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THE EFFECTS OF THE INTRAHOUSEHOLD ORGANIZATION  
OF PRODUCTION AND THE DISTRIBUTION OF REVENUE  
ON THE PARTICIPATION OF RICE CULTIVATORS IN  
THE SEMR I RICE PROJECT

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## Background

From April 1980 through March 1982 two teams of researchers associated with the Centre de Recherches Economiques et Demographiques (CRED) have conducted field research aimed at determining the socioeconomic impact of the SEMRY I irrigated rice cultivation project based in North Cameroon. This research was carried out as part of the Cameroon Social Science Research and Training project (631-0007) financed by the U.S. Agency for International Development.

The first team collected data in the Yagoua area from April through December 1980 and March 1981. The economic and geographic aspects of the impact of SEMRY I have been discussed in research reports issued by CRED.\* The second team, consisting of an economist and an agroeconomist, has continued the first team's investigation into SEMRY's impact on farm families in the area. Their results will be published as two separate studies. The following report presents the preliminary results of one team member's research on the participation of women in rice cultivation. The other member's research report, an analysis of the economic impact of SEMRY at the family level, will be issued by CRED at a later date.

At the time this report was written, Ms. Jones was a junior researcher at the Fletcher School of Law and Diplomacy and a doctoral candidate in the Economics Department at Harvard University. She worked at CRED under USAID contract AID/afr-C-1610 with Tufts University.

\*Andrew B. Sisson and Theodore H. Ahlers, "The Socio-economic Impact of SEMRY: Economic Aspects," CRED Research Report No. 1, June 1981.

Samuel Ndembo, "L'Impact Socio-Economique de la SEMRY I: Aspects Géographiques," CRED Rapport de Recherche No. 2, Juin 1981.

## 1. Introduction

SEMRY, the Société d'Expansion et de Modernisation de la Riziculture de Yagoua, is an autonomous government owned corporation responsible for all product activities related to rice--provision of inputs, extension services, purchase of paddy, milling and marketing. At present it consists of three production units, the oldest of which is based in Yagoua. SEMRY's predecessor, the Secteur Experimental de Modernisation, was created <sup>in</sup> 1954 with the mandate to develop land for irrigated rice cultivation, provide farmers with the necessary inputs and services, and to purchase, process and market the milled rice. The irrigation network was gravity fed from the Logone River at its high stages with the result that the water supply was irregular. The SEMRY project was designed to remedy this problem by providing a controlled supply of water. Implementation of SEMRY I began in late 1972 with external financing provided by the LBRD, the FAC and the CCCE. Project works included the construction of four pumping stations, rehabilitation of part of the existing irrigation and drainage system, creation of new irrigation and drainage works and the construction of another rice mill. By 1977, with supplementary financing, a total of 5,350 ha. of land had been developed for irrigated rice cropping.

The original project appraisal estimated that yields of 3 tons per ha would be obtained on the 4,300 hectares of land which would be cultivated, of which about 1,500 ha would be double cropped.<sup>1</sup> Thus at full development (in the tenth project year) total paddy production was projected to be about 17,000 tons. This figure has since been revised substantially upward to take account of the increase in yield which occurred when broadcasting of seed was abandoned in favor of transplanting, the additional area which was developed with supplementary financing and the greater potential for double cropping than was originally foreseen. On the basis of these revised estimates, at the time of appraisal of SEMRY II in 1977 total production for SEMRY I was expected to reach 35,000 tons

during 1982.<sup>2</sup>

Whether SEMRY will achieve this goal depends on its ability to attract farmers and maintain the requisite yields. In recent years there has been marked variation in both yields and in the area transplanted as Table 1.1 demonstrates. SEMRY has not been able to attract enough farmers to cultivate the land which it prepares each season for cultivation. The area actually transplanted by farmers in the rainy season has never exceeded 4,000 ha, even though 5,000 ha are theoretically available. It is doubtful that SEMRY will achieve its production target of 35,000 tons in the near future and, in fact, in recent years production has barely exceeded the original estimate of 17,000 tons. SEMRY hopes that the increase in the producer price which took effect in late 1980 will reverse the downward trend of recent years. On the basis of the 1981 sample survey data for the rainy season, however, yields, both commercialised and total, remain at the 1980 rainy season level.<sup>3</sup>

Sustaining high yields and attracting large numbers of cultivators depend in large part on the farmers' assessment of whether rice cultivation is more remunerative than other activities in which they could engage. The research undertaken by economists at CRED has been designed to provide information on the returns to labor of various farm enterprises in order to explain the observed pattern of labor allocation in the project area. A cross-sectional approach has been used to compare the income of farm families who cultivate rice with those who do not. This information can then be used to assess the economic impact of SEMRY on participating farm families and to determine whether rice cultivation is an attractive option for farm families in the project area. A description of the objectives and methodology of the farming systems research can be found in the CRED research by Sisson and Ahlers.<sup>4</sup> They are also summarized in the following section of this report.

In particular, the research on which this report is based focuses on how the intrahousehold relations of production

Table 1.1 Area Transplanted (not including nurseries) and yields

| Year                   | Area Trans-<br>(ha) | Planned Area<br>(ha) | Marketed Yield<br>(T/ha) | Total Est.<br>Yield (T/ha) |
|------------------------|---------------------|----------------------|--------------------------|----------------------------|
| <b>A. Dry Season</b>   |                     |                      |                          |                            |
| 74                     | 516                 |                      | 1.7                      | 1.91                       |
| 75                     | 846                 |                      | 3.9                      | 4.30                       |
| 76                     | 1,073               |                      | 4.1                      | 4.85                       |
| 77                     | 1,402               |                      | 3.10                     | 5.02                       |
| 78                     | 1,196               | 2,118                | 4.18                     | 4.79                       |
| 79                     | 2,217               | 2,430                | 4.44                     | 5.07                       |
| 80                     | 1,181               | 1,300                | 4.57                     | 4.86                       |
| 81                     | 2,060               | 2,366                | 5.02                     | 4.36                       |
| <b>B. Rainy Season</b> |                     |                      |                          |                            |
| 74                     | 2,213               |                      | 2.7                      | 2.97                       |
| 75                     | 3,169               |                      | 4.4                      | 4.85                       |
| 76                     | 3,853               |                      | 4.0                      | 5.02                       |
| 77                     | 3,826               |                      | 3.65                     | 4.79                       |
| 78                     | 3,744               | 4,900                | 4.31                     | 5.07                       |
| 79                     | 2,281               | 4,874                | 3.93                     | 4.86                       |
| 80                     | 2,965               | 4,672                | 3.59                     | 4.36                       |
| 81                     | 3,300               | 4,400                | 3.61*                    | 4.62*                      |

Source : SEMRY, SEMRY I dans l'ensemble SEMRY :  
Rapport de synthèse, DOC 81-52, October 1981,  
 PP. 11,12, 29.

Calculated from sample survey data. See note 3 to  
 to Chapter 1.

and distribution influence the extent to which individual family members, and especially women, participate in rice cultivation. The Project Performance Audit Report of SEMRY I issued in 1978 draws attention to the significant labor contribution made by women to rice cultivation. The continuing high level of participation by women is jeopardized, the Audit Report suggests, <sup>by</sup> the resentment women feel over the fact that they do not control <sup>the</sup> income received from sales of paddy in proportion to the labor they contribute. Thus, it is essential to understand the factors which determine the level of <sup>female</sup> participation in rice cultivation in order to explain the present and predict the future level of farm family involvement. This report addresses the issue of female participation in rice cultivation. It is intended to serve as a complement to the farming systems research concurrently underway which uses the farm family as its unit of analysis.

## 2. Research Objectives

In order to determine the economic impact of the SEMRY I project, it is necessary to show how the adoption of irrigated rice cultivation has changed the resource allocation pattern and thus the income of farm families in the project area. The economic impact of the project is then measured by the increase in farm household income which results from cultivating rice. Since no useful baseline data are available, it is impossible to show how the resource allocation pattern of households has changed over time. Therefore, the economist must resort to a cross-sectional approach which compares the pattern of resource allocation of compounds involved in rice cultivation with that of compounds which do not cultivate rice but are similar enough in other respects so that a meaningful comparison can be made. Furthermore, since not all compounds within the project area are involved in rice cultivation to the same extent, the economist needs to show what factors account for the observed variation in participation and thus for the differential impact of the project on its target population.

The farm level studies of the economic impact of SEMRY I done under the auspices of CRED view the farm compound as a production unit whose goal is to maximize farm income. In order to specify the relevant production function, the range of available activities, the prices of both inputs and outputs and the constraints which exist on input levels must first be determined. The range of available activities as well as the production functions which determine output for a particular combination of inputs depend in large part on the compound's location in the SEMRY project area. Thus, location is an important factor in determining the extent of a household's involvement in rice cultivation. Because of this, it was decided to choose the sample households from several villages selected according to their location vis-a vis the rice fields.

The following villages were chosen for the second phase of the farm level survey: Vélé and vounaloum from the eastern

side of the Semry perimeter, Widigué from the western side, and Zébé from outside the project area. The essential difference between villages located on the eastern side of the project area and those located on the western side is in the amount of land available for activities other than rice cultivation. Villages on the eastern side are squeezed in between the Logone River and the rice fields. As a result they have less land available for both rainy and dry season sorghum and livestock grazing and are not served by SODECOTON, a parastatal organized along similar lines to SEMRY but oriented towards cotton. These villages do, however, have ready access to fishing in the Logone River as does Zébé. Villages on the western side have more land available for cultivation but are a quite a distance from the rice fields. It takes about two hours during the rainy season for farmers from Widigué to walk to their rice fields, often at times through hip deep water and mud. Villagers from Vélé, however, can arrive at the same group of fields in about a half an hour. As a result of both the proximity of the rice fields and the fact that their other options are limited, almost all compounds in Vounaloum and Vélé cultivate rice. In 1980 in widigué, however, only 19% of the compounds cultivated rice and 18% cultivated cotton.<sup>1</sup> In Zébé, farmers cultivate neither rice nor cotton but do cultivate tobacco on a large scale in the bed of the river which dries up during the dry season. A more complete description of three of the villages surveyed in 1980, widigué, vounaloum and Zébé, can be found in the reports of Sisson and Ndembou.

The first study of the economic impact ~~impact~~ of SEMRY I, based on preliminary results, offers an explanation of why villages on the western side of the SEMRY perimeter are less involved in rice cultivation than those on the eastern side, i.e. that the returns to labor from sorghum cultivation are higher on the western side than on the eastern side and that there is also a profitable alternative to rice on the western side, cotton, which is not an option on the eastern side.

Even among farm households in the same village, however, there are significant differences in the cropping patterns which were not explained by the preliminary results. Why, for example, do some farms on the western side cultivate neither rice nor cotton? And why do farms on the eastern side cultivate difference amounts of rice land per worker when land developed for rice cultivation can be assumed to be more or less in abundant supply? Various factors such as farm size, availability of animal traction, access to land suitable for dry season sorghum, etc. have been posited, but have not yet been shown to <sup>be</sup> critical in determining what mix of farm enterprises is undertaken by families in the project area. Thus, a significant amount of the variation among farm families, even when location is controlled for, remains to be explained.

There is, however, an additional source of variation in farm family resource allocation which cannot be explained solely by reference to models which regard the farm family as a production unit whose goal is to maximize income. Although farming systems research stresses the interrelationship of the farm (the production unit) with the family (the consumption unit), in practice most farming systems studies ignore the consumption decisions made by the family. In particular, they do not consider family labor to be a good which can be consumed either in the form of time by allocating it to nonincome producing activities or in the form of increased income by allocating it to income producing activities. Rather they view the amount of labor which the family supplies as predetermined and thus incorporate it into the model as a constraint on the production function. In effect, the assumption implicit in such a formulation is that the marginal utility of the ninth hour (or however long the workday is assumed to be) devoted to income producing activities is vastly inferior to the marginal utility which would be enjoyed if that hour were devoted to nonincome producing activities. Thus, time is not included as an argument of the utility function which is thus reduced to a function of one variable, namely income. Maximization of the utility

function then is nothing more than the maximization of family income and the production and the utility function collapse into one.

Models of the agricultural household do exist in which family labor is treated as a variable input. Barnum and Squire develop a model which does in fact view the agricultural household as both a production and consumption unit.<sup>2</sup> As they show, the modeling of the agricultural household is simplified when an active labor market exists, since the production decision as to the quantity of labor which should be employed (irrespective of source) can then be separated from the consumption decision as to the optimal quantity of labor which should be supplied by the household. In such models the goal of the production side is the maximization of income which determines the optimal level of factor inputs. The decision of how much labor will be supplied by the household and how much will be hired depends on the relative value of time and income which is determined by maximizing the family's utility function. Thus in the presence of a labor market the consumption decision as to how much time and how much income should be consumed is made independently of the production decisions as to what the optimal level of factor inputs should be. The implicit valuation that most farming systems studies make of time versus income would be most correct in very homogeneous farming communities in which there is little variation families in per capita labor input attributable to factors such as education, for example, which might alter this valuation on a systematic basis.

