. Labor time spent in weeding is also included in the figure. The following points can be highlighted:

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10 In considering labor time statistics, a number of assumptions were made. We believed initially that farmers would be telling us they were working their fields more than actually was the case. This was because, without watches, work start-up and termination periods were judged on the basis of position of the sun and actual observations by research assistant of when farmers departed for and returned from fields. (The interviews were usually undertaken at the farmer's field.) Yet our data, averaged out over the sample, seem to justify this approach as fairly congruant with reality. We assume furthermcre that there is a relationship between man -hours units (m ha) spent in planting (given a certain technique and soil) and the land unit concerned. This assumption has also proven justified in most cases, though clearly it is more reliable within one household than projected to a large sample.

11 Next year, we feel it would be important to have day by day information on weeding and planting for the first three or four weeks of the season to clarify appropriation of time among household members.

12 For purposes of comparison, this starting date is used in illustrating labor allocation on a time scale across all zones. Figures I and II, along with all the other Figures discussed (Figures III - XII) are given together in one place at the end of the study.

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a) Correlation of Major Planting and First Planting Rains

Figure I illustrates dramatically that the date of planting is related closely to the date of onset of the first major rains of the year. The farmers were ready at that date and accomplished a significant portion of their planting during the first three or four days following the first major rains of the season. This pattern is clear across the country. The data from Ouahigouya/Sodin (Figure X), Kaya/Tagpooré data (Figure VII), and Zorgho/Digré (Figure IV) all show the same pattern. During preceeding weeks, many of these fields had been cleaned and burnt over in preparation for planting.

If the big rains had come during the first ten days of May Nedogo farmers probably would not have planted, knowing that these rains were too early and likely to be followed by a long dry period. This point is demonstrated in the case of the Kaya data[13]. In this northern area the early rains were not followed by early planting. Here, farmers waited until the first part of June to plant, doing little on their until that time particularily in the south farmers do hope to plant during the last half of May. Given a good rain during this period, farmers can be expected to begin planting in earnest trusting. They think that the risk of loss from a false start is less than the certainly of loss from late planting. There is always a certain risk in planting too early or waiting too late. Farmers generally make their decision based on the period of the month when the first big rains come, how big the rain was (it has to be more than about 20 mm.), and what they see and hear from other farmers in the village doing.

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13 Kaya data were collected in three villages under the direction of anthropologist Dr. Broekhuyse of the Royal Tropical Institute, Holland, using FSU/SAFGRAD forms.

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b) Rainfall Patterns

Looking at Figures I, II, III, one can class Nedogo in 1980 as an example of rainfall pattern 3 described earlier. The year started out well. Planting followed in an orderly progression in different area/terrain types, with a minimum of replanting. If the year had ended well, Nedogo would have had an excellent harvest. However, they were destined to have drought in september.

Zorgho/Digré rainfall can also be as Pattern 3, even though the start of the rains was two weeks later than in Nedogo. The rains stopped even more abruptly in September.

Pattern 1 characterized Zone 4, Kaya/Tagpooré. Rains started earlier than expected and continued regularily through-out the season. Harvests were very good.

Ouahigouya/Sodin, Zone 2, followed Pattern 2. Rains started off fairly well, followed by a dry spell of about two weeks. Rains also broke off too early at the end of the season. Planting in this zone was characterized by extensive land preparation before planting (by hoe) and by much replanting. As elsewhere, the millet crop suffered the most for the early end of the rains.

c) Crop Order in Planting

Locking at Figure I, there is a definite succession of crop types planted and of specific types of fields planted. The succession begins with millet and cowpeas (and a small amount of white sorghum) on major family fields located at some distance from the village. It continues with millet, red sorghum and white sorghum, all associated with cowpeas, on the smaller, often individually owned, bush and village fields. The planting succession continues with corn (and associated crops) on compound plots; then with

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more peanuts and earth peas, and then finally finishing up with roselle as a border crop around many of the already established fields. One would also have a few manioc and sweet potatoe plots being planted at this time. Some overlap exists. For farmers with lowland type soils (bas-fonds or valley bottoms with heavy soils), sorghum and sometimes even corn will be planted before anything else. Nedogo has very little of this type of land. In other zones, however, this pattern was observed. In zones where major slopes are cultivated (e.g. Houndé région a higher rainfall zone), planting of sorghum and corn began first at the highest topographical point, followed by the same crops a few days later at lower elevations.

d) Inappropriateness of Cultivation before Planting on Major Cereal Fields [14]

It may be clear from Figure I (and IV, VII, X) why farmers tend to resist plowing their major sorghum and millet fields before planting, even if when they have the equipment available. "Since a animal traction farmers are encouraged by extension agents to plow their land before planting, they must wait until a good rain for the soil to be soft enough for seedbed preparation. Having done this, they must wait until the next big rain to plant... The farmer using local technology will have finished most of his major planting by the time the animal traction farmer starts. Farmers almost always state that it is better to plant too early than too late in the season, since it is impossible to know how the rains will begin each year much less if they will last long enough at the end of the season. The animal traction farmer, by planting two or three weeks late, is vulnerable to a year of poor rain;

[14] Zones with heavy soils as well as those with an average yearly rainfall exceeding 1000 mm are excluded.

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his fields may not get a good start early enough. An additional problem is that all those crops which follow his major fields in planting will also be delayed, resulting in declining yields for these as well (they may have passed their optimum time for planting)" (Swanson, Gourmantché Agriculture, p. 57, 1979).

In addition to the risks of loss due directly to delayed planting, there are also risks of loss from delays in weeding which are associated with the use of preplanting plowing of the major cereal fields. Although yield responses to preplanting plowing with oxen may be substantial in terms of percentages, the absolute magnitude of the response per hectare in kilograms is not large on most of the Mossi plateau. This is due to the generally poor fertility of the soils. Farmers are therefore forced to adopt a strategy in which they maximize their incomes by cultivating large areas but are forced to accept rather low yield levels.

There is good evidence that the factor which limits the area which a farmer can cultivate is his ability to do the weeding, particularly the first weeding. Preplanting plowing interfers with the first weeding because it can delay planting into a time when weeding would normally be taking place. In the zones sampled by the FSU last year, with the exceptions of Sodin and Kaya, farmers were planting about 80% of their total land area before weeding time. In Kaya and Sodin there were early rains which produced unusual early weed growth. In response to this unusual early weed growth farmers did do a relatively large amount of hand plowing or hand preplanting cultivation.

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This problem with plowing in central Upper Volta is linked to soil fertility. If the farmers had access to large quantities of fertilizer at low prices, the response to plowing would be more than enough to compensate for "minor" yield reductions due to planting and weeding delays. With no fertilizer these "minor" reductions are major problems.

Given the current situation, farmers do have time to plow after the first big rains for a restricted number of crops and field types. Indeed, given weed growth, they have to. The main crops are peanuts, maize, and early sorghum. The maize and early sorghum are located mainly on village fields. The problem is that these remaining fields are small (1/4 ha. or less) and usually scattered. On major cereal fields, the only conditions under which plowing of large areas of land could take place before planting (with minimum changes in existing farming system) would be to encourage animal traction farmers to take advantage of the years when rains come too early (as in Kaya and Sodin this year) for planting. They need to be ready during late April and early May.

e) Planting Sequence

By June 5, 18 days after initiation of first planting rains of the season in Nedogo, 89% of the major fields (principally millet) had been planted. Most of this planting was done during the first three days. During the same 18 day period, 76% of all labor inputs for planting for all crops was completed. In all other zones except Sodin the major planting period was even shorter. Zorgho (Figure IV) rains were almost late getting started, causing some people to begin dry planting. When rains came, planting was intense for everyone for several days.

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June 9 was the first recorded date for peanut planting in Nedogo. By June 28, 70% of the total labor input for peanut planting by our farmers had been completed. This means a major portion of cash crop planting had also been completed before time of heaviest weeding. By June 29, 29% only of the labor time spent in all first weeding had been completed.

For a time, the first cultivation after planting of grain fields is competed for family labor with preplanting cultivation of land for peanuts and corn, and with planting of peanuts and corn. Changes in the amount of land farmers allocate to maize production will effect the amount of time they will have available for the first weeding.

Of all the crops planted, corn had the most limited planting period. The planting was confined to a few days of intense activity. In only 6 days, between June 20 and 25, 86% of planting was initiated and terminated (Figure 1)[15] Following a rain of 18 mm, every family in the village began planting. This corn planting temporarily replaced the place of planting peanuts and earth peas that had been occupying their time. In Digré (Zone 3), 80% of the corn was planted in only a three day period, following a rain of 70mm (Figure V). Other zones demonstrated the same pattern. In each case, such planting followed the first big rain after about 80% or more of the cereal fields had been planted. In Nedogo this was only four weeks after initiation of rains because of insufficient corn planting rains. In both cases, corn harvests were fair.

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15 Fully 36% of labor time spent in planting the corn plots for our 20 sample households was done on day 173. All such planting was completed between day 172 and 181. For any one household, the planting of the corn plots was usually accomplished during part of one day, usually during morning. As already noted, these plots are almost all located immediately surrounding the compound, always include associations of some kind of white sorghum, hemp, okra) and are usually relay-cropped with either tobacco or cotton.

f) Replanting

80% of the replanting in Nedogo was done in 13 days, between May 29 and June 10. Weeding of the first fields planted began just after this time. Total man-hours spent in replanting represented 10% of total time spent in the first planting. In Zone 4, Kaya/Tagpooré, because of the good beginning and continuation of rains, there was no replanting. In Zone 3, Zorgho/Digré, some replanting was made necessary by a slightly dry spell between the beginning of rains and final establishment after the 12th of July. In Zone 2, Ouahigouya/Sodin, a major dry period following planting resulted in much replanting.

As an example, the rain had not come again on day 149 in Nedogo, a great deal more replanting would have been necessary. This was 8 days after the last big rain when much planting had been done. Some of that first planting would already have begun to die, making a certain amount of replanting necessary after this second good rain. Because the earth is so dry and hard after months of no rain, the first big rain does little more than soften up the top few centimeters of soil. Most of the rain water runs off quickly into streams and ponds. Planting at this time can only be successful if the initial rains are soon followed by another good rain.

At the beginning of the season the structure of the soils and their location influences directly the length of time a particular crop can survive after planting before another rain. On the light, sandy soils common to in the Nedogo area about six or seven days after a big rain is the limit of time a germinating seed can survive after planting whithout more rain. These soils are generally found higher up in the topo-sequence. Lower down on this sequence, along water courses leading into ponds or streams or around such ponds, one finds heavier clay soils which will hold the moisture for up to two weeks after a

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big rain. Sorghum planted here would have a better chance of surviving than either sorghum or millet planted higher up on the sandier soils. In Nedogo very few farmers possess this latter type of land. One could generally say that for most of the Mossi plateau the land represented by this type of soil/topography is in short supply. Those who have it are the fortunate few. Those who have such land, begin their planting on it, as the Kaya data clearly illustrates. For the less fortunate majority, planting must begin on the bush fields higher up and on poorer soils.

Either because of drought or other factors (cattle grazing, excessive rain causing serious erosion through a part of a field) farmers may attempt to fill in their fields by transplanting. Transplanting is used as a strategy when replanting time has already passed.

Labor time in three major activities for different crops, in man hour units (MHU) for the average household in Nedogo is presented in Table 4 below.

TABLE 4: LABOR TIME FOR THE MAJOR CROPS IN MAN HOUR UNITS FOR THE AVERAGE HOUSEHOLD IN NEDOGO

Crops	Ha	Preplanting Cultivation[16]			Planting			First Cultivation After Planting		
		MHU[17]	MHU/ha.	MDU/Ha[18]	MH	MH/Ha	MDU/Ha.	MH	MH/Ha.	MDU/Ha
Millet	4.6	0	0	0	195	42	7	767	167	28
Sorghum[19]	1.4	4	-	-	52	36	6	203	135	22
Corn	.2	43	215	36	26	130	22	55	275	46
Peanuts	.36	35	97	16	27	75	13	89	247	41
Okra	.02	1.2	-	-	.5	25	4	1	50	8
Others	.02	1.3	-	-	.6	25	4	3	150	25
TOTAL	6.6	85.5	312	52	301.1	333	56	1118	1024	170

16 Preplanting cultivation normally done manually (hand hoe).

17 Man-hour units were calculated by counting and weighting number of men, women, and children who actually worked on household fields during the year. When the number differed between activities an average was taken. The man-unit values were then calculated for each household.

18 MDU = Man Day Units: the period of the day normally consecrated to an agricultural activity by an adult man or equivalent (Memento of l'Agronome, 1971,p. 129). In Nedogo, this amounted to a 6 hour work day average on household fields and plots.

19 Mainly red sorghum.

3.3.3. The Rational for the Introduction of the Mechanical Seeder

We have noted that for the village as a whole 43% of the households had animal traction. Among the sub-sample of 20 households discussed above, 13 or 65% had animal traction (donkey). Our data show that at planting, 12 households used their cultivators as row markers. Virtually all of the marking of rows was done upon the family millet fields and a few sorghum fields. Rarely did a household use the cultivator marker for all the major fields, much less on all the small, individually owned plots. A donkey (sometimes horse) was used, accompanied by a man holding the cultivator (HV1-A) and adjusted to three teeth for row marking. A child would often be present to goad the donkey along. Women would come along behind and plant in the rows.

A few farmers were observed to mark their field with both rows and perpendicular cross marks. Alining plants in adjacent rows allows cultivation in both directions. This was only done on part of the fields because it took so much longer. The practice was observed more frequently among farmers using horses. The cultivator-marker can be modified for 4 teeth for the larger draft animals.

Weeding clearly consummes more of the families work time than does planting. It is the first constraint to increasing the area cultivated. Labor available for planting can be a constraint to production in two ways. The first way is by interfering directly through late planting. The second way is when a limited amount of labor blocks planting during the short optimum periods after the early rains. For the family which uses the donkey drawn cultivator, the limited capacity to do timely planting is particularly constraining. Use of the cultivator increases the amount of land per person which can be weeded, but use of the cultivator as a weeder requires that the crop be planted in rows. Planting in rows actually slows down the planting process. Because of the

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relatively small number of early planting days available, planting by households planting in rows is frequently substantially delayed.

The average household in Nedogo prossessed 4.5 man-units of labor resources. A check through the data from the sample indicated that in any given week, throughout the season, no individual worked more than an average 6 hour/day.[20] That most family members worked considerably less on the average is illustrated in the Figures for Nedogo and for the other zones. Given a potential 12 hour/day an individual might work (6 am. to 6 pm.), half the time and more is spent in other activities. The data seem realistic and supported by observation.

One and sometimes two days per week does pass without any work being done by household members on their fields and plots. Market days occur every three days and always draw people. Other activities would include visiting and chatting with friends, household maintenance work. Various ailments often keep various members from work. Add to this the fact that, during any given day, considerable time (4-5 hours) can be spent walking or biking to and from distant fields,[21] eating and resting, guarding or checking out one's fields, preparing food/beer, caring for children and livestock, and a host of other small duties. Physiological heat stress could well limit the work days in the field especially during arduous weeding time.

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[20] Calculated by adding all the hours worked by any given individual for a week, in any agricultural activity at any location, divided by 7.

[21] Sixty percent of major fields were located 1-3 kilometers from the compound; 40% were located 4 kilometers or more. Minor fields generally were in or very near village/household (kilometer or less).

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What seems to be evident is that though labor time in general (on a weekly average bases) may not be a limiting factor at the beginning to the season, it may be during certain specific time periods of less than a week. It seems clear that the amount of planting during the optimal days is constrained by family labor availability, especially in the case of households with animal traction options. Planting not done early could result in lower yields, depending on how the season ended. This would influence negatively the profitability of animal traction. As noted above one rarely, if ever, finds a farmer our household member planting the field of some other household during the early season. The household needs its own resources at this time.

The days immediately following the first planting rains are characterized by an average of over 8-10 hours planting per day per man-unit. Planting drops off to 3-5 days per man-unit after the first big rains because soils have already become too dry for proper germination and establishment of seedlings. Unless ox-traction were used, it would be too dry for plowing too. With the next major rain comes another surge in planting.

In Nedogo animal traction (AT) farmers (members of larger households with more land) are planting more land than non-animal traction farmers. Given similar planting methods used, AT farmers are spending the same number of man-hours per hectar planting as their non-AT neighbors (Table II below). However, they are unable to plant all their major fields after the first big rain, so must wait until the second in order to continue (week and a half later). Whether AT farmers had planted as much as they would have liked to or not by the time the third big rain comes (about 3 weeks after first rains), only a little cereal planting could be achieved because weeds in the fields which were planted first already need attention, and because of the preparation and planting required for the next series of crops (peanuts, corn, earth peas, sesame, roselle).

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In Zone 3, Zorgho/Digré, where only one farmer in sample had animal traction, one notes in Figure IV that farmers managed to accomplish most of the planting of principal cereal fields during the first four days following the first big planting rain. The second major rain was not followed by a large surge of planting as it was in Nedogo. Had animal traction been important in the area, we would have expected such a surge.

In Zone 4, Kaya/Tagpooré, (Figure VII), half the sample of farmers possessed animal traction (donkey). Again, one notes the presence of two major surges of planting corresponding to the first two big rains. The second surge is again mainly related to the extra efforts of animal traction users. In a later report, FSU/SAFGRAD will demonstrate the dynamics of such planting by providing Figures illustrating the difference in labor utilization patterns by different strata of producers. We would expect the planting profile for non-AT farmers in Kaya to resemble that of Digré i.e: one major peak following the first rain.

In Zone 2, Ouahigouya/Sodin (Figure X), households are considerably larger than in either of the other zones (Table I); 45% of them also possess animal traction. These factors, combined, result in planting schedules unparalleled in the other regions. Planting goes on longer and with greater intensity than elsewhere. Yet again all such planting is confined within the parameters of periods after major rains when soil moisture was adequate. For local cultivars of sorghum and of millet, planting occuring after the first two big rains would have passed the optimal planting period, yet the resource limitations of the households required planting during these non-optimum periods.

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One conclusion one can drawn from these data is that the use of a mechanical planter would be extremely useful to farmers already possessing animal traction. This would enable them to plant more at the optimal planting period, a factor of great importance in higher yields for local varieties of sorghum and millet. Using a planter has the added advantage of conserving extra moisture along the small trench in which the seed is dropped, providing a more rapid start for the plant. In this regard, field trials last year showed great contrast between seeds planted with planter and those planted without.

Use of a mechanical planter would in turn enable the farmer to maximize the use of his cultivator in weeding activities after planting, something which does not presently seem to be the case. One might even expect the farmer to increase somewhat the number of man-hours he is willing to work per day, assuming he can have a second donkey to relieve the first. Future FSU/SAFGRAD pre-extension field trials will test these observations further, using a mechanical seeder.

3.3.4. Labor Used in Cultivation

Two major types of cultivation need to be differentiated:

a) that done before planting

b) that done after planting.

a) Cultivation Before Planting and Animal Traction

Within the agricultural systems found across most of Upper Volta, the first cultivation after planting is by far more important in terms of man-hours spent than cultivation before planting. Farmers everywhere stress the necessity of planting immediately following the first major planting rains so that crops and first weeds can come up together. Should a big rain or two come earlier than normal (i.e. early May), the farmer is placed at a disadvantage when planting time does come,

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because of the need to weed, cultivate, before planting. Figure VII, Kaya/Tagpooré and Figure X, Ouahigouya/Sodin illustrate this problem.

In most of the zones in which FSU/SAFGRAD works, cultivation preceeding planting usually occurs by hand hoe on small parcels of land, such as those intended for corn (compound plots), or those for individually owned plots of earth peas, peanuts, okra, some sorghum. Under normal circumstances (i.e. no very early rain as in Kaya), such cultivation before planting occurs after the major cereal fields have been planted (See Figures I, III, IV, VI, VII, IX, X). Furthermore, 93% of all Nedogo labor time spent in cultivation before planting took place in weeks 24-26, corresponding to the planting of corn and peanuts. This time was spent on 89 of the 130 plots or 69% of the field areas under these crops, thus indicating the remaining fields were fairly small in size.

Review of Figures I, IV, VII, X for all zones suggests that just after the major planting rains, there is a period of time when farmers could use animal traction equipment in plowing up the land they intend to plant in peanuts and corn. These are crops which would be especially responsive to such management. Chemical fertilizers, phosphates could be added at this time, and would further increase profitability. Since farmers already are accustomed to cultivating such land before planting, adding the animal traction component for these activities is not be a radical departure from the traditional farming system. It would certainly not be as radical as the change implied in changing to plowing before planting major cereal fields (which has met with limited acceptance. As already suggested, this might be possible during years when rains are earlier than normal.

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The FSU therefore recommends that the use of plowing and high rates of fertilizer application be focused on the compound plots and on the villages fields. The cereal crops on which one can focus the efforts toward intensification of production are maize and sorghum. In addition to maize and sorghum, one can look toward the more intensive production of cotton and sesame as cash crops if the insect control necessary for their production can be economically justified. Use of preplanting plowing and of rocks phosphates can also be focused on peanut plots. Peanut plots are always rotated with cereals.

The preplanting plowing of a peanut field provides a means to work the rock phosphate into the root zone where the cereals which will follow the peanuts can benefit from the phosphate in subsequente years. Higher rates of phosphate application can be justified when the phosphates can be well plowed in. Although the average per family surface area in peanut production is currently about one half hectare, the fields are usually dispersed. Some grouping of peanut fields would be necessary to accomodate preplanting cultivation. This ½ hectare figure is somewhat above the average figure for area cultivated per man unit. From this, one can conclude that access to more animal power, either larger animals or more donkeys, and access to improved equipment for planting, either multiple (row markers) or planters, can permit more intensive use of animal traction equipment and permit higher labor productivity.

b) Cultivation Following Planting and Animal Traction

Farmers pointed out that, the first cultivation following planting should begin in about three weeks after planting on land without weeds (either planted after first rains or after a weeding). Figure 1, IV and X indicate that this is very much the case. Farmers say that the

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area one man can plant in one full day (8-10 hours) would take him three to four (6-8 hours) days to weed. From values in Figures I and II, one can calculate that these observations are confirmed by local practice. The average household in Nedogo spent 300 man-hours in all their planting against 1118 man-hours in total time spent in first weeding, a ratio of slightly less than 1:4.

The same ratio holds generally for the data from the other three zones. 703 man-hours were observed during in second weeding. Once can calculate planting/first weeding /second weeding ratios of about 1:4:2. Total man-hours spent in replanting as compared to first planting for the average household was 1:10 this season. Ratios such as given above may prove usefull for making a quick assessment of the production potential of a particular year when actual hectares under cultivation per crop are not yet known.

Donkey traction farmers use the HV1-A cultivator in all the fields planted in rows. In Nedogo, only one farmer in the sample had planted more land than he eventually could weed. This farmer was one of the richest in the village and had used the donkey cultivator modified as a 4 row marker during planting. He had 24 ha. under cultivation.[22] For this household, this amounted to 1.9.ha./man-unit or .64 ha./person.

22 Good land is limited throughout this region. Some farmers do not have enough for their own needs, a situation which encourages migration. Farmers with large land holdings purposely plant some of their land simply to be able to say they are "using" it. They won't look bad when they have to refuse someone in the village who wants to use it. Also this way, when the owner needs it in a few years, he has someplace to move to. Such land, though planted, is not weeded. Because of intense population pressure, farmers are indeed land-poor in most of the Mossi plateau. Intensification of cultivation on present land resources seems to be the only way of increasing food resources and security. The alternative would be to produce elsewhere within the country, or out of the country, and sell to the farmers. Given forseeable transportation costs of produce, this does not seem feasible for many regions.

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One can hypothesize that farmers using the donkey drawn cultivaters would be able to make more use of them if they were able to plant more land during the optimal planting times.

In Nedogo, the year began well. As households spent less time planting, the time spent in weeding gradually increased. By the time cultivation was at its most intense and labor input per week at its peak most planting had been finished. Clearly a major replanting during the middle of June would have caused a serious chain reaction of delayed planting and cultivation. Understanding of the dynamics of this process of labor allocation for different types of households will become more clear as further data from other zones may be integrated with the information from Zone 1, Nedogo. Several years experience with different rainfall patterns at each site will prove especially valuable in clarifying the production strategies for different rainfall patterns.

3.3.5. Household Statistics

A review of the basic household statistics for labor time allocation in FSU/SAFGRAD zones of research is given below in Table 5.

TABLE 5: LABOR TIME STATISTICS FOR THE AVERAGE HOUSEHOLD IN 4 ZONES OF MOSSI PLATEAU

	ZONE 1 Nedogo	ZONE 2 Sodin	ZONE 3 Digré	ZONE 4 Tagpooré
Members of Household (Absent/Present)	15	19	11	?
Persons Per Household Present	12	15	9	9
Persons Actually Working in Fields	6	9	5	4.4
Man-Units Available	4.5	6.5	5	3.2
Total Hectares Cultivated	6.8	6.7	4	3.14
Hectares Per Man-Unit	1.5	1	1	1
Hectares Per Person Present	.6	.4	.40	.4
TOTAL MAN HOUR UNITS (MHU) SPENT IN:				
Planting	301	385	190	146
MHU Planting/Hectare	44	57	48	47
MHU Planting Per Man Unit Available	67	59	38	46
Replanting	29	71	19	0
Cultivation Before Planting	86	194	95	70
First cultivation After Planting	1 118	1 222	684	674
Second Cultivation after Planting	703	662	270	483

3.3.6. Stratification of Sample

Research assistants over the past year have come to know a great deal about the households with which they work. Much of this subjective knowledge is unrecorded. Such knowledge takes the form of impressions formed during the course of day by day contact with farmers, seeing what they are doing, hearing what they are saying. Based on these impressions, our assistants were asked to rank household in order of "wealth". They were to determine whom people of the village consider rich or well off, poorest, or average (doing alright, but not rich). Assistants had little difficulty making such a ranking. The families were stratified on this basis, and the objective data on the characteristies of each group compared.

Table 6, 7 and 8 below give the results of this study for Nedogo. Major differences do exist between these three groups, differences which are hidden using statistical averages. For instance, 9 out of 20 households (45%) were considered "well off". Could this really be true for the village as a whole? Research assistants were convinced that close to half the households of the area could be considered as sharing the attributes of the "well-off" group. This is certainly an observation not immediately obvious when looking at the poor quality of the land resources available.

