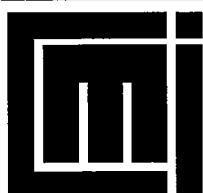


Share-tenancy within the household unit

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Summary:

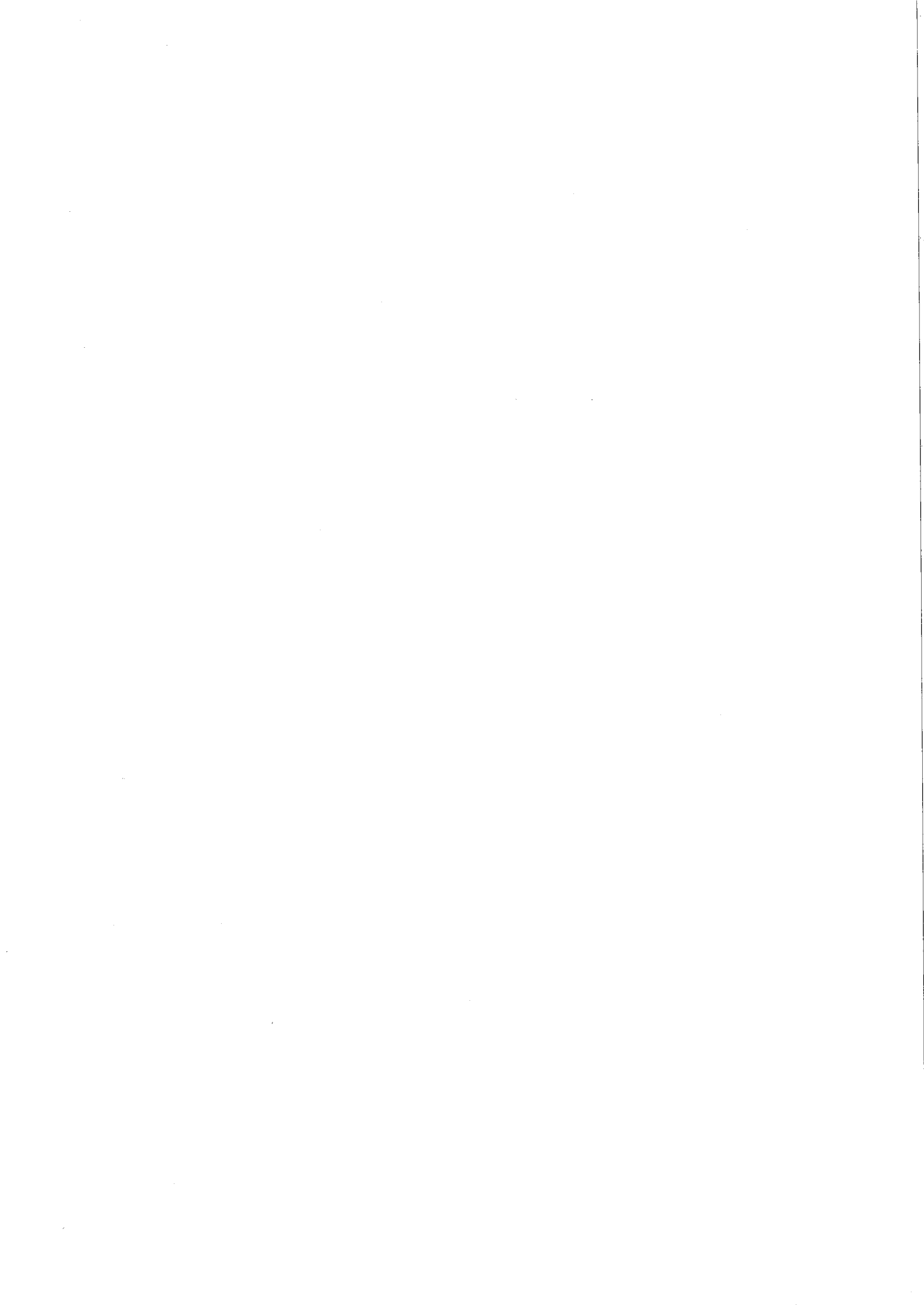
Virtually all peasant household models assume efficient allocation of household productive resources between different household activities. In an African context characterised by different plots of land being cultivated and controlled by different household members, the efficiency assumption has been shown to be incorrect. In order to capture central aspects of African household organisation, this paper introduces the "share-tenancy" household model viewing the husband-wife relationship as a landlord-tenant relationship. The asymmetric relationship existing between husband and wife influences the way they react to changes in exogenous variables and explain the often observed lack of correspondence between changes in producer prices and agrarian output levels. The model also shows how such changes may influence the welfare levels of different household members in various ways.

