

SESSION 8
GENDER

A COMPARISON OF BEAN PRODUCTION BY MALE- AND FEMALE-HEADED HOUSEHOLDS IN THE BOSSET AREA, CENTRAL ETHIOPIA

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ABSTRACT

This study looks at gender differentials in bean production among household types, categorised by the gender of the household head, type of family (monogamous or polygamous), and land ownership. Forty households were randomly selected from each of four household types: male-headed with one wife, male-headed with more than one wife, female-headed, and male-headed landless. Data were collected by interviewing household heads using semi-structured questionnaires in the 1999-2000 cropping season. The results showed that more beans are grown by male-headed households, compared to female-headed households, increasing with the number of wives in the household. The proportion of cropland allocated to beans indicates that it is a major crop in the area, in line with teff, maize, and sorghum. In general, ploughing, planting, piling, and winnowing are activities undertaken by adult male family members, whereas weeding, harvesting, transporting, threshing, and storing are commonly done by all family members, including children. Only seed cleaning is done by adult females, even though few households do this. The decision on which bean variety to plant is heavily influenced by the local market, and all household types sell their beans at local markets immediately after harvest, mainly to generate cash. Only a few said that they sell immediately to avoid storage losses. The male-headed landless household type achieved higher productivity, which has implications for existing land-ownership policies. Existing policies result in fragmentation of farms, which will, again, have a negative impact on productivity because the plot size allocated for beans has a positive effect on yield (as do off-farm activities and ox ownership).

RÉSUMÉ

Cette étude examine la problématique homme-femme au niveau de la production du haricot dans le contexte de différents types de famille, caractérisés par le sexe du chef de famille, la composition de la famille (monogame ou polygame) et la propriété de la terre. Quarante familles d'agriculteurs ont été sélectionnées au hasard parmi quatre catégories : famille avec chef de famille de sexe masculin ayant une seule femme, famille avec à sa tête un homme ayant plusieurs femmes, famille dirigée par une femme et famille sans terre dirigée par un homme. Les données ont été rassemblées en interviewant des chefs de famille sur la base d'un questionnaire semi-directif pendant la saison de récolte 1999-2000. Les résultats montraient que le pourcentage de cultivateurs de haricots blancs est plus élevé pour les familles ayant à leur tête un homme (augmentant en fonction du nombre de femmes composant la famille) que pour celles ayant à leur tête une femme. La proportion de terres de culture consacrées au haricot indique que ce dernier représente une culture essentielle dans la région, de même que le teff, le maïs et le sorgho. De façon générale, le labour, l'ensemencement et le vannage sont des activités entreprises par les hommes de la famille, tandis que le désherbage, la récolte, le transport et l'entreposage sont normalement effectués par tous les membres de la famille, y compris les enfants. Seul le nettoyage des semences est exclusivement le fait des femmes adultes de la famille, mais cette activité n'est pas communément répandue. Le choix de la variété qui sera plantée dépend fortement du marché local et toutes les familles, indépendamment de leur composition, vendent leurs haricots sur les marchés locaux immédiatement après la récolte, principalement pour obtenir des revenus qui permettront soit d'acheter des denrées alimentaires soit de payer des salaires. Seuls quelques cultivateurs évoquent les pertes liées à l'entreposage comme raison de cette vente immédiate.

INTRODUCTION

There is a growing recognition of gender-differentiated interactions among welfare, efficiency, and the success of technology transfers. A number of studies have documented differences in productivity between female- and male-headed households (Udry et al., 1995; Quisumbing, 1996; Addis et al., 1999). Other studies have shown gender differences in the adoption of improved technologies (Mwangi et al., 1999). These findings have shown the need to create a gender-disaggregated framework for targeting policy and interventions.

Most of these studies have focused on households, based on the gender of the household head, and implicitly

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viewed the household as having only one set of preferences (the unitary model of households). This assumption has been a powerful tool for understanding household behaviour, such as the distribution of tasks. Moving further, Alderman et al. (1995) argue that more effective policy instruments can emerge from analysing the processes by which households balance the diverse interests of their members (the collective model).

This study looks at the gender differentials in bean production among household types, categorised by the gender of the household head, type of family (monogamous or polygamous), and land ownership. In addition, it attempts to look at the involvement of household members in the production and decision-making processes on the assumption that understanding the specialised tasks within the household and identifying the division of labour by gender will provide a wider understanding of a given farming system as a whole.

THE STUDY AREA

The study was conducted in Bosset *woreda* (the third level administrative unit under the regional state in Ethiopia), which is the major bean-growing area in the central Rift Valley of Ethiopia. The area is semi-arid with rainfall ranging between 600 mm and 800 mm per year and altitude between 1500 m to 1880 m. The major crops are maize, *teff* (*Eragrostis teff*, the major cereal crop in Ethiopia), haricot bean (*Phaseolus vulgaris*, known as the 'haricot bean' in Ethiopia and hereafter referred to simply as 'bean', and sorghum. In the Eastern Shoa zone, where Bosset is located, 6.45% of the cropland was allocated to beans in the 1998/99 cropping season, compared to a 1.62% of national average (CSA, 1999).

In the study area, 78.3% of households were found to be male-headed with one wife, 2.4% male-headed with more than one wife, 7.68% female-headed, and 11.66% landless. The female-headed households sampled became that way because of either divorce or the death of the male spouse. Landless households are those that do not own their own land; all the landless households in the sample were found to be male-headed and not registered as members of the peasant associations (PAs).