It is evident that the land is not the only resource which people are relying on for financial/material growth (though it certainly represents the starting base). Cash flows from migrants as well as the rarely seen but nevertheless numerous livestock (cattle, sheep, goats) of the "well off" prove to be decisive elements of wealth. The number of man-units of labor available per household proves critical as well.

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Surplus from agricultural commodities are shifted into investments in livestock and donkey traction. One conclusion that can be drawn is that the region around Ouagadougou, due to heavy population and very poor soils, is becoming increasingly similar to the more northern and western zones (Kaya, Ouahigouya) in the relative importance given to livestock and migrant labor cash flows.

The importance of the cohesion of the household group and extended family in this process is crucial. Tables 6, 7, and 8 indicate that the larger the household, the stronger, wealthier and more productive it is on a per person basis. Between the "rich" and the "poor" groups, there is a difference of almost 1 ha./man-unit, a difference partly explained by the presence of animal traction equipment and large families in the former group. Animal traction does therefore increase the productivity per person of these households. It also decreases the time spent per person per hectare in weeding activities. And to add to this, animal traction does increase production per unit area.

TABLE 6:

CROP PRODUCTION LABOR USAGE AMONG NEDOGO HOUSEHOLDS, AS STRATIFIED BY HOUSEHOLD WEALTH: PLANTING

	HOUSEHOLD STRATIFICATION	Poorest	Average, Doing Alright	Rich	Statistical Average
	% with Animal Traction	0	38	100	46
	Number of Households	3	8	9	-
	% of Total Households	15	40	45	-
	Total Persons Claimed	8	14	19	15
	Persons Actually Present	7	11	15	12
	Persons Actually Actively Engaged in Agriculture	3.8	5.8	7.9	6
	Man-Units Available	2.9	4.3	5.7	4.5
PLANTING	Man-Hours Spent Planting	127	235	419	301
PLANTING	% of Man-Hours Actually Worked By Household Head	33	23	16	16
PLANTING	% of Man-Hours Worked by Other Men (not Household Head)	2	9	21	18
PLANTING	% of Man-Hours Worked by Women	47	50	46	48
PLANTING	% of Man-Hours Worked by Children Under 15 Years	18	21	17	18
PLANTING	% of Total Planting Time Spent on Household Head Controlled Cereal Fields	77	77	78	77
PLANTING	% of Total Planting Time Spent on Household Head Peanut Plots	2	4	5	4
PLANTING	% of Total Planting Time Spent on Women's Millet Fields	.2	5	3	3
PLANTING	% of Total Planting Time Spent on Women's Peanut/Earth Pea Plots	6	6	3	5
PLANTING	% of Total Planting Time Spent on all other Crops (mostly corn)	15	8	11	12 9= corn

TABLE 7:

CROP AREAS CULTIVATED PER HOUSEHOLD BY DIFFERENT CLASSES OF PERSONS AS STRATIFIED BY HOUSEHOLD WEALTH

	HOUSEHOLD STRATIFICATION	Poorest	Average, Doing Alright	Rich	Statistical Average
	% with Animal Traction	0	38	100	46
	Number of Households	3	8	9	
	% of Total Households	15	40	45	
	Total Persons Claimed	8	14	19	15
	Persons Actually Present	7	11	15	12
	Persons Actually Actively Engaged in Agriculture	3.8	5.8	7.9	6
	Man-Units Available	2.9	4.3	5.7	4.5
CULTIVATION AFTER PLANTING	Man-Hours Spent in First Cultivation After Planting	775	972	1 363	1 118
	% of Man-Hours Actually Worked by Household Head	29	21	14	22
	% of Man-Hours Worked by Other Men (not Household Head)	23	6	19	17
	% of Man-Hours Worked by Women	39	53	48	47
	% of Man-Hours Worked by Children Under 15 Years	5	19	19	15
	% of Total Weeding Time Spent on Household Head Controlled Cereal Fields	85	81	79	80
	% of Total Weeding Time Spent on Household Head Peanut Plots	2	3	6	5
	% of Total Weeding Time Spent on Women's Millet Fields	1	7	3	4
	% of Total Weeding Time Spent on Women's Peanuts/Earth Pea Plots	3	3	3	3
	% of Total Weeding Time Spent on all other crops (mostly corn)	9	6	9	8

TABLE 8:
STRATIFICATION OF NEDOGO HOUSEHOLDS: HECTARES CULTIVATED PER CROP PER HOUSEHOLD CATEGORY OF PERSON

HOUSEHOLD STRATIFICATION	Poorest	Average, Doing Alright	Rich	Statistical Average
Man-Units For Average Household	2.9	4.3	5.7	4.4.
Hectares Cultivated	2.85	5.2	9.3	6.7
Cereals as % of Total Cultivated Land	90%	86%	90%	90%
Hectares of Cereals (Sorghum,Millet)	2.56	4.47	8.39	6.028
Hectares Per Man-Unit	1	1.2	1.6	1.5
Hectares Per Household Member	.41	.47	.62	.56
Hectares of Household Head Controlled Millet	2.46	3.15	6.03	4.34
Household Head Controlled Sorghum	.04	1.11	1.75	1.24
Hectares of Woman's Millet	.01	.34	.48	.36
Hectares of Woman's Sorghum	0	.06	0	.02
Hectares of Household Head Controlled Peanuts	.04	.07	.4	.22
Hectares of Woman's Peanuts	.06	.17	.21	.12
Household Corn	.05	.16	.29	.20
Cereals of Other Household Men (not Household Head)	.05	0	.13	.08
Other Crops (okra, rice, earth peas)	.09	.06	.11	.08
Household Head's Cereal Fields as % of Total Area	88%	82%	84%	84%

Several further observations can be made from Tables 6, 7, and 8:

a) Animal (donkey) traction has had a significant inflence on the productivity of the households concerned and their well-being. None of the "poor" had animal traction, all the "rich" had at least one set of equipment and animals.

b) The available labor force inflences household labor productivity. The "rich" households achieved more than three times the planting and cultivated land with only twice the available labor force as "poor" households.

c) The smaller (poorer) the household, the more important the relative time spent by the household head in comparison to the others. The inverse is true of large households. The small household is far more vulnerable to long term effects of temporary illness of one of its members than large households. An accident or illness of example of the household head during critical planting time (3-4 days) removes 33% of the labor force of a poor household, while the similar situation in the "rich" households accounts for 16% of the labor force.

d) The average household cultivates 1.5 ha./man-unit, which translates into .56 ha. per person (man, women, child). This is one half hectare higher than in the other sites and seems to reflect the more significant role donkey traction holds in Nedogo where long experience has been gained.

e) Total hours worked by household members in agricultural activities (not including land clearing/cleaning, harvest, storage) for all fields and plots equalled 2237 man-hours for the average household. With 6.7 ha./household, this is equivalent to 334 man-hours/ha. per household. This would be equivalent to 56 man-days per hectare per household spent in agricultural activities. With average household labor resources, at 4.5 man-units, this is equivalent to:

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12.4 man-days/man-unit, or
9.3.man-days/person (man, woman, child).

f) The relative area under cereal production (sorghum, millet) for the average household was 90%. Of total cereal production, the household head directly controls over 93%.

g) The area under corn production averages only 3% of total land cultivated by the average household, a figure which corresponds closely to the figure obtained for maize in the Eastern part of Upper Volta (Swanson, Gourmantché Agriculture, p. 65, 1979). Interestingly, the figure is relatively homogenious from household to household. All households cultivate maize on about 3% of their land. "Rich" households had almost six times the amount of maize as the "poor" households with only twice the labor force, but even in the richest household, maize hectares still represented only 3% of total household hectares.

h) The average household possesses half a hectare for corn and peanut production, the production activities on which one could initially focus preplanting cultivation using animal traction. To this area which could be plowed one might add another 1.3 hectares of sorghum land mostly found on village fields. Since village fields are also the last ones normally planted[23] also focus on them as possible sites for cultivation before planting.

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22 At the beginning of the rainy season livestock must be kept and fed for a few weeks within the village and away from the bush fields. By the time village fields are to be planted, there is enough grass growing in the fallow and bush areas to allow the goats and sheep to be tied out in one spot. In Digré, village fields are planted first, then bush fields. Animals are kept away from the village, herded by younger children of the village.

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i) Women generally have small personal plots of millet and peanuts (rarely sorghum). The better off the household, the more time women are able to give to personal fields. Although women of the average "rich" household only possessed about one half a hectare of millet, this represented 48 times that possessed by women of "poor" households (who spent most of their time on the family fields.

j) Crops cultivated by women such as millet and peanuts were largely intended for sale. Portions of the roselle and earth peas were also intended for the market while okra was largely consumed within the household. Household women (an average of about 3 per household) cultivate half a hectare of land on the average for their crops. This produce is often the first on the market to avoid the household head's potential requests for the grain to replenish low household stocks in the event that harvests from family fields prove inadequate. Mossi women, like the Gourmantché to the East, consider it the household head's responsibility to assure the household of its subsistance needs. For this reason the household head controls most of the grain production of the household by controlling most of the land.

k) Household men, other than the household head, among Mossi Households sampled, proved to control very little land of their own. While the average household head controlled 90% of the land cultivated, household women controlled 9%, and other men about 1%. In the eastern Gourmantché region, the household head controlled 67%, household women 17%, and household men 16% (Ibid.p.73).

4.0. CONCLUSION

During the coming 1981 crop year, the FSU will evaluate the potential of a series of agronomic techniques and packages through the use of large scale field trials. The trials will be conducted in the villages where work time studies resembling those presented here will be done. The availability of yield response information and the accompanying information on labor requirements and other costs will permit a rational evaluation of these techniques.

FSU Agronomic recommendations and 1981 trials are based upon the socio-economic and agronomic studies and observations of prior years. Some of the basic points supporting the rationale for the recommendations are:

1) Animal traction is a profitable technology for many environments within the Semi-Arid Tropics. The type of draft animal used must be appropriate for the environment.

2) Under conditions where farmers do not have access to large amounts of fertilizer and where soils are relatively poor, farmers should not be encouraged to adopt preplanting plowing before they have mastered the techniques for weeding with animal traction. Where yield levels are low the potential loss from planting delays may be greater than the potential gain from plowing.

3) Farmers who currently use animal traction for weeding, and who have large areas of sandy soils sown to sorghum and millet may benefit greatly from the adoption of an animal drawn planter. This would permit farmers to plant local varieties in a timely manner. Local varieties require the maximum period possible for development if good yields are to be realized. Selection of a planter and its modification for millet

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planting posses problems. In the interim, the FSU thinks that the modified Malian Super Echo planter may prove satisfactory. We wish to determine where it is best adopted, how it can be improved or possibly modified.

4) The strategy for the use of these animal drawn planters for cereal planting would be that planting would start at the beginning of the traditional planting season. Use of the planter would permit better stand establishment through precise timing of planting. At the same time, use of the planter would release labor for allocation to other agricultural production activities. One hopes that 80% of the cereal planting could be achieved in the first four days of the planting season. Given drought and need for replanting, its use under dry planting conditions will be evaluated.

The labor released from planting activities would be applied to plowing the fields which are normally planted later. These fields are frequently in the village and planted to maize and sometimes sorghum. Relatively high rates of fertilizer application could be productively made at the time of plowing. Peanut fields should also be plowed after application of relatively large amounts of phosphate fertilizers for the benefit of succeeding cereal crops. This land to be plowed represents about 15% of a household's total cultivated land, slightly less than one hectare on the average. One donkey in 8 to 9 days could plow this area.

5) With the introduction of animal traction, one expects farmers to be motivated to regroup some of their small peanut and earth pea plots. The manoeuvering of the animals at the ends of rows requires a certain emply spacing on field borders. Dispersion of the plots results in inefficiencies in the transport of materials and equipment. Consolidation fields for intensification of agriculture also increases the farmers' risk to localized rains at critical periods.

6) Maize will respond better to improved land preparation and fertilization then other cereal crops. The increased yield of the commercial crops, such as cotton, normally associated with maize, may justify the application of the higher fertilizer rates on the plowed village plots. Early photo-period insensitive varieties of sorghum may permit sorghum-cotton associations where soils are too drought sensitive for the production of maize.

7) If one can speed up the planting and weeding of cereal crops one may be able to introduce new cash crops in addition to being able to expand the areas planted to traditional commercial crops and crop associations. One such possible new cash crop would be photo-period insensitive cowpeas for export. This crop requires spraying when the cowpeas are flowering. Promotion on a national level seems justified only if there is an export market.

8) Behind all the discussions of planting techniques, of land preparation, and of fertilization, lies the understanding that early planting/weeding are currently the limiting factors in Voltaic cereal production. Techniques succeed or fail to the extent to which they help or hinder good weeding.

The FSU will continue to deepen its understanding of the crop production choices which farmers make. More complete statistics on the requirements for different crops and crop-soil combinations will be compiled, taking into consideration the options open to different (stratified) groups of farmers.