Indexing terms:

Peasant households
Share-cropping
Gender
Division of labour
Africa

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Introduction*

Economic reform programs in developing countries often contain an element labelled “getting the prices right”. By this is meant removal of regulations etc. which result in distorted price regimes, regimes not reflecting the true alternative cost of resources and products thus giving wrong signals to the actors in the economy. As part of the policy reform taxes are removed and tariffs reduced. The aim is to increase producer prices in order to enhance production and income. There is, however, a widespread recognition that the supply response to the liberalisation of prices have been disappointing (Campbell & Warner, 1997, Evers & Walters, 1998) and that the costs and benefits tends to distribute unequally between men and women (Elson, 1991).

The motivation behind this paper is to provide a possible explanation for the weak supply response in an agrarian African setting, as well as for the variable welfare effects. In order to do so an economic model capturing essential aspects of African peasant households is put forward. Unequal control over resources and conflicting interests among family members are central elements in the model.

Economic theorising on family behaviour normally assumes the family to maximise a common household function. Traditional agricultural household models, of which Singh, Squire & Strauss (1986) is an often quoted example, build upon this assumption and presume all household land and labour to be pooled and utilised according to comparative advantages. As a result the outcome reached is efficient. Within this efficiency approach, no conflicting interests or disagreements exist.

* I would like to thank Urganhan Berkok, Ragnhild Balsvik, Bjørn Sandvik and two anonymous referees for insightful comments. The usual caveats applies.

Nash-bargaining models brought conflicting interests related to intrafamily distribution to attention (Manser & Brown, 1980, McElroy & Horney, 1981). These models addressed distributional conflicts and predicted goods to be distributed between family members according to the bargaining power of the different members. The goods bargained over, however, were assumed brought forward by efficient use of household resources. With regard to production therefore, these models continue to be efficiency models. The same goes for more general collective approaches to household behaviour put forward by Chiappori (1988) and Bourguignon, Browning and Chiappori (1994). With regard to an African context, though, Urdu (1996) shows that the conventional pooling model of household resource allocation is false and that both co-operative bargaining models and the more general model of efficient household allocations are inadequate for describing the allocation of resources across productive activities in the household.

In order to capture the African situation, therefore, non-cooperative models of household behaviour should be considered. Non-cooperative models of family behaviour point to the fact that individual family members have individual rather than family welfare in mind when acting. In deciding upon the control variables under their command, individuals choose the options maximising their individual welfare even though such choices might result in inefficiencies reducing family welfare. Non-cooperative models analysing distributional conflicts within the household encompass the work of Leuthold (1968), Ulph (1988), Wolley (1988) and Koreman & Kapteyn (1990). Non-corporate models incorporating household production as well as consumption include Bragstad (1991), Lundberg & Pollack (1993), (1994) and Konrad & Lommerud (1995a), (1995b). These models assume each household

member to control a given resource endowment (labour, land) he or she individually allocates to private or public good provision. Distribution within marriage depends on these individual resources or the economic value these resources represent for the spouse.

The anthropological literature on agricultural households in Sub-Saharan Africa documents a wide variety of farming systems. Despite the variation however, one outstanding characteristic is for men and women of the same household to grow private plots, controlling the output individually. Household income is usually not pooled. Another outstanding characteristics is that when households produce both for the market and for the family, men usually concentrate on cash-crops and women on subsistence crops. A third characteristic is the gendered labour pattern prevailing, crosscutting the gendered plot structure. This gendered work pattern requires the individual producer to mobilise family or extra household labour in order to grow his/her land. Due to male seniority and the fact that men have ultimate control over land, men are more able to mobilise labour than women. Women on their part are obliged to perform domestic work in addition to their agricultural work. As a result women usually work longer hours than men (Koopman, 1993).

Darity Jr. (1995) present a model of agricultural household production encompassing central characteristics of the Sub-Saharan agricultural household organisation. Men work on the cash crop and seek to maximise their income. They do not contribute to the subsistence sector which is considered "women's work". Women, on the other hand, have a commitment to perform "female tasks" on cash crop land in addition to their subsistence obligations. A higher demand for cash crop will increase the demand

for female labour within cash crop production. The demand is assumed enforced by a combination of acceptance of gender norms, female identification with family interest, some extra income and force. The effect of increased labour input in cash crop production is reduced labour input elsewhere and increased effort intensity. However, given the women's prior commitments to the subsistence sector, there is some minimum input into the subsistence sector which may restrict their supply response to higher demand from the cash crop sector.

Evans and Walter (1998) examine the Darity's model of gender-segregated agrarian society in light of evidence from Uganda. They find that the rural household organisation in Uganda fit several of the stylised facts of the Darity model. They point out, however, that the model's main weakness, which do not appear to fit evidence from Uganda or elsewhere, is the assumed passivity of women as women are presumed to act reactive rather than purposive. They suggest, therefore, to include maximisation of a female objective function and to re-formulate the model in terms of a bargaining framework. From a technical side Campbell & Warner (1997) show that as formulated, there is no internal maximisation solution possible in the Darity model. Part of the reason they see as the man's assumed ability to determine the woman's labour allocation as well as the wage she receive from working the man's cash-crop land. In their view the best solution to this problem would be to model a non-symmetric bargaining process within the household.

