The Women Labor Allocation Dilemma in Organic Cotton Production in Benin: Using a Nonlinear Programming Model for Decision Making

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Abstract

Similarly to most francophone West African countries, the economy of Benin is highly dependent on cotton production. Cotton provides more than 64% of the export income and 24% of the Gross National Product. At micro level, it generates 36 to 41% of household’s income.

The adoption of organic cotton farming by households affects significantly the size of women’s cotton farms. In Central Benin, a typical household has a common farm, which is managed by the husband. The latter provides his wife with a small plot to grow crops of her choice. However, she is required to work prior on the common farm. Cotton farming improves women’s financial independence and women are intended to increase the size of their cotton farm. This trend is subsequent to the adoption of organic farming and constitutes a potential dilemma in the household upon the wife’s labor allocation between her own farm and the common one. The present study shows a model that can guide a concerted resource allocation within a household in Central Benin.

As methodology, a nonlinear programming was used to maximize the household farming income under the constraints of land and labor availability. Two scenarios were analyzed: a) increasing women labor demand in the common farm, and b) increasing land demand by women for their own farm.

The first scenario shows that the optimum household income requires an increase by 30% of wife’s labor in the common farm. However, the corresponding income distribution deepens the gender gap. According to the second scenario, the optimum household income is reached by increasing the share of land used by women from 20 to 50%. This reallocation reduces the gender gap in income distribution. This scenario is achievable only if, in short term, adequate credit facilities are given to women to hire labor and in long term, relevant policy measures are initiated to ease access to land by women. The model indicates also that, to obtain a consensus within household, the wife should allocate at least one third of her labor to the common farm and she should use less than half of total household’s land.

Key words: women labor, household income, organic cotton, Benin

1- Background

Cotton has been introduced in Benin (like in most West African countries) during the colonial period. After the independence, cotton farming helped to build a commercial relationship between the country and the rest of the world. Currently, cotton contributes for 24% to the Gross National Product (GNP) and 64% to the country export revenue. In the world scenario, Benin is the 12th largest cotton exporter (Minot et al., 2002). The successive governments in Benin gave a strong organizational support to the cotton sector (input provision, credit, extension and marketing). Unfortunately, the governmental provisions were gender biased and hence women hardly benefited from both financial and technical supports. Women have limited access to
modern inputs (pesticides and fertilizer) since these are distributed through farmers’ organization, mostly composed of men, curtailing their chances for conventional cotton farming. Few women holding separate conventional cotton farm get access to those inputs through their husbands or other male relatives (VODOUHÈ, 2003). Mostly, women are employed as labour in the cotton farm of their husbands.

Improving condition of women in developing countries through opportunities to raising cash income has been given more attention recently by many scientists and policy makers. Particularly, the structural adjustment programs launched by Word Bank and IMF, early 1980s, are said to favor cash crop farmers who were mostly men (HADDAD et al. 1995). According to IFPRI (2000), projects should be designed to benefit women by enhancing their productivity and earnings alongside those of men. In many rural areas, growing cash crops is one of the very limited possibilities to earn cash income. Therefore, the constraints preventing women from growing cash crops should be levitated. Technologies making use of locally available resources and inputs can help in this regard.

According to TOVIGNAN and NUPPENAU (2005) women as separate farm manager in the context of Benin, make less profitable cotton farming. One major reason explaining this difference of profit could be the social organization of farming activities at the household level in the study area. Generally, the household (consisting of husband, wife and children) has a common farm (for food crops and cash crop), managed by the husband and every member (included the wife) is supposed to provide his/her part of labour on that farm. In addition, the wife is given a small plot of land on which she can grow the crop that she prefers. However, she has to contribute labour to the common farm before working for her own farm. Two basic facts characterize the current model of resource sharing in the study area. Firstly, the patriarchal order of the society denies women the right to access to land by inheritance and as a result, they have to depend, mostly, on their husband or other male family member. Secondly, the husband doesn’t work on his wife’s farm in general but in exceptional cases, especially when the activity is physically demanding such as plowing and spraying.