- -o-o-o-o-o-o-o-

A N N E X

QUESTIONNAIRE ON HOUSEHOLD FIELDS' LABOR TIME

(Plus Codes)

FSU-SAFGRAD

ENQUETE SOCIO-ECONOMIQUE ET AGRONOMIQUE

LES CODES

ZONES

1- Ouagadougou
2- Oushigouya
3- Zorgho
4- Kaya
5- Fada
6- Houndé

VILLAGES

01- Nédogo
05- Sodin
06- Aoréma
07- Tougou
08- Gandsogo
09- Digré
11- Tanghin
12- Diapangu
13- Tanpsoré
14- Bambriké
15- Kolma
16- Dohoun
17- Tioro

LES ACTIVITES

01- Débroussaillement
02- Nettoyage
03- Labour (avant semis)
04- Semis
05- 1er Resemis
06- 2ième Resemis
07- 1er Sarclage
08- 2ième Sarclage
09- 3ième Sarclage
10- 4ième Sarclage
11- Récolte
12- Stockage
13- Irrigation, Arrosage
14- Aménagement de bas fonds ou d'une diguette
15- Construction d un grenier
16- Clôture de parcelle
17- Autre
18- Gardiennage
19- Transplantation, repiquage
20- Démariage
21- Rayonnage
22- Buttage avant semis
23- Buttage après semis
24- Transport
25- Traitement engrais, Fumier
26- Coupe de tiges après récolte
27- Cultivateur
28- Eleveur
29- Commerçant
30- Apiculteur
31- Tisserand
32- Boucher
33- Forgeron
34- Dolotière
35- Fileuse
36- Jardinier
37- Berger
38- Gardienne d Enfant
39- Elève
40- Ménagère
41- Petites affaires irrégulières

LES UNITES

01- Tine locale
02- Tine ORD
03- Assiette Torubo
04- Grande assiette
05- Grand panier en paille
06- Petit panier en paille
07- Grand panier en bois
08- Petit panier en bois
09- Grande calebasse
10- Petite calebasse
11- Grenier
12- Sac de 100 KG.
13- Sac de 50 kg.
14- Sac de 25 kG.
15- Seau
16- Charette remplie
17- Grande louche
18- Petite louche
19- Tas sec
20- Tas frais
21- Litre
22- Tête
23- Boule
24- Boîte de paté
25- Jour
26- Coudde
27- Cuillère, pièce de calebasse
28- Canari
29- Rouleau
30- Unité
11- Grappe (de maïs,etc)
12- Botte (paille, foin)
11- Francs CFA
14- AUTRE

LES CULTURES

01- Sorgho rouge
02- Sorgho blanc
03- Petit Mil Tardif
04- Petit Mil hâtif
05- Riz
06- Piment
07- Aubergine
08- Sésame
09- Tabac
10- Manioc
11- Arachide
12- Pois de Terre
13- Maïs
15- Herbe pour Sauce
16- Oseille
17- Soja
18- Niébe, haricot
19- Né
20- Coton
21- Gonho
22- Igname
23- Fabirima
24- Calebasse
25- Gourde
26- Louche
27- Courge
28- Patate
29- Oignon
30- Pomme de Terre
31- Tomate
32- Salade
33- Chou
34- Carotte
35- Canne à sucre
36- Papayer
37- Manguier
38- Goyavier
39- Citronnier
40- Bananier
41- AUTRE
42- Ponio
43- Karité
44- Néré
45- Baobab
46- Tamarinier
47- Cailcédrat
48- Anthropogon (herbe)
49- Raisinier
50- Acacia
51- Nime

EQUIPEMENT UTILISE

01- Daba ou houe
02- Pioche de semis
03- Hache
04- Machète
05- Couteau,
06- Panier (toute sorte)
07- Charette tombereau (avec côtés)
08- Charette plateau (sans côtés)
09- Houe manga avec ane
10- Charrue avec boeuf
11- Rayonneur
12- Sarclaur
13- Butteur
14- Semoir
15- Louche
16- Pelle
17- Seau
18- Arrosoir
19- Faucille (guego)
20- Rateau
21- Grande pioche
22- 02 & Petit Calebasse
23- Brouette
24- Velo
25- Voiture
26- moto, mobylette
27- Corde
28- 22 & 11
29- 07 & 11
30- 22 & 14
31- couteau & panier
32- 02 & 16
33- 02 & 23
34- 01 & 02
35- 20 & 21
36- 07 & 16
37- 09 & 01
38- 07 & 02
39- 02 & 21

OUI/NON

1- Oui
2- Non

QUANTITE

1, 2, 3 ...etc.

HOMMES/FEMMES/ENFANT

Enfants- moins de 15 ans

CODE 98- ne sait pas
99- code pas valable
(utilisé avec réserve)

FORME

01- battu
02- non-battu
03- en coque
04- décortiqué
05- en poudre
06- en nature
07- en feuilles
08- en pièces
09- produits transformés
10- Autre (à spécifier)

DISTANCE (de la Concession)

01- 0 (autour la concession
02- 0 à 500 metres
03- 500 - 1 kilometre
04- 1 à 2 kms.
05- 2 à 5 kms.
06- plus de 5 kms.

PROGRES DE L ACTIVITE

1- pas encore terminée
2- terminée
3- ne sera jamais terminée

SEXE

1- Masculin
2- Feminin

TYPOGRAPHIE

1- Kunkubiri Gbangbanli
2- Kossogo, Fuano
3- Boango, Baogu
4- Terrain plat

Type de Champ

1- Champ de case
2- Champ dans le village
3- Champ autour du village
4- Champ de brousse

TYPE DES INTRANTS

01- On parque le bétail sur la champ
02- Fumier de Boeuf
03- Fumier de chèvre, mouton
04- Fumier de volaille
05- Fumier de cheval ou âne
06- Déchets,fumier de la concession
07- Engrais coton
08- Phosphate naturel
09- Autres engrais (spécifier)
10- Semences améliorées, introduite
11- Urée
12- L'eau
13- L'insecticide
14- Le pesticide (antiparasite)
15- Le fongicide
16- Argent Espèce
17- Semence
18- Dépense
19- Rendements
20-

40- 11 & 01
41- 01,02 & 04
42- 01 & 04
43- 07 & 09
44- 09 & 22
45- 02 & 09
46- 01 & 06
47- 02 & 00
48- 04, 05 & 06
49- 01,02, & 06
50- 04 & 20
51- 03 & 20
52- 05 & 19
53- 02 & 20
54- 05,06, & 08
55- 01,05,06
56-
57-

RESIDENCE PRINCIPALE EN HIVERNAGE

1- au village
2- campement de culture
3- Autre village/ville du pays
4- Hors du pays

LIEN DE PARENTE AVEC LE CHEF DU MENAGE

01- CM
02- sa femme
03- son fils
04- femme de fils
05- enfants de fils
06- sa fille
07- son père
08- sa propre mère
09- autres femmes de son père
10- son frère (de même père)
11- autres frères
12- femmes de frères
13- sa soeur (même père)
14- autres soeurs
15- frères du père
16- Femmes de FR. du père
17- soeur du père
18- sa belle-famille
19- Autre -dankonro
20- enfant de frere

CULTURES PRINCIPALES MODIFIEES

01 - Sorgho rouge
02 - Sorgho blanc
03 - Petit Mil
04 - Arachide, Pois de terre
05 - Maïs
06 - Cultures diverses de jardin (gombo, calebasse, etc.)
07 - Autres cultures de rente (oseille, sésame, fonio, dâ)
08 - Légumineuses - niébé, soja
09 - Coton
10 - Riz
11 - Petit mil hatif
12 - Tubercules

PERSONNES EXTERIEUR DU MENAGE QUI TRAVAILLENT SUR LE CHAMP

1 - Ceux qui viennent pour une invitation de culture
2 - Manoeuvre salarié (CFA/hr)
3 - Contractuels
5 - Fiancé
6 - Dépendant du CM, mais n'est ni membre de la famille, ni manoeuvre
7 -

SITUATION FAMILIALE

1 - Marié
2 - Célibataire
3 - Divorcé
4 - Veuf/veuve

ETHNIE

1 - Mossi
2 - Silmimoaga
3 - Peul
4 - Bwaba
5 - Gourmantché
6 -

RELIGION

1 - Animiste
2 - Musulman
3 - Catholique
4 - Protestant

VENDEUR/ACHETEUR

01 - Cultivateur du même village
02 - Cultivateur des autres villages
03 - Petit commerçant du village du marché
04 - Petit commerçant hors du village du marché
05 - Grand commerçant du village
06 - Grand commerçant hors/village
07 - ORD ou OFNACER
08 - Quelqu'un hors du pays

DROIT FONCIER

1 - Champ familial
2 - Champ personnel hérité
3 - Champ personnel acheté
4 - Locataire (non-payé)
5 - Loué de terre en nature
6 - Loué de terre en espèces
7 - serf
8 - Champ de la communauté
9 -

SOURCE

1 - né, produit, ou fabriqué sur l'exploitation
2 - hérité
3 - reçu comme cadeau
4 - Marché (acheté)
5 - ORD, encadreur
6 - Commerçant du village
7 - Commerçant hors du village
8 -

DISPOSITION DES SEMIS

1 - Associé sur tout le champ
2 - Associé dans une partie du champ
3 - Culture pure dans une partie du champ
4 - Culture pure (pas d'association)
5 - En bordure
6 - En lignes dans le champ
7 - Quelques petites pures dans plusieurs parties du champ ou suivant les ruisseaux
8 - Diverses parties du champ

ALPHABETISATION

1 - parle français
2 - écrit français
3 - écrit l'arabe
4 - écrit le moré
5 - écrit le Gourmantché
6 - Analphabète

TYPE D'ECOLE

1 - Militaire
2 - Ecole rurale
3 - Ecole Normale
4 - Ecole Coranique
5 -

NIVEAU ACTUEL

00 - 0
01 - CP 1
02 - CP 2
03 - CE 1
04 - CE 2
05 - CM 1
06 - CM 2 CEP
07 - Sixième
08 - Cinquième
09 - Quatrième
10 - Troisième BEPC
11 - Seconde
12 - Première
13 - Terminale BAC
14 - Université
15 - Première année - 1er niveau
16 - Deuxième année - 2e niveau
17 - Troisième année - 3e niveau
18 - Autre
19 - Quatrième année - 4e niveau

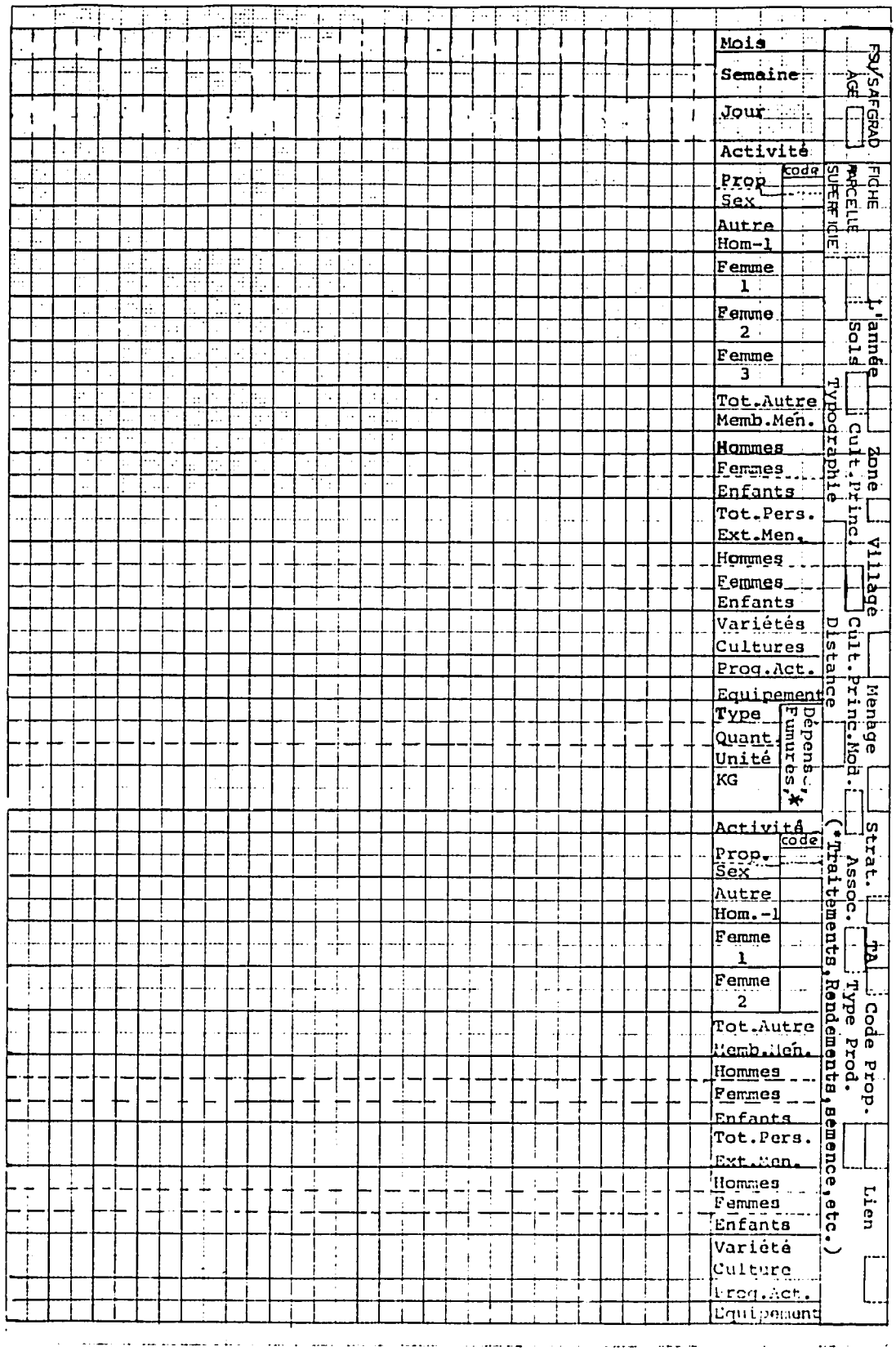
TYPE DE SOL

Champs autour des cases - à côté des maisons occupées ou inoccupées
01 - Champs de case sableux
02 - Champs de case graveleux

Sols peu profonds - pas assez profond pour un bon sorgho, utilisé rarement pour le sorgho, à une densité de population très basse, sols secs.
03 - Sols peu pronds sableux, appropriés pour le mil ou l'arachide
04 - Sols peu profonds graveleux, meilleurs pour la production du mil que pour celle de l'arachide.