Assume, however, that the production and utility functions in a model of a farming household are correctly specified. Would such a model remain valid in the presence of technological change or a shift in relative prices? After all, the primary purpose of such models is to be able to predict the changes which would occur in household resource allocation and consumption patterns if the environment in which the farm operates were altered. The validity of the predic-

tion depends on whether the form of the utility function remains the same and whether the family is capable of shifting its resource allocation pattern to the new one which maximizes the production function applicable to the changed environment. The invariability of the utility function and the ability of the family to reallocate its resources can be most easily assumed to obtain in the case in which the production and consumption decisions are made by the same family member. Hence in farming systems research, "...it is generally assumed that the objectives of the farmer--usually the head of the family unit--reflect those of the family as a whole...."<sup>3</sup> Farming systems research does not deny that there are farm families which are composed of multiple decision makers who independently control certain resources. It does assume, however, that a consensus exists among the various producers regarding the form of the utility function and also regarding how they as individuals will allocate their resources so as to maximize the family's utility and production function. This insures that the sum total of family resources is allocated optimally.

The assumption that such a consensus exists and more importantly that it remains stable in the presence of change is rarely, if ever, examined explicitly in farming systems studies. On what is the understanding among family members based regarding which family members perform which tasks, how much family labor should be contributed to production activities, whose cash should be used and whose labor employed to achieve the optimal level of factor inputs? Essentially the problem for the economist trying to determine if the production and consumption functions will remain valid when the farming environment changes is to neither underspecify or over specify the model, or alternatively to know if the production and consumption functions need to be reformulated before they can be used to predict the resource allocation pattern which will obtain in the altered circumstances. This involves

determining a priori how the intrahousehold allocation of resources would be affected by changes in the environment in which the household operates.

It would seem most realistic to assume that family members might have different conceptions of what combination of goods would maximize both individual and family welfare and which family member's resources should be devoted to the production or the procurement of those goods. Family members might even value output differently; for example, they might disagree on the value to be assigned to a crop which is mostly home consumed. The extent to which any member could impose his or her own conception and then mobilize the family's resources to produce accordingly would determine the combination of goods produced, how they are produced and in what form they are consumed. Such a process of interaction among family members might be conceptualized as a mixed motive non zero sum game. The payoff matrix of the game would be the utility each family member receives from consuming the goods (including time) produced by the family in accordance with whatever game plan was finally decided upon by the family. Such a formulation has the advantage of not assuming that the outcome would be optimal for all family members; in fact, it might be suboptimal for each family member.

In order to predict the outcome of the game one would need to know what form each family member's utility function would take and what determines his or her ability to impose that utility function on other individuals. This in turn would determine the extent to which individuals' resources could be mobilized for different productive activities and thus the constraints, if any, which would need to be imposed upon the production function to account for any rigidities in the intrahousehold organization of production. Changes in the household's environment would presumably alter the relative negotiating strength of family members and would result in a different outcome. The factors which determine an individual's negotiating strength might include the socially sanctioned intrahousehold division of labor,

of labor, how access to resources is acquired and maintained, the ability of individuals to control the disposal of goods produced by the household and the responsibility of each family member for the maintenance of the household.

Admittedly, it would be impossible to formalize a game theoretic model for agricultural households. Nonetheless, the organization of production and consumption at the intra-household level needs to be understood before models can be formulated which can then be used to predict shifts in the pattern of farm resource allocation which would occur in response to external changes. Consideration of the above-mentioned factors enables one to begin to understand the likely response of farm households to changes in their economic environment. With respect to the introduction of irrigated rice among the Massa in the SEMRY I project area, one needs to address the following questions. How have the pre-rice intrahousehold production and consumption patterns influenced the manner in which rice cultivation has been integrated into the Massa farming system? What effect has rice cultivation had and is likely to have on these patterns? And, finally, what does this suggest about the future of rice cultivation?

To answer these questions one must first isolate the individuals in the Massa compound who are most likely to be in conflict with each other regarding what activities should be pursued and at what levels and whose resources should be devoted to those activities. In the Massa compound there are two groups of individuals who are potentially the most likely to be in conflict with each other: older and younger men and men and women. This report focuses on the latter set but does not deny the importance of the former.

Most of the information presented here was obtained from extensive informal interviews and formal surveys carried out in three of the villages in which the 1981 farm survey was conducted. They are vélé, Vounaloum and Widigué. Logistical and financial consideration dictated that only one of the two villages on the eastern side of the perimeter could be chosen.

Vélé was selected instead of Vounaloum because not all farmers in Vélé cultivate rice in both the rainy and dry season as most do in Vounaloum. Thus it was possible to choose a sample in Vélé stratified on the basis of one or two season rice cultivation and thus to make comparisons between the two strata. The description of the sample actually chosen from each of the three villages is presented in Chapter Four which outlines the hypotheses which will be tested using data from the formal surveys.

### The Intrahousehold Organization of Production and Distribution of Income

This chapter is organized as follows. First the structure of the Massa compound is described in order to provide the framework necessary for understanding the organization of production within the compound. Next, the two major income producing activities in which both men and women participate are discussed. These are sorghum and rice cultivation. The organization of cotton production has not been systematically investigated for the following reason. The basic objective of this research is to explain how the intrahousehold organization of production influences the way in which the household allocates its resources between rice and other income producing activities. Very compounds and even fewer households in those compounds cultivate both rice and cotton, since both are grown primarily for the ready source of cash they provide. Being cash crops, the intrahousehold organization of production and distribution of revenue for one does not differ much from the other. / Thus, once the decision has been made, usually by the head of the household, to grow either rice or cotton, it is at that point that the intrahousehold organization of production intervenes to determine how the household's resources are allocated between traditional food crops and the cash crop. Of course it is possible that other household members may object to growing rice because of the arduousness of the work it entails or they may object to growing cotton because it is not a food crop. Generally, however, household members follow the decision of the head of the household regarding the choice of whether a cash crop and which one should be grown. Thus, the intrahousehold relations of production have little effect on whether the household decides to cultivate either rice or cotton.

The discussion of sorghum and rice production is followed by a consideration of the social sanctions which reinforce the patterns of production and the distribution of revenue.

### 3.1 The Massa compound

The basic co-residential unit among the Massa (the major ethnic group involved in rice cultivation in the-SEMPY I project area) is the compound, or zina in Massa. The term zina refers to the collection of huts which are arranged in a circle around a central granary. One or more households, here defined to be a husband and his wife or wives and their children, reside together in the zina. The oldest male in the zina is the head of the zina and is called the boumzina. If there is a household other than his in the zina, it is formed by one of the boumzina's younger brothers, cousins or sons together with his wives and children. There are zinas which are headed by women, though they are rare. These women are widows whose deceased husbands had no other close adult male relatives. If he had a younger brother, a cousin or son by another wife, his wife will be inherited by that relative and become part of his household. In the case where a widow has an adult son and is not inherited, her son is considered head of the household of which she is then a part.

In the zina there are three different units which carry out domestic and productive activities: the zina as a whole, the individual household, and finally the individual household member. Which unit performs any given task depends on the task. For example, food preparation is most often done on an individual basis by each married women in the compound. However, fields are cultivated by individuals, households or the entire zina. In the past very few tasks seem to have been carried out by the household. Indicative of this is the fact that in the massa language no word exists which designates the household. The living quarters of household members are not even necessarily grouped together in the same part of the zina. There is a word, however, diguilligna, which refers to the area in the zina which is the province of a woman. It includes her hut where she and her children sleep and her kitchen area. With the cultivation of rice, however, the household has taken on much more importance as a productive unit.

### 3.2 Sorghum (and Millet)

#### 3.21 Land

Each compound has usufructory rights to the land which surrounds it. This land is usually partitioned into a collective field called the sinema ngolla (large field) and into smaller fields cultivated on an individual basis by the married women in the compound. Each married woman is allocated one of these fields located quite close to the compound by the humzina except perhaps if the zina is very large. In that case the women who have most recently married into the zina may be given fields which are located further away. Occasionally a woman will also cultivate a field belonging to one of her parents. The compound may also acquire usufructory rights to additional land located "en brousse" at some distance from the compound if one of the members of the compound, male or female, decides to clear and cultivate land which had hitherto been uncultivated by other zinas. In general sorghum land is readily available, albeit occasionally at some distance from the compound. In villages located on the eastern side of the perimeter some compounds may have little land available around the concession and will have women's fields located away from the compound. These compounds may also decide to intensify rather than extensify their sorghum cultivation if extensifying would involve cultivating a field a long walk away from the compound. There is no land market although there are occasional cases where someone from another compound will "lend" his or her field to someone else for a year if he or she is unable to cultivate it. Recognition of the proprietor's claim is made by a token pretestation of grain or a small cash payment at the harvest from the cultivator to the proprietor.

#### 3.22 Labor

With the exception of the collective field to which every member of the compound is expected to contribute at most several days labor for any given activity, sorghum fields are cultivated on an individual basis. In addition to the

collective field the boumzina may have other fields which he cultivates alone. Other men in the concession, particularly those who are unmarried, might work only on the collective field with the boumzina if it is quite large or they may have their own fields.

Members of the zina might occasionally help each other out if they have completed an activity on their own fields, but in general they work mostly on their own fields. Sometimes in a monogamous household a husband or wife might work extensively on the spouse's field if the spouse is incapacitated during part of the growing season. Several cases were found in which women who had just given birth or who were about to give birth worked on the fields closest to home while their husbands cultivated the ones which were further away, irrespective of whose fields they were. In another case a woman who broke her husband's arm during a dispute at the beginning of the rainy season did much of the work on both their fields until he recovered at which point they worked both fields together. In Véle there were cases where a husband and wife jointly cultivated one field together. Upon further questioning, however, the fields are actually considered to be the wife's and her husband contributes some labor but not as much as she does. These are households which are more involved in rice cultivation and do not have a great deal of land located near the concession. Even in Véle, however, the greater majority of husbands and wives have their own fields.

Husbands do not mobilize their wife's labor for their own sorghum fields. This is primarily due to the fact that sorghum is not cultivated as a cash crop but rather as a subsistence crop. Except in very good years, it would be very difficult to produce enough sorghum so that there would be a substantial surplus which could be sold for cash. Women do sell small quantities of sorghum primarily to get cash to make other food purchases. Women may be reluctant to work on their husbands' sorghum fields if working on their own

fields might provide them with a small amount of cash which can then be used to their other subsistence obligations. In effect, the system seems to be such that a husband can mobilize his wife's labor (or the income from that labor) only if her labor generates a substantial cash income above and beyond what is needed to meet subsistence needs. Finally, producing sorghum may not be the most profitable use of women's time-- cash cropping or brewing sorghum beer might be more profitable. In the past it may have also been necessary to mobilize her labor in order to fulfill the quota of groundnuts or cotton required by the colonial administration.

Individuals hire very little labor to work on their sorghum fields. Sometimes a person will ask another household member to organize a work party in his or her behalf. The proprietor of the field will then provide a big meal at the end of the day for the work party. However, villagers report that this practice is becoming less common now that most people prefer to work for cash in the rice fields. After her own crop is harvested a woman will sometimes return to her village and help her mother harvest her crop. She usually receives a sac or so of grain from her mother. Labor is hired, however, to clear the fields and transplant the varieties of sorghum which grow during the dry season. These varieties, called dongolonga in Massa, are started in seedbeds at the end of the rainy season and are transplanted into fields of a very high clay content which are flooded during the rainy season. These soils hold sufficient moisture to support the sorghum plants throughout the four month growing period during the dry season. Since not every compound has access to fields which are suitable for dongolonga (SEMRY appropriated many of the dongolonga fields for rice cultivation) there is a bigger labor pool available for hire than there is during the rainy season when cultivators are busy with their own fields.

As can be deduced from the fact that fields are cultivated on an individual basis there is no division of labor by sex

in sorghum cultivation. Each person is expected to carry out all the tasks involved in cultivating sorghum on his or her own fields. When asked which sex does more work on sorghum both men and women replied that they work the same amount of time. However, they said the same was true of rice cultivation yet survey data show that women's contribution exceeds men's.

### 3.23 Capital

Cultivating sorghum requires very little capital investment. Fertilizer and manure are hardly ever purchased and the agricultural equipment employed is rudimentary. The major exception would be the cases in which animal traction is used to plow fields. Hopefully the farm level survey will determine the salient characteristics of compounds which use or hire animal teams and what the benefits of using animal traction are.

