Constraints to the Diversification of the Use of Animal-Drawn Implements in the Gambia

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Abstract

This paper describes the introduction of ox-drawn multipurpose implements into the Gambia in 1975, their subsequent testing, evaluation and adoption for most upland crops such as maize, millet, sorghum, cotton, groundnut and cowpea. The technologies, however, were not adopted by rice farmers. The paper speculates on the reasons behind this non-adoption and proposes multidisciplinary approaches to research and transfer of these technologies to rice-growing areas.

Background

Animal draught power was introduced in the Gambia in the 1940s by the early researchers in agriculture who worked under the colonial government at the time. A single mouldboard plough was used to demonstrate ridge cultivation in upland soils and was later adopted by the farmers. In the early 1950s the 'Emcot' and 'A-Plus' ridgers were also tested under the same conditions and were adopted. The ridgers became more popular than the single mouldboard plough as they served as dual purpose implements, being used both for ridging and for inter-row weeding The ridgers are still very popular with farmers in western Gambia who still practise ridge cultivation. As mentioned above, these implements were all tested in upland soils for the purpose of producing export crops such as groundnuts and cotton and to a very limited extent maize, millet and sorghum for home consumption. Rice is the staple food in the Gambia and no provision was made to introduce suitable animal-drawn implements which could be used in the rice-growing areas. It could thus be seen that the colonial government was only interested in the production of export crops; and as a result the bulk of rice consumed in the Gambia was always imported. This situation continued even in post- independence days when big rice-producing schemes (using high technology and large capital investment launched by foreign banks on international donor agents) were undertaken from time to time and could not be sustained after the departure of the funding agent.

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In 1975/76 animal-drawn multipurpose implement packages were imported from Senegal and tested in almost all the crop ecologies in the Gambia by two foreign engineers (M D P Mathews and D W M Pullen). The extension services of the Department of Agriculture were responsible for introducing these packages to farmers but tended to concentrate on introducing them in upland areas alone. The implement packages won farmer acceptance by the late 1970s and became the dominant technologies used in upland soils for production of ground-nuts, maize, millet, sorghum and cowpea.

Information available on the evaluation work of Mathews and Pullen was inadequate. Successors of Mathews and Pullen in the Agricultural Engineering Unit of the Department of Agriculture did not make any research efforts to encourage the use of these packages in rice growing areas. The technologies to date remain underutilised by rice farmers despite the fact that there is strong evidence that the packages were tested in all the crop ecologies and that they are proven technologies.

The implement packages were manufactured in Senegal and consist of:

1. A Sine Hoe frame, a multipurpose tool frame to which can be clamped a 225 mm single mouldboard plough, 3 or 5 tine weeders, a groundnut-lifter and an earthingup-attachment for cotton.
2. A Super-Eco seeder used for direct row-seeding of all the main crops such as maize, millet, sorghum, groundnuts, cotton and cowpea.

Major Constraints on Increased Rice Production

Undeveloped Potential Rice-growing Areas

Apart from irrigated rice production,where pumps are used to control the water required, all the other rice ecologies in the Gambia are undeveloped. These are mainly the hydromorphic areas, mangrove swamps, tidal swamps and the rainfed inland valleys. The labour and capital investments required to develop these areas can be very high. From 1966 to 1984 big rice schemes, launched by foreign missions, international banks and several non-governmental organisations were set up in these areas for small scale rice producers. Nearly 6000 ha of land was developed at selected sites along small river banks near villages with a history of rice cultivation and where farmers showed an interest in irrigation development. The survey design and construction of the schemes were under the supervision of the mission engineers whilst the farmers in the form of a village rice society provided the labour for construction and land-levelling. Pumps of 7–20hp were used for the distribution system. Inputs for the first year were provided free of charge to farmers by the missions and this included pumps and implements for working the soil and planting. In subsequent years no inputs were given to the farmers as the mission expected them to have earned enough cash in the first year to maintain the swamp infrastructure and purchase their seasonal inputs. This unfortunately did not work out and farmers were no longer able to maintain the schemes and had to abandon them

Inadequate Research and Development Facilities

To date facilities for promoting the use of the acquired knowledge are lacking. There is yet much to be done in this field to convince rice farmers that these technologies are viable and that the recommended practices be utilised. At present it can only be hoped that the Department of Agricultural Research Services will come up with solutions to these problems.

The Need for Technology Transfer

Economic and social factors combine to make the need even more pressing for full utilisation of animal-drawn multipurpose mechanical packages and for more land to be utilised for rice.

Upland land has become scarcer due to the withdrawal of such land by big horticultural farms to produce vegetables and fruit for export, and organised women's societies to grow vegetables for the home market. The effects of such demands over the past decade and a half include a decline in holdings at the farm level from 0.5 ha to almost 0.1 ha, a decrease in the fallow period to 2 years and a marked increase in the cost of agricultural land. Another effect is the felt need to use the previously underutilised rice ecologies of the tidal swamp and the rainfed inland valleys. These ecologies would add up to about 64,000 ha which if developed could have great potential for rice production. The inland rainfed valleys can in most cases serve 2 purposes: they can be used for seasonal production of rice and (where the water table is high) for production of vegetables during the off-season period. They also offer great advantages for extending the grazing period after the rains when livestock can have access to crop residues and fresh growth of palatable grass species.

The traditional production system is normally used in the undeveloped ecologies. This involves a great deal of hand labour for land preparation and sowing (i.e transplantation), and the crop yields expected cannot be more than 800 – 1000kg per ha. With the use of appropriate technology, crop yields expected can be as high as 5000 kg /ha, drudgery is saved and timeliness of operations is greatly enhanced.

Strategies For Technology Transfer

In order to transfer the acquired technologies to the Gambian rice farmers effectively, the following areas are considered important:

- Review of the evaluation data on the Sine Hoe implement packages;
- Establishment of a unified training scheme for rice farmers who are owners of land, draught animals and implement packages;
- Design and development of the implement where necessary, and improvement of the harnessing method used at present.

Review of Evaluation Data

Since the technologies were previously tested in all the crop areas, it would be proper for the works of Mathews and Pullen to be reviewed before an attempt is made to transfer these technologies to rice farmers. The data could be used as guidelines to avoid any duplication of effort. Following the review, the needs and objectives of transferring the technologies should be clearly defined and a programme and a budget prepared for the project.

Improvement of Tidal Swamps and Rainfed Inland Valleys

Close cooperation with the Soil and Water Management Unit at the Department of Agricultural Research Services) will be essential before the above mentioned task is undertaken. The staff of this unit have been involved in this sort of work for many years and have gathered a great deal of experience not only in carrying out land development alone but also in organising villagers and working with them to carry out development tasks. Other agencies such as the Department of Water Resources, The Gambian Renewable Energy Centre and the Agricultural Mechanisation Unit of the Department of Agricultural Research Services could play their role in the project. A multidisciplinary team should be formed to tackle this task.

Establishment of a Unified Training Scheme for Rice Farmers

A multidisciplinary approach to the design and implementation of the scheme should be adopted. The Department of Agricultural Research Services with its training component could design an appropriate format which might include the following:

- Training of draught animals and of large groups for handling draught animals. Use of the facilities of nearby mixed farming centres may be necessary. Trainers could be taught implement setting uses and maintenance tasks. They could also be taught the crop husbandry practices to be used in the rice ecologies.
- On-site demonstration of what has been taught, i.e. implement setting, uses and crop husbandry. Organisation of trial schemes may be considered later. Target farmers should be involved in the development of the rice ecologies at the initial stages so as to acquaint them with the repair and maintenance of features such as bunds, channels and water-gates etc. Collaboration with the Department of Agricultural Extension for support services would enhance these activities.

Design and Development of Implements and Improvement of Harