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WOMEN'S LABOUR ALLOCATION AND IRRIGATED RICE PRODUCTION IN NORTH CAMEROON

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Introduction

The way in which labour is mobilized within the household is rarely examined by agricultural economists, yet it has important implications for intrahousehold resource allocation, labour productivity, and welfare. In African farming systems where there is a gender specific division of both financial and material responsibility for family maintenance, a woman may be willing to allocate her labour to a newly introduced cash crop controlled by her husband only if they reach a consensus regarding the distribution of incremental benefits resulting from her contribution. The particular hypothesis examined in this paper is that the extent to which husbands can mobilize their wives' labour depends on the rate of compensation they offer. The rate of compensation would therefore determine to a large degree changes in the pattern of resource allocation and the distribution of benefits within the household.

Anthropologists (Dey; and Guyer) have provided evidence that in certain societies women's labour has indeed been mobilized by their husbands, but only with some remuneration. However, economists have not investigated the relationship between the level of remuneration and the amount of labour women contribute to their husbands' crops which should obtain if women are utility maximizers. The data collected to assess the impact of an irrigated rice production project on women in North Cameroon can be used to explore this relationship in more detail. In the last 8 years, rice cultivation has become an important source of income for farm families in the Yagoua area, most of which are Massa. It supplements sorghum, the traditional food crop.

To provide some background, the next section of the paper describes the Massa farming system, the organization of production, and the disposition of income from rice and sorghum, the two major income generating activities for women in the project area. The third section of the paper tests the hypothesis that the level of remuneration is related to the amount of labour women contribute to rice production. The fourth section discusses some of the shortcomings of the traditional approach, which assumes that the family is a homogeneous decisionmaking unit.

The Massa Farming System

Cropping Calendar

The parastatal SEMRY, which is responsible for all rice production and marketing activities in North Cameroon, determines the date at which transplanting can begin by when it makes seedlings available to farmers. The rains, however, determine when sorghum planting begins. In 1981, the rains did not begin with any regularity until late June. Thus sorghum planting was effectively limited to a 2 week period which partially overlapped with the beginning of rice transplanting. The major conflict between rice and sorghum occurred in late July and in August, when the sorghum crop was being weeded and transplanting was still underway. Rice weeding and sorghum harvesting overlapped in September and October. The rice crop was harvested in November and December.

Women have to choose between transplanting rice and weeding sorghum. In one village, Widigue, where only about a quarter of the households cultivate rice, women who grew only sorghum spent 7 hours a day, 7 days a week, planting and weeding sorghum--in addition to the 3 or 4 hours a day they spent preparing food

and fetching water. Since this is about the minimum amount of time in which these essential tasks can be performed, women are forced to reduce the amount of time they spend on sorghum in order to transplant rice. To confirm that rice transplanting substitutes for sorghum weeding, rice transplanting labour was regressed on sorghum weeding labour for a sample of 37 women from another village in the project area, Vele, where all households cultivate rice:

(1) transplanting labour = 371 - 1.07 (weeding labour)

$$R^2 = 0.54, n = 37, t = 6.39$$

As expected, the coefficient indicates that women make a one-to-one tradeoff between the two crops.

Organization of Production and Distribution of Income

Each woman has a sorghum field near the compound in which she lives. Men also have their own sorghum fields. With the exception of the collective field to which all compound members contribute several days of labour, sorghum fields are cultivated individually. A husband and wife may help each other occasionally, but each is responsible for his or her own field. Both men and women can obtain additional fields, and there is no market for sorghum land.

Each woman stores her sorghum in her own granary. If a woman's sorghum is not sufficient to meet the food needs of the family, her husband will give her some of his sorghum when her supply is exhausted. Women sometimes sell small quantities of grain to buy soup ingredients (usually vegetables, palm oil, etc.) but in general, neither husband nor wife sells grain unless the family has produced a surplus.