Balsvik (1995) apply a bargaining framework to analyse supply reaction within African rural households. She assume, in the same manner as Darty, men and women to control independent plots of land and male cash-crop production to be dependent

upon input of female labour. By applying a bargaining approach she shows that the woman's supply of labour to male cash-crop production depends upon her bargaining power, determined by her fall-back position within marriage and the probability of divorce.

That women act according to own interests rather than passively fulfilling gender ideologies, is evident from many part of Africa. Among the Mossi of Burkina Faso in Western Africa the proverb goes; "women's fields are made at night", indicating the men's prominent role in directing women's labour toward their own fields (Kevane & Gray, 1998). When investigating the women's time allocation through interviewing the women, however, it turned out that the women worked for their husbands approximately one day a week (Kevane & Wydick, 1998). The divergence between ideology and reality reveal that the women have been able to lower their work burden on male land either through bargaining or by utilising the fact that men, due to the gender segregated work, may be unable to control the activities of the women.

In the following a household model characterised by a gendered plot and labour structure is put forward. Men grow cash crops and women food crops. The men control the cash-crop output and the income derived. The women control the food-crop harvest and derive their personal incomes from sales of output exceeding family consumption needs. In contrast to the Darity (1995) approach, our model assume both men and women to act purposively and to maximise their individual objective functions. The main difference between the sexes lies in their access to the productive resource land. Men have ultimate control over all household land, both male and female. This implies that in cases of marriage split up, due to divorce or death of the

husband, women lose their access to household land. The women's inferior access position, however, do not allow men the ability to direct the women's labour power to their liking as such direction require close monitoring. The gender segregated labour pattern prevailing make such monitoring costly.

The share tenancy household model

The fact that household land is a male controlled resource women can gain access to through a man only, combined with few alternative employment opportunities for women in rural areas, gives the man the power to arrange the relationship between the spouses to his benefit. The husband-wife relationship is thus seen akin to a landlord-peasant, or more generally a principal-agent, relationship. The man, due to his control over land, can be considered principal whereas the woman, lacking such control, must be considered agent. Getting married therefore can be seen as the family version of entering into a principal-agent relationship. The conjugal or marriage contract, specifying the terms between the spouses, acts as the family version of the principal-agent contract. As part of this contract, the man delegates a part of his land to his wife (wives), getting the right to be fed by her in return. In addition the wife is obliged to work his plot(s) of land. For this labour supply the woman is compensated by a share of output produced.

The share-tenancy household in this paper is modelled as follows. The conjugal contract gives the woman the right to a part of household land as her private land. On this land she grows grain which either can be sold in the market or used as input in her food production. We have assumed no market for ready made food, requiring all food

to be produced within the household. As compensation for the land the man has the right to a share of his wife's food production. In order to simplify the analysis, the amount of land delegated to the woman and the share of the food belonging to the man is assumed exogenously given, determined by social norms in the society. On the man's plot, cash-crops (cotton, tobacco, groundnuts, rice et. al) are grown for the market. Cash-crop is assumed not consumed by the household. In order for the man to induce his wife to work the cash-crop land, he gives her a share of cash-crop output. The size of this share is controlled by the man. In addition to working the household land and doing domestic labour, the woman can work in the market. The income derived is used to buy market goods, goods the household cannot produce itself. In order to simplify the analysis the woman is assumed the sole producer of both food and cash crop. The man is thus seen as a pure landlord renting out his land in exchange for a share of his wife's output of food and cash-crop.

The model is inspired by West-African intra-household relations observed in rural areas going through developments projects and other modernisation approaches aimed at increasing the degree of commercialisation in the area. In the Gambia a rice project partly initiated by the government transformed the production of rice from subsistence, mainly female controlled crop, to a cash-crop controlled by the men. Rice production, however, continued to be heavily dependent on female labour. In order for the women to be interested in supplying labour, they had to be compensated either by controlling some rice land or by getting a share of the paddy produced.¹ If they received neither, they chose to hire themselves out as wage labourer or concentrated

¹ To control some rice land is equivalent to a share crop system where the woman gets all the output on a share of the land.

on working their dry land crops (Carney & Watts, 1990). For north Cameroon, Jones (1986), pointed out that women, working on their husbands cash crop fields demanded to be paid according to their input of labour and that they, rather than working for their husbands for only nominal compensation, often chose to work on their own less productive food crop fields or to hire themselves as wage-workers for outsiders. Given inadequate registration of labour input in the society, payment according to labour input may in practise imply an output dependent payment scheme. Jones is not clear on this issue, but her demonstration that women in households controlling more cash-crop land received a higher rate of compensation than those whose husband cultivate less such land – for the same amount of time devoted to cash crop production as recorded by Jones– indicate an output related payment scheme. Among the Mossi of Burkina Faso women, married to settlers in a cotton production scheme, were generally compensated by a portion of the cotton harvest when working on their husbands cotton fields (McMillan, 1995). Kevane and Gray (1998) also found that women in cotton producing areas of Burkina Faso were entitled to a share of their husbands cotton production. In addition the women worked their individual land and/or worked as labourer in the market. The literature thus indicate a setting where the woman operate as sharecroppers on their husbands cash crop land - receiving a share of total output as compensation – in addition to working their individual land and/or working in the market.