METHODOLOGY

Sampling procedure

Multi-stage semi-random sampling was used to select farmers. First, a production area known as Boffa was selected from the *woreda*, based on the level of production (about 52% of the total area allocated to beans in the 1999 cropping season). The four peasant associations in Boffa (Ararso-Bero, Sara-Areda, Kechachule-Guji, and Dire-Degaga) were then sampled further for household type:

- male-headed with one wife (MHoW)
- male-headed with more than one wife (MHmW)
- female-headed (FH)
- male-headed, landless (ML)

Following this, lists of households were prepared for each PA. The list used for collecting land tax provided male- and female-headed households. For landless households, the list was based on key informants and the Ministry of Agriculture development agents (DAs). Informants and DAs also identified male-headed households with more than one wife. Ten households for each household type were randomly selected from each PA, making a total sample size of 160 households. The data were collected by well-trained enumerators using structured questionnaires under strict supervision of researchers.

Analytical framework

A descriptive approach was employed to compare the socio-economic characteristics and gender differentials among household types. Differences in productivity were assessed using a simple multiple-regression model:

$$Y = \alpha + \beta_{Area} X_{Area} + \beta_{Age} X_{Age} + \beta_{Ox} X_{Ox} + \beta_{Off_farm} X_{Off_farm} + \\ + \beta_{MHmW} X_{MHmW} + \beta_{FH} X_{FH} + \beta_{ML} X_{ML} + \varepsilon$$

Where:

Y	= Yield in <i>quintals</i> (100 kg) per <i>hectare</i>
X_{Area}	= Area allocated for beans (in hectares)
X_{Age}	= Age of the household head
X_{Ox}	= 1, if the household owned ox or oxen, 0 otherwise
X_{OFF_farmx}	= 1, if the household head had off-farm activities, 0 otherwise
X_{MHmW}	= 1, if male-headed with one wife, 0 otherwise
X_{FH}	= 1, if female-headed, 0 otherwise
X_{ML}	= 1, if male-headed landless, 0 otherwise
α, β_i	= parameters to be estimated
ε	= a disturbance term with $\varepsilon \sim \text{IID}$

This relation, of course, is not a production function that can map inputs to outputs, determined by biology and the technical efficiency with which inputs are used. Instead, it is a reduced form, which provides a test of the efficiency of the allocation of inputs.

The following assumptions were hypothesised:

1. The size of the area allocated will affect the yield either positively or negatively.
2. Ox ownership will have a positive effect on yield.
3. Age of household head will have a positive effect on yield because experience in production is positively correlated with age.
4. There will be yield difference among household types because they have different resources available and different use-patterns and production constraints.

SOCIO-ECONOMIC CHARACTERISTICS

Household head

Household heads are characterised in terms of age, religion, level of education, and off-farm income (table 1). The average age of the female and male heads of households was similar, about 50 years, whereas the heads of landless household were 29 years old on average. Ninety-five percent of the households were Christian and the remaining, Moslem. All of the heads of households with more than on wife were illiterate, and about 98% of the female heads of households were illiterate, whereas about 75% of the landless heads of households (the younger generation) were illiterate.

The involvement of household heads in generating off-farm income varied among household types: 35% of MHoW, 8% of MHmW, and 20% of female-headed and landless households had off-farm income. The types of activities for generating off-farm income also varied. The main source for MHoW households was selling firewood and for female-headed households it was selling alcohol (table 1).

Household characteristics

Household size

MHmW households had the largest families (the most labour available), followed by MHoW households (table 2). Female-headed households had the smallest families. Except between female-headed and landless households, the differences are statistically significant.

Resource ownership

Table 3 summarises the differences among household types in resource ownership, i.e., type of house owned, number of oxen, and land size. In areas where there is erratic rainfall, the scheduling of farm activities is very important. One of the limiting factors is the availability of oxen, and we found a difference among

Table 2. Characteristics of Household Head

	Household type				
	MHoW	MHmW	FM	ML	Total
Age of household head					
Average in years (Standard Deviation)	49.35 (11.90)	50.90 (10.37)	51.20 (13.54)	28.57 (4.86)	45.01 (14.25)
Religion (%)					
Moslem	5	5	2.50	7.50	5.00
Christian	95	95	97.50	92.50	95.00
Education (%)					
Illiterate	90	100	97.50	75.00	90.06
Off-farm income (%)					
Farmers with off-farm income	35	8	20	20	22
Types of off-farm activities (%)					
Labour	10	—	—	—	3
Trade	5	—	5	10	5
Selling firewood	18	5	2	8	8
Land leasing	2	3	—	—	1
Local alcohol seller	—	—	18	2	5

household types in the number of oxen owned. At 32%, female-headed households had the lowest percentage of ox ownership.

Type of house can be seen as an indicator of wealth: owners of iron-roofed houses are richer than those with a grass-roofed house. Male-headed households with one wife and landless households tended to have grass-roofed houses, whereas about 13% of MHmW and female-headed households lived in iron-roofed houses. For MHmW households, house type refers to the house where the first wife lives. It is a tradition that the first wife is more respected than the other wives. In many cases, there are grass-roofed houses for the other wives near the iron-roofed house.

Table 3. Family Size

	Household Type				
	MHoW	MHmW	FH	ML	Total
Household size	6.25 (2.05)	9.45 (3.19)	3.98 (1.73)	4.18 (1.34)	5.96 (3.10)
Male adult	1.93 (1.00)	1.83 (1.03)	1.00 (0.88)	1.10 (0.30)	1.46 (0.94)
Female adult	1.45 (1.01)	2.63 (1.23)	1.15 (0.48)	1.03 (0.16)	1.56 (1.04)
Children	2.88 (1.45)	5.00 (2.45)	1.83 (1.60)	2.05 (1.15)	2.94 (2.13)

Note: Entries are mean values with standard deviation in parenthesis.