Sols intermédiaires et sols profonds - on ne les trouve pas à côté des cases ou des bas-fonds.
05 - Sols profonds argilo-sableux ou argilo-graveuleux appropriés pour le mil, le sorgho rouge, quelques variétés de sorgho blanc résistantes à la sécheresse (sauf le sorgho blanc tardif) et assez fertiles pour être utilisés pour le sorgho plus d'une année sur deux. Sols pas appropriés pour l'arachide à cause de l'argile ou du gravillon.
06 - Les mêmes qu'au numéro 5, mais pas assez fertiles pour produirele sorgho plus d'1 an sur 2. Semé en mil la plupart des années
07 - Sols sableux profond et sols sablo-argileux profonds appropriés pour la production de mil, de sorgho rouge ou d'arachide. Assez fertiles pour être utilisés pour le sorgho plus d'1 année sur deux.
08 - Les mêmes qu'en 7, mais pas assez fertiles pour être utilisés pour le sorgho plus d'1 année sur 2. Semé en mil la plupart des années.
Sols lourds - 09 - Sols argileux à côté de bas-fonds pas appropriés pour le mil ou l'arachide, et trop secs pour la culture du riz.
10 - Sols pour la culture du riz, trop mal drainés pour une bonne production de sorgho.
11 - Dagrû, sols argileux et secs

Champs de village - reçoivent les quantités substantielles de fumier chaque année.
12 - Champs de village sableux
13 - Champs de village graveleux


Mois
Semaine
Jour
Activité
Prop
code
Sex
Autre
Hom-1
Femme 1
Femme 2
Femme 3
Tot.Autre Memb.Men.
Hommes
Femmes
Enfants
Tot.Pers. Ext.Men.
Hommes
Femmes
Enfants
Variétés Cultures
Proq.Act.
Equipement
Type
Quant.
Unité
KG
Dépens., Fumures, *
Activité
Prop.
code
Sex
Autre
Hom.-1
Femme 1
Femme 2
Tot.Autre Memb.Men.
Hommes
Femmes
Enfants
Tot.Pers. Ext.Men.
Hommes
Femmes
Enfants
Variété Culture
Proq.Act.
Equipement
FSV/SAFGRAD
AGE
FICHE
PARCELLE
SUPERFICIE
l'année
Sols
Typographie
Zone
Cult.Princ.
Village
Cult.Princ.Mod.
Distance
Menage
Strat.
Assoc.
TA
Type Prod.
Code Prop.
Lien
(*Traitements, Rendements, semence, etc.)

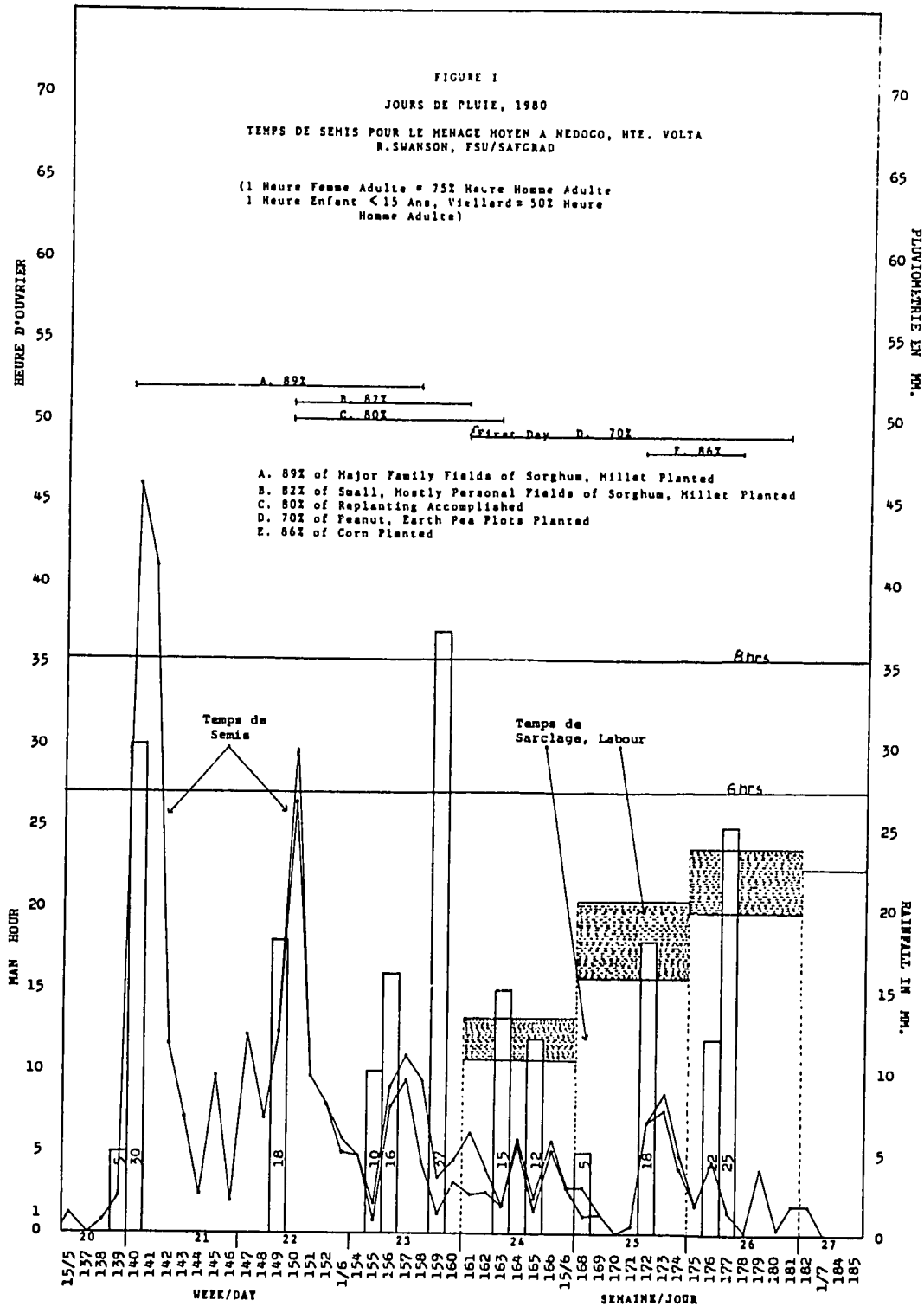


FIGURE I
JOURS DE PLUIE, 1980
TEMPS DE SEMIS POUR LE MENAGE MOYEN A NEDOGO, HTE. VOLTA
R.SWANSON, FSU/SAFGRAD
(1 Heure Femme Adulte = 75% Heure Homme Adulte
1 Heure Enfant < 15 Ans, Vieillard = 50% Heure
Homme Adulte)
A. 89%
B. 82%
C. 80%
Prior Day
D. 70%
E. 86%
A. 89% of Major Family Fields of Sorghum, Millet Planted
B. 82% of Small, Mostly Personal Fields of Sorghum, Millet Planted
C. 80% of Replanting Accomplished
D. 70% of Peanut, Earth Pea Plots Planted
E. 86% of Corn Planted
8hrs
6hrs
Temps de Semis
Temps de Sarclage, Labour
HEURE D'OUVRIER
MAN HOUR
PLUVIOMETRIE EN MM.
RAINFALL IN MM.
WEEK/DAY
SEMAINE/JOUR

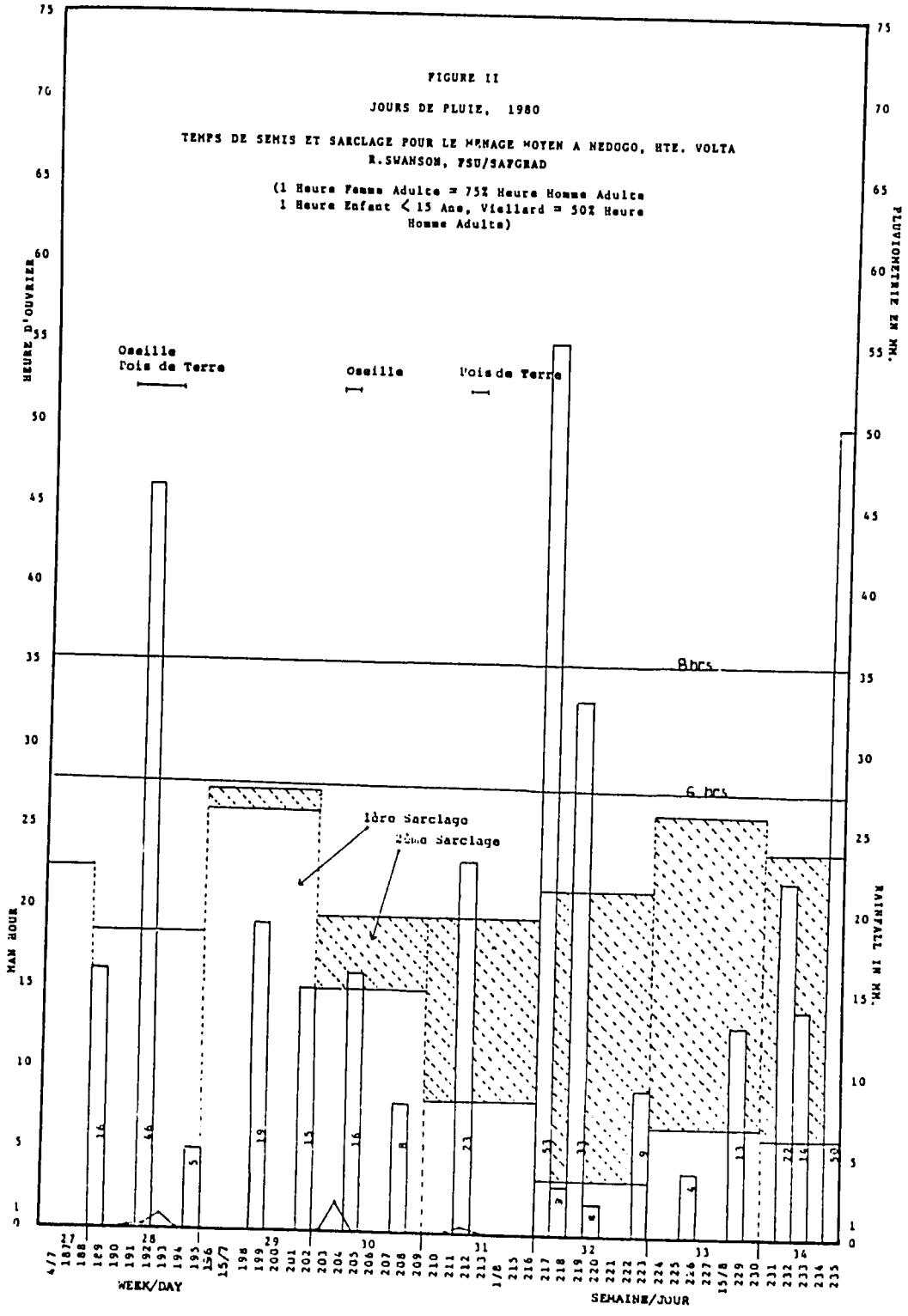


FIGURE II
JOURS DE PLUIE, 1980
TEMPS DE SEMIS ET SARCLAGE POUR LE MENAGE MOYEN A NEDOGO, HTE. VOLTA
R.SWANSON, FSU/SAFGRAD
(1 Heure Femme Adulte = 75% Heure Homme Adulte
1 Heure Enfant < 15 Ans, Viellard = 50% Heure
Homme Adulte)
HEURE D'OUVRIER
MAN HOUR
PLUVIOMETRIE EN MM.
RAINFALL IN MM.
Oseille
Pois de Terre
Oseille
Pois de Terre
8hrs
6 hrs
1ère Sarclage
2ème Sarclage
WEEK/DAY
SEMAINE/JOUR