Rice cultivation contrasts sharply with sorghum. All the irrigated rice land is owned by the government and is ceded to SEMRY. Farmers can continue to cultivate the same fields as long as they pay the fixed charge which covers the cost of the inputs which SEMRY provides. Both men and women can sign up for rice fields. Irrespective of whose name a field is registered in, however, it is almost always cultivated jointly by a husband and his wives. Even if a field is in a woman's name and she actually sells the paddy to SEMRY, she is obliged to turn over all the proceeds to her husband. He then decides how much he will return to her.

This accords with a husband's traditional right to appropriate any income which his wives earn in excess of what they need to buy food. Women explain this by saying that they belong to their husbands since they have been "bought" by the payment of bridewealth. The bridewealth, paid in cattle, represents a substantial sum of money, about 60,000 CFA², or a household's cash proceeds from about 10 seasons of rice cultivation. A woman knows that she risks being severely beaten by her husband if she does not turn over her income to him. She has little source of recourse, as divorce is quite rare.

The surplus value a husband receives from his wife's labour is substantial. A husband nets on average about 90,000 CFA, including the paddy which he retains. He gives his wife less than a quarter of the proceeds; women receive on average 20,000 CFA, about 8,000 CFA in cash and 12,000 CFA in paddy. The market value of a woman's labour is about 36,000 CFA, so husbands derive a surplus of about 16,000 CFA per wife. When they need cash to buy food, women will occasionally work as hired labour. Men, however, rarely do. In general, households hire little labour, usually only if someone falls sick or if they have the cash resources to cultivate additional fields.

No doubt women benefit from some of the purchases their husbands make with the income from rice. Men invest primarily in livestock, which enables them to acquire additional wives and to accumulate wealth which can be drawn on in

times of need. Women, however, carry the major part of the burden to supply the family with food. Although men do contribute some grain to the household food supply, they expect that their wives will earn the income necessary to buy soup ingredients and make up shortfalls in grain. Only in times of serious food shortage would a husband sell part of his herd. Although a husband and wife benefit from one another's expenditures, they place priority on their own obligations as long as the immediate survival of the family is not threatened. Since the time a woman spends transplanting rice for her husband is at the expense of growing her own sorghum, she would be unwilling to transplant unless she were adequately compensated for the sorghum production she foregoes.

Level of Remuneration and Labour Allocation

This section tests the hypothesis that the amount of labour a woman contributes to her husband's rice crop is a function of the rate of compensation she receives. Interviews with women provided qualitative evidence that labour and receipts are linked. The money and paddy that husbands give to them, women state, are "payment for their sweat." If their husbands give them little or no money without good cause, then women refuse to work on their husbands' rice fields the following year. Thus, there is an established tradition of remunerating a wife for her contribution.

To confirm that a relationship exists between women's receipts and their labour input, the cash value of what women receive from their husbands was regressed on their labour input (in hours):

$$(2) \quad \text{net receipts} = - 6390 + 40 (\text{labour})$$

$$R^2 = 0.54, n = 20, t = 4.57$$

The amount of labour they contribute explains a substantial part of the variation in their net receipts. Moreover, the rate at which they are compensated by their husbands is significantly greater than zero and also significantly less than the average market wage of 57 CFA/hour, even taking into account that women do not incur search costs when working for their husbands.

Would married women allocate more labour to their husbands' rice crops if they received a higher rate of compensation? An indirect means of answering this question is to compare the labour allocation pattern of married women with that of women who are independent rice cultivators. After first excluding all women who had very small children, which would have prevented their working in the rice fields, a sample of 37 women from Vele was randomly selected. Twenty-one of the women were married to men who controlled the disposition of the rice income. The other sixteen were widows whose husbands had no younger brothers or sons by other co-wives to inherit, or were married women whose husbands were sick or very old, cultivated little, and did not control the disposition of the rice income. The women were interviewed every other day about how much time they spent cultivating which crops on whose fields.

The assumption which underlies this comparison is that the utility functions of the two groups of women are identical with respect to how they treat income from sorghum and rice. Since sorghum is the preferred grain for consumption, it might have a premium value associated with it which depends on the number of children a woman has to feed. However, the number of children is not likely to be a factor which would explain the difference in labour allocation between the two groups, since they had the same number. Nor was the amount of sorghum land a factor, since both groups had the same area under cultivation.