In this study, the female-headed household were those where the household head was either widowed or divorced. In either case, they inherited some wealth from their husbands, which could explain why most of the FH households had iron-roofed houses. Moreover, these households commonly get support from their sons and daughters.

In all household types, there was no division of land among household members. Even in polygamous households land was cultivated jointly.

The average farm size (cultivated and uncultivated land) for each household type is shown in table 3. The difference in farm size between male-headed households (both types) and female-headed households is statistically significant.

GENDER DIFFERENTIALS IN BEAN PRODUCTION

The gender differentials were analysed in terms of the importance of bean growing, cropland allocation, variety preference, family members' involvement in agronomic practices, and differences in productivity among household types.

Importance of growing beans

The percentage of bean growers is higher for male-headed households, compared to the female-headed households, ranging from 58% of female-headed to 85% of MHmW households (table 4).

Table 4. Households Growing Beans and Their Reasons

	Household type			
	MHoW	MHmW	FH	ML
Bean growers (%)	75	85	58	78
Reasons for growing beans				
Beans can be sold for a better price	96	94	100	97
Beans are important for home consumption	90	56	9	73
Beans do not require much labour	7	18	4	17

Table 5. Resource Ownership (Percent of Households)

Number of oxen owned	Household type				Total
	MHoW	MHmW	FH	ML	
0	50	27	68	52	49
1	22	38	15	30	26
2	20	25	12	18	19
> 2	8	10	5	0	6
Type of house owned					
Grass-roofed	100	88	88	100	94
Iron-roofed	0	12	12	0	6
Land ownership					
Average (Standard Deviation)	2 ha (4.27)	2.5 ha (5.37)	1.3 ha (3.03)	1.6 ha (3.94)*	1.9 ha (4.56)

Note: Land is traditionally measured in *kert*, which is approximately equal to 0.25 ha. Amounts shown here are in hectares (converted from *kert*).

*Amount of land under cultivation.

The survey looked at reasons for growing beans; more than 90% of all household types responded that beans could be sold for better price (table 4). This shows that in the study area beans are considered a cash crop. All female-headed households responded that they grew beans because of the better price, compared to other crops.

Land allocation for beans

The proportion of total cropland allocated to beans ranged from 30% to 40% (table 5), indicating that beans are a major crop in the area in line with *teff*, maize, and sorghum. Even though fewer FH households grew beans, compared to the other household types, they allocated a higher proportion of the land they own to beans, mainly because they believe that beans can be sold for a better price than other crops. The MHmW households allocated larger amounts of cropland for beans, compared to the other household types. The differences in mean land size allocated for beans among household types are statistically significant.

Preference for bean varieties

In the study area the decision on which type of bean variety to plant was heavily influenced by the local market. Almost all the interviewed farmers (96%) responded that they preferred to plant the variety called 'Mexican 142' (locally called 'Lemat') due to its higher price at the local market, attributed to its white

Table 6. Percent Cropland Allocated to Beans, Boffa Area, 1998/99 Crop Season

	Household type				Total	
	MHoW	MHmW	FH	ML		
Growers (%)	75	85	58	78	73.75	
Area allocated to beans	≤ 0.25 hectare	17	24	26	23	
	> 0.25 hectare to ≤ 0.5 hectare	47	26	39	29	
	> 0.5 hectare to ≤ 1 hectare	37	32	35	29	
	> 1 hectare	—	18	—	16	
	Average size in hectares	0.6	0.7	0.5	0.7	0.6
	Standard Deviation (SD)	(0.85)	(1.90)	(0.92)	(1.90)	(1.55)
Average share of cropland in beans	0.33	0.30	0.40	0.39	0.33	
Standard Deviation (SD)	(0.19)	(0.14)	(0.19)	(0.16)	(0.14)	

colour. Only 4% of the bean-growing farmers grew local varieties. Local varieties were grown by none of the MHoW households, 60% of the MHmW, 20% of the FH, and 20% of the ML.

In answer to the question, “What is the usual source of seed?” two major sources were indicated: from own stock and from the local market. Forty percent of MHoW, 71% of MHmW, 30% of FH, and 58% of ML households retained their own seed from their own production. The rest bought from the local market at planting time—at a higher price and commonly low quality.

With respect to consumption preferences, the majority of the farmers consumed beans bought from warehouses. These were of low quality and mixed, locally called *megazene* (warehouse). This is because they can buy more in terms of quantity for home consumption by selling a small amount of their own quality beans. The price of *megazene* ranged from 50 to 62 ETB/quintal (US\$6.80 to US\$8.44 per 100 gm, at the exchange of 7.35 ETB = US\$1.00 at the time of this survey).

Household differences in gender division of labour

To compare family members’ involvement in different agronomic practices, family members were grouped into adult male, adult female, and children. Anyone aged 15 years or older was considered an adult.

In general, ploughing, planting, piling, and winnowing are activities undertaken by adult male family members, whereas weeding, harvesting, transporting, threshing, and storing are commonly done by all family members, including children. Only seed cleaning is done by adult females, even though only a few households undertake this activity. A chi-square test was performed to see whether there was a difference among household types in the involvement of family members in each agronomic practice. The results show that there is a significant difference.

Seed cleaning

Seed cleaning is not a major activity. It was done by 45% of ML, 23% of MHoW, 13% of FH, and 12% of MHmW households.