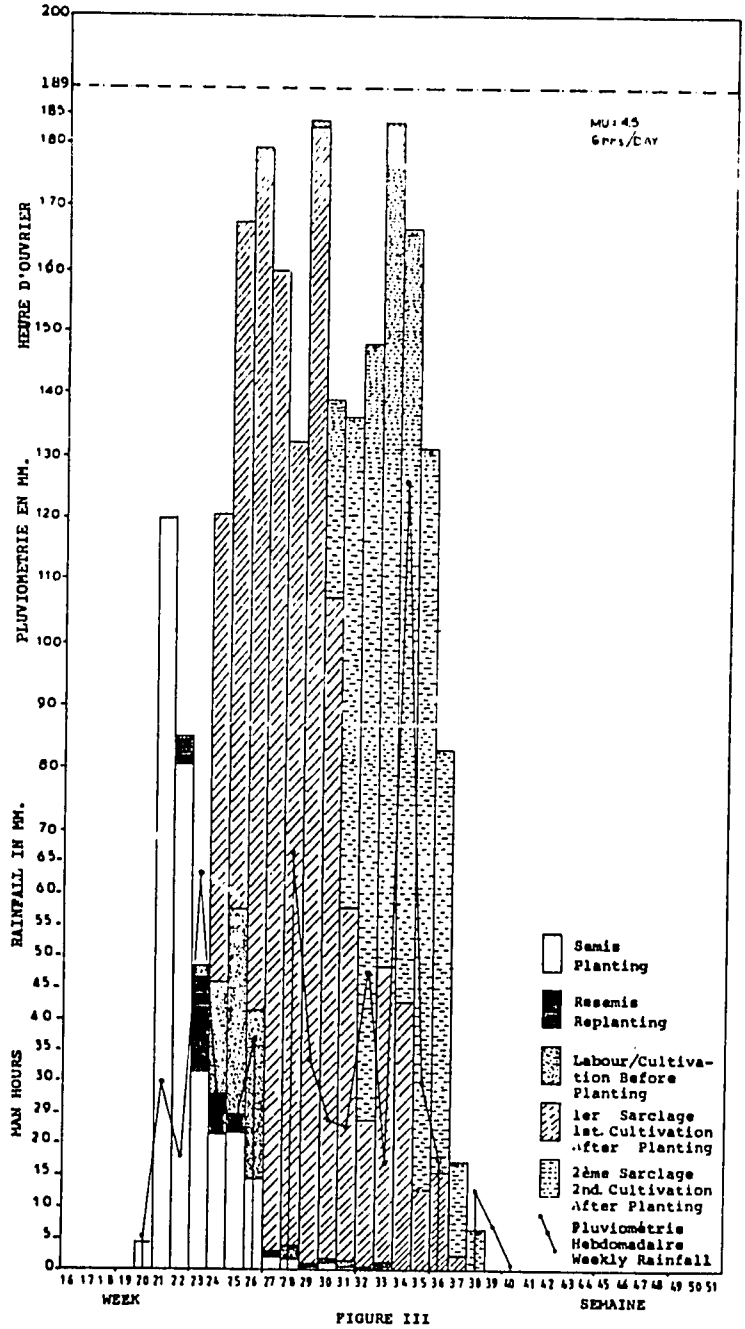


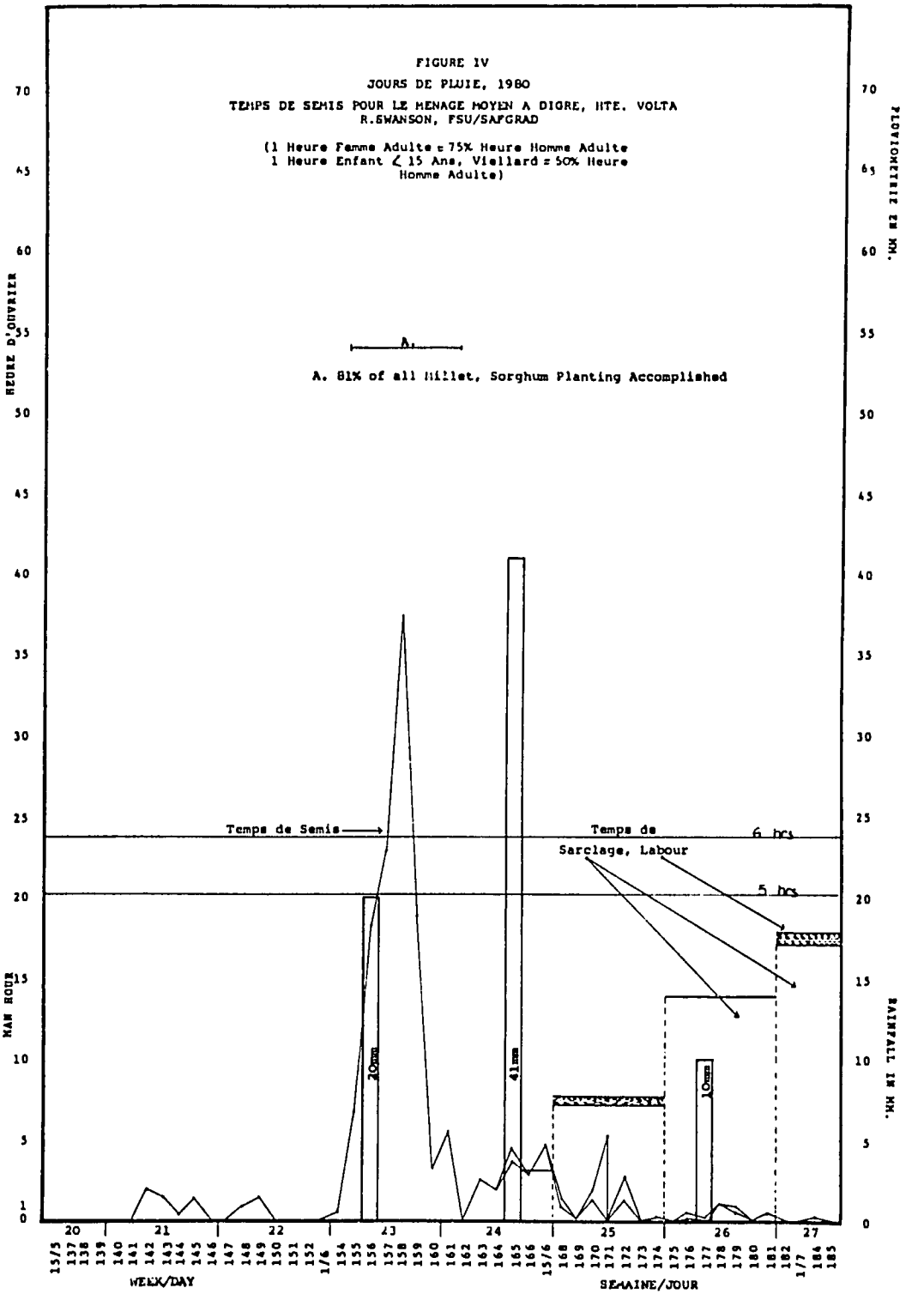
FIGURE III
TEMPS DE TRAVAIL AGRICOLE PAR SEMAINE
POUR LE MENAGE MOYEN A NEDOGO, HTE.VOLTA
R.Swanson, FSU/SAFGRAD
1980

FIGURE IV

JOURS DE PLUIE, 1980

TEMPS DE SEMIS POUR LE MENAGE MOYEN A DIORE, HTE. VOLTA
R.SWANSON, FSU/SAFGRAD

(1 Heure Femme Adulte = 75% Heure Homme Adulte
1 Heure Enfant < 15 Ans, Viellard = 50% Heure
Homme Adulte)



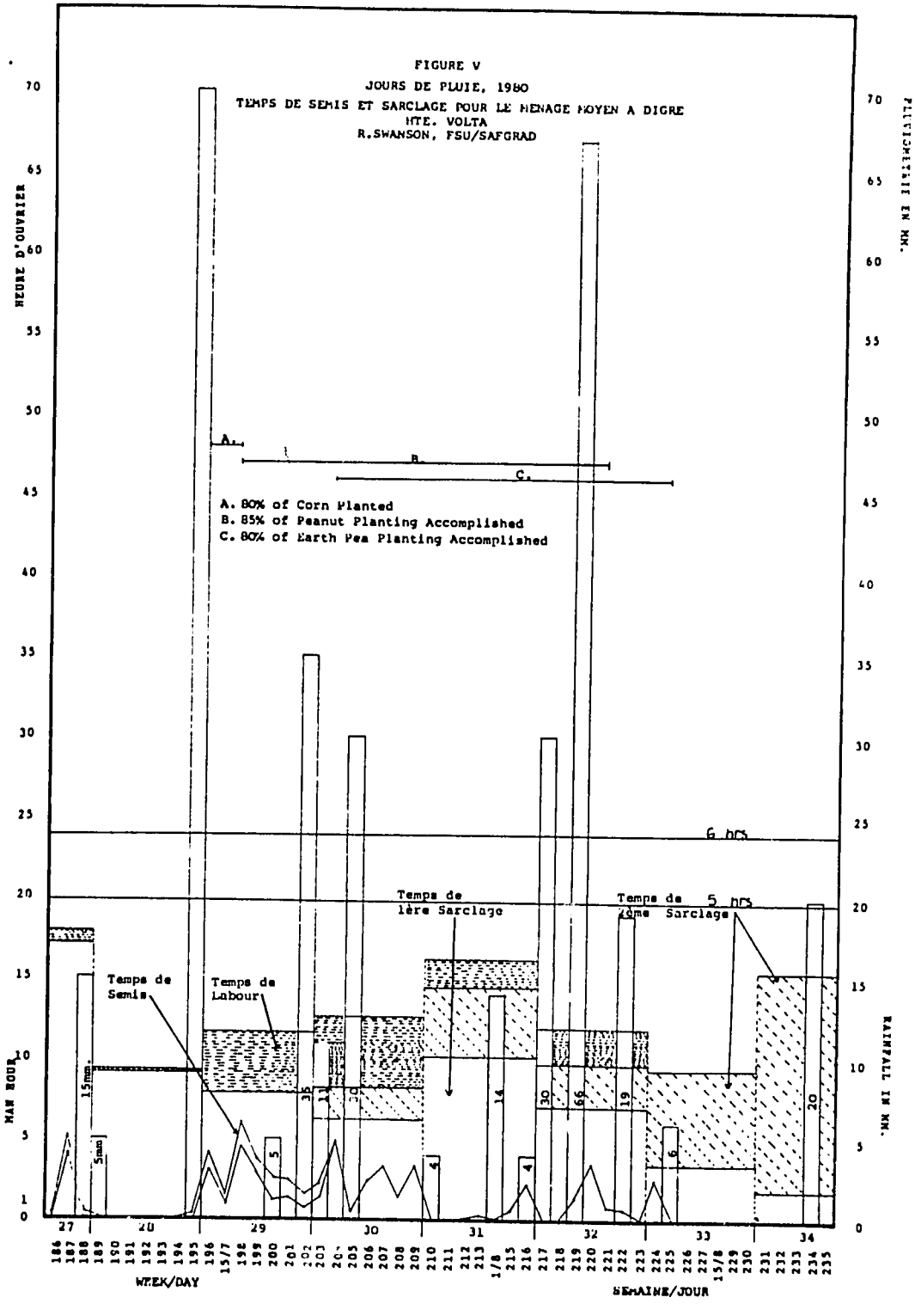


FIGURE V
JOURS DE PLUIE, 1980
TEMPS DE SEMIS ET SARCLAGE POUR LE MENAGE MOYEN A DIGRE
HTE. VOLTA
R.SWANSON, FSU/SAFGRAD
HEURE D'OUVRIER
MAN HOUR
PLUVIOMETRIE EN MM.
RAINFALL IN MM.
A.
B.
C.
A. 80% of Corn Planted
B. 85% of Peanut Planting Accomplished
C. 80% of Earth Pea Planting Accomplished
6 hrs
5 hrs
Temps de 1ère Sarclage
Temps de 2ème Sarclage
Temps de Semis
Temps de Labour
15mm.
5mm.
WEEK/DAY
SEMAINE/JOUR

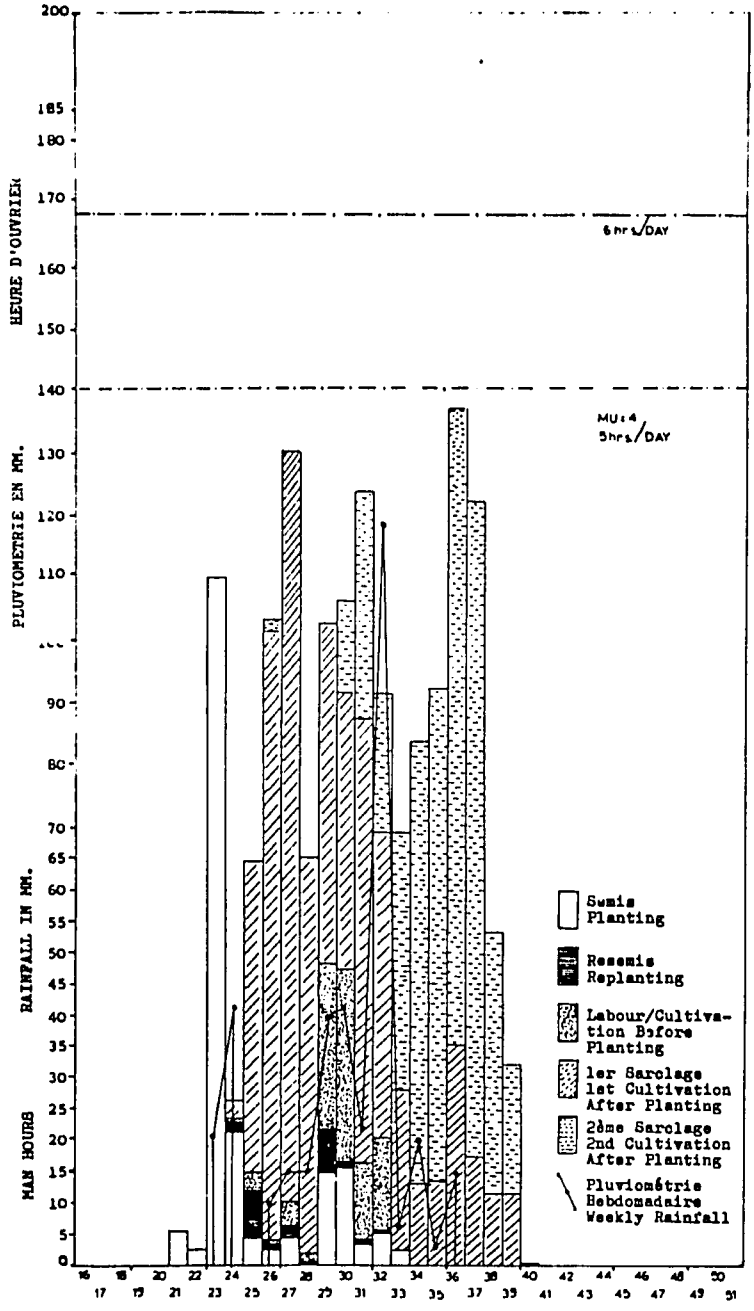


FIGURE VI
TEMPS DE TRAVAIL AGRICOLE PAR SEMAINE
POUR LE MENAGE MOYEN A DIGRE, HTE.VOLTA

R.Swanson, FSU/SAFGRAD
1980

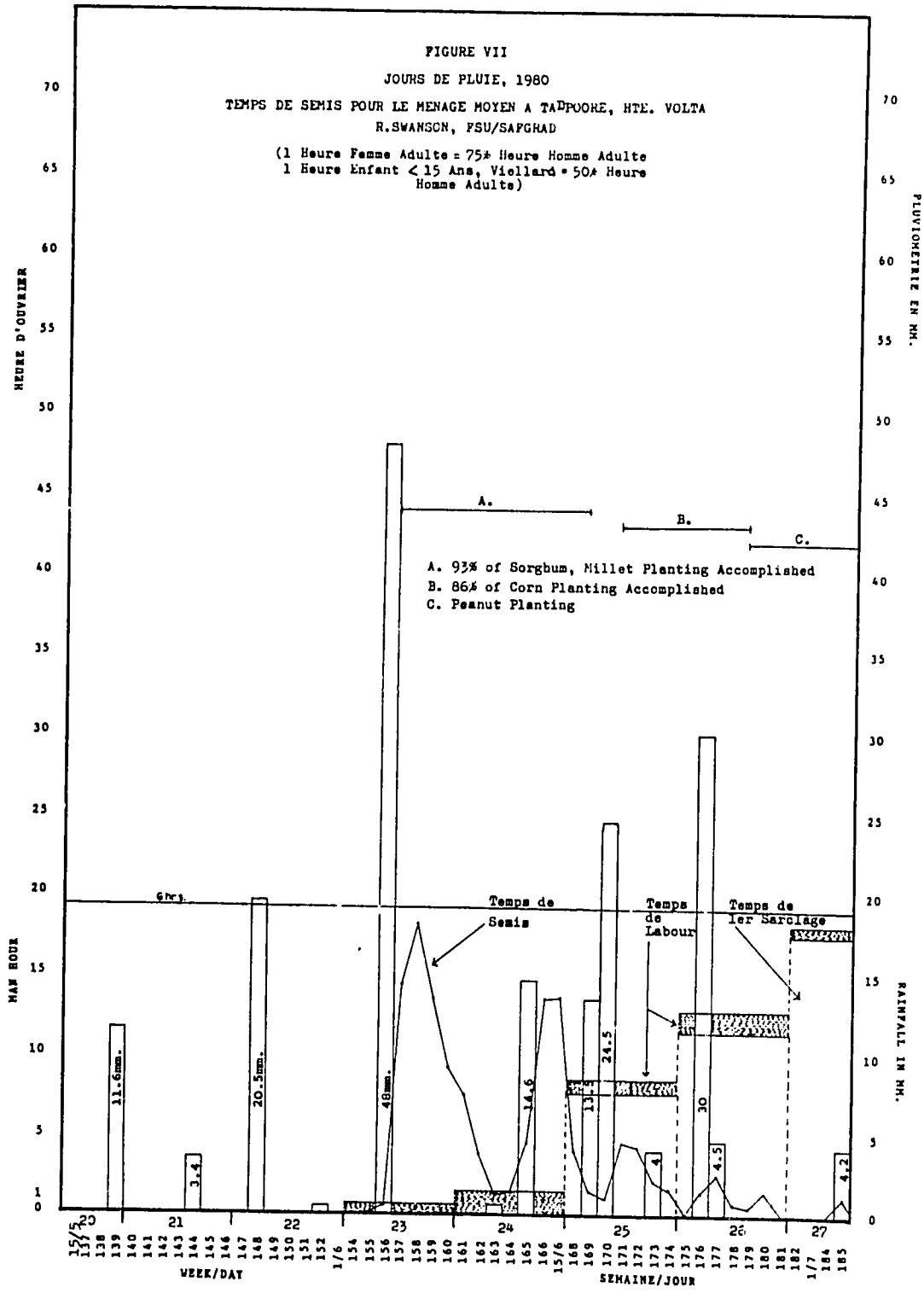
FIGURE VII

JOURS DE PLUIE, 1980

TEMPS DE SEMIS POUR LE MENAGE MOYEN A TAPOORE, HTE. VOLTA

R.SWANSON, FSU/SAFGRAD

(1 Heure Femme Adulte = 75% Heure Homme Adulte
1 Heure Enfant < 15 Ans, Viellard = 50% Heure Homme Adulte)



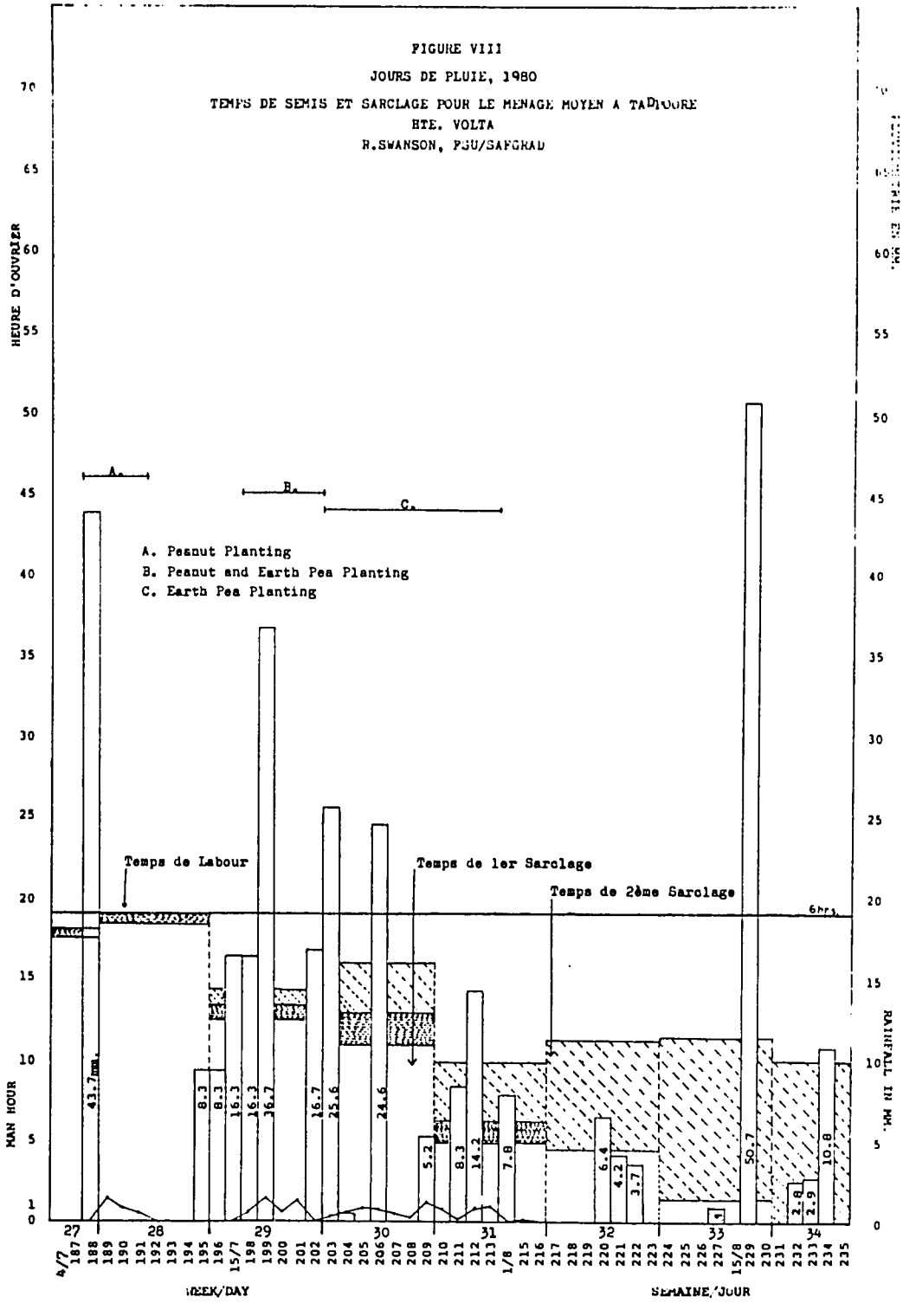


FIGURE VIII
JOURS DE PLUIE, 1980
TEMPS DE SEMIS ET SARCLAGE POUR LE MENAGE MOYEN A TAPOORE
HTE. VOLTA
R.SWANSON, PSU/SAFGRAD
HEURE D'OUVRIER
MAN HOUR
RAINFALL IN MM.
A.
B.
C.
A. Peanut Planting
B. Peanut and Earth Pea Planting
C. Earth Pea Planting
Temps de Labour
Temps de 1er Sarclage
Temps de 2ème Sarclage
6hrs.
43.7mm.
8.3
8.3
16.3
16.3
36.7
16.7
25.6
24.6
5.2
8.3
14.2
7.8
6.4
4.2
3.7
50.7
2.8
2.9
10.8
WEEK/DAY
SEMAINE/JOUR

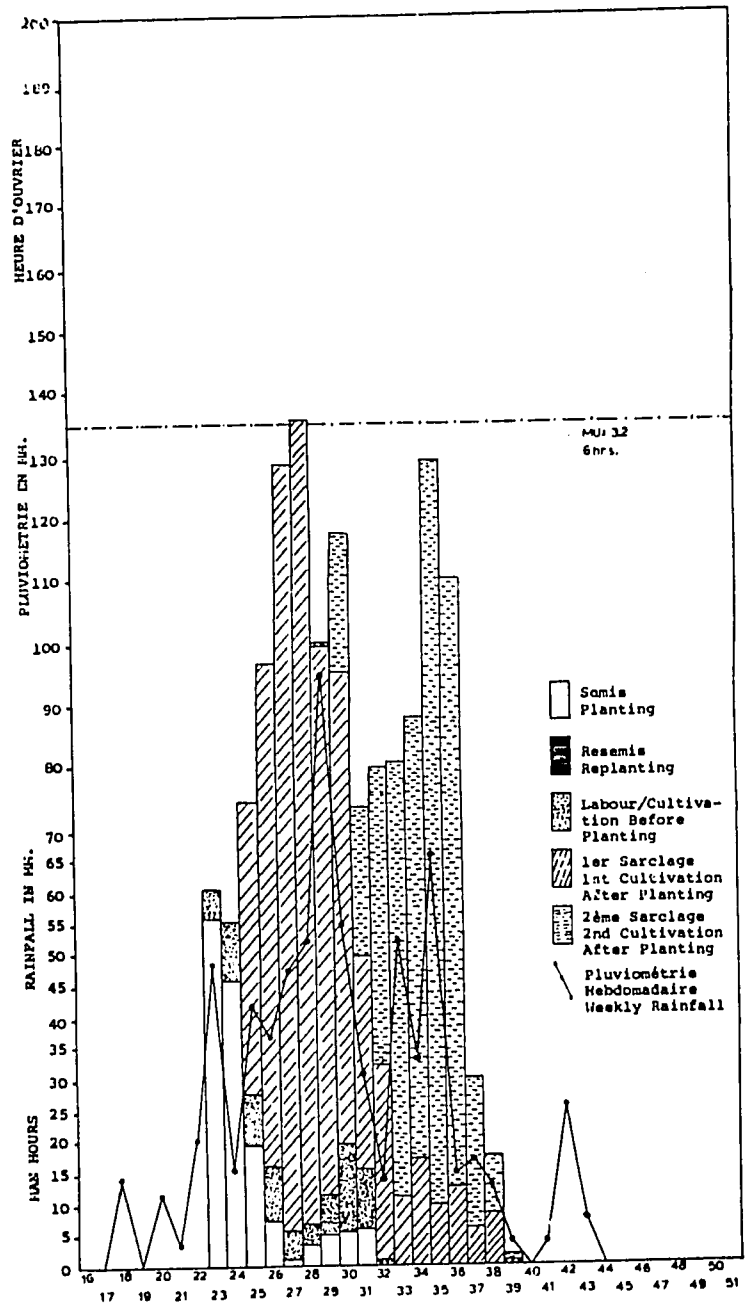


FIGURE IX
TEMPS DE TRAVAIL AGRICOLE PAR SEMAINE
POUR LE MENAGE MOYEN A TAMPOORE, HTE.VOLTA
R.Swanson, FSU/SAFGRAD
1980

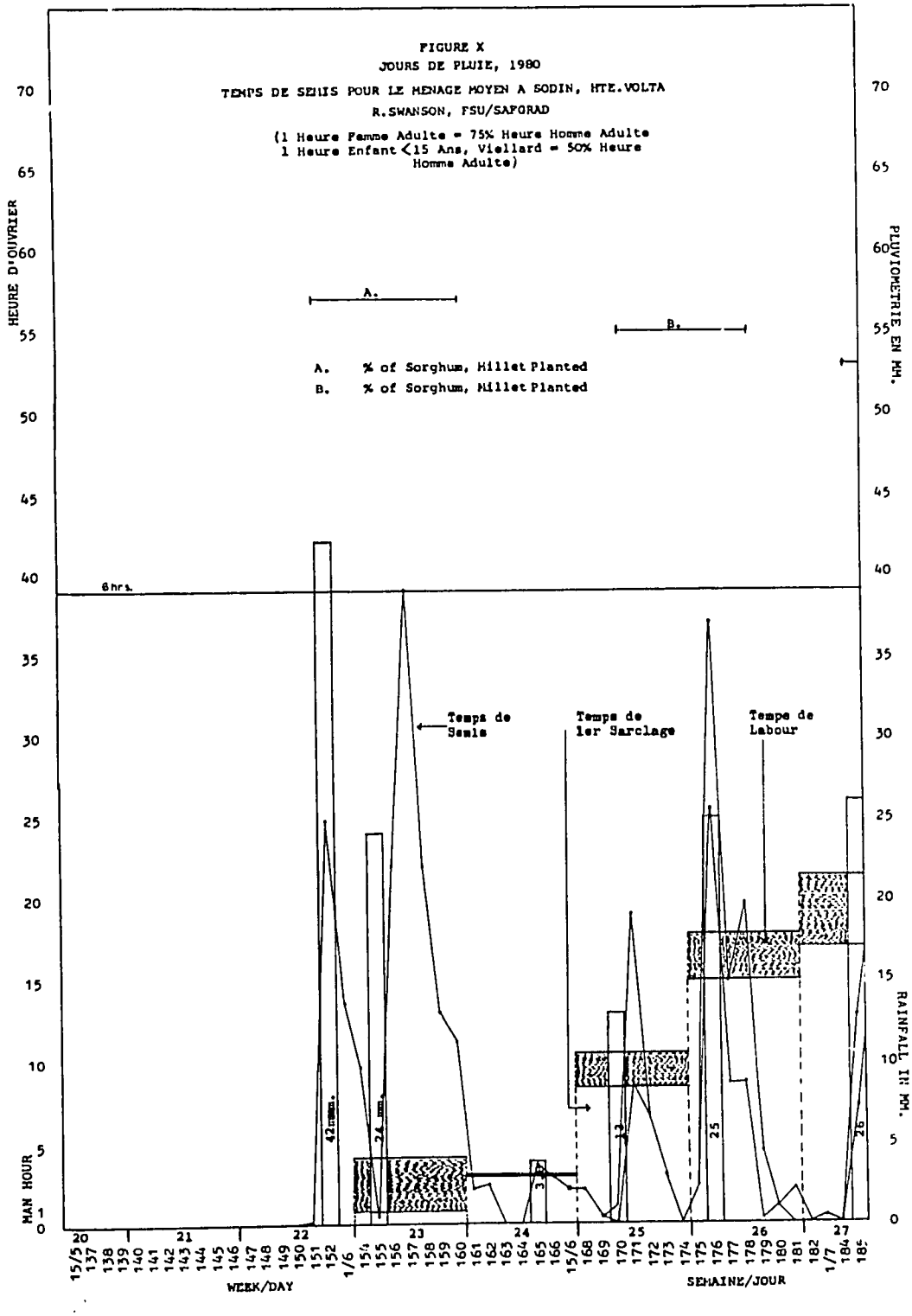


FIGURE X
JOURS DE PLUIE, 1980
TEMPS DE SEMIS POUR LE MENAGE MOYEN A SODIN, HTE.VOLTA
R.SWANSON, FSU/SAFORAD
(1 Heure Femme Adulte = 75% Heure Homme Adulte
1 Heure Enfant <15 Ans, Viellard = 50% Heure
Homme Adulte)
A.
B.
A. % of Sorghum, Millet Planted
B. % of Sorghum, Millet Planted
HEURE D'OUVRIER
MAN HOUR
PLUVIOMETRIE EN MM.
RAINFALL IN MM.
6hrs.
Temps de Semis
Temps de 1er Sarclage
Tempe de Labour
42mm.
24 mm.
WEEK/DAY
SEMAINE/JOUR

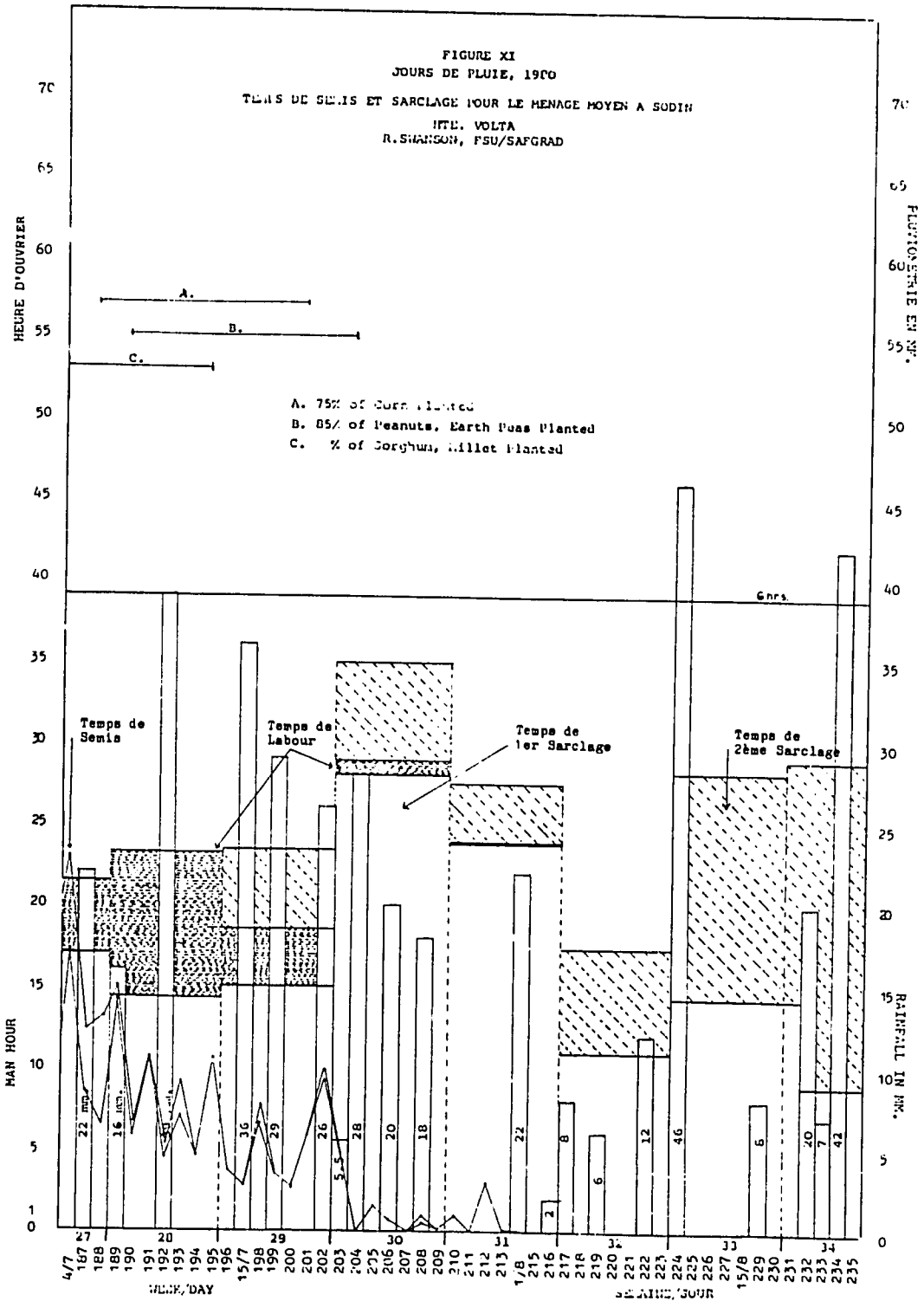


FIGURE XI
JOURS DE PLUIE, 1970
TEMPS DE SEMIS ET SARCLAGE POUR LE MENAGE MOYEN A SODIN
HTE. VOLTA
R.SHANSON, FSU/SAFGRAD
HEURE D'OUVRIER
MAN HOUR
PLUVIOSITE EN MM.
RAINFALL IN MM.
A.
B.
C.
A. 75% of Corn Planted
B. 85% of Peanuts, Earth Peas Planted
C. % of Sorghum, Millet Planted
Gnrs.
Temps de Semis
Temps de Labour
Temps de 1er Sarclage
Temps de 2ème Sarclage
JOUR/DAY
JOUR/DAY

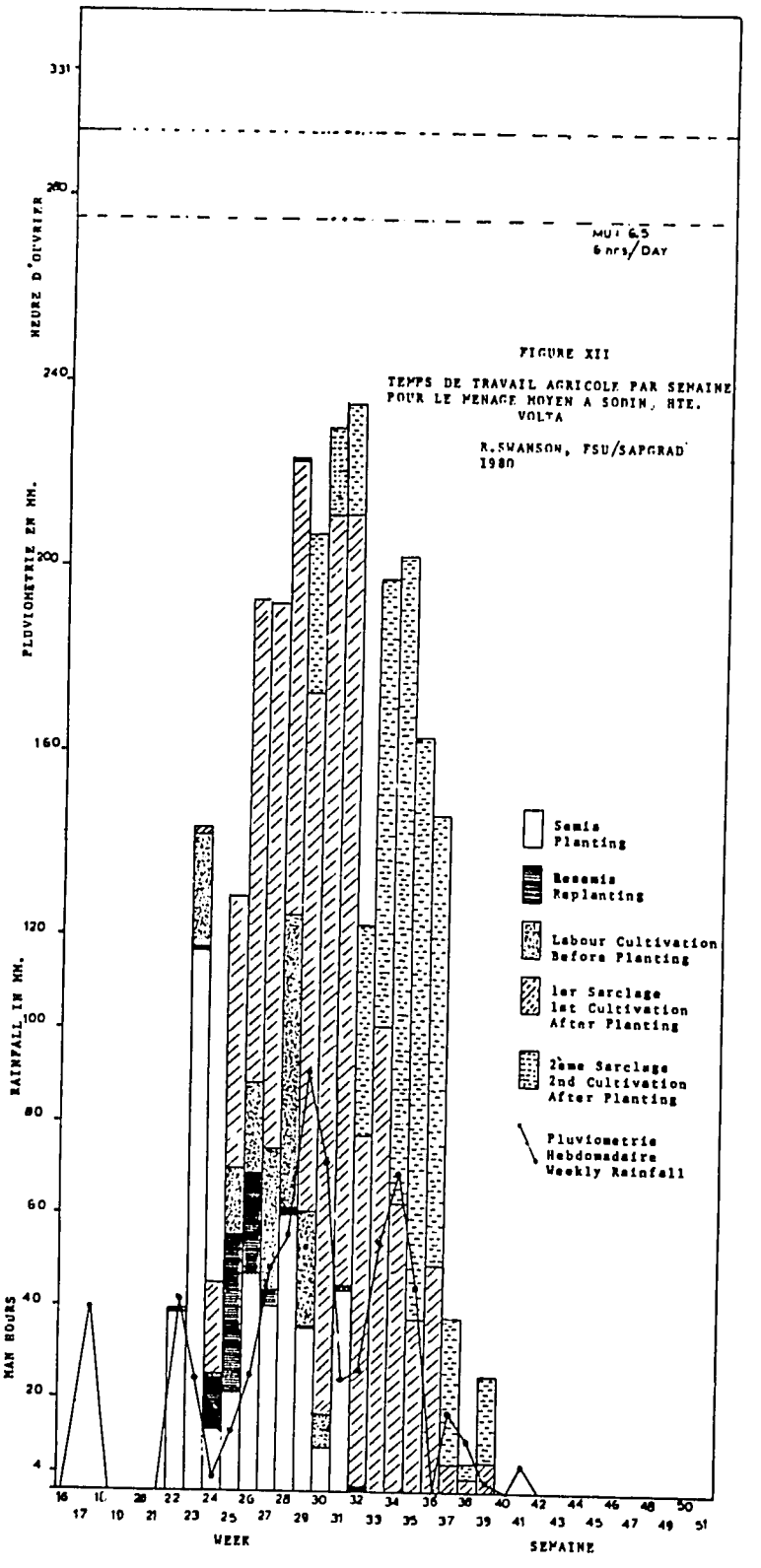


FIGURE XII

TEMPS DE TRAVAIL AGRICOLE PAR SEMAINE POUR LE MENAGE MOYEN A SORIN, HTE. VOLTA

R.SWANSON, FSU/SAFGRAD
1980

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