

# Socio-economic constraints to the use of animal traction for rainfed rice production in The Gambia

by

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## Abstract

*Farm mechanization in The Gambia is widespread but its use has been restricted to upland crops. Recent research has shown that upland equipment can also be used in rice fields. There are a number of socio-economic factors associated with gender roles in crop production and resource control, which must be confronted if the use of animal traction is to spread to rice. Household case studies indicate that rice is cultivated by hand as women's contribution to domestic food production and not as a cash crop. On the other hand, men, with the aid of animal traction, cultivate both food crops (millet and sorghum) and cash crops (groundnuts). It appears that the household head must be convinced that use of animal traction in rice farming will increase production and thereby diminish his need to purchase staple food.*

## Introduction and rationale

National development policies emphasize the need to reduce food imports (mainly rice) thereby cutting the annual balance of trade deficit (EIU, 1985). Consequently rice self-sufficiency has been adopted as a long-term policy goal. Inland valleys are a priority focus for rice research in The Gambia for three reasons:

Although precise area estimates are not available, inland valleys are thought to represent a significant proportion of the total potential area for rice production. Reduced rainfall since the Sahelian drought in the early 1970s has left inland valleys as the sole wet-land rice

ecology in most of western Gambia (Jones and Posner, 1987). Much of this land comprises sandy loams or highly organic soils which can be worked by draft animals at the start of the rains.

There are two government departments, Agriculture and Water Resources, involved in the construction of earth dykes for retaining rainfall in inland valleys, thereby raising potential productivity. The infrastructural investments necessary to upgrade valleys for rice production are low cost and offer high returns (Elias, 1987).

A pool of potential technologies already exists to exploit the increased productivity of improved rice lands. Improved varieties and fertiliser rates were recommended following rice trials between 1982-1986. A suitable mechanization package has been identified, comprising a Sine Hoe (*Houe Sine*) and Super Eco seeder (Matthews and Pullen, 1976).

Improved technology packages combining these components were assessed on-farm in the 1987 season. Economic analyses of these packages suggest that inland valley rice production can be competitive with imports (Jones, 1988).

The objectives of the socio-economic component of the rice research programme are two-fold:

- to identify socio-economic constraints to the adoption of improved technologies for rice cultivation;
- to provide an economic evaluation of tested technologies. This paper sum-

\* Position at the time of the 1988 workshop.  
A subsequent address may be found in the workshop participant address list.

marises findings with respect to the first objective.

## Methodology

Field work took place within research cluster sites in North Bank and Western Divisions (NBD and WD). Case studies were used as the most cost-effective method for the collection of qualitative farm management data (Maxwell, 1984). Four representative households were selected, two in each *Dabada* (one household production unit). Each household was visited fortnightly.

Semi-structured interviewing was used to investigate the influence of the intra-household distribution of responsibilities for crop production on farm management decisions. Specific reference was made to resource allocations of rice. Labour-use profiles were constructed for each woman in the case study households (Jones, 1987).

## Findings and discussion

Household members have rights and obligations to each other determined by their relative positions in a male-dominated age-gender hierarchy. The responsibility for ensuring that households have sufficient staple food to meet their needs rests with the household head. Working household members have an absolute obligation to contribute their labour to the production of food crops; men to millet and sorghum, and women to rice. Throughout The Gambia there is a strong gender division of labour between crops reflecting the influence of the Mandinka ethnic group, with the result that women are virtually the sole cultivators of rice (Carney, 1986).

The head is responsible for allocating household resources such as land, draft animals and equipment and for providing purchased inputs for production of food crops. In the study areas women do not own rice land; a household's rice lands belong to the lineage of the household head. All existing rice fields are reserved for domestic food crop production

and their produce is not normally sold. This finding is consistent with case study findings of Elias (1987).

Only male household members actually operate draft animals and equipment. This reflects how farm mechanization was promoted in The Gambia to increase and diversify the production of "male" upland food and cash crops (Dunsmore *et al.*, 1976; Mettrick, 1978). By excluding women, subsequent training programmes reinforced men's control over animal traction resources (Nyassi, 1987).