Ploughing

In the majority of households (over 52%), adult males did the ploughing. In FH households, it was done by non-family labour (hired labour or a relative). Twenty-two percent of FH households undertook bean production for a share (production share arrangements are a common practice where a household with excess land or shortage of labour, as in the case of FH households, gives land to a farmer in return for a share of the produce, commonly 50% of production); about 13% of them got labour from relatives without payment. In 38% of male-headed households (both types), children were also involved in ploughing.

The majority (61%) of landless households did not undertake a second ploughing and 35% of FH households did not undertake a second ploughing.

Sowing

Sowing was done by adult males. In about 35% of FH households, sowing was done by non-family labour.

Fertilising

The majority of households did not fertilise their bean fields: 76% of male-headed, 91% of female-headed, and about 58% of ML households. In those households where beans were fertilised, the activity was conducted mainly by adult males with some involvement of adult females.

Weeding

Except for FH households, bean fields were usually weeded. In male-headed households, all family members participated, whereas in the majority of ML households, only adults did the weeding.

Harvesting

Except for FH households, where adult female and male family members and non-family labour did the harvesting, all family members participated in bean harvesting: 47% of MHoW and 65% of MHmW households. In about 84% of the landless households, harvesting was done by adults of both sexes. In about 35% of the FH households, harvesting was done by non-family labour, paid for by a share arrangement for labour and oxen in about 35% of FH households. The rest is from the labour of unpaid relatives.

Transporting

All family members in all types of households participated in transporting harvested beans for threshing, except in landless households, where adult females and males took the responsibility. In female-headed households, non-family labour did in this—as in other activities.

Piling

Piling was an activity done predominantly by adult male members in all household types. In about 22% of FH households, hired labour was involved in piling.

Threshing

There was a significant variation among households, even within each household type, in the participation of household members in threshing. In male-headed households, all household members were involved whereas in FH and ML households, adult members of both sexes took the responsibility.

Winnowing

Adult males in all household types did the winnowing. In male-headed households, children also participated.

Storing

Adult family members did storing, with more participation from male adults. The activity was not undertaken in about 3% of MHoW and about 6% of MHmW households.

Differences in productivity

The average yield in the area was 450 kg/ha, with a huge variation in yield even within each household type: 340 kg/ha for FH, 350 kg/ha for MHoW, 420 kg/ha for MHmW, and 450 kg/ha for ML households (CSA, 1999). The values of the coefficient of variation range from about 125% for FH households to 52% for MHmW. The yield level achieved in the area is far below the level achieved in the zone—or even at the national level—may be due to the rainfall pattern in the area during the cropping season.

Table 6 summarises the variables used to estimate the differences productivity, which are described in terms of their mean value and standard deviation.

The regression estimates revealed that plot size allocated for beans, ox ownership, off-farm activity, and the dummy variable for landless households are statistically significant and have a positive effect on the yield achieved per unit area. Households with larger allocations for beans achieved a higher yield per unit of area. Farmers with an ox or oxen had higher yields per unit area, compared to those without oxen, which is in line with farmers' own assessment of their major production constraint: lack of oxen. Farmers involved in off-farm activities had higher yields than those with no off-farm activity, which could be explained by the greater ability of those who have an off-farm income to purchase inputs.

There was no statistically significant difference in productivity among MHoW, MHmW, and FH households. Landless households had higher productivity than the others, which has implications for existing policies on land ownership. Under the current policy, land cannot be sold or exchanged, which limits the transfer of land to efficient producers. In addition, it causes a further reduction of farm size, as the only way of acquiring land remains inheritance. The fragmentation of farms will have a negative impact on productivity because plot size has a positive correlation with productivity.

Table 7. Yield-Determinant Variables in Bean Production

Description	Mean	Standard deviation
<i>Dependent variable</i>		
Yield (100 kg/ha)	382.83	3.2187
<i>Explanatory variables</i>		
Area allocated to beans (in hectares)**	0.64	0.3871
Age of household head	44.7	14.3828
Ox ownership dummy = 1 if own an ox, 0 otherwise**	0.58	0.4948
Off-farm income dummy = 1 if off-farm income, 0 otherwise**	0.19	0.3911
Household type dummy (MHoW is reference)		
MHmW = 1 if male-headed household with more than one wife, 0 otherwise	0.29	0.4548
FH = 1 if female-headed household, 0 otherwise	0.19	0.3948
ML = 1 if landless household, 0 otherwise**	0.26	0.4419

** Significant at $\alpha \leq .05$.

*** Significant at $\alpha \leq .01$.

GENDER DIFFERENTIALS IN BEAN MARKETING

Markets

Farmers were aware of the cost of transportation to nearby town markets, which equalised the price difference between the town and local markets, so all household types sold their beans in the local market. Household heads undertook the marketing in the majority of the households, except ML households, where selling was done by both female and male adult members of the family. Few households did not sell beans. A chi-square test showed that there was a significant difference in the involvement of family members among household types in selling beans (table 7).

Table 7. Involvement of Family and Nonfamily Members of Bean-Growing Households in Selling Beans

Family and nonfamily members	Household type				χ^2
	MHoW	MHmW	FH	ML	
Adult males	21 70%	21 62%	1 4%	9 29%	122.10**
Adult females	1 3%	1 3%	21 91%	—	
Children	—	—	—	—	
Adult females and males	6 20%	7 21%	—	20 64%	
Adult females and children	—	—	—	—	
Adult males and children	—	2 6%	—	—	
All family members	1 3%	1 3%	—	—	
Do not undertake the activity	1 3%	2 6%	1 4%	2 6%	
Nonfamily members	—	—	—	—	

** Significant at $\alpha \leq .05$.

Almost all the sampled farmers said that they sold beans immediately after harvest to generate cash either for food items or loan settlement. Only a few responded that they sold immediately to avoid storage loss.

Variations in bean price

Since almost all farmers sold beans immediately after harvest, it was not possible to assess price variations over time. But in looking at data over three months, we observed that there was a price difference among household types, with FH households selling at a higher price than other household types. Because all household types grew only one variety (Mexican 142), it is possible to compare price variations among households (table 8).

Table 8. Selling Time and Price Variations among Household Types

	Household type							
	MHoW		MHmW		FH		ML	
Time of sale	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
October	22.60	18.97	22.64	22.12	—	—	19.73	19.15
November	23.92	14.43	23.84	15.29	23.85	8.74	22.85	8.85
December	—	—	—	—	27.21	0.00	21.77	0.00
Total average	23.26	16.99	23.54	17.23	24.49	12.65	22.21	13.62

Note: \bar{X} – average price in US\$/100 kg; SD – standard deviation.
The difference between the price obtained by FH households and other household types is significant ($\alpha \leq .1$).

Statistical tests for the mean price difference between household types show a significant price difference between households except between MHoW and MHmW and between MHmW and FH households.

The reason for FH households getting a better price is that in addition to the time of sale, females tend to sell retail, whereas males sell in bulk. In addition, females have better bargaining abilities and are capable of predicting price variations, even within a single market day.

DECISION MAKING IN BEAN PRODUCTION

Farmers were asked the role of the household head, wife (or wives), and relatives in making decisions, ranging from which variety to plant to the use of the income from bean sales.

All decisions were made either by the household head (HHD) alone or by the HHD in consultation with his wife or wives (table 9). In the majority (over 51%) of MHoW households, decisions were made by the HHD in consultation with his wife, whereas in MHmW households, decisions were made predominantly by the HHD. In FH households, decisions were made by the HHD, except for a few cases where either adult family members or relatives were consulted. In households where production was undertaken under a share arrangement (common for FH households), decisions were de facto made through negotiation, even though the household head de jure claimed that decisions were made by her/him. In ML households, decisions were predominantly made by the HHD in consultation with his wife.

The implication of these findings is that in addressing the issue of transferring improved technologies efficiently, one can see which family members in each household type should be first consulted and convinced. In the case of MHoW and ML households, both the HHD and the wife should be involved in any extension activity concerning beans, whereas in FH and MHmW households, the HHD is the one who should be consulted.

PRODUCTION CONSTRAINTS

Farmers were given a list of production constraints and were asked to identify and prioritise them, taking their own situation into consideration. The result is summarised in Table 10. Ranks were determined based on the highest percentage of households giving the same rank for a constraint. Blank entries imply that the constraint under question was not identified as a production constraint.

Table 9. Decision Making among Household Types in Bean Production (Percent of Households)

Decisions	Household type							
	MHoW		MHmW		FH		ML	
	HHD	Both	HHD	Both	HHD	Other	HHD	Other
Which variety to plant	46	54	78	22	93	8	45	55
Accepting a new variety	46	54	81	19	93	8	45	55
How much to plant	49	51	84	16	93	8	50	50
Which plot to use for each crop	49	51	84	16	93	8	47	53
Whether to use fertiliser	41	59	70	30	93	8	45	55
When to sell	28	72	57	43	93	8	29	71
How much to sell	28	72	57	43	93	8	29	71
For what purpose to use income from sale	28	72	59	41	93	8	34	66

Note: HHD = decision is made by household head alone; Both = both HHD and wife or wives make decisions; Other = HHD and either adult family members or relatives make decisions.

Table 10. Production Constraints and Their Priority among Household Types

Constraints	Household type			
	MHoW	MHoW	FH	ML
Lack of improved seed	2	2	2	2
Shortage of land	—	—	4	3
Shortage of oxen	1	1	1	1
Lack of fertiliser	4	3	5	4
Shortage of rainfall	3	4	3	5

The main production constraint for all household types was lack of oxen, followed by lack of improved bean seed. Labour shortages, problems with disease and pests, and price variability were not identified as constraints. A shortage of land was identified by FH and ML households as a constraint.

The erratic nature of the rainfall pattern in the area makes scheduling of agronomic practices more important. When the rain falls, there is a competitive demand for oxen for land preparation and planting of almost all crops in the area. Therefore, those farmers without oxen cannot time farm activities effectively, which may result in the total loss of the crop.

Due to the nature of subsistence farming and the fear of losses in storage, the majority of the farmers are obliged to buy seeds during planting, which means paying a higher price or accepting lower quality. The Ministry of Agriculture (MOA) has tried to address this problem by providing improved bean seed for selected farmers just for the purpose of seed multiplication. The intention was to buy the seed back from these farmers and sell to other farmers at a fair price. The arrangement was to keep the seed until planting and sell back to the MOA at the price set immediately after harvest, which, because of the price arrangement and the cost incurred in storage, is obviously a disincentive for these farmers.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study looked at the gender differentials in bean production among household types, categorised by the gender of the household head, type of family (monogamous or polygamous), and land ownership. In addition, it attempted to look at the involvement of household members in production and decision-making processes.

The analysis shows a high percentage of bean growers, 57.5% of female-headed to 85% of MHmW households. The proportion of total cropland allocated to beans ranges from 30% to 40%, indicating that beans are a major crop.

In the study area, the decision on which type of bean variety to plant is heavily influenced by the local market demand. Almost all the interviewed farmers said that they preferred to plant 'Mexican 142' because of its higher price at the local market.