Table 1 shows the labour inputs of married and independent women to rice and sorghum during the periods of rice transplanting, weeding, and harvesting. Although both groups spent the same number of hours cultivating at trans-

planting time, independent women allocated more labour to rice than married women. There is not such a great disparity in the time the two groups spent weeding rice, however, and the differences in the amount of time they spent harvesting rice and sorghum probably reflect differences in their prior labour inputs.

A simple optimizing model explains the difference in their labour allocation during transplanting season. Curve ABC in figure 1 represents the value of sorghum production as a function of weeding labour (with area held constant). The compensation women receive from their husbands for transplanting rice, the slope of BD, is assumed to be less than the real returns to their labour, the slope of AE, which independent women receive. The returns to transplanting are assumed to be constant since uncultivated rice land of quality equal to that which is cultivated is generally available in the project area. Thus, if women equate the marginal returns to labour on the two crops, married women will allocate more labour to sorghum than independent women, L_m and L_i units, respectively.

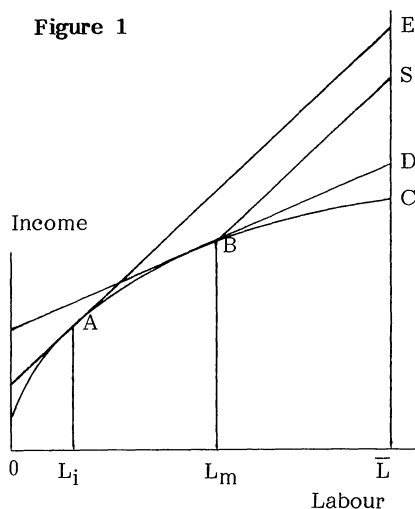


Table 1. Labour Inputs (Hours) of Independent and Married Women

	Period of Rice Transplanting June 20-August 31	Period of Rice Weeding September 1- October 31	Period of Rice Harvesting November 1- December 31
Sorghum (household fields)			
Independent	156 (p=0.11)	36 (p=0.10)	
Married	208	63	
Rice (household fields)			
Independent	317 (p=0.13)	158 (p=0.38)	299 (p=0.11)
Married	257	136	254
Total labour input (all fields, all crops)			
Independent	491 (p=0.79)	239 (p=0.85)	324 (p=0.17)
Married	482	234	291
Labour input (hour/day)	7	4	5

Note: p is the probability associated with the t-statistic used to test the hypothesis that the mean labour inputs of the two groups are equal.

If the assumptions of the model approximate actual conditions, then differences in the labour allocation pattern of the two groups should be reflected in differences in the rate at which their labour is compensated. In particular, since married women spend less time transplanting, but about the same amount of time weeding rice as independent women, the household wage should be less than the market opportunity cost of transplanting but not weeding labour. The household wage rates are obtained by regressing women's net receipts on their labour differentiated by task. Because of problems of multicollinearity due to the high correlation of harvesting labour with transplanting labour, two different regressions were run: one which drops harvesting labour from the regression, under the assumption that the wage rate for harvesting is zero; and the other which combines transplanting and harvesting labour, under the assumption that the wage rates for the two activities are equal.

The results are as expected—the transplanting wage is significantly lower than the market rate, but the household weeding rate is not. The result for the weeding wage rate, though consistent with the labour allocation pattern, is somewhat surprising, since the opportunity cost of women's time would seem to be low as they spend less time on agricultural activities during this period than at any other time of the year. However, there are several factors which may contribute to raising women's reservation wage to the market level. They lose a visible amount of weight during the transplanting season, not only because transplanting is so arduous, but also because they are sometimes too busy or too tired to prepare what little food they have left before the harvest. Once the new crop of sorghum can be eaten, however, women may prefer not to weed but to regain their strength before the exhausting work of hand threshing, which is largely their responsibility, begins. They may also prefer brewing sorghum beer to weeding rice, since sales of beer provide them with cash to buy food, especially fish which are most plentiful at this time of year.