The adoption of organic cotton affects significantly the size of women’s cotton fields. It improves their financial independence and obviously women would like to increase the size of their cotton fields. This tendency is stronger with the adoption of organic farming as it eliminates different bottlenecks associated with conventional farming. As far as women are concerned it triggers a dilemma in the household over the wife’s labor allocation. Therefore, households adopting organic cotton are more vulnerable for conflict as there is higher chance that it may brood over issue of allocating women’s labor between common and individual farms. This justifies optimization scenarios, which are presented by non linear programming models, developed in organic cotton farming. The main objective, now, is to assess the effect of women’s labor and land allocation on the household income and its distribution. In order to develop acceptable (for both men and women) scenarios which optimize the household income, modeling is needed.

2- Theoretical orientation

Methodologies used to analyze household behavior are based on the so called “unitary model” and “collective model” (HADDAD et al., 1997 and SMITH et al., 1999). The former considers the household as a single person with homogenous preferences over the resources allocation and outputs distribution, while the latter model is based on the assumption that the household is a set of individuals engaged in a cooperation process with heterogeneous preferences. In other words, the collective model, in contrary to the unitary one, expresses the gender specificities in resources allocation and output distribution. Therefore, the collective model is more suitable to analyze the context of the ‘household’ and it is the backbone over which other arguments are built up in the current study.
According to Smith et al. (1999) the separability of preferences of West African spouses' in decision making processes is well established. Jones (1983) found a significant relationship between husband-wife transfers and the time wives allocate on common fields. It has been also observed that, these transfers often arise with the initiation of cash crop production on common farms.

Potential conflicts between men and women in household can stem out from the fact that the wife’s labor allocated to her separate field is a loss of labor and indirectly income for the common farm. Moreover, the increasing involvement of women in cotton production can affect the intra-household allocation of productive resources and the output distribution. So ensuring cooperation between spouses in the household will be essential for efficient use of resources and consequently achieving the maximal income. Alderman et al. (1995) by studying the gender differentials in farm productivity in Burkina Faso, used the production function approach, and found that, women are less efficient than men and that, total household output could be increased by 10 to 20 percent through the reallocation of production factors between men’s (including communal plots) and women’s plots. They concluded that the household income maximization is not achieved in the present conditions. In order to assess the allocation of production factors and income distribution within household in the study area, a non linear model has been formulated.

3- Objective function and constraints in the model

Based on the collective model, the objective function is to maximize agricultural income of the family, expressed as the sum of the income from the communal farm and the one from the wife’s separate field.

Income measures are expressed as gross margins by subtracting the input costs from total returns. Two main constraints, the first related to the land availability and the second to labor availability, are considered in the model. The land constraint assumes that the sum of land area cultivated by the husband and his wife is less than the land available. With regards to the labor constraint, it assumes that the sum of the labor that the wife uses for farming activities in her own as well as the common farm and the labor that other family members (including the husband) allocate for both farms is less than the family labor available.

Scenarios definition and rationale

The wife’s labor contribution to the common farm can be defined as the ratio of the wife’s labor used in the common farm and the total wife’s labor available. In the model, a range of values (above and below the base value) will be assigned to this ratio in order to analyze the corresponding change of family income and its distribution. The value of the ratio which will maximize the family income will be compared to the base value observed during the field study. The rationale of this scenario anchors on the fact that one of the objectives of the study is to assess the impact of the changes in women labor contribution on family agricultural income and its gender wise distribution.

Similar to the labor contribution, the share of land used by the wife for her separate farm is defined as the ratio of the land used for her activities (cotton and maize) to the household’s total landholding. In the model, an increasing range of values will be assigned to the ratio in order to analyze the corresponding change in the family income and its distribution. The value of that will maximize the family income will be compared to the base value observed during the field study. In the light of the analytical results showing that the adoption of organic cotton determines significantly the size of female cotton farm, the above mentioned scenario is useful to assess the impact of land allocation on family agricultural income and its distribution.
4- Results and discussion

In terms of income distribution within household, the first scenario shows three different possibilities.

a) the wife’s income exceeds her husband’s when the wife provides less than 30 percent of her available labor to the common farm. In the current social setup, it may be difficult to achieve such a distribution of income as the men may be loosing the economic dominance. A consensus with such a skewed distribution can be hardly achieved as society views the man’s income as the principal income of the family and women’s as a subsidiary one.

b) the wife’s income is equal to the one of her husband when she provides 30 percent of her labor to the common farm. In other words, the wife requires 70 percent of her own labor available per season to reach the same level of income as her husband but this scenario also has similar limitations as the first one but can be a long-term objective to achieve equality of income distribution.

c) the husband’s income exceeds that of his wife’s as the latter provides more than 30 percent of her labor to the common farm and can be socially acceptable in present circumstances. But, the inequality in income distribution deepens as the wife allocates more and more labor to the common farm. In general (a part from the structure made above), the increase in women labor allocation to the common farm leads to an increase in its income while women farm income goes down.

Considering the family income, one can notice a progressive increase till the maximum point, corresponding to allocation of 80 percent of available women labor to common farm, is reached. The field study data showed that an average of 52 percent of available women labor is allocated to the common farm. It points to the inefficiency of the women farm compared to the common farm and in an economic sense, allocating the women’s labor to common farm is more beneficial. It can be recommended to increase women labor contribution from 52 percent to 80 percent from the economic point of view. But the income gap resulting from this is not favorable to women. The present scenario increases the income distribution gap between the husband and his wife for more than two times (from 41,391 to 102,211 FCFA). This can be possible, in a social point of view, if there is an agreement within the household to reallocate the supplementary income gain.

As a conclusion to this scenario, it is socially acceptable and economically beneficial when the wife’s labor contribution to the common farm is more than 30 percent of her labor available and it is economically optimal when the wife labor contribution to common farm reaches 80 percent of her available labor. For this optimality to be reached there is a need of an agreement within the household upon the distribution of the supplementary income gain.

The second scenario reveals firstly that, due to low profitability, women’s farm can not exceed the income from common farm till 70 percent of household land is allocated to it. Her income is increasing at a less rate than the decrease in income from the common farm. Secondly, if the woman used 70 percent of the household land, her income is equalized to the income of the common farm. Thirdly, if the woman uses more than 70 percent household land, her income is greater than the income from the common farm.

The family income is increasing and reaches its maximum when 50 percent of household land is used by women. The field study showed that women use 20 to 23 percent of the household land. It means that an additional 30 percent of total farm area should be allocated to women’s farm to

\[1 \text{ Euro} = 665.95 \text{ FCFA}\]
reach this maximum. In addition, the distribution pattern while achieving the maximum family income in this scenario is beneficial for women because it reduces the gap between male and female income from 176,069 to 16,850 FCFA.

In conclusion of this scenario, it is advisable that land used by women increased at least to 40 percent of the total area cultivated by the household. A credit policy supporting women may help them to hire labor in order to meet the demand of labor in the additional land without changing the share of their labor to the household common farm.

5- Concluding remarks

The first scenario shows that an increase by 30 percent of wife’s labor in the common farm will result in optimum household income but the corresponding income distribution deepens the gender gap. In the second scenario, the optimum household income can be reached by increasing the share of land used by women from 20 to 50 percent. This reallocation of household’s land reduces the gender gap in income distribution. This scenario is achievable only if, in short term, adequate credit facilities are given to women to hire labor and in long term, relevant policy measures can be initiated to ease access to land by women. It will be a long social process during which household partners will negotiate in order to reach a consensus. Adequate attention must be given to protect the possibility of women to earn income over which they can have control, because of its important social role. Therefore, the model suggests some indicative thresholds for labor allocation and land holding by the wife in an average household. It indicates that, to obtain an economic and social consensus within household, the wife should allocate at least one third of her labor to the common farm and she should use less than 80 percent of total household’s land.

References


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