There is a significant difference among household types in the involvement of family members in each agronomic activity, which is related to the availability of labour within each household type. In general, ploughing, planting, piling, and winnowing are activities undertaken by adult males. Weeding, harvesting, transporting, threshing, and storing are commonly done by all family members, including children. Only seed cleaning is done by adult females, even though only a few households undertake the activity.

Beans are considered a cash crop in the study area, with more than 90% of the households in all household types saying that they grow beans because they can be sold for better price. All household types sell their beans at the local market rather than nearby town markets because of transportation costs. Almost all the sampled farmers said that they sell beans immediately after harvest mainly to generate cash for food items or loan settlement. Only a few responded that they sell immediately to avoid storage losses. Female-headed households sell at a significantly higher price than other household types because females sell retail (whereas males sell in bulk) and females have better bargaining abilities and are more sensitive to price variations.

All decisions (from which variety to plant to the use of income from bean sales) are made either by the household head alone or in consultation with his wife or wives. In the majority of MHoW households decisions are made by the household head in consultation with his wife, whereas in MHmW households, decisions are tend to be made by the household head alone. In FH households, decisions are made by the household head; in a few cases adult family members or relatives are consulted. In addressing the issue of transferring improved technologies efficiently, one can see from these results which family members in each household type should be first consulted and convinced. In MHoW and ML households, both the household head and the wife should be involved in any extension activity concerning beans, whereas in FH and MHmW households, the household head is the one who should be consulted.

The main production constraint in the area is identified as a lack of oxen, followed by lack of improved bean seed. Female-headed and ML households have problems with land shortages.

The simple multiple regression analysis showed that there is a difference in productivity only between landless and other household types, with higher productivity achieved by landless households. The plot size allocated for beans, off-farm activity, and ox ownership have a positive effect on yield.

The higher productivity achieved by ML households has implications for existing policy on land ownership, prohibits land from being sold or exchanged. This limits the transfer of land to efficient producers and causes further reduction of farm size because the only way of acquiring land is through inheritance.

Recommendations

Most studies on gender differentials are meant to generate information that can assist the formulation of more effective policies to address existing production problems.

In this study, female-headed households were found to have the most limited resource ownership (land and oxen), compared to the male-headed households.

There was no statistically significant difference in productivity between FH, MHoW, and MHmW households, but ML households had higher productivity than the other household types.

Any extension activity regarding agronomic practices in bean production should consider household types, as there is a difference in the involvement of household members in different types of households.

The significant positive effect of plot size on productivity and the higher productivity achieved by landless households implies a need for further study (looking at all crops and livestock) on current land ownership policy and its effect on productivity.

Lack of oxen, which is the major production constraint that had a significant effect on productivity, has to be addressed through better animal-production practices, especially by minimising the death of animals during drought. Formal and informal credit systems should also be encouraged to alleviate the problem.

Even though many improved bean varieties appropriate to the area have been released, farmers predominantly plant “Mexican 142” and stated that varieties other than the local ones were not available. Rigorous efforts should be made to provide farmers with a choice of improved varieties. The Ministry of Agriculture’s effort to provide farmers with improved varieties should be strengthened and the pros and cons of the current seed dissemination strategy should be analysed. A strategy that can provide sustainable economic incentives for seed multipliers should also be designed.

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THE ROLE OF WOMEN IN BEAN PRODUCTION FOR FOOD SECURITY IN SUDAN

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ABSTRACT

In Sudan, it is generally acknowledged that women play a very important role in the production and preparation of food and marketing. The objective of this study was to evaluate the role played by rural women in bean production and to examine the access of rural women to improved agricultural technology. The study revealed that the contribution of rural women to bean production is significant. They work as farm owners, partners, and farm labourers and are involved in planting, weeding, and harvesting. The participation of women in these activities is an indication that the users of a technology need to be considered. The study also showed that the adoption of production technology by women farmers is satisfactory and comparable to that of male farmers. Despite this fact, there is a need for more extension targeted to women by female extensionists to help increase production and, thus, food security in Africa.

RÉSUMÉ

Au Soudan, il est généralement reconnu que les femmes jouent un rôle très important dans la production des cultures vivrières. Elles mènent à bien le processus de production, la préparation de la nourriture et la commercialisation. La présente étude avait pour objectif d'évaluer le rôle joué par les femmes rurales dans la production du haricot et d'examiner l'accès de ces femmes aux technologies agricoles améliorées. Elle a révélé la contribution importante des femmes rurales à la production du haricot, celles-ci travaillant en tant que propriétaires d'exploitation, partenaires ou employées agricoles et prenant part au semis, au désherbage et à la récolte. La participation des femmes à ces diverses opérations implique la nécessité de les prendre en considération en tant qu'utilisatrices des technologies. L'étude montrait également que l'adoption de la technologie de production par les femmes agricultrices est satisfaisante et comparable à celle des agriculteurs. Il est toutefois nécessaire d'intensifier la vulgarisation axée vers les femmes par des agents de vulgarisation féminins afin d'aider à augmenter la production et, de cette manière, la sécurité alimentaire en Afrique.

Key words: *Bean, adoption, extension, food security*

INTRODUCTION

Agriculture is the backbone of the Sudanese economy, contributing significantly to the gross domestic product—30% to 40% over the last decade (Bank of Sudan, 1999). It is also the main source of foreign exchange earnings. Agriculture employs about 70% of the population and provides livelihoods for almost all rural people. In addition, it provides raw material for all processing industries.

The contribution of women to agricultural production in the Sudan is substantial—a claim supported by statistical evidence. However, this contribution has varied from one area to another depending on variations in socio-cultural and economic factors (Ahmed, 1992). Modernisation is often a factor that reduces women's contributions to agriculture (Basher, 1987).

OBJECTIVES AND METHODOLOGY

The objectives of this study were to explore the role played by rural women in bean production and examine the access of rural women to improved agricultural technology. The study aimed to identify the main agricultural activities in which women participate and to quantify the time spent in the field. The methodology was an exploratory survey to collect primary and secondary information on the role of women in the production of common beans (*Phaseolus vulgaris*) in the Sudan. The field survey was conducted on a

random sample of 40 female farmers in the 2001 production season in the public and private pump schemes in the Nile River State (for dry beans) and in Khartoum State (for exported green beans).

THE ROLE OF WOMEN IN AGRICULTURE

As females constitute more than 49 percent of the Sudanese population, they can play a great role as a labour force in various part of the country (UNFPA/CBS, 1999). Sudan's 1993 census showed that an average of 25% of the female population were economically active, compared to 71% of males. However, the census underestimates women's economic productivity, and there is a wide range of regional differences. A high percentage of active females was reported in the states of Darfur (58.5%) and Kurdofan (45.9%) in western Sudan due to the participation of women in traditional agricultural activities (1993 Census). In addition to household activities, they have to fetch water and fuel-wood, which are very time consuming. Thirteen percent of females in Khartoum State are economically active, 13.7% in the eastern states, 10.5% in the central states, and 6% in the northern states.

The role of women in agriculture in Sudan is generally acknowledged. In addition to the significant role they play in agricultural production, women also prepare food and do the marketing. They are actively involved in the production of vegetables for both local consumption and export, providing support and livelihood for their families. Women's activities extend throughout food production and processing. However, the role of women is hardly mentioned and they lack access to the means of production.

PRODUCTION OF THE COMMON BEAN IN SUDAN

The common bean is one of the most important food legumes in the Sudan, consumed in almost all parts of the country as a major source of low-cost protein for the middle- and low-income segments of the population. Production is mainly concentrated in the Nile River State, particularly in the Barbar-Damar and Shendi-Salawa areas, taking advantage of the relatively cool winter compared to the rest of the country. The area planted to the common bean was about 14,400 ha in the 2000 season. To meet rising consumption demands, the dry bean was imported from Ethiopia, resulting in a decrease in the cultivated area to 5250 ha in the 2001 season in the Nile River State.

In Khartoum State, green beans have been cultivated on small private farms along the Nile River and in intensive production in large farms for export. Sudan imported about 27 tons of green beans in 1997 (valued at US\$ 31,000) but it also exported about 903 tons of green beans to European countries in 1998.

The dry bean varieties include Sarrag, RO2/1, Basabeer, Giza, and traditional varieties, whereas the green bean varieties include bobby beans, fine beans, extra-fine beans, Giza-3, haricot, and needle beans. The average productivity of dry beans in the Nile River State is about 2.0 tons/ha, which is lower than that of other bean-producing countries. The major factors responsible for low productivity are (1) low yields of traditional varieties, which are susceptible to pests and diseases, (2) poor management practices, (3) inadequate control of weeds and pests, and (4) inadequate credit and marketing facilities and traditional crop-sharing arrangements, which often prevent adoption of improved production technologies because of a conflict of interest with tenants, land owners, and owners of water pumps. The average productivity of green beans in the Khartoum State ranges between 5 tons/ha and 10 tons/ha.

Research on common beans has been going on in Hudeiba Research Station, with a focus on improving the productivity and quality of the crop through plant breeding and crop husbandry. Improved varieties (with a significant increase in yield) have been developed but their dissemination to farmers is still slow. It is evident that yields could be considerably increased if improved technologies are adopted. Self-sufficiency is within reach provided that inputs are secured in a timely way and more farmers adopt the improved technologies. Thus, it is necessary to strengthen extension and expose more farmers to the package of improved practices.

The farming systems where the common bean is produced are characterised by a system of crop sharing that involves the pump owner (known as the 'scheme owner') and sharecroppers (who may or may not own the land). The production relationships between the two parties are based on resource participation. The pump owner is responsible for providing water, while the sharecropper provides labour for field operations. Other inputs are shared according to specific percentages, depending on the input, and the produce is equally shared. These traditional production relationships create conflicting perceptions about the use of new technologies if they alter the pre-existing shares. The irrigation regime illustrates this well: farmers, who have limited control of the level of water they receive, might like to adopt a higher irrigation level, but the

pump owner, who has full control of the water (and who is solely responsible for the cost of irrigation water), would prefer the lower technology level.

THE ROLE OF WOMEN IN BEAN PRODUCTION

Women are economically important members of their households and they usually have multiple economic roles, dividing their time between home and farm activities. These unpaid activities are very time consuming and make a vital contribution to the economy of poor rural households. Although women carry out heavy duties and responsibilities, ensuring the food security and nutritional well-being of their households as well as that of the extended family, they do not get the recognition and opportunity to improve their status, develop their skills, or change their position. Apart from land preparation (which is carried mechanically) and irrigation (which is dominated by men because of the physical nature of the work), all other agricultural activities are performed by women. In the Nile River and Gezira States, women are involved in the planting, weeding, and harvesting of dry beans.

Women are not paid for weeding; they do it to feed their animals and sell their milk. In harvesting, women represent 50% of the labour force. They are not paid in cash; they only take part of the hay for their animals, in addition to some produce. In Gezira State, they did these activities because the common bean is a family crop. In Khartoum State, women also participate in grading and packing produce (green beans) for export. Women make up the entire labour force in green-bean production because they accept lower wages than men. Also, women can exert more effort and such a crop demands intensive activity. Men receive higher wages for less-demanding activities, such as fodder production. At the time of our survey, the daily wage of women in Khartoum State ranged between SD 200 to SD 300 (approximately US\$0.80 to US\$1.20). The majority of the working women were above 35 years of age. Sixty-two percent of the working women in Khartoum State were married, 17% divorced, 14% single, and 7% widowed. Many of them are displaced persons. With respect to their education, the survey indicated that about 77% of them were illiterate while 23% of them had an elementary education (Ishtiag, 2000).

The survey showed that the adoption of production technologies by women farmers is satisfactory and comparable to that of male farmers. Their work during harvesting green beans is appreciated and outweighs that of men. They work as farm partners in the Gezira and Khartoum states and as farm labourers in the Nile River and Khartoum states. In green-bean production, women are expected to spend about 38 working days in the field, planting, replanting, thinning, weeding, harvesting, grading, and packing.

IMPORT AND CREDIT POLICY

Producers complain about imports and claim that large quantities traded through the Ethiopian border have disrupted the crop supply and prices. Imports have increased the market supply, leading to a drop in prices and directly affecting the cropped area and, finally, the women workers. Policymakers should consider regulation of imports and border trade with respect to the level and timing of imports in relation to the domestic supply so that a stable supply and prices can be attained. It could be observed that following the adoption of the new open-market policies and their implications for credit and pricing policies and, in the absence of appropriate policies to alleviate their negative effects, the policy environment does not encourage the use of higher technology.

The farming systems under which the common bean is produced are characterised by small private pump schemes, which, for long time, enjoyed subsidised credit and inputs. Following the enforcement of the open-market policies in the early 1990s, new finance policies were adopted by the Agricultural Bank of Sudan and commercial banks. These new policies require credit to be extended only to farmers with bank accounts, and the level of credit is proportional to the size of the customer's deposits. Most producers have no savings to deposit and are therefore ineligible for credit. This has negatively affected farmers' access to and use of technologies, resulting in lower adoption levels. Farmers attributed the decreasing trend in adoption levels of technology, particularly the irrigation regime, to the high cost of production, unavailability of inputs, and lack of credit, which are all related to the set of policies discussed above. Farmers may also cultivate the common bean with no tillage because of the lack of tractors (in some cases) and with the objective of decreasing production costs (in most cases).

The issue of women farmers and their access to technology is complex. Despite the fact that women are involved in the planting process, they do not receive extension services. This is partly because of cultural

restrictions that prevent extension officers from meeting women farmers and domestic responsibilities that limit women's mobility, making it harder for them to attend meetings and courses away from home.

With respect to credit, many women are unable to meet the collateral required by the bank to get credit. Very few women own land or have deeds of ownership to physical property such as homes. Such deeds are always in the names of men. So, their limited access to resources—be it land, credit, extension services, or appropriate technology—is the major constraint that women face with respect to food security in Sudan.

LIMITATIONS

Despite the significant contribution of women in production, there are many limitations that cripple them in their activities. The following factors greatly contribute to the neglect of female farmers:

1. Women's indispensable role as mother—caring for babies and children and managing the entire family—exerts a time constraint, keeping them from participating effectively in agricultural production.
2. Women suffer from cultural and social structural biases as a result of practices related to the ownership and inheritance of land.
3. Limited access to resources—credit, land, and other operating inputs, such as research and extension services—because of legal, social, and institutional factors create barriers to women and circumscribe male-female interactions. This is in addition to the fact that women have less mobility.
4. Women are affected by technological biases; i.e., technology delivery targets male farmers because most extension staff are males.
5. Women lack input into decision making because the tradition is that men are the authority figures responsible for making key farm decisions.
6. Formal and informal education of women is limiting; however, this situation is expected to change in the next generation.

SUMMARY AND CONCLUSIONS

The call for the advancement of women in agriculture is becoming increasingly loud and clear. Rural women are an enormous resource and are crucial to agricultural production. This study explored the role of women in production practices for the common bean in the Sudan, revealing that rural women make a significant contribution to agriculture, in general, and bean production, in specific. Women are involved in the planting, weeding, and harvesting of dry beans in the Nile River and Gezira states. In addition, in Khartoum State, they effectively participate in grading and packing green beans for export. The participation of women in these operations necessitates consideration of the user's perspective of technology.

Results also showed that only a few farmers are exposed to technologies (improved seeds). Farmers in general have weak contacts with the extension and other agricultural service departments, while women lack even this contact: more extension efforts are needed. The effectiveness of demonstration programmes and their success in exposing a broad range of farmers to the recommendations is an important issue to address. Following the recently adopted free-market policies, the policy environment is not conducive to the use of high technology. Correcting this situation would need policy-reform measures in the following areas:

1. monitoring imports and regulating illegal border trade with respect to levels and timing of import flows in relation to the domestic supply so that a stable supply and prices could be attained
2. credit policy reform to ensure credit eligibility for small farmers and their access to commercial inputs
3. efforts to regroup small pump units into larger irrigation units in order to economise on the cost of irrigation, along with a clear rate for water use

RECOMMENDATIONS

The achievement of food security in common-bean production in Sudan could be attained if the following recommendations were observed:

1. The effective introduction of improved agronomic practices could be enhanced by fully involving women where appropriate in introducing improved bean varieties that are high yielding, more drought and disease resistant, early maturing, and have lower labour requirements.

2. There should be a mandate to support women farmers in bean production to alleviate food crises in Sudan.
3. Attention should be focussed on women in research, extension, and improved technologies to help increase production and, thus, food security. Extension services should be available for all women, and training programmes should be organised for women farmers to upgrade their working knowledge of common-bean production and to help increase production and, thus, food security in Africa.

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