### 3.24 Control over the disposal of sorghum

Who controls the disposal of sorghum produced by various members of the compound is reflected in the grain storage pattern. In a multi-household compound there is typically one granary controlled by the boumzina and one granary (or separate storage area if the granary has not yet been built) for each married or widowed woman in the compound. Grain from the sinema ngolla and any other field cultivated by the boumzina is stored in his granary. Each woman places the sorghum harvested from her fields in her granary. If a married man has his own fields he may construct a granary for himself or may divide up the sorghum among his wives. Some married men who have their own fields may store their grain with the boumzina, but this practice is rare. An unmarried male who has his own fields will most often store his grain in the granary of the woman who prepares his meals for him, usually his mother if she is alive. In a monogamous single household zina often there will only be <sup>one</sup> granary in which is stored both the husband's and wife's grain.

The grain that is stored in the woman's granary is consumed first. When it is exhausted her husband, if he has a

separate granary will then distribute his grain among his wives. If individual households exhaust their stock of grain before the new harvest is in, the boumzina will distribute his grain equally among the women of the compound during the rainy season. Thus, the grain stored in the boumzina's granary constitutes a reserve stock. If it was a good year and grain is plentiful then the boumzina may be able to sell some of his grain and invest, for example, in livestock.

A woman has the right to sell small quantities of grain from her granary (or her husband's if she shares one with him) without first asking her husband's permission. It is understood that money from the sales of grain should be used to finance other food purchases or for necessities such as medicine. Clothing, shoes, cookware, etc. are not considered necessities. For sales exceeding one or two thousand CFA she will often discuss the sale with her husband beforehand and get his permission to sell the grain and make her intended purchase. In any case, there is an implicit limit on how much grain she can sell because it is she who must provide the grain for a large part of her own and her children's needs over the course of the year. The fact that a woman almost always buys the grain which she uses to make soghum beer is further evidence that her grain is to be only used to meet her subsistence needs.

The grain storage and consequent consumption patterns described above are the ones most frequently encountered. However, there were several cases of multi-household compounds in Vélé in which the grain from the boumzina's granary is not distributed on a compound wide basis. Rather, his grain is only distributed to the women of his immediate household after their stocks are finished. The households of these zina are more autonomous with respect to grain distribution than the households which form the typical compound. If, in fact, these cases are indicative of a trend towards greater inter-household autonomy and are not just aberrant cases, one can then begin to theorize on how rice cultivation has brought about greater interhousehold autonomy.

The more intensively households cultivate rice, the more they are able to make up their grain deficits by the sacks of rice which they save for home consumption. In fact, if rice cultivation causes them to abandon the sorghum fields which they traditionally cultivated then they will need to either eat some of the rice they produce or use their income from rice to buy sorghum. Because the household controls the production and the disposal of the income, cash or in kind, from rice production, there would then be little need for the *buzina* to provide grain for the entire compound. In the past, his control of the central granary invested in him a certain degree of authority over and responsibility for the welfare of compound members which seems to be diminished as individual households assume the responsibility for meeting their own food needs.

### 3.3 Rice

#### 3.31 Land and inputs provided by SEMRY

Title to about 6000 ha. of land to be developed for rice cultivation was vested in SEMRY by the Cameroonian government. The land to which SEMRY obtained rights was mostly flooded during the rainy season and thus not used for rainy season sorghum. It was used, however, to cultivate dry season sorghum. Thus the fields of many compounds were appropriated by the SEMRY. In the absence of uncultivated land suitable for dry season sorghum these compounds do not have the possibility of cultivating dry season sorghum. All of the households surveyed in *vélé* which do not cultivate *dongolonga* reported that their fields had been taken over by the SEMRY.

SEMRY allocates 0.5 ha. plots, called *piquets*, to interested farmers each season. Generally a farmer whose production is acceptable and pays SEMRY for the services it provides has usufructory rights to the same *piquet* (or *piquets*) year after year. Since each season more land is plowed by SEMRY in preparation for transplanting than there are candidates to cultivate rice, rice land can be said to be readily available.

However in the dry season only certain groups of piquets are irrigated and up until this year they have been located in the southernmost part of the project area. Thus cultivators who live in the northern part of the project area do not have the opportunity to cultivate dry season rice. There is no policy which prevents women from having their own piquets and many in fact are registered in the names of women.

Cultivators pay no fee for the use of the land. They do pay, however, a fixed charge of 55,000 CFA per piquet for the inputs and services SEMRY provides. These services include mechanised plowing, seedlings, water, fertilizer, extension services and maintenance of the irrigation works. A recent study done of SEMRY estimates that about 87% of SEMRY's revenue comes from the difference between the cost of the services and the charge which the cultivators pay.<sup>1</sup> This money is then used to cover general administrative costs and amortization of equipment. The other source of revenue is the difference between the cost of buying and milling the paddy and the consumer price of rice.

The person in whose name the piquet is registered is not necessarily the actual cultivator of the piquet. Sometimes a household finds itself unable to cultivate all the piquets which it normally does and will "lend" one to someone else, who perhaps no longer wants to cultivate his own piquet because he is indebted to the SEMRY. People are able to escape paying their debts by taking new piquets and registering them in the name of someone else. SEMRY has a limited capability at this point for keeping track of rice cultivators who are in debt and forcing them to repay their debt whether or not they cultivate the same piquet on which they incurred the debt. Households whose piquets do not produce well will sometimes give their paddy to a friend to be sold along with his and will receive from the friend the full value of the paddy, 55 CFA per kilo. In this way they avoid paying SEMRY's fixed charges but in the process is one of SEMRY's major problems.

### 3.32 Labor

Rice piquets are generally worked by all members of the household. There is no collective compound piquet analagous to the collective sorghum field. Thus rice production differs significantly from sorghum cultivation in that it is primarily carried out at the household level rather than at the individual or compound level. This is most likely due to the fact that rice production is primarily destined for sale rather than for home consumption. Traditionally household heads have had rights to the income earned by any member of their households. The boumzina cannot appropriate money earned by members not belonging to his household. Thus, cultivation of rice was integrated into the farming system on the basis of traditional rights to income and not according to the way production of sorghum, which produces a surplus, is organized to meet subsistence needs, is organized.

A household generally cultivates all of its piquets without reference to the name under which the piquet is registered. They even though one piquet may be registered in the name of the husband and another in the name of his wife, in general they will complete a task on one piquet together before moving on to the other piquet. Occasionally in a polygamous household one wife will decide to cultivate a piquet by herself and will carry out the great majority of the work herself.

As with sorghum, there is no division of labor by sex in rice cultivation. However, a preliminary examination of the data collected in the survey suggests that women provide the majority of labor. 58% of the labor provided by the compound for piquets cultivated by members of the compound for the activities of transplanting and weeding, those in which men are most heavily involved, is female.<sup>2</sup> This does not imply that men work shorter days than women; men in fact may work slightly longer days than women because a woman may sometimes leave the rice field ahead of her husband to return home and prepare the evening meal. Rather women probably work more days on rice than men do. A time allocation study is needed in order to ascertain the other activities to which both sexes allocate their time.

The Massa distinguish three different types of labor contribution: 1) goutna, labor donated without the expectation of any recompense at the end of the workday (and possibly none at all), 2) dei'na, labor performed with the expectation that the worker will be treated to a big meal at the end of the day, a "work party", and 3) kerena, labor which is remunerated in cash almost always at the end of the workday. Generally the labor which one household member contributes to the cultivation of a piquet of a member of another household in the same compound is goutna. It does happen, however, that one household member will hire him or herself out to someone else in the compound not of his or her immediate household. This is further evidence that rice cultivation has led to an increasing autonomy among households of the same compound.

A substantial amount of the labor furnished by those who are not part of the compound is also goutna. People will often help out their friends in other compounds for a day or two, particularly if they have finished with their own piquet. Rarely does the person doing the goutna receive any payment. The proprietor of the piquet may buy "beignets" for those aiding him or her or may give a small quantity of paddy to the goutna labor during <sup>threshing</sup> time. People do goutna on a longer term basis of a <sup>week</sup> or more primarily on the piquets of their relatives. Women in particular will often aid members of their immediate natal family or their married daughter's household. In this case payments of money or a sac or so of rice (about 80 kg.) will be given to the woman after the harvest.

Kerena labor is remunerated in cash at the end of the workday. Payment for transplanting and weeding is made on the basis of the area which the hired laborer transplants or weeds. However, for cutting, threshing and winnowing the payment is a function of the amount of time worked and how much is accomplished. Usually someone from the household works alongside the hired laborer to supervise and establish the rhythm of work and rest.

The actual labor contribution to a compound's piquet made by people not belonging to the compound is quite small; for weeding and transplanting it represented 9% of the total

labor input. Since rice piquets are generally available there are very few people in the project area who work only as hired labor. However, people who traverse the Logone River from Chad, especially in the dry season and hire themselves out as kerena. The primary reason why people work as kerena instead of working on their own piquet particularly during the period of peak labor demand in the rainy season is because they want the cash. This is borne out by the fact that 89% of kerena labor hired for transplanting and weeding is female.<sup>4</sup> They work as kerena primarily in order to acquire the cash to buy food.

The average wage received for transplanting and weeding for an eight hour day is about 470 CFA.<sup>5</sup> This is equal to the average returns to labor from rice cultivation using the unadjusted eight hour workday labor input and average yield presented by Sisson for Voualoum.<sup>6</sup> People however, do borrow money to hire labor especially for transplanting. The interest rate in the area for a loan made over any period of time is 50%. The high cost of capital which cultivators are willing to bear suggests that the returns to labor for transplanting are higher than the average returns to labor for all activities. One would expect this to be the case given that yields drop over rapidly once seedlings reach a certain age.

If the returns to labor are higher for transplanting than the average returns to labor, then the wage rate would be inferior to the returns to labor from transplanting. Since most of the labor force is assumed to be cultivating their own piquets, they should only be willing to hire themselves out if the wage rate equalled the opportunity cost of their time. There are two reasons, however, which might explain why people are willing to work for a wage less than the opportunity cost of their time. The first is one which has already been discussed: the need women have for cash to purchase food which induces them to supply their labor at less than its opportunity cost. The second is that the opportunity cost of women's labor, since it is women who constitute the majority of the hired labor force, may not be

determined according to the returns to labor from rice cultivation. Rather it might be determined according to the returns to labor from sorghum cultivation. Given that women receive very little direct payment for the labor they contribute to the household's piquets, the actual returns to their labor from rice cultivation are very low. In that case the returns to her labor from sorghum cultivation would exceed the returns from rice cultivation. The marginal returns to labor from sorghum cultivation during the period of rice transplanting are probably inferior to those from transplanting rice. This may in part explain the depressed wage rate, which even after the producer price of paddy was increased, did not rise. In any case more information is need about the marginal returns to labor before any definitive conclusions can be made about how the wage rate is actually determined.

### 3.33 Intrahousehold distribution of income

In principle cultivators are required to sell all but 10% of their production to SEMRY. The paddy which is not sold to SEMRY is intended for home consumption and is not supposed to be sold elsewhere. In reality, the amount of paddy not sold to SEMRY is about 17%.<sup>7</sup> A portion of the retained production is sold on the market either as paddy or as hand pounded rice at prices which exceed both the producer price for paddy paid by SEMRY and the the consumer price for milled rice. The paddy which is not sold to SEMRY is distributed by the head of the household to the women of his household for consumption and also possibly to friends and relatives who contributed goutna labor. Occassionally sacs of paddy are retained by the head of the housenold to be sold later on the parallel market.

After payments to goutna labor, bribes to extension agents, bribes to those who weighed the sacs, etc., the mean number of sacs retained by a married woman is 4.86 and for a widowed woman (or married woman whose husband is absent) is 2.13.<sup>8</sup>

If a woman has co-wives the number of sacs she received was adjusted upward to reflect the fact that she shares the task of preparing for for her husband with her co-wives. Thus the figure 4.86 can be considered the number of sacs which a monogamous household has available for home consumption. It is not significantly different from the number of sacs which widows retain or receive if that figure is doubled.<sup>9</sup> The amount of sacs which a woman receives from her husband is not a function of the labor she contributed, as a husband give the same number of sacs to each wife regardless of the amount of labor each contributed.

The distribution of the cash received from the sale of paddy is the prerogative of the husband if he has been even marginally involved in cultivating the household's piquets. Even if the piquet is registered in the wife's name and she actually receives the money from SEMRY, she will turn over all the money to him. He will then decide how much money to give to her. Some women did not even know how much money their husbands received from the sale of paddy and asked me to tell them when I was copying the production figures from the sales ticket SEMRY gives each cultivator.