The literature indicate also a relative permanent land allocation structure where land is delegated according to custom and tradition. In spite of male land ownership their dispositions tend to be circumscribed by social conventions. Changes in land

allocations tend to arise as response to changes in external factors influencing existing conventions. Influential external factors in this respect are governmental initiated development projects and/or high in-migration resulting in increased cash-crop land scarcity. The effect of such changes on the women's access to food-crop land is smaller the more different the types of land required for the two types of production (e.g. dry land- versus swamp land production). The effect is also smaller the more able the women are to substitute loss of food-crop land from within the household with land obtained from outsiders. As land become more scarce, surplus land households become more interested in renting out land to women as women - as opposed to men - cannot claim permanent land rights to land they have grown (Kevane & Gray, 1998). The modifying effect of conventions combined with strategies to keep control over land by renting it out to women as land become more scarce, circumscribe the husbands' ability to choose the amount of food-crop land to delegate to their wives and render the allocation relatively exogeneous.

Within the model presented the focus is on the husband-wife relationship and on the goods produced and consumed within the household. As there is no market for ready made food in the economy, the man's access to food goes through his wife. In such societies, however, the woman's food production (and consumption) may represent more than sheer food access for the man. As feeding the family is a central female responsibility, the amount of food at the women's disposal is often considered an important aspect of a woman's general well-being in the society. Furthermore, as the contract partners in traditional arranged marriages are the families of the spouses rather than the individuals themselves, marriage is in many respects closer to an economic and political alliance between families than a personal alliance between

individuals.² Man and wife may as a result be viewed as representatives of their respective families rather than as independent, isolated individuals. The treatment they receive within marriage will as a consequence become a concern not only for the persons directly involved but also a concern for their respective families. By treating the spouse well, respect and esteem is shown towards his/her kinsfolk. And by showing respect, good relations are established. In many societies good relations to one's affinals are essential in order to raise economic and political support needed to obtain a good living. By treating food production as an indicator of the man's relations to his wife's kin, the amount of food produced influences the man's well-being both directly via his consumption of food, and indirectly via the establishment of relations to his wife's kinsfolk. The importance of kin relationship can be seen by the tendency of women, who hold the opinion that their men do not behave as husbands should, to complain to their fathers and brothers in order to make them intervene. The woman's kinsfolk thus act as an informal court of appeal controlling the terms of the marriage contract and that these terms are adhered to.

Given the share-tenancy framework, the effects of changes in exogenous parameters like crop prices and the wage rate are investigated. We are interested both in how individual producers and households react to changes in the price of labour and male and female products, as well as how individuals and households themselves are affected by these price changes. Due to the fact that agricultural products are

² In rural areas in developing countries arranged marriages are far the most common marriage practise where the families, especially the woman's family, participate in the marriage negotiations on behalf of their daughter/sister.

important export products for many African countries, a better understanding of the mechanisms at work are important also with respect to national income situations.

The rest of the paper is organised as follows. First the woman's and thereafter the man's maximisation problem are presented. When maximising the spouses are assumed to take the structure of the marriage contract as given. They do not contest or bargain over the woman's right to control food-grain land, her duty to feed the family or the man's right to determine the share on cash crop land. Given the husband's and the wife's optimal adaptation, the effects of a change in the price of cash-crop, food-crop and the market wage rate are traced.

The woman

The woman is assumed to maximise her utility function, defined over food, Z^w , market goods, M , and leisure time, l .

$$U = (Z^w)^{\sigma_z} (M)^{\sigma_M} (l)^{\sigma_l} \quad (1)$$

In doing so she has to take into account the fact that only a given amount of the food she produces is consumed by her. Let Z be the total quantity of food produced and $1-r$ the share belonging to the woman.

$$Z^w = (1-r)Z \quad (2)$$

The food is produced by combining given proportions of grain and labour time.

$$Z = aY_{gz} = bl_z \quad (3)$$

where Y_{gz} is the amount of grain used as input in food production and l_z time used to produce food. The time allocated to the different activities leisure, l , food production, l_z , production of cash crop, l_c , and grain, l_g , and time sold in the labour market, l_w , cannot exceed the total amount of time available, L .

$$l + l_z + l_c + l_g + l_w \leq L \quad (4)$$

The income spent on market goods and grain must be smaller than or equal to the income earned by working in the labour market and selling the output from cash crop and grain production.

$$M + p_g Y_{gz} \leq wl_w + (1-s)p_c Y_c + p_g Y_g \quad (5)$$

Total cash-crop production is denoted by Y_c and the price of cash-crop p_c , total grain production by Y_g and the price of grain by p_g . Market goods M is chosen as numeraire and M can alternatively be seen as the money income needed to buy market goods. Equation 5) captures the fact that the woman receives only a share $(1-s)$ of total cash-crop production.