Household heads are also responsible for rice purchases to supplement shortfalls in domestic food production (Dey, 1982). Rice is regarded as the preferred staple food throughout The Gambia. In the study area most households have a rice deficit though not necessarily an overall food deficit.

Household members have a secondary and competing objective: earning cash to meet personal expenditure. Therefore in addition to cultivating rice for domestic consumption, women work as hired labourers and/or cultivate groundnuts and vegetables for sale. Cash earned belongs to the individual and payments for inputs is the responsibility of the cultivator. For women farmers, input payments generally include hire of animal traction. The access of women farmers to animal traction tends to be more limited than that of men; animal traction also tends to cost more for women. As a result women concentrate their purchased inputs on cash crops from which they receive a direct monetary return.

Land availability is not a constraint to rice production in the study areas. Using data derived from aerial photograph interpretation and the 1983 census (Central Statistics Department), in the NBD cluster area there is approximately 0.55 ha of rice land per working woman (women in the age group 13-59 years). The actual rice land cultivated per working woman for the NBD case studies in 1987 was approximately 0.25 ha. In the WD cluster the average area of rice land available

**Table 1: Farm machinery packages used in the researcher-managed on-farm trials in western Gambia**

Package	Land preparation	Seeding	Weeding
1	Two oxen; Sine Hoe; five tines fitted with reversible chisel points	Casamance two row manual rice seeder	Hand
2	Two oxen; Sine Hoe; single mouldboard plow	Donkey; Super Eco seeder fitted 32 hole rice plate hoe	Donkey; Occidental Hoe
3	Two oxen; Sine Hoe; five tines fitted with reversible chisel points	Donkey; Super Eco seeder fitted 32 hole rice plate hoe	Hand
4	Two oxen; Sine Hoe; single mouldboard plow	Transplanted	None
5	Two oxen; Sine Hoe; single mouldboard plow	Transplanted	None
6	Two oxen; Sine Hoe; single mouldboard plow	Donkey; Super Eco seeder fitted with 32 hole rice plate	Hand
7	Two oxen; Sine Hoe; single mouldboard plow	Donkey; Super Eco seeder fitted with 32 hole rice plate	Donkey; Occidental Hoe
8	Two oxen; Sine Hoe; single mouldboard plow	Donkey; Super Eco seeder fitted with 32 hole rice plate	Hand plus <i>Tamariz</i> herbicide at 6 l ha <sup>-1</sup>

is 0.61 ha per working woman, and in the case study, women cultivated approximately 0.21 ha each. Rice production techniques are manual and it seems reasonable to assume that case study figures are representative of their area as a whole.

In inland valleys both swamp and upland rice are cultivated. Two distinct manual production techniques exist: broadcasting and transplanting. Upland rice fields are exclusively broadcast whereas swamp fields may be broadcast or transplanted depending upon the physical characteristics of individual fields. The main constraint is the labour bottleneck faced in August and September when broadcast swamp and upland fields are weeded and when land preparation and transplanting coincides with the weeding of groundnuts. To relieve their labour constraint and reduce the drudgery of manual operations, women sometimes work in groups, either on a reciprocal basis (*barakio*) or as hired labourers (*kaffo*). In NBD, creating and repaying labour obligations spreads the peak in labour demand. In the NBD case studies, where all rice fields were broadcast, the women were over two thirds fully employed in agriculture from August to November. Nevertheless in neither household could all planted fields be weeded.

In the WD case studies swamp fields were transplanted. From August to September women in the WD case studies were up to 80% fully employed in agriculture.

Draft animals and equipment are owned by approximately 75% of rice cultivating households but used exclusively on the uplands. Mechanization provides an alternative means of alleviating labour constraints by more than halving labour requirements as demonstrated by the improved technology packages in the 1987 season (Jones, 1988). These packages were tested on farms, under conditions of researcher management. Packages occupied whole fields at different locations within the toposequence in order to cover the range of production environments faced by farmers. Packages 1-3 were located in NBD, 4-8 were located in WD (Remington, 1988). The combinations of farm machinery used in the packages is detailed by operation in Table 1.