The actual amount of money which women receive is quite small relative to the total earnings of her husband and also to the amount of labor she contributed. On average husbands received 75.750 CFA from SEMRY and gave 8.800 to their wives.<sup>10</sup> Unlike the sacs of rice which a woman receives which are destined primarily for consumption, women are not expected to use all the money they receive for food purchases: they are entitled to spend most of it on items such as clothing, shoes and cookware. Because of the discretionary nature of her purchases, however, if the husband thinks that they are more pressing needs then he may not give his wife any of the money. Such cases might include the repayment of money borrowed to hire labor or buy grain, payment of bridewealth or purchase of a bicycle. Women would not necessarily object if they received no money in such cases, but they will refuse a sum of money offered by their husbands if they think that it is too small relative to the sum he received. One man, who

received 85,000 CFA from the sale of his paddy offered his wife 1000 CFA. She refused to accept it, thereby expressing her contempt for him.

Thus, men are able to mobilize their wives' labor for rice cultivation at considerably less than its opportunity cost. The same can not be said for sorghum cultivation, however. Women cultivate their own fields and control the disposal of their grain. In the sense that rice cultivation is primarily an activity which generates cash and not a subsistence activity it is governed by the cultural norms concerning the rights of a husband to the cash income earned by his wives. Traditionally women in Massa society have had rights to very little of the income they earn. An anthropologist who worked with the Massa twenty years ago that a woman was appreciated by her husband primarily for the cash she earned which he could then appropriate and use to acquire another wife and thus more prestige.<sup>11</sup> Even now a woman who cultivates tobacco and sells more than 2000 CFA worth or so will return home and hand over the money to her husband. Thus rice cultivation has been integrated into the Massa agricultural system according to women's traditional rights (or lack of rights) to dispose of the income they earn above and beyond what is needed for food purchases.

Occasionally husbands do allow their wives to keep a greater than average percentage of the cash earned from sales of paddy if she has taken on the cultivation of a piquet by herself. Several women received more money than their co-wives because the former had cultivated a piquet by themselves while the latter only aided their husbands.

There were also several women who distributed the money they earned from their piquets and kept a much greater percentage of their earnings than the percentage of a husband's earnings usually given to his wife. These were women whose husbands were sick or old and did not help their wives at all with the cultivation of their piquets and did not cultivate their own piquets. These women gave their husbands about 21,000 CFA out of earnings which averaged 51,000 CFA.<sup>12</sup> The rest of the money was distributed among their children and put away to be used to hire

labor the following season, with about ten or fifteen thousand CFA kept for food and miscellaneous expenditures.

### 3.4 Sanctions

When women were asked why they cultivated tobacco or rice when their husbands appropriate the majority of their proceeds, they usually gave one of three answers. Some said that if they didn't work they and their children would starve. Others said that if they didn't work their husbands would beat them. Disputes between a husband and wife end often enough by the husband beating the wife. Disputes arise for a variety of reasons--for example, if a woman is too tired and doesn't prepare dinner, if she refuses to work several days in the rice fields, if one spouse discovers that the other has a lover, if she spends money which was given to her for the sauce on something else--are among the more common reasons. However, the impression that one gets is that beatings do not serve so much to make women obey their husbands but rather to reestablish the husband's authority over her when her behavior is not in accordance with the social norms. The third reason that women gave was that they were brought to their husbands' compounds and that they had to obey them because of the bridewealth which given to acquire them. The husband has the prerogative to his wife's income, many women told me, because he "bought" her. Women actually used the verb "to buy" in saying this.

The bridewealth which is given to the woman's family represents an enormous sum of money. The typical payment consists of about ten cattle, whose market value is about 500,000 to 600,000 CFA. Occasionally direct cash payments are made, but this practice is limited almost exclusively to Yagoua. Payment of bridewealth does insure that a woman will not be terribly mistreated by her husband. If she is, she will return home to her family. Depending on the nature of the dispute which resulted in her departure her family may not be obligated to refund the bridewealth if she does not return to her husband. But if the payment of bridewealth serves as some sort of minimum guarantee that she will not be mistreated it also

prevents her from seeking a divorce except in the most extreme of cases. If she goes home her parents will do everything possible to convince her to return to her husband so they will not have to refund the bridewealth.

Thus, Massa women are conscious that they represent an investment of a substantial sum of money on their husbands' parts and that this gives their husbands the right to mobilize their labor and appropriate their income. They are aware that the system does not favor them. When a number of village women were asked whether they would have preferred to have been born as a man or woman, every single one replied, "as a man--men's lives are so much easier than women's." One village woman compared the life of a Massa woman to that of a donkey. Although they recognize that a certain inequality exists between them and their husbands, it is a fact of life because of the payment of bridewealth which was made to acquire them. Yet the system is such that women are taught to value themselves according to the number of cattle which were given in return for them.

#### 4. Increasing Farmer Participation in Rice Cultivation

SEMRY was created as a Société de Développement (Development Company) with the double purpose of both increasing the living standard of farm families in the region and also contributing to self-sufficiency in food production. In order to realize these goals it may be that the Cameroonian government is willing to accept a lower rate of return on its investment than could be had if it made an alternative investment. Even if the government is willing to accept a zero rate of return, however, SEMRY would still have to earn sufficient revenue to meet its operating costs, maintain its capital stock and repay its loans. Instead, ten years after its inception SEMRY I finds itself in the position of requiring additional financing to renew its capital stock and reduce its operating costs. In principle this investment would insure that the production and milling operations would generate sufficient revenue so that SEMRY I would be economically viable. This level of profitability is contingent upon a certain level of production-- the study which calls for additional financing assumes that 8000 ha. would be cultivated each year and that 4.5 ton/ha. would be commercialized for an annual production of 36,000 tons of paddy.<sup>1</sup> From the past production and sales figures presented in the first chapter of this report it is evident that it will not be easy for SEMRY to achieve this goal. It depends in part on whether the returns from rice cultivation are sufficiently attractive that they induce farmers to produce and sell more paddy than they have in previous years.

This of course raises the question of whether rice cultivation is economically competitive at the present producer price for paddy with the other income generating activities pursued by farmers in the project area. At the old paddy price the returns from cotton cultivation equalled those from rice and resulted in the defection of some rice farmers to cotton production. Now that the paddy price has been increased, however, one would expect that farmers would return to rice cultivation. In any event, it is sorghum production which

competes for labor which might otherwise be allocated to rice even though, as Sisson's study shows, the returns to labor from sorghum production are inferior to the returns from rice at the new paddy price in both widigué and vounaloum.<sup>2</sup> How then does one explain not only the apparent difference in labor input between the two villages but also why farmers in both villages continue to cultivate sorghum if cultivating rice is a more profitable use of their time?

Sisson's report suggests that the intervillage difference in labor input to rice and thus presumably the intervillage difference in rice yields which are observed can be explained by the fact that the returns to labor from sorghum cultivation during July, in month of peak labor demand, are actually higher than the returns to labor from rice cultivation in Widigué but not in Vounaloum.<sup>2</sup> Thus, the higher returns from sorghum in widigué would induce farmers to allocate their time to sorghum instead of<sup>to</sup> rice while the higher returns to labor from rice cultivation would induce the opposite labor allocation in vounaloum. If one looks at the calendar of labor inputs to sorghum and rice which is presented in the report, however, one finds that widigué farmers devote more labor per hectare to rice in July than vounaloum farmers do.<sup>3</sup> The biggest difference between the two villages in labor input to rice occurs during the months of August and September. The difference is so large that it is possible that there may be problems with the accuracy of the data for those months. At any rate, on the basis of the data presented for July it does not appear that farmers in vounaloum are induced to allocate more labor to rice and those from widigué to allocate less because of the relative returns to labor from sorghum and rice cultivation.

Aside from the large differences in sorghum yields observed between the two villages in 1980 which may be an aberration, the primary reason that returns to labor from sorghum in widigué exceed those in vounaloum during the month of July is because the labor input per hectare for sorghum is more than twice as large in vounaloum as it is in widigué. On the

other hand, vounaloum compounds cultivate less than half as much sorghum land per worker as compounds in Widigué. This suggests that because sorghum land is not as readily available to farmers Vounaloum as it is in Widigué, vounaloum farmers cultivate what sorghum land they do have to produce some minimum amount of sorghum. In Widigué, on the other hand, where land is more readily available, farmers can extensify rather than intensify their sorghum cultivation.

The amount of time per worker allocated to sorghum, however, is not appreciably different between the two villages. Using the data for area, labor input and number of workers per compound found in Sisson's report, one can calculate how the worker in each village allocates his or her labor during the month of July. 6.19 days are devoted to rice and 6.09 days are devoted to sorghum in vounaloum whereas in Widigué only 3.15 days are allocated to rice and 5.85 days allocated to sorghum. vounaloum farmers spend twice as much time cultivating rice in the month of July as Widigué farmers but the former also cultivate twice as much rice land as the latter. Farmers in both villages spend approximately the same amount of time cultivating sorghum however. This suggests that rice cultivation has resulted in a reallocation of time not between sorghum and rice but rather between rice and other nonagricultural activities. Since baseline data are not available one cannot be certain of this however. It is possible that farmers in both villages allocated more time to sorghum in the past and were induced by rice cultivation to reallocate part of that time to rice. If one compares the labor allocation of farmers in Widigué who cultivate rice with those who do not, however, one finds that the time they allocate to sorghum is about the same--6.59 days for non rice farmers and 5.86 days for rice farmers.

→ The above data suggest that any model of the Massa agricultural household which considers the present family labor supply as a constraint on agricultural production will likely have limited predictive value. The data presented above leads one to conclude that the introduction of profitable cash crops

has most likely increased the total amount of time allocated to agricultural activities while at the same time inducing a shift of some, but not much, labor out of sorghum and into cash crops. Therefore, any model which attempts to predict the future level of Massa farmer participation in agricultural activities would need to take this shift into account and alter whatever constraint on household labor supply is posited accordingly.

If the above interpretation of the data is correct, one can conclude that farmers are reluctant to abandon production of their primary subsistence crop in favor of rice production even though it would be more profitable for them to do so. The two reasons usually advanced to explain this reluctance are that one, farmers do not have confidence that they will be able to purchase sufficient quantities of sorghum on the market at attractive prices after the rice harvest and that two, rice cultivation is riskier than sorghum cultivation. In principle Office Cerealier does sell sorghum to people at subsidized prices. However, problems of transport, bureaucracy and the fact that the limit is one <sup>sq.</sup> per customer in periods of peak grain demand effectively preclude people from relying on Office cerealier.

Although it is easy to comprehend people's reluctance to rely on the market to meet their subsistence needs, it is more difficult to determine whether they perceive rice cultivation as being riskier than sorghum cultivation. Given that rice is an irrigated culture with an assured supply of water, it would seem that rice cultivation is far less risky than sorghum cultivation which is at the mercy of the rains. However, the rice farmer must deliver two tons per hectare before he begins to show any profit at all. Assuming that rice and sorghum cultivation require about the same labor input per hectare and that the returns per hectare from sorghum are on the order of 50,000 CFA, a farmer would need to obtain a yield of 3 ton/ha. in order for the returns to labor from rice cultivation to equal the returns to labor from sorghum cultivation. Thus how risky rice cultivation is depends on the extent to which a farmer has confidence in his ability to obtain such a yield.

If yields are largely a function of timely labor input assuming that farmers follow the prescribed methods of cultivation then presumably the farmer could obtain these yields if his labor supply were assured. The most common reasons usually cited for low production is insufficient irrigation usually resulting from failure to level the piquet properly or that transplanting was done too late. Thus the labor supply is not assured mostly because people allocate their time to sorghum first. How much of an overlap there is between the sowing of the sorghum crop and the transplanting of rice depends on the rains. Assuming that once a farmer masters the techniques for growing rice rice cultivation would seem to be financially risky for the farmer only because he chooses to allocate his time first to sorghum production.

What options are open to SEMRY if farmers continue to insist on cultivating sorghum despite the greater profitability of rice? One option would be for SEMRY to develop higher yielding sorghum varieties on the assumption that farmers could meet their subsistence needs with a reduced labor input that they would allocate the time then freed up to cultivating rice. However, high yielding varieties would then increase the returns to labor from sorghum cultivation and could potentially induce a reallocation of labor from rice to sorghum. This would certainly not be in SEMRY's interest. Using the labor input, cost of production and rice yield data for Widigue presented in Sisson's report and the 1981 post rice harvest average sorghum price of 70 CFA per kilo, yields from sorghum would only have to increase to 1221 kg/ha. in order for the returns to labor from sorghum to equal the returns of labor from rice.<sup>5</sup> Using the same vounaloum data, yields from sorghum would have to reach 1555 kg/ha in order for sorghum to be as profitable as rice.<sup>6</sup> These yields are not inconceivable; agronomists at IRA have already field tested varieties of sorghum which produce in this range. Obviously the extension of higher yielding sorghum varieties will probably have a negative impact on rice production.

Another option being considered at SEMRY is growing irrigated sorghum. The thought is that if SEMRY could produce

a sufficient quantity of sorghum so that sorghum prices would fall and farmers would be assured of an adequate supply of sorghum even in bad years farmers would then be induced to abandon sorghum production on their own fields and allocate their time to rice instead. It is not clear, however, where SEMRY thinks that the labor supply will come from to produce enough sorghum to effectively depress the sorghum prices in all of north Cameroon and in the regions of Nigeria and Chad which border on north Cameroon and at the same time meet SEMRY's paddy production target. Even if it were possible, it does not necessarily follow that people would give up subsistence production of sorghum.

Before a woman would abandon sorghum cultivation she would have to have confidence that her husband would use his rice income to buy sorghum. Given women's traditional obligations for providing food she would probably be very reluctant to depend on her husband's willingness to spend a portion of his cash income on sorghum. He might of course buy some sorghum-- after all he needs to eat too-- and leave his wife the task of earning enough income to meet the rest of the family's food needs. Of course a woman might decide to earn her cash income by working as hired labor in the rice fields which would increase the total labor supply allocated to rice, dubious that she would count on the possibility of working on a year round basis as hired labor to provide her with cash. Sorghum has the advantage of providing her with income anytime she decides to go to market and sell some. If sorghum production rose and sorghum prices fell, women would earn less money from their sales of sorghum and might even be induced to allocate more time to subsistence sorghum production. For women who do not live close enough to the areas where dry season rice cultivation is practiced and who depend on income from sales of sorghum during the dry season, a decline in the price of sorghum could have a negative impact on food expenditures.

Since women provide the majority of labor for rice cultivation, the above comments suggest that SEMRY should pay

careful attention to the factors which determine how much time women allocate to rice cultivation and to other rainy season agricultural activities so that whatever action is undertaken to increase rice production results in both the desired increase in labor allocated to rice and a neutral, if not positive, impact on food consumption. Two factors are primarily responsible for determining how women allocate their time: what the major sources of her income are and whether there exist any positive incentives which would induce her to participate more in rice cultivation. What the sources of her income are also determines how much money she has available to spend on food. Since Massa women are presumed to be the primary providers of food for the household and in particular the primary providers of ingredients for the sauce which supplements the grain dish, it is hypothesized that the amount of time she devotes to rainy season agricultural activities is a function of the what other income generating options exist for her. One can propose the following hypotheses, the first three of which are related to the sources of women's income and the last three of which are related to the existence of positive incentives for women to increase their labor contribution to rice. First, women with sources of income other than from sales of grain allocate the least amount of time to agricultural activities during the period of peak labor demand in the rainy season. Second, rice cultivation has increased the total amount of time women allocate to agricultural activities during the rainy season because it provides them with little additional disposable income. As time allocated to rice increases, time allocated to sorghum decreases, but less than proportionately. The more a woman depends on sorghum production to meet her income needs, the less of a trade-off she makes between sorghum and rice. Third, there is one major exception to the second hypothesis: women who retain the great majority of their earnings from rice cultivation cultivate relatively less sorghum than women who only receive a small recompense for their labor contribution to rice. Fourth, women who cultivate rice with their

husbands are not reimbursed at the opportunity cost of their time, defined to be the average wage rate. Fifth, a correlation does exist, however, between the amount of time which women allocate to rice and the recompense they receive. Men, in effect, make a trade-off between lower production (or hiring kerena labor) and hiring their wives. Sixth, women who retain the greater percentage of their earnings from rice production allocate more time to rice than women who do not.

Data to evaluate the above hypotheses was collected during two surveys. One provided information on women's income and the household's expenditures on food and the other determined how much time women allocated to different agricultural activities. The purpose of the income and expenditure study was to ascertain 1) what percentage of food purchases are made by women, 2) whether men contribute any money to food purchases, 3) if there are significant differences between villages in the amount of food purchased and whether these differences can be attributed to differences in the level and source of women's income and 4) what the major sources of women's income are in different villages. The labor allocation survey recorded how much time and to which agricultural activities women allocated their labor during the period of peak labor demand and also recorded how much labor time women allocated to rice cultivation during the entire period of rice cultivation.

A random sample of women was selected from a random sample of households which were censused in each village in February.<sup>3</sup> The final sample consisted of 30 women from Zébé, 30 women from Widigué and 44 women from Vélé.<sup>7</sup> The sample was stratified in each of the villages. In Zébé and Vélé it was stratified on the basis of whether women were widowed or married. This was done to determine what effect marital status has on food expenditures, income earned by women and labor allocation. The sample of married women was further stratified in Vélé on the basis of whether their households engaged in both rainy season and dry season rice cultivation or only in rainy season rice cultivation. The purpose of this stratification was to insure that there would be enough cases to determine what effect

the income received from the sales of dry season rice have on food expenditures and income. The sample in Widigué was divided into women from households which cultivate rice and women from households which do not cultivate rice. Women from households which intended to cultivate cotton were excluded from the sample in order to control for the effects of rice cultivation on food expenditures, income and labor allocation. Thus the sample is not representative of all women in Widigué. For that reason, no village estimates will be given for Widigué and for expository purposes, women from households which cultivated rice are considered to belong to Widigué (rice) and those from households which do not cultivate rice to Widigué (non rice). However, several households from which women were chosen did decide to cultivate cotton after the sample had already been selected. Since these were households which had not cultivated cotton in the past and since cotton had not been sold at the time of the final survey round, cotton cultivation probably had very little effect on food expenditures and income. The final composition of the sample is given in the following table.

Table 4.1: Composition of the Sample

| Village            | Stratum                                | Sampling Fraction | Sample Size |
|--------------------|--|-------------------|-------------|
| Zébé               | widows                                 | 14/16             | 14          |
|                    | married                                | 16/109            | 16          |
| Vélé               | widows                                 | 10/14             | 10          |
|                    | married women, dry season rice         | 17/158            | 17          |
|                    | married women, no dry season rice      | 17/283            | 17          |
| widigué (rice)     | rice cultivating households            |                   | 16          |
| Widigué (non rice) | households which do not cultivate rice |                   | 14          |

It was not possible to analyze the data using a computer at the time that this report was written. However, the income and expenditure data were partially analyzed using a hand-held calculator. The following sections describe in greater detail the income and expenditure<sup>survey</sup> and the results which were obtained from a preliminary analysis of the data.

#### 4.1 Description of the income and expenditure survey

Five rounds of the income and expenditure survey were conducted, each time for a period of two weeks on a two day recall basis. The period of two weeks was finally adopted when it was found that women would not tolerate being interviewed about their income and expenditures for any longer than about two weeks on such an intensive schedule. The relatively short length of each round was compensated for by the number of women interviewed and the short recall period which it was hoped would reduce recall error. Despite the number of survey rounds, the short length of each makes it difficult to estimate what a household's food expenditures and income would be on an annual basis. In order to maximize the seasonal contrast the survey was conducted during the following two week periods: 1) in May, before the harvest of the dry season rice crop, 2) in June, after the sale of the dry season rice crop, 3) in late August, before the harvest of the sorghum crop when grains supplies are at their lowest point, 4) in November, after the sorghum harvest and finally 5) in January after the sale of the rainy season rice crop.

During the first two rounds that income and expenditure data were collected, the questionnaire covered the major categories of expenditure (food, clothing, household items, animals, medicine, school fees, etc.) and income, broken out by source as well as transfers to and from husband, children and others. Due to the lengthy nature of the questionnaire and the difficulties which the enumerators had in administering it correctly, a modified version of the questionnaire was used in subsequent rounds. The expenditure part of the revised questionnaire asked for purchases of food made by women on

ingredients for the sauce and grain. Whether she spent her own money or money given to her by her husband or children or others to buy food was also recorded. Furthermore it was also noted whether the woman's husband made any food purchases himself which he then gave to her to prepare. Income which women earned was recorded by source. The categories which were used were: sales of grain, tobacco, vegetables, animals, sorghum beer, fish, cash received for working as hired labor and other sales.

For the purposes of the preliminary analysis, the data were aggregated into the following categories: 1) women's expenditure on sauce ingredients, 2) women's expenditure on grain, 3) women's total food expenditure, the sum of categories one and two, 4) total expenditure made for food prepared by women (this includes purchases of husbands, sons and others) and 5) total income. When the data were analyzed, the most important sources of women's income for each stratum were noted but the income data were not tabulated by source. The means and standard deviations for each of these categories are presented in Tables 4.2. (Vélé), 4.3 (Zébé) and 4.4 (Widigué rice and non rice). Chart 4.1 presents a graph of women's expenditures on food, total household expenditures on food, and income earned by women for each village for the last three survey periods. The graph shows that food expenditures are at their lowest in rice cultivating villages in November and that in general expenditures in Vélé and Zébé exceed expenditures in Widigué.

T-tests were used in order to determine if these apparent seasonal and intervillage differences are significant. Where sample means were hypothesized to be equal, a two-tailed t-test was used and where one sample mean was hypothesized to be greater than the other a one-tailed t-test was used. A more complete description of the testing procedure can be found in the notes.<sup>8</sup> The t-statistics used in making intervillage comparisons are presented in tables 4.8, 4.9, 4.10, and 4.11. Those used to make interseasonal comparisons are found in tables 4.2 (Vélé) 4.3 (Zébé) and 4.6 (Widigué rice and non rice). These tables also give the F statistic used to test the hypothesis that

the sample variances are equal. Finally, if the t-statistic is significant at the 5% level for the degrees of freedom indicated, it is marked by one asterisk. If it is only significant for a one tailed test it is marked by two asterisks.

#### 4.2 Results of the income and expenditure survey

##### 4.21 Men's contribution to household food expenditures

Men have no obligations to provide money for the purchase of sauce ingredients, though there<sup>is</sup> the expectation that if they do happen receive some money they will contribute a small part of it for purchases of fish or meat for the sauce. Out of the 70 married women in the sample surveyed informally, about two-thirds indicated that their husbands do contribute money for food when and if they happen to have any, with the emphasis falling on the "if". A woman has no choice but to earn money unless she is content to prepare sauces out of whatever leaves she can gather and fish she might occasionally trap. Sometimes if her husband goes fishing he will contribute some of the day's catch.

If the family runs out of grain, however, both the husband and wife will do what they can to earn money to buy more. The husband will often use the money which his wife has earned from selling the tobacco to buy grain, or he may sell off some of his livestock. And especially in villages which cultivate rice men will borrow money to buy grain and repay the debt either in cash or in kind by payments of rice after the rice harvest. The impression received from talking with both men and women is that where there is access to some activity which generates cash, she is the one who buys the grain. Selling livestock or borrowing money is a last resort.

The sample was stratified in Zébé into widowed and married women to determine if there was any difference in their food expenditures and if men's contributions significantly increased the household's food expenditures. Married women's food expenditures were significantly greater than widowed women's in only one out of the three survey periods, November.

Income earned by married women was also significantly greater than that earned by widowed women in that month, however. The additional expenditures made by other members of their households were sufficiently large that the total food expenditure of married women's households were significantly greater than widowed women's in the months of August and November. The amount which husbands contributed varied in accordance with the relative scarcity of grain. In August, when all but several women were relying on purchased grain, husbands' contributions over a two week period averaged about five hundred CFA, less than a third of women's food expenditures. Husbands' contributions also increased food expenditures by about 500 CFA in the month of January when households were again purchasing grain. In November immediately after the harvest men contributed only about 200 CFA. Married women's income was also significantly greater in November than in August and January, primarily due to sales of fish.<sup>9</sup> These results indicate that husbands do contribute money to the family food budget, particularly when grain supplies are lowest. However, as the comparison with widowed women shows, husbands' expenditures do not substitute for expenditures of their wives.

The mean food expenditures made by the husbands of the married women in the Vélé sample were also calculated to determine if men contribute more money when their incomes are higher and particularly after the sale of paddy. The means, standard deviations and t-statistics used to make interseasonal comparisons are presented in the following table.

Table 4.12: Contributions made by Husbands in Vélé

|  | August                              | November                           | January                              |
|--|-------------------------------------|------------------------------------|--------------------------------------|
| Food exp. by husbands                      | x= 615.84<br>s.d.= 1212.47<br>n= 32 | x= 396.06<br>s.d.= 542.20<br>n= 34 | x= 1046.60<br>s.d.= 1769.01<br>n= 34 |
| T-tests                                    | AUG. vs. NOV.                       | NOV. vs. JAN.                      | JAN. vs. AUG.                        |
|  | F= 5.00<br>t= 0.94<br>d.f.=42.36    | F=10.64*<br>t=-2.05<br>d.f.=39.15  | f= 2.13<br>t= 1.10<br>d.f.=58.62     |
| * significant at 5% level, two-tailed test |                                     |                                    |                                      |

Husbands do contribute significantly more to the food budget in January after the rice harvest than they do in November. Contributions made in January are not significantly different than those made in August, however, probably for two reasons: some men purchased sacs of grain in August and men have had some cash left from the sale of paddy cultivated during the dry season. As in Zébé, however, the contribution made by husbands did not substitute for expenditures made by women in January. The following table presents the mean expenditures made by married women and widowed women in Vélé in January. As the t-statistic shows, one can accept the hypothesis that mean expenditures made by married women and widowed women are equal.

Table 4.13: Food expenditures made by widowed and married women in Vélé during January

| Food exp.               |                           | T-test                           |
|-------------------------|---------------------------|----------------------------------|
| married women<br>(n=34) | x=1296.53<br>s.d.=3811.38 | F= 3.48<br>t=-0.05<br>d.f.=28.67 |
| widowed women<br>(n=10) | x=1321.50<br>s.d.=1046.27 |                                  |

Thus, while husbands do make contributions to the food budgets, they do not relieve women of the responsibility of buying the basic food ingredients. Their contributions supplement the food purchases made by the women.

#### 4.22 Seasonal differences in food expenditures

In households which cultivate rice one would expect that food expenditures would peak after the sale of paddy. Thus it is hypothesized that in Vele and Widigué (rice) mean expenditures on food in January would be greater than food expenditures during November. This hypothesis is confirmed by the results of one-tailed t-tests presented in Tables 4.2 and 4.7. Both women's food expenditures and total food expenditures are greater in January than in November in both villages. One would also expect that food expenditures made in January would be greater than those made in August. This hypothesis is accepted for Widigué also but is rejected for Vélé. This latter result

can be explained from the residual effect of the income from dry season rice and also by the fact that women whose households did not cultivate dry season rice earned a substantial amount of money working as hired labor. Very few women in Widigué participated in dry season rice cultivation or were engaged as hired labor during the rainy season.

Households which do not cultivate rice must depend on other sources of income. If these sources vary seasonally then one would expect food expenditures to vary also. Women from households in Widigué which do not cultivate rice depend on sales of sorghum for the majority of their income. Thus, these women's food expenditures should increase after the sorghum harvest. As Tables 4.4 and 4.7 demonstrate both women's and total food expenditures are significantly higher in January than in August. Although women's food expenditures made in November are higher than those made in August, the difference is not significant. However, expenditures made in January are significantly greater than those made in November, though the level of significance is not as high as it is between the January and August expenditure means. Women probably prefer to wait until begins to rise before selling off some of their grain.

In Zébé, however, the sources of income for women are more varied and less seasonal than in Widigué (non rice). Women earn substantial sums of money throughout the year from their sales of tobacco. And when the level of the Hogône River begins to drop women can earn as much as a thousand or two thousand CFA a day from fish commerce. Thus, food expenditures in Zébé should not show much seasonal variation. On the basis of the two-tailed tests presented in Table 4.3, there is no significant difference in mean food expenditures made by women or in total food expenditures between months. In August and November, a substantial portion of women's food expenditures is for grain, which confirms that women as well as men purchase grain.

#### 4.23 Intervillage differences in food expenditures

Not only do food expenditures vary by season but they also vary between villages at the same period of the year depending on what income generating activities are available to women in

each village. Although rice is cultivated in both Widigué (rice) and Vélé, food expenditures are significantly higher in Vélé than in Widigué (rice) during the months of August and November. Incomes earned by women in Vélé, however, are not significantly greater than women's income in Widigué (rice). This suggests that women in Vélé were spending money saved from working as hired labor, or saved from what they received from dry season rice and also from sales of sorghum beer. In January, however, there is no difference between the two villages in expenditures made by women, as one would expect since the major source of income at that time is from the sales of rainy season paddy. There is a difference in January, though, between the two villages in total food expenditures. Husbands in Vélé seem to contribute more of their income to food purchases than do husbands in Widigué (rice). Since husbands in both villages receive approximately the same amount on average for their paddy, this result is somewhat curious. Perhaps this is due both to the fact that fish is more readily available in Vélé than it is in Widigué and also that Vélé seems more "modern" than Widigué. There is an active Catholic mission in Vélé, six grades of primary school compared to the two in Widigué and more young men who speak French in Vélé than in Widigué.

As one would also expect, food expenditures made by women and total food expenditures are higher in Zébé than in Widigué (non rice) during the months of August and November when women in Zébé earn money from sales of tobacco and fish commerce. By January, however, women have sold much of their tobacco and fish commerce is tapering off whereas in Widigué (non rice) women are beginning to earn money from sales of sorghum. Thus one would hypothesize that in January, there would not be any significant difference in food expenditures between the two villages. A two tailed t-test shows this to be the case.

villages which cultivate rice do not necessarily have more money available to spend on food, however. The mean income received by women in Zébé from their sales of tobacco over a six month period from July through January was about 25,000 CFA. This is about three times as much as what women

received from their husbands after the sale of rainy season rice. Even if one adds to the cash payment she receives half the value of the sacs which are retained, income from sales of tobacco still exceeds income which women receive from rice. Thus, one would expect that food expenditures made by women in zébé would be greater than those made by women in vélé before the rice harvest but that they would be equal after the rice harvest. As Table 4.11 shows this is indeed the case for November and January. There is no significant difference between the two villages in August, again because women in zébé were forced to sell their tobacco to buy grain and women in vélé had income from dry season rice and from working as hired labor.

Similarly, one would expect that expenditures on food made by households which cultivate rice in Widigué would be less than those made by households which do not cultivate rice in Widigué in November after the sorghum harvest but before the rice harvest. After the rice harvest, however, food expenditures should not be significantly different between the two groups of women. This is confirmed by Table 4.8. Interestingly, however, expenditures on food, both women's and total, are higher among rice cultivating households than non rice cultivating households in August. The major source of income earned by women from rice cultivating households in August was from sales of sorghum. Women from non rice cultivating households, however, sold relatively less sorghum in August. Thus one can hypothesize that the rice which rice cultivating households retain for home consumption enables women to sell off some of their surplus sorghum stock come the rainy season. Another factor is that all the rice cultivating households in Widigué cultivate dry season sorghum but not all the non rice cultivating households do. In any event, women from rice cultivating households are not likely to give up cultivating sorghum when it enables them to sell off surplus sorghum. It also suggests that women from non rice cultivating households do not cultivate appreciably more sorghum than women from rice cultivating households.

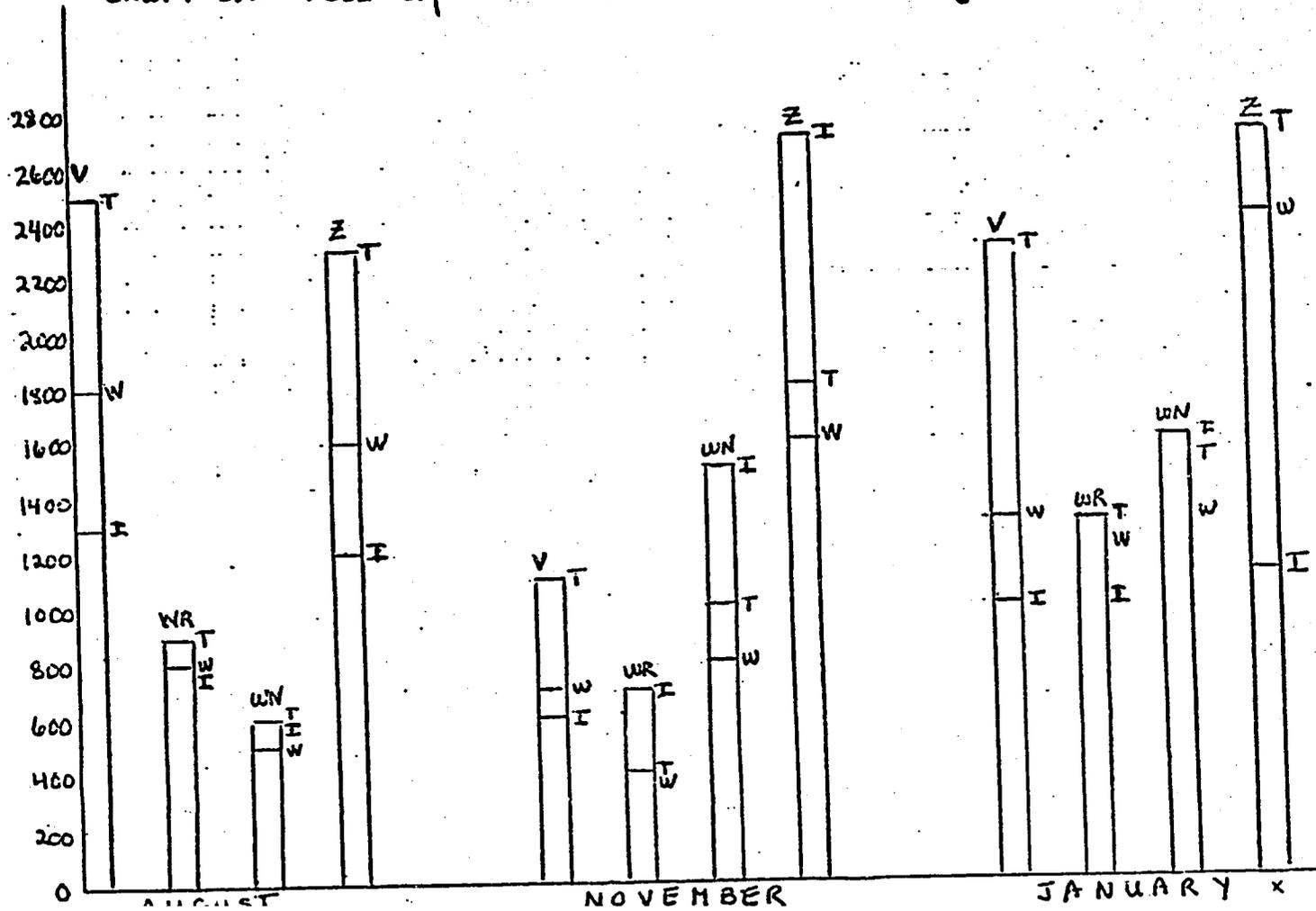
### 4.3 Conclusions

The results of the income and expenditure survey show that the majority of the household's food purchases are made by women. The amount of money which they spend on food is a function not only of how much money they earn per year but also of how those earnings are distributed throughout the year. Sales of tobacco, fish and sorghum provide women from villages which do not cultivate rice with steady incomes which may in some cases be greater than what women from villages which do cultivate rice receive from their husbands for their labor contribution and from working as hired labor. Thus, any plan of action for increasing rice production which does not take into account what the sources of women's income are and the pattern of labor allocation implied therein may fail. Even if the plan succeeds, it may have a negative impact on food consumption. Women who rely on the sales of sorghum which they have produced to provide them with the cash to buy food which adds protein to their diet may be especially reluctant to abandon their sorghum fields. If irrigated sorghum production became possible, it would probably be integrated into the Massa agricultural system in much the same way which rice production has. Women would probably benefit very little by contributing more labor to either the irrigated sorghum or rice production.

If the last three hypotheses which were presented are correct, they suggest that women's participation in rice cultivation would be increased if they controlled a greater percentage of the rice income. Food expenditures most likely would increase also. However, there is very little if anything which SEMRY can do to affect a redistribution of income between husbands and wives. Any attempts to put more income into the hands of women will be frustrated by the right which men have to women's income. What are the prospects then of SEMRY meeting its production goals? Unless there is a major shift in the relative price of sorghum and rice farmers are unlikely to reallocate their time to rice. And even if there were such a shift, the rigidities which currently exist in the distribution of income and obligations to provide food at the intrahousehold

might reduce the favorable impact of an increase in the producer price of paddy. One hope for the future of SEMRY is that women may become increasingly unwilling to contribute their labor if it is not remunerated at its opportunity cost. If women become independent producers in their own right, then they will most likely allocate more time to rice production. Indeed, men are beginning to realize that they stand to benefit if they allow their wives to take on the responsibility of cultivating their own piquets and retain a greater percentage of the earnings. The trend is in the right direction. "It used to be," a woman from Widigué told me, "that we were happy when our husbands gave us two or three thousand CFA after the sale of paddy." "Now," she said, "they know that they have to give us ten thousand X. if they want us to be happy and work hard the following year."

Chart 3.1: Food Expenditures and Income by Village by Month



V = Velé  
 WR = Widigué rice cultivators  
 WN = Widigué non rice cultivators  
 Z = Zébè

T = Total food expenditures  
 W = Women's food expenditures  
 I = Earned income

Table 4.2 Food Expenditures and Income: Vele

|                            | August<br>(n = 42)                     | November<br>(n = 44)                     | January<br>(n = 44)                  |
|----------------------------|--|--|--------------------------------------|
| Women's Exp.<br>Sauce      | x = 1740.98<br>s.d. = 1433.84          | x = 722.38<br>x = 989.74                 | x = 1295.76<br>s.d. = 1692.81        |
| Women's Exp.<br>Grain      | x = 69.33<br>s.d. = 267.21             | x = 0<br>s.d. = 0                        | x = 1.30<br>s.d. = 7.16              |
| Women's Total<br>Food Exp. | x = 1809.95<br>s.d. = 1524.08          | x = 722.38<br>s.d. = 989.74              | x = 1297.06<br>s.d. = 1689.03        |
| Total Food Exp.            | x = 2507.67<br>s.d. = 1957.42          | x = 1130.85<br>s.d. = 1234.91            | x = 2322.26<br>s.d. = 2245.52        |
| Earned Income              | x = 1266.93<br>s.d. = 2622.89          | x = 639.53<br>s.d. = 1485.11             | x = 969.84<br>s.d. = 1758.81         |
| T-tests                    | Aug. vs. Nov.                          | Nov. vs. Jan.                            | Jan. vs. Aug.                        |
| Women's Total<br>Food Exp. | F = 2.37<br>t = 3.90 *<br>d.f. = 69.86 | F = 2.92<br>t = -1.94 **<br>d.f. = 69.34 | F = 1.33<br>t = -1.47<br>d.f. = 84   |
| Total Food<br>Exp.         | F = 2.56<br>t = 3.85 *<br>d.f. = 68.24 | F = 3.31<br>t = -3.08 *<br>d.f. = 66.83  | F = 1.29<br>t = -0.41<br>d.f. = 84   |
| Earned Income              | F = 3.12<br>t = 1.38<br>d.f. = 64.20   | F = 1.40<br>t = -.98<br>d.f. = 86        | F = 2.22<br>t = -.61<br>d.f. = 71.24 |

\* Significant at 5 % level, two tailed test

\*\* Significant at 5% level, one tailed test

Table 4.3 Food Expenditures and Income: Zébé

|                            | August<br>(n = 28)                      | November<br>(n = 30)                     | January<br>(n = 30)                     |
|----------------------------|---|--|---|
| Women's Exp.<br>Sauce      | x = 767.57<br>s.d. = 780.54             | x = 1454.83<br>s.d. = 1439.86            | x = 1524.68<br>s.d. = 2006.80           |
| Women's Exp.<br>Grain      | x = 1035.46<br>s.d. = 2042.70           | x = 85.87<br>s.d. = 281.82               | x = 838.42<br>s.d. = 2984.97            |
| Women's Total<br>Food Exp. | x = 1644.24<br>s.d. = 2176.69           | x = 1594.03<br>s.d. = 1558.36            | x = 2363.10<br>s.d. = 3987.11           |
| Total Food<br>Exp.         | x = 2252.68<br>s.d. = 2852.96           | x = 1773.50<br>s.d. = 1759.73            | x = 2799.60<br>s.d. = 4092.93           |
| Earned Income              | x = 1215.79<br>s.d. = 2510.51           | x = 2680.67<br>s.d. = 4734.77            | x = 1069.73<br>s.d. = 1974.39           |
| T-tests                    | Aug. vs. Nov.                           | Nov. vs. Jan.                            | Jan. vs. Aug.                           |
| Women's Exp.<br>Sauce      | F = 3.40<br>t = 2.28 *<br>d.f. = 45.31  | F = 1.94<br>t = - 0.15<br>d.f. = 58      | F = 6.61<br>t = 1.91 **<br>d.f. = 38.00 |
| Women's Exp.<br>Grain      | F = 52.54<br>t = 2.44 *<br>d.f. = 27.96 | F = 112.19<br>t = - 1.37<br>d.f. = 29.52 | F = 2.13<br>t = - 0.30<br>d.f. = 51.48  |
| Women's total<br>Food Exp. | F = 1.95<br>t = .10<br>d.f. = 56        | F = 6.55<br>t = - 1.37<br>d.f. = 29.52   | F = 3.36<br>t = 0.86<br>d.f. = 45.50    |
| Total Food<br>Exp.         | F = 2.63<br>t = .76<br>d.f. = 44.37     | F = 5.41<br>t = - 1.26<br>d.f. = 39.37   | F = 3.54<br>t = 0.64<br>d.f. = 44.82    |
| Earned Income              | F = 3.56<br>t = - 1.49<br>d.f. = 44.74  | F = 5.75<br>t = 1.72 **<br>d.f. = 39.37  | F = 1.62<br>t = - 0.25<br>d.f. = 44.82  |

\* Significant at 5 % level, two tailed test

\*\* Significant at 5% level, one-tailed test

Table 4.4 Food Expenditures and Income: Widigüe  
Rice Cultivators and Non Rice Cultivators.

|                                  | August                      | November                   | January                      |
|----------------------------------|-----------------------------|----------------------------|------------------------------|
| Women's Exp. Sauce<br>Rice cult. | X = 834.38<br>s.d. = 375.26 | X = 433.33<br>x = 279.46   | X = 1187.33<br>s.d.= 518.11  |
| Non Rice Cult.                   | x = 489.29<br>s.d. = 467.47 | x = 789.29<br>s.d.= 335.23 | x = 1022.50<br>s.d.= 357.68  |
| Women's Exp. Grain<br>Rice cult. | x = 0<br>s.d. = 0           | x = 0<br>s.d.= 0           | x = 0<br>s.d.= 0             |
| Non Rice Cult.                   | x = 50.0<br>s.d. = 128.60   | x = 0<br>s.d.= 0           | x = 332.14<br>s.d.= 854.76   |
| Women's Food Exp.<br>Rice Cult.  | x = 834.38<br>s.d. = 375.26 | x = 433.33<br>s.d.= 279.46 | x = 1187.33<br>s.d.= 518.11  |
| Non Rice Cult.                   | x = 539.59<br>s.d. = 489.18 | x = 789.59<br>s.d.= 335.26 | x = 1354.64<br>s.d.= 1098.06 |
| Total Food Exp.<br>Rice Cult.    | x = 945.63<br>s.d. = 508.81 | x = 433.33<br>s.d.= 279.46 | x = 1270.67<br>s.d.= 475.99  |
| Non Rice Cult.                   | x = 589.59<br>s.d. = 476.44 | x = 967.86<br>s.d.= 329.69 | x = 1501.00<br>s.d.= 1106.64 |
| Earned Income<br>Rice Cult.      | x = 848.44<br>s.d. = 885.03 | x = 682.17<br>s.d.=1068.10 | x = 1000.67<br>s.d.= 718.24  |
| Non Rice Cult.                   | x = 639.29<br>s.d. = 643.94 | x =1527.50<br>s.d.=1085.16 | x = 1574.29<br>s.d.= 799.57  |
| Sample Size<br>Rice              | n = 16                      | n = 15                     | n = 15                       |
| Non Rice                         | n = 14                      | n = 14                     | n = 14                       |

Table 4.5 Food Expenditures and Income : Zébé  
Widowed and Married Women

|                    | August                       | November                     | January                      |
|--------------------|------------------------------|------------------------------|------------------------------|
| Women's Exp. Sauce |                              |                              |                              |
| Widowed            | x = 673.21<br>s.d.= 657.66   | x = 970.71<br>s.d.= 688.27   | x = 1042.50<br>s.d.= 985.86  |
| Married            | x = 783.57<br>s.d.= 432.09   | x = 1602.81<br>s.d.= 730.66  | x = 1610.0<br>s.d.= 1422.30  |
| Women's Exp. Grain |                              |                              |                              |
| Widowed            | x = 715.71<br>s.d.= 739.75   | x = 114.29<br>s.d.= 427.62   | x = 486.79<br>s.d.= 843.59   |
| Married            | x = 1087.50<br>s.d.= 1564.66 | x = 81.25<br>s.d.= 228.67    | x = 900.00<br>s.d.= 2526.39  |
| Women's Food Exp.  |                              |                              |                              |
| Widowed            | x = 1401.79<br>s.d.= 935.44  | x = 1085.00<br>s.d.= 709.78  | x = 1529.29<br>s.d.= 1581.21 |
| Married            | x = 1871.07<br>s.d.= 1457.54 | x = 1684.06<br>s.d.= 858.10  | x = 2510.00<br>s.d.= 3079.75 |
| Total Food Exp.    |                              |                              |                              |
| Widowed            | x = 1426.43<br>s.d.= 920.58  | x = 1085.00<br>s.d.= 709.78  | x = 1536.43<br>s.d.= 1575.06 |
| Married            | x = 2396.07<br>s.d.= 1802.52 | x = 1894.38<br>s.d.= 954.11  | x = 3020.31<br>s.d.= 2980.05 |
| Earned Income      |                              |                              |                              |
| Widowed            | x = 1898.57<br>s.d.= 3829.87 | x = 1000.00<br>s.d.= 1440.09 | x = 1514.29<br>s.d.= 2421.33 |
| Married            | x = 1100.00<br>s.d.= 1931.02 | x = 2971.88<br>s.d.= 3608.46 | x = 906.88<br>s.d.= 1522.99  |
| Sample Size        | Wid. n = 14<br>Mar. n = 14   | Wid. n = 14<br>Mar. n = 16   | Wid. n = 14<br>Mar. n = 16   |

Table 4.6 T-tests : Zébé widowed vs. Married Women

|                            | August                                   | November                                 | January                                 |
|----------------------------|--|--|---|
| Women's Exp.<br>Sauce      | F = 2.42<br>t = - 0.53<br>d.f.= 26       | F = 1.13<br>t = - 2.59 *<br>d.f.= 28     | F = 2.08<br>t = -1.28<br>d.f.= 28       |
| Women's Exp.<br>Grain      | F = 4.47<br>t = - 0.80<br>d.f.= 18.54    | F = 3.50<br>t = 0.26<br>d.f.= 19.27      | F = 8.97<br>t = -0.62<br>d.f.= 18.72    |
| Women's total<br>Food Exp. | F = 2.43<br>t = - 1.18<br>d.f.= 26       | F = 1.46<br>t = - 2.07 *<br>d.f.= 28     | F = 3.79<br>t = -1.12<br>d.f.= 22.99    |
| Total Food Exp.            | F = 3.83<br>t = - 1.79 **<br>d.f.= 19.35 | F = 1.81<br>t = -2.60 *<br>d.f.= 28      | F = 3.58<br>t = -1.73 **<br>d.f.= 23.36 |
| Earned Income              | F = 3.93<br>t = - 0.70<br>d.f.= 25.97    | F = 6.28 **<br>t = - 2.01<br>d.f.= 20.19 | F = 2.53<br>t = 0.69<br>d.f.= 28.00     |

\*Significant at 5% level, two tailed test  
 \*\*Significant at 5% level, one tailed test

Table 4.7 T-tests : Widigé : Comparison between months

|                                | Aug. vs. Nov.                          | Nov. vs. Jan.                             | Jan. vs. Aug.                          |
|--------------------------------|--|---|--|
| <b>A. Rice Cultivators</b>     |  |   |  |
| Women's Food Exp.              | F = 1.80<br>t = 3.36 *<br>d.f. = 29    | F = 3.44<br>t = -4.96 *<br>d.f. = 21.56   | F = 1.91<br>t = 2.16 *<br>d.f. = 25.42 |
| Total Food Exp.                | F = 3.32<br>t = 3.50 *<br>d.f. = 23.89 | F = 2.90<br>t = -5.88 *<br>d.f. = 22.63   | F = 1.14<br>t = 1.84 **<br>d.f. = 27   |
| Earned Income                  | F = 1.89<br>t = .59<br>d.f. = 29       | F = 1.28<br>t = -1.28<br>d.f. = 28        | F = 1.52<br>t = 0.53<br>d.f. = 27      |
| <b>B. Non Rice Cultivators</b> |  |   |  |
| Women's Food Exp.              | F = 2.12<br>t = -1.57<br>d.f. = 26     | F = 10.72<br>t = -1.84 **<br>d.f. = 15.40 | F = 5.04<br>t = 2.54 *<br>d.f. = 17.96 |
| Total Food Exp.                | F = 2.08<br>t = -2.44 *<br>d.f. = 26   | F = 11.27<br>t = -1.73<br>d.f. = 15.29    | F = 5.39<br>t = 2.83 *<br>d.f. = 17.66 |
| Earned Income                  | F = 1.03<br>t = -2.18 *<br>d.f. = 26   | F = 1.84<br>t = -0.13<br>d.f. = 26        | F = 1.78<br>t = 2.62 *<br>d.f. = 26    |

\* significant at 5 % level, two tailed test

\*\*Significant at 5% level, one tailed test

Table 4.8 T-tests : Widigés : Rice Cultivators vs. Non Rice cultivators.

|                         | August                              | November                              | January                             |
|-------------------------|-------------------------------------|---------------------------------------|-------------------------------------|
| Women's total Food Exp. | F = 1.69<br>t = 1.87 **<br>d.f.= 28 | F = 1.43<br>t = -3.11 *<br>d.f.=27    | F = 4.49<br>t = -0.52<br>d.f.=18.23 |
| Total Food Exp.         | F = 1.14<br>t = 1.97 **<br>d.f.= 28 | F = 1.39<br>t = -4.72 *<br>d.f.=27    | F = 5.41<br>t = -0.72<br>d.f.=18.23 |
| Earned Income           | F = 1.45<br>t = 0.59<br>d.f.= 28    | F = 2.84<br>t = -2.53 *<br>d.f.=20.86 | F = 1.24<br>t = -2.04 *<br>d.f.=27  |

\* Significant at 5 % level, two tailed test

\*\* Significant at 5% level, one tailed test

Table 4.9T-tests : inter-village Comparisons ; V616 vs.  
Widig6 Rice Cultivators

|                            | August                                  | November                                 | January                                 |
|----------------------------|---|--|---|
| Women's Total<br>Food Exp. | F = 14.49<br>t = 3.58 *<br>d.f. = 51.52 | F = 12.54<br>t = 1.74 **<br>d.f. = 56.04 | F = 10.66<br>t = 0.38<br>d.f. = 56.73   |
| Total Food Exp.            | F = 15.07<br>t = 4.72 *<br>d.f. = 52.20 | F = 19.53<br>t = 3.49 *<br>d.f. = 53.20  | F = 22.26<br>t = 2.92 *<br>d.f. = 52.29 |
| Earned Income              | F = 8.78<br>t = -0.91<br>d.f. = 55.60   | F = 5.32<br>t = -0.19<br>d.f. = 53.51    | F = 6.00<br>t = -0.10<br>d.f. = 54.96   |

\* Significant at 5 % level, two tailed test

\*\*Significant at 5% level, one tailed test

Table 4.10 T-tests : Intervillage Comparisons : Zébé vs. Widigüe  
Non Rice Cultivators

|                            | August                                   | November                                | January                               |
|----------------------------|--|---|---------------------------------------|
| Women's Exp.<br>Sauce      | F = 2.79<br>t = 1.44<br>d.f. = 38.49     |   | F = 31.48<br>t = 1.32<br>d.f. = 32.74 |
| Women's Exp.<br>Grain      | F = 252.30<br>t = 2.54 *<br>d.f. = 27.43 |   | F = 12.20<br>t = 0.86<br>d.f. = 37.50 |
| Women's total<br>Food Exp. | F = 19.80<br>t = 2.56 *<br>d.f. = 32.05  | F = 21.61<br>t = 2.70 *<br>d.f. = 34.28 | F = 13.18<br>t = 1.28<br>d.f. = 37.01 |
| Total Food<br>Exp.         | F = 35.86<br>t = 3.00 *<br>d.f. = 29.90  | F = 28.49<br>t = 2.42 *<br>d.f. = 33.10 | F = 13.68<br>t = 1.62<br>d.f. = 36.78 |
| Earned Income              | F = 5.52<br>t = 1.04<br>d.f. = 39.37     | F = 19.04<br>t = 2.25 *<br>d.f. = 34.91 | F = 6.10<br>t = 1.20<br>d.f. = 41.52  |

\* Significant at 5 % level, two tailed test

\*\*Significant at 5% level, one tailed test

Table 4.11 T-tests : Intervillage Comparisons : Zébe vs. Vélé

|                            | August                                   | November                                | January                              |
|----------------------------|--|---|--------------------------------------|
| Women's Exp<br>Sauce       | F = 3.37<br>t = - 3.66 *<br>d.f. = 65.81 |   |                                      |
| Women's Exp.<br>Grain      | F = 58.44<br>t = 2.49 *<br>d.f. = 27.62  |   |                                      |
| Women's Total<br>Food Exp. | F = 2.04<br>t = - 0.35<br>d.f. = 44.41   | F = 2.48<br>t = 1.73 **<br>d.f. = 48.09 | F = 5.55<br>t = 0.58<br>d.f. = 40.96 |
| Total Food Exp.            | F = 2.08<br>t = - 0.41<br>d.f. = 44.05   | F = 2.03<br>t = 1.73 **<br>d.f. = 48.09 | F = 3.32<br>t = 0.58<br>d.f. = 40.96 |
| Earned Income              | F = 1.09<br>t = - .08<br>d.f. = 68       | F = 10.16<br>t = 2.30 *<br>d.f. = 32.92 | F = 1.26<br>t = 0.22<br>d.f. = 72    |

\* significant at 5 % level, two tailed test

\*\*significant at 5% level, one tailed test

## NOTES

## Chapter

1. IBRD, Appraisal of the Semry Rice Project: Cameroon, Report No. PA-103, December 29, 1971, p. 17.
2. IBRD, Appraisal of a Second Semry Rice Project: Cameroon, Report No. 1722a-CM, December 27, 1977, p. 37.
3. A total of 60 women were selected from rice cultivating households for the labor allocation survey described in Chapter Four. Sixteen women were selected from Widigué and forty four from Vélé. Selection of villages is described in Chapter Two. Data on the quantity of paddy produced, sold to SEMRY and retained by the household were obtained for each rice field to which a woman in the sample contributed labor and for which the principal cultivator was someone in her household. The average yields (total and commercialized) for all of the household's fields on which she worked was calculated for each woman. The total and commercialized yields given in Table 1.1 for the 1981 rainy season were calculated by averaging the mean household yield for each woman. The total amount of cash received from the sale of the paddy produced on each field was recorded for each of these fields.

The final sample consisted of 57 women. One woman from Vélé was dropped because no one in her household cultivated rice in 1981. Two others were dropped because there were serious doubts about the veracity and accuracy of their responses. Out of these 57 women, 34 cultivated piquets with their husbands, 8 were married women who cultivated their own piquets and distributed the revenue from sales of paddy, 5 were married or widowed women who worked on their son's fields, 9 were widowed women who cultivated their own field and 1 was a married woman who worked on her co-wife's piquet. Where indicated in the text, the total/revenue earned by the principal cultivator and how much he or she distributed to the woman in the sample (or how much she retained) were calculated for these subsamples.

In all cases, the data for Widigué and Vélé were combined after first determining that the difference between the means calculated for each village was not significant at the 5% level using a two-tailed t-test.

4. Andrew B. Sisson and Theodore H. Ahlers, op. cit. (in introduction). The report will hereafter be referred to in the text by the name of its principal author for the sake of brevity.
5. IBRD, Project Performance Audit Report: Cameroon--Semry Rice Project, Report No. 2054, May 12, 1978, p. 11.

## Chapter 2.

1. Andrew B. Sisson and Theodore H. Ahlers, op. cit., p. 20.
2. Harold N. Barnum and Lyn Squire, A Model of the Agricultural Household: Theory and Evidence, (Baltimore: IBRD, 1979).
3. Elon H. Gilbert, David W. Norman and Fred E. Winch, "Farming Systems Research: A Critical Appraisal," MSU Rural Development Paper No. 6, (East Lansing: Department of Agricultural Economics, Michigan State University, 1980), p.13.

## Chapter 3.

1. SEMRY, SEMRY I dans l'ensemble SEMRY: Rapport de Synthèse, Doc. 81-22, Octobre 1981, p. 51.
2. This figure was calculated from labor input data collected by Bikoi Achille (see his research report to be issued by CRED, forthcoming) for a sample of 22 rice fields in Vele.
3. This result is obtained using the same sample described in note 2 to Chapter 3.
4. This result was calculated using a sample of 33 piquets for which there were transplanting data and 24 piquets for which there were weeding data. The 22 piquets described in note 2 to Chapter 3 were the piquets in this sample for which there were both transplanting and weeding data. The 33 piquets were cultivated by compounds chosen for the farm level survey in Vélé.
5. Data for this result were provided by the labor input and wage rates for hired labor for the sample of piquets described in the preceding note.
6. Andrew B. Sisson and Theodore H. Ahlers, op. cit., p. 15 and footnote 3, p. 27.
7. See note 3 to Chapter 1 for source of data.
8. See note 3 to Chapter 1 for source of data.
9.  $x(\text{married}) = 4.36$  and  $s^2 = 11.76$ ;  $x(\text{widows}) = 4.36$  and  $s^2 = 2.70$ .  $t = 0.90$ , not significant at 5% level.
10. See note 3 to Chapter 1 for the source of this data. The following regression equation was estimated:  
 (money received by wife) = .057(money earned by husband) + 4454  
 $r = .041$  and is significant at the 5% level for 30 degrees of freedom.

## NOTED (cont.)

11. Igor deGariné, Les Massa du Cameroun: Vie économique et sociale, (Paris: P.U.F., 1964), p.131.
12. Source for the data is described in note 3 to Chapter 1. The following regression equation was estimated:  
 $(\text{Money given by wife to husband}) = .55(\text{Money earned by wife}) - 7185$   
 $r = .836$  significant at the 1% level for 6 degrees of freedom.

## Chapter 4.

1. SEMRY, SEMRY I dans l'ensemble SEMRY: Rapport de Synthèse, Doc. 81-52, Octobre 1981, p.83.
2. Andrew B. Sisson and Theodore H. Ahlers, op. cit., p.19.
3. Ibid., p. 14.
4. Ibid., pp. 8,9,14.
5. Ibid., p. 16 and the mean of Yagoua market price for sorghum from Oct. 10 through January 21, 1982.
6. Ibid., p.15.
7. In Zébé and Widigué, only compounds which had been included in the survey directed by Sisson were recensused. Thus any calculations using a subsample of his sample should be weighted by the product of the sampling fraction for his survey and the sampling fraction for the survey of women for the villages of Zébé and Widigué. However, to simplify calculation with a hand calculator, the Zébé sample was weighted using the sampling fractions for the subsample, i.e. the fraction of women chosen out of the population of all women in Zébé from compounds selected for Sisson's survey. The justification for this was that the stratification employed by Sisson in Zébé was thought to have little, if any, effect on either women's labor allocation during the period of peak labor demand or on their incomes and expenditures. In Widigué, since the sample is not intended to be representative of Widigué village and since the sample was divided into two groups, women from rice cultivating households and women from non rice cultivating households, the same justification is thought to apply. When the computer analysis is done, the samples will be weighted proportionally to the sampling fractions for both surveys where necessary.
8. An F test was performed to determine if the null hypothesis that the sample variances are equal could be accepted. The criterion was  $F = s_1^2/s_2^2$  where  $s_1^2$  and  $s_2^2$  are the

## OTES (cont.)

sample variances and  $s_1^2$  is greater than  $s_2^2$ .

If the F statistic was not significant at the 5% level, then the null hypothesis that the sample variances are equal was accepted. A t-test was then performed to test the null hypothesis that the population means are equal against the alternative hypothesis that they are not equal. The t value was calculated for the difference of sample means using the pooled variance estimate of the population estimate.

If the F statistic was significant at the 5% level then the null hypothesis that the sample variances are equal was rejected. In that case an approximation to t was calculated to test the null hypothesis that the population means are equal against the alternative hypothesis that they are not equal. The approximation to t was calculated using the following formula:

$$t = (\bar{x}_1 - \bar{x}_2) / (s_1^2/n_1 + s_2^2/n_2)$$

It was evaluated according to the one or two tailed probability values for t with degrees of freedom giving by the following formula:

$$d.f. = \frac{[(s_1^2/n_1) + s_2^2/n_2]^2}{[(s_1^2/n_1)^2/(n_1-1)] + [(s_2^2/n_2)^2/(n_2-1)]}$$

9. Using the data presented in Table 4.5, the following t statistics can be calculated: Nov. vs. August,  $t=1.80$ ,  $d.f.=23.5$   $F=3.49$  (t significant at 5% level using a one tailed test; Nov. vs. Jan.,  $t=2.11$ ,  $d.f.=20.18$ ,  $F=5.61$ . (t significant at 5% level using a one tailed test).