Finally, if the labour input is linked to the level of compensation for any given activity, the higher the rate of compensation, the more labour women should allocate to that activity. It is not possible, however, to regress women's labour inputs on household wage rates since the latter are derived from the regression rather than observed. If the hypothesis is correct, however, a model which assumes that the rates of compensation are not constant should have greater explanatory power than the linear regressions which assume that the intra-household rates are constant for all labour inputs. In fact, regressing women's net receipts on the squares of their labour inputs explains 10 percent more of the variance in net receipts than the linear regression do and, given the positive regression coefficients of the squared labour terms, implies that a higher wage is received for a greater labour input. Thus, both the comparison of married and independent women's labour allocation and the greater explanatory power of a nonlinear regression are consistent with the hypothesis that Massa women allocate their labour according to the amount of compensation they receive.

Conclusions

The view of intrahousehold dynamics presented in this paper assumes that, at the margin, a family member would rather spend an additional unit of income on fulfilling his or her own obligations than give it to the other family members. This is contrary to Becker's assumption that the household contains an altruist who trades off some of his or her own consumption for an increase in that of other family members. In his model, all family members act as if they are maximizing the utility function of the altruist, which then becomes a de facto family utility function. Thus Becker's model provides a theoretical justification of the assumption made by most agricultural economists that the African family is a homogeneous decisionmaking unit which maximizes a joint utility function, despite acknowledgements to the contrary (Cleave). If the division of obligations

for family maintenance is gender specific, however, then there is not likely to be a joint utility function or an altruist in the household. Each household member will meet his or her own obligations under the assumption that others will do the same. Resources will thus be allocated not necessarily to the most productive activities regardless of who actually controls the income streams, but to those activities which best enable individuals to fulfill their obligations given the existing intrahousehold rate of remuneration. It is the intrahousehold rate of compensation and not the market opportunity cost of labour which determines the productivity of women's labour and the intrahousehold pattern of income distribution.

This can be clearly seen by referring to figure 1 again. Assuming that the slope of AE, the real returns to rice transplanting labour, equals the slope of BS, a husband will receive a surplus value of DS units of income from the $L_m \bar{L}$ units of labour his wife allocates to transplanting. Thus, the household receives only $\bar{L}S$ units of income from the woman's labour, in contrast to the $\bar{L}E$ units of income received by an independent cultivator. SE units of income are foregone because women allocate their labour on the basis of the actual returns to their labour which are determined by their husbands. Because sorghum fields are cultivated individually, the loss in income to the married household by the distortion in the opportunity cost of labour cannot be recovered by an underallocation of a husband's time to sorghum to compensate for his wife's overallocation of time.

To conclude, the intrahousehold distribution of income and pattern of labour allocation are best viewed as part of an ongoing process of negotiation between husband and wife. Since most of the income a woman receives is spent on goods which improve her family's as well as her own standard of living and labour productivity (fish or meat for the soup, clothing for herself and her children, medicine, cooking utensils, a pair of plastic sandals for walking to the rice fields, or having grain ground by the village mill), perhaps husbands are becoming more willing to let their wives keep a greater part of the rice income. It may also be that women are becoming more resentful of the fact that they do not get a greater percentage of the income, especially as consumer goods become more available and as they realize that rice cultivation can provide a relatively dependable source of income year after year. Both of these factors may ultimately contribute to raising the level of compensation women receive. "It used to be," said a woman from Widigue, "that a woman was happy if her husband gave her 2,000 or 3,000 CFA a year after the sale of paddy. Now a husband knows he has to give his wife 10,000 CFA if he wants her to work hard the following year."

Notes

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²In December 1981, 300 CFA were worth about \$1.

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OPENER'S REMARKS—Per Pinstrup—Andersen

Following the tradition of economic analysis, few of the papers presented at this conference have disaggregated beyond the household. Yet development has to do with people, not merely households. Growth may be influenced by changes in intrahousehold arrangements, and equity among households need not assure equity among individuals.

As pointed out by the three papers presented here, failure to consider intrahousehold factors may result in erroneous estimates of the impact of policies and projects on growth as well as equity. Thus, the predictive ability of our analyses may be enhanced if we do not stop at the household behaviour per se, but attempt to understand the interactions among individual household members and how they in turn shape household behaviour.

The three papers are highly complementary. Burfisher and Horenstein discuss how sex role differences in the farming household may influence the impact of agricultural projects, and illustrate how a rural development project in Nigeria might be modified to change the impact on women.

Cloud and Overholt assess the current state of knowledge regarding women's productivity in rural households. They then proceed to identify principal deficiencies in past work, highlight the principal issues to be considered in assessing productivity, and suggest a framework for analysis.

Finally, Jones reports on a study of women's labour allocation in irrigated rice production in North Cameroon, with emphasis on testing the hypothesis that the extent to which husbands can mobilize their wives' labour depends on the rate of compensation they offer.

While all three papers focus on various aspects of the role of women in rural households, they do so within the context of household decisionmaking. It is emphasized that the role of women, whether as productive resources or as beneficiaries of development, should be studied as an integral part of analyses of particular problems or issues. This is in contrast to a large number of other studies which often isolate the role of women from the interactions within their environment, and thus frequently do not provide results useful for policymaking.

The papers presented here, on the other hand, provide clear illustrations of how improved understanding of intrahousehold issues can lead to specific suggestions for modifications of rural development projects and related policies. One very clear example of the utility of research on intrahousehold issues for policymaking is provided by Jones' finding of externalities in the allocation of family labour to sorghum and rice in North Cameroon. Under the existing arrangements, the women capture only part of the marginal value product (MVP) from their labour in rice transplanting, whereas they capture the total MVP from sorghum weeding. Since the two activities compete for time, the allocation of time to each will be different from that expected on the basis of a traditional farm firm analysis. A number of other examples are given, including the need to adapt extension to the intrahousehold processes and the correct focus of incentive policies.

If we are to fully understand the policy relevant processes operating within the household, many issues must be resolved. The papers presented here make a significant contribution, but we are still in the initial phases, and a great deal of additional sound research is needed. Much of the available evidence is anecdotal and not of much use for policymaking.

The papers presented here focus on women's productivity. Clearly this is only one aspect of intrahousehold processes. Another equally important aspect relates to women's control of incomes and expenditures. Here again, past research has little to offer, but one may hypothesize that one of the principal reasons why traditional economic analysis is frequently unable to provide a satisfactory explanation of variations in household food acquisition behaviour among equally poor or food deficit households is that it ignores intrahousehold

differences in budget control and marginal propensities to spend. This relates back to the need to replace the traditional household utility functions with a set of individual utility functions and relate these to the bargaining process and individual bargaining positions within the household. Attempts are currently being made to model these relationships (using, for example, Nash bargaining approaches), but existing theory as well as analytical methodology is still deficient.

Let me finish by considering the question of why economists have not paid more attention to intrahousehold relationships. I suggest three major reasons: first, these relationships are not considered to be economic in nature; second, analysis of these relationships may be perceived as an infringement of household sovereignty; and third, it was generally believed that the household decision-making process involved optimizing a household utility function with little or no conflict among household members, or a lack of ability of the household members to express such conflict.

I believe it has been shown beyond reasonable doubt that the intrahousehold processes can play a significant role in determining household resource allocation, expenditure patterns, and the distribution of welfare among individuals. Thus, it is clearly an issue for economic analysis. Regarding household sovereignty, one could argue that a better understanding of intrahousehold processes would provide useful policy guidelines but need not change the processes, thus leaving household sovereignty unaffected. One could, of course, also argue that normative economic analyses which focus on income distribution and welfare should pursue these topics wherever relevant, and that exploitation within households is just as important a research area as exploitation among households or groups of households.

RAPPORTEUR'S REPORT—Katherine McKee

The discussion focussed on three issues: (1) the implications of inadequate understanding of women's production roles within the household, and the resultant need for improved microeconomic analytical frameworks incorporating attention to gender differentials; (2) suggested theoretical and methodological improvements in existing economic models; and (3) means to incorporate community level and intrahousehold power structures in economic analysis, so as to better understand and predict the equity and productivity consequences of gender differentials in decisionmaking and access to resources.

On the first point, discussants concurred that the three papers had set forth the principal problems posed to microeconomic models by our as yet limited understanding of production roles and behavioural determinants below the household level. This shortcoming is not limited to the developing countries; the empirical base in developed countries concerning women's productive roles and intrahousehold variables is also very sketchy. These variables need to be better analyzed, both to improve existing micro level economic models and for policy purposes, to be better able to predict and plan favourable measures to improve the welfare and economic status of particularly disadvantaged target groups, such as women. The consequences of these gaps for farming systems research and design of agricultural projects were described. An inadequate understanding of individual family members' work roles and labour profiles has often contributed to incorrect project design and low participation rates in certain project activities. In these cases, gender differentials in labour constraints impede adoption of project measures, which can introduce serious inequities and divergent productivity between men and women within farming households.

Development planning and research is itself a value laden process; planners' and researchers' own cultural biases (whether within their own societies or others) about the family unit may hinder efforts to disaggregate below the household level, and may shape their assumptions about family composition and

behavioural patterns. Until it is possible to demonstrate with empirical evidence the payoffs of such disaggregation and intrahousehold analysis, efforts to assess determinants of individual family members' decisions may continue to be labelled as western, individualistic, and anti-family, and prevailing myths about women's roles and the family will go unchallenged.

The second part of the discussion focussed on suggestions for revising current microeconomic models to better incorporate attention to gender and intrahousehold variables. A number of problems for economists emerge from the theoretical and empirical issues raised by the papers—inadequate (or under-utilized) tools and methodologies for assessing household labour allocation and decisionmaking, the evidently incorrect assumption implicit in microeconomic models of a unified household utility function, and the dearth of measurement techniques and data on gender differentials in income and expenditure patterns. Adequate attention to some of these variables would require the development of new tools, but others could be approached through modification of existing methodologies, with relatively modest increases in the cost and complexity of microeconomic research. Many of the current criticisms of the social utility function also apply to the household level utility function. Some field research appears to indicate a game theory negotiation process between adult household members to determine labour allocation, income distribution, and investment decisions; application of exchange theories and game models may offer some promise for elucidating intrahousehold behaviour.

Several participants emphasized the need to develop dynamic models of changes in gender assigned production roles and household adjustments to new economic opportunities; the apparent assumption of static gender roles was questioned. Better understanding is needed of the implications of women's life cycle patterns in determining their productive and reproductive roles.

The political and social control elements need to be incorporated into analysis of household decisionmaking and behaviour. More explicit attention within microeconomic theory to power relationships within and between households was urged, including the gender dimension of power differentials. More interdisciplinary research (e.g., the study of the household from a politico-economic perspective) is required; it is only with such theoretical and methodological developments that researchers or policymakers will be able to assess whether intended project beneficiaries (especially when they are disadvantaged sectors of the community or household) can actually capture the benefits.

Overholt responded that in the analysis of power structures, the comparative advantage of economists probably lies in measuring and analyzing the efficiency issues (e.g., the productivity loss and foregone output attributable to unequal male-female access to resources), while suggesting their relationship to equity, political, and social change objectives; in this context, further empirical work on intrahousehold resource access and allocation, for example, would be especially important. Jones concurred with the need for further analysis of power relationships and exploitation within the household, and noted that documentation of specific incidences of such exploitation and distortion of economic decisionmaking (such as that suggested by her North Cameroon data) can be illuminating to economists seeking to improve their models, and to the policymakers and social activists. The payoffs of increased understanding of women's productive roles and of the determinants of gender based productivity differentials may be reaped in terms of equity, efficiency, political stability, or all three.

Participants in the discussion included J. P. Hrabovszky, R. Kada, Michel Petit, Ann Sutoro, Ken Swanberg, and Abraham M. Weisblat (Session Chairman).