The justification for allocating additional resources to rice rests on their net effects on production of both upland and lowland crops, and on food purchases. Initial economic analyses on this are encouraging. In NBD, where farmers broadcast their swamp fields, the most appropriate technology seems to be tine cultivation followed by line seeding using the

Super Eco seeder and hand weeding. On the organic soils of NBD, land preparation and seeding of packages 1-3 was conducted dry in June, when women prepared their rice fields. In WD plowing with a single mouldboard plow and then transplanting appears to be the most appropriate technology. Land preparation in WD is delayed until soils, which are low in organic matter, become moist. Use of the single mouldboard plow however permits earlier land preparation than is possible by hand. Consequently more land can be prepared and longer duration varieties can be introduced. Weed avoidance by transplanting is more cost-effective than line seeding and weeding, whether manual, mechanical or chemical, and is thus preferred where it is possible (Jones, 1988).

According to a recent study, draft animals and equipment appear to be under-utilized in some households, at least in WD (Elias, 1987). For these households, well-equipped for animal traction, utilization was only 40% of its potential during the months of July and August, when the animal traction equipment might be usefully deployed to rice fields. However the level of male labour employment probably represents a greater constraint to the more intensive use of animal traction than does the availability of animals and equipment. Anticipated shortages of skilled male labour may be overcome by training women to use animal traction; either by their inclusion in existing programmes, or through specific women's training programmes.

Mechanization of rice cultivation will have a complex impact on the gender division of labour in rural Gambia and on crop use patterns. The experience of the Jahally Pacharr smallholders irrigated rice project is perhaps illustrative of the changes to be anticipated. Initial analyses of this project indicated that women were being replaced by men as irrigated rice farmers, and were losing their rights to grow rice for sale on their own behalf (Carney, 1986; Dey, 1982). Subsequent analysis shows that women have been able to reallo-

cate labour to the production of upland cash crops on their own behalf (von Braun and Webb, 1987).

## Conclusions

The combined effects of gender divisions between crops, and the dichotomy between farmers' objectives for cash and food crop production have a number of important implications for both research and extension.

The main socio-economic factor constraining innovation in rice cultivation is its designation as a food crop grown by women. It is not necessary, nor is it in women's interests, to invest scarce capital in a crop from which no monetary reward is expected.

Technological change in rice cultivation will rely on male household heads being prepared to allocate increased resources to rice. The incentive for men to invest in rice will be net savings anticipated due to reduced need for them to buy clean rice.

Animal traction has the potential to increase rice production. Training women to use animal traction may facilitate its adoption for rice production. In addition, it is anticipated that women will seek to redeploy any "freed" labour towards activities earning private income. This will effectively spread indirect benefits from mechanizing rice production throughout the farming system.

Topics for subsequent socio-economic investigations include:

- assessing whether or not there is sufficient flexibility in the upland cropping calendar to facilitate the use of animal traction for rice cultivation;
- determining the effect of using animal traction for rice cultivation (under farmer management) on net farm incomes;
- specifying more explicitly the obligations of women to contribute their labour for rice production, and the obligations of household heads to contribute other inputs to rice production. The objective here is to determine whether domestic re-

quirements for rice will set a limit on rice production, or whether households will produce a marketable surplus. Should they do this, it will need to be seen how the income will be distributed between investors and farmers;

- to assess the impact of innovations of female and male labour-use patterns.

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### Résumé

*La mécanisation agricole est largement répandue en Gambie, mais son utilisation est limitée aux plateaux. De récentes recherches ont montré que les équipements utilisés sur les plateaux conviendraient à la riziculture. Toutefois, le passage à une riziculture en traction animale dépend de la prise en compte d'un certain nombre de facteurs socio-économiques relatifs à la distribution sexuelle du travail et au contrôle des ressources. Des études de cas spécifiques indiquent que le riz n'est pas une culture de rente, mais une culture vivrière cultivée manuellement par les femmes. Par contre, les hommes, seuls utilisateurs de la traction animale, cultivent aussi bien d'autres produits vivriers (mil et sorgho) que les cultures de rente (arachide). Il apparaît donc essentiel de convaincre les chefs de ménage que l'utilisation de la traction animale en rizière augmentera la production et réduira les dépenses en produits vivriers.*

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