The woman's problem can now be solved through a two-step procedure. First we consider her allocation of time to different income generative tasks and thereafter the allocation of time between market production, production for household consumption

and leisure time. The woman's optimal allocation of labour time to food-crop and cash-crop production, is the outcome of her profit-maximising strategy with respect to food- and cash-crop production.

$$\pi^i \left((1-s_i)p_i, h_i, w \right) = \underset{\{l_i\}}{\text{Max}} (1-s_i)p_i Y_i - w l_i \quad \begin{array}{l} i = c, g \\ s_c = s, s_g = 0 \end{array} \quad (6)$$

Assuming constant returns to scale Cobb-Douglas production functions in cash-crop and food production, $Y_i = h_i^{\alpha_i} l_i^{(1-\alpha_i)}$, the woman's labour-supply functions becomes.

$$l_i = h_i \left(\frac{w}{(1-s_i)p_i} \frac{1}{(1-\alpha_i)} \right)^{\frac{1}{\alpha_i}} \quad (7)$$

The woman's labour supply is a function of the supply of land to cash-crop and food-crop production, h_i , the technology parameter, α_i , and the real wage rate. In cash-crop production this real wage rate will be "tax" corrected, the tax being the share of the output going to the man. The woman's output, Y_i , and profit-functions, π_i , are equal to:

$$Y_i = h_i \left(\frac{w}{(1-s_i)p_i} \right)^{\frac{1}{\alpha_i}} \quad (8)$$

$$\pi^i = \left((1-s_i)p_i (1-\alpha_i) \right)^{\frac{1}{\alpha_i}} w^{1-\frac{1}{\alpha_i}} \frac{\alpha_i}{1-\alpha_i} h_i \quad (9)$$

By combining equations 2), 3) 4) and 5), given 9), the restrictions become one.

$$M + p_z Z^w + wl = m \quad (10)$$

$$\text{where } m = wL + \pi^c + \pi^g \quad \text{and} \quad p_z = \frac{1}{1-r} \left(\frac{p_g}{a} + \frac{w}{b} \right)$$

The price p_z is a price index for food, where the expression inside the parenthesis is an index for the Leontieff technology and $\frac{1}{1-r}$ is a modification resulting from the fact that the woman only keeps $(1-r)$ of Z .

Maximising the women's utility function 1) given the restriction 10), the woman's demand functions for food, market goods and leisure are given by:

$$X_k = \frac{\sigma^k m}{p_k} \quad k = Z^w, M, l \quad \text{and} \quad p_l = w, p_M = 1 \quad (11)$$

The women's demand functions determine her reactions to changes in exogenous variables. As such they influence the man's maximisation problem. The woman's indirect utility function becomes:

$$U^* = m\vartheta \quad \text{where} \quad \vartheta = \left(\frac{\sigma^z}{p_z} \right)^{\sigma^z} (\sigma^M)^{\sigma^M} \left(\frac{\sigma^l}{w} \right)^{\sigma^l} \quad (12)$$

The women's indirect utility function show her maximum achievable utility at given prices, income and production parameters.

The man

In exchange for the use of the land, the husband has the right to obtain a share of his wife's production of food and cash crop. As a consequence, his utility depends on his wife's time allocation. By changing the control parameter under his command, i.e. the tax on cash crop production, s , the man can influence her time allocation.

The man is assumed to maximise his utility defined over his consumption of food, Z^m , and market goods, N , given the restriction that his wife will not dissolve the marriage contract by divorcing him.

$$\underset{\{s\}}{\text{Max}} V = v(Z^m, N) \tag{13}$$

subject to $U^* \geq K$

The constraint is the wife's acceptance condition, given her first order condition for labour allocation. K is the woman's reservation utility level, the utility she can receive by operating outside the marriage context. K is assumed exogenously given.

Since the man's control parameter influences his wife's production of both food and cash crop, he may be unable to secure optimal amounts of both goods and at the same time push his wife down to her reservation utility level. As a result the restriction may not bind. A non-binding restriction reveals that the woman experiences a welfare level above her reservation utility level when married. This being the case, she has no incentive to dissolve the marriage contract. The man will thus not have to take the possibility of divorce into consideration when maximising his utility, but can

maximise his unconstrained utility. Assuming a Cobb-Douglas function, inserting

$Z^m = \frac{r}{1-r} Z^w$ and $N = sp_c Y_c$, the man's utility function is given by;

$$V = \left(\frac{r}{1-r} Z^w \right)^\phi (sp_c Y_c)^{1-\phi} \quad (14)$$

His first order condition for utility maximisation is:

$$\phi \frac{\pi^c}{m} = (1-\phi) \frac{\alpha_c^{-s}}{s} \quad (15)$$

The second order condition is equal to:

$$V_{ss} = \frac{V}{(\alpha_c(1-s))^2} \left[\phi \frac{\pi^c}{m} \left(1 - \frac{\pi^c}{m} \right) - (1-\phi) \frac{\alpha_c^2}{s^2} (1-s) \right] \quad (16)$$

The second order condition is negative given that $\frac{\pi^c}{m} \left(1 - \frac{\pi^c}{m} \right) < \frac{1-\phi}{\phi} \frac{\alpha_c^2}{s^2} (1-s)$

The probability that the second order condition is fulfilled is larger a) the more unequal the woman's income shares, b) the less the man value food as part of his total consumption and c) the larger the production parameter α_c relative to the share s . In the following the fulfilment of the second order condition is assumed.

The first order condition for the man's utility maximisation is equivalent to:

$$\phi El_s Z^m = (1 - \phi) El_s N \quad (17)$$

The first order condition for utility maximisation tells that the optimal tax s is found by equating the subjective value of the percentage reduction in the man's food consumption resulting from an one percent increase in the tax rate s with the subjective value of the percentage increase in his market good consumption brought forward by the same tax increase. The subjective value parameters are the weights assigned to food, ϕ , and market goods, $1 - \phi$, as parts of the man's total consumption.

From 15) it follow that $s \leq \alpha_c$. The intuition is that an increase in s will have two opposing effects on the man's ability to buy market goods. A higher s will increase the man's share of the total income from cash crop production, increasing his buying power. But at the same time it will reduce the woman's supply of labour to cash crop production, reducing the total quantity grown. When $s > \alpha_c$ the negative "production effect" dominates the positive "share effect" resulting in reduced money income for the man. He will thus never choose $s > \alpha_c$.

Should the restriction be binding is the man's control parameter, s , given by the woman's acceptance condition. Solving $U^* = K$ with respect to s , where U^* is given by 12), the restriction-binding tax rate, \bar{s} , is found to be;

$$\bar{s} = 1 - \frac{w \left(\frac{\bar{l}_c}{h_c} \right)^{\alpha_c}}{p_c (1 - \alpha_c)} \quad \text{where } \bar{l}_c = \left(\frac{1}{\delta} K - wL - \pi^g \right) \left(\frac{1 - \alpha_c}{w \alpha_c} \right) \quad (18)$$

The nominator, \bar{l}_c , is the woman's input of labour to cash crop production when her utility equals her reservation utility level. The restriction-binding tax rate \bar{s} is larger a) the smaller the labour input, \bar{l}_c , b) the bigger the input of land, h_c , c) the lower the real wage in cash crop production, w/p_c , and d) the bigger the relative weight of labour input, $1 - \alpha_c$, in the total output of cash-crop production. A lower real wage results in higher profit and higher income. Higher $1 - \alpha_c$ gives higher output per input of labour into cash crop production, and thereby higher income. A higher income gives more room for increases in \bar{s} without the woman reaching her reservation utility level. A small \bar{l}_c on the other hand implies that the woman, for given leisure time and time used to produce food, gets more of her income from sources other than cash crop production. The smaller her income-share from cash crop production, the less is her total income affected by an increase in \bar{s} and the more \bar{s} can increase without violating the restriction. To see when the restriction will be binding we use the fact that the woman's indirect utility function U^* is decreasing in s .

$$\frac{\partial U^*}{\partial s} = -\vartheta p_c Y_c < 0 \quad (19)$$

The restriction is binding whenever the tax rate s^* solving $V_s = 0$, exceeds the tax rate \bar{s} , given by 17). The optimal rate s^* is given only indirectly by the man's first order condition, but situations and parameter values making a binding restriction plausible, can still be traced. First, parameter values resulting in a big \bar{s} make it more plausible for the restriction not to bind. As shown above, a big \bar{s} is more probable the higher

the women's income and the bigger the income share she receives from sources other than cash-crop production. Secondly, a small α_c (making the right hand side of 15) zero for a small s , thus making it optimal for the man not to increase the tax rate any further), will also increase the plausibility of a non-binding restriction. Thirdly, the more the man values food (or relations to affinals) as part of his total consumption, that is the smaller the ratio $\frac{1-\phi}{\phi}$, the higher the probability of a non-binding restriction.

In order to visualise the man's problem, think of it in the following way. The man can be seen as the director of a firm jointly producing the two goods food and market goods. He can thus be seen as facing a transformation curve showing the possible combinations of the two goods given his wife's optimal allocation of labour. The slope of the tangent to a point on the transformation curve is the rate at which one good must be sacrificed in order to obtain one unit more of the other good without varying any of the parameters the woman is facing. This slope is the marginal rate of transformation (*MRT*) given by;

$$MRT = -\frac{Z_s^m}{N_s} = -\frac{Z^m \frac{\pi^c}{m}}{N \frac{(\alpha_c - s)}{s}} \quad (20)$$

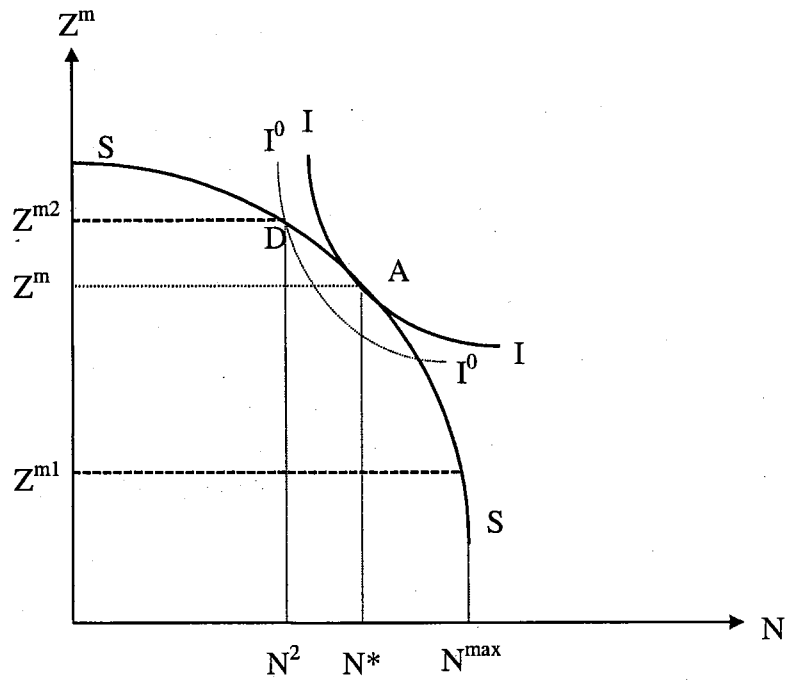
For tax rates exceeding, α_c , the marginal rate of transformation is not defined. The first and second derivative of *MRT* with respect to s is positive, ensuring the transformation curve to be downward sloping and concave. The transformation curve is given by curve *SS* in figure 1.

The man however is not only the director of production, but also the consumer of the produced goods. In order to maximise his utility therefore, the man's objective is to find the tax rate s which results in the transformation curve SS being tangent to his indifference curve Π . This condition is fulfilled in the point where the slope of the transformation is equal to the slope of his indifference curve, given by the marginal rate of consumption MRS .

$$MRS = \frac{V_N}{V_{Z^m}} = \frac{(1-\phi)Z^m}{\phi N} \quad (21)$$

Equating MRT with MRS gives, not surprisingly, the man's first order condition 15). In ordinary market analyses with exogenously given prices, optimum is characterised by the marginal rate of transformation being equal to the marginal rate of consumption which again is equal to the price ratio between the goods in question. Within our household economy therefore, the first order condition can be seen as the man's shadow-price ratio between food and market goods. $MRT = MRS$ is given by point A in figure 1.

Figure 1



By changing the tax rate s the man moves up and down the transformation curve, the maximal $s = \alpha_c$ resulting in N^{\max} . The man, however, might not be able to reach the first best point A. Whether this is possible or not depends upon the action space open to him. The action space is determined by the transformation curve in combination with the woman's participation constraint $U^* = K$, which alternatively can be written $m = \frac{1}{\theta} K$. For given parameter values the woman's reservation income, and thereby her consumption of food, market goods and leisure, are given. And since the man's consumption of food depends directly on the woman's food consumption through $Z^m = \frac{1}{1-r} Z^w$, a binding participation constraint determines the man's food

consumption as well. Based on this fact, the woman's participation constraint is represented in figure 1 by the male food consumption level it requires³.

The participation constraint may or may not bind, dependent upon the amount of food given by the man's first best solution relative to the amount required by the constraint. Assume first that the participation constraint is represented by Z^{m1} . This constraint will not bind because the man is interested in getting more food (better relations to his affinals) than a binding constraint would result in. On the other hand, a constraint represented by a food consumption equal to Z^{m2} will bind. In this case the man would have liked to raise the tax rate further in order to get more market goods and less food but is prevented from doing so because a further increase in s will push his wife beneath her reservation utility level. A binding restriction is represented by point D in figure 1.

Changes in exogenous variables

In this part we want to investigate how changes in exogenous variables affect the productive and consumptive activities of the household, as well as individual welfare. Exogenous variables can change in response to changes in e.g. world market prices or as a function of revised domestic policies. Irrespective of the cause of the change, however, our objective is to investigate how such changes influence household behaviour.

³ As the participation constraint is not related to the Z^m , N space, its exact form in this space is unknown.

We have chosen to analyse changes in the parameters: price of cash-crop, price of grain and the wage rate. These parameters are chosen as they determine the money value of the male controlled cash-crop output, the female controlled grain output and the women's labour time. Given the gender segregated production and consumption pattern within the household, effects due to changes in parameters directly related to male and female activities appear as interesting objects of investigation.

As shown in the previous part, dependent upon whether the restriction is binding or not, two different adaptations prevail. In order to capture the effects of changing parameters therefore, we have to distinguish between the restriction-binding and the non-binding cases.

When the restriction is binding, the man's control parameter, s , is determined by the woman's acceptance condition. Analytically the effect on s due to parameter changes can be found by differentiating the woman's acceptance condition with respect to the parameters in question. These effects, however, are influenced by the assumptions underlying the woman's reservation utility level K . Assuming K constant presumes the woman's reservation utility level to be autonomous and unaffected by changes in the parameters of the model. This specification may cover situations where unmarried women live together with their kin, taking part in their productive activities and receiving goods equal to a socially defined utility level K in return. The alternative to marriage however, may be for women to live on their own selling their labour power in the labour market. In order to feed themselves (and their children) they must buy grain in the market and transform this grain into food by the use of their unpaid labour power. The reservation utility level K will now be influenced by changes in the wage

rate, w , and the price of grain, p_g , as will be spelled out in more detail later. We will denote the two situations 'living with kin' and 'living alone'.

Higher price on cash-crop

We start out by examining the effect of a higher price of cash-crop on the man's share parameter, on household production and individual welfare. First we consider the situation without a binding participation constraint and thereafter the situation when the restriction is binding.

A non-binding participation constraint.

A non-binding restriction reveals that the women's utility level exceeds her reservation utility level. The tax on cash crop production is thus determined by the man's unconstrained first order condition for utility maximisation. The effect of changes in exogenous parameters on the man's share parameter is traced by differentiating his first order condition (15) with respect to the variables in question.

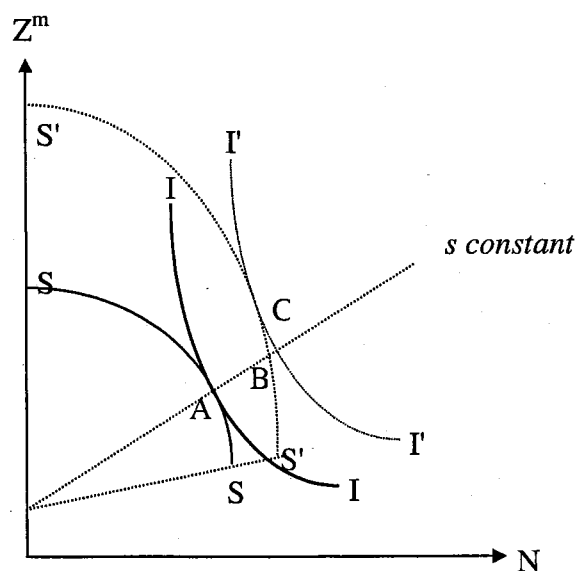
$$\frac{\partial s}{\partial p_c} = (1-s) \frac{Y_c}{m} \left(1 - \frac{\pi^c}{m} \right) \frac{V}{\alpha_c (1-s) V_{ss}} < 0 \quad (22)$$

The effect is negative by the second order condition for an optimum given by eq.16).

When the price of cash-crop goes up, the man's income and thereby his access to market goods goes up as well. A higher price has a direct positive effect on his income by increasing the value of his share of cash-crop output. In addition to this it has an indirect effect through changes in the woman's production of cash-crop. A higher

price increases the woman's profit within cash-crop production inducing her to expand the production. The indirect effect thus reinforces the direct effect, resulting in a further increase in the man's income. Higher profit within cash-crop production increases the woman's income as well. The income increase induces her to demand - and produce - more food. For a given share s therefore the man gets more of both goods. This change is portrayed in figure 2 by the move from A on the original transformation curve SS, to B on the new transformation curve S'S'. For $\pi^c < m$ and s constant, B is given by the intersection between the new transformation curve and a straight line through A with a positive slope and a positive intersection at the Z^m axis (see appendix).

Figure 2.



Due to a higher price on cash-crop both profit, π^c , and income, m , goes up. But since $m = wL + \pi^c + \pi^g$, the woman's income increases relatively less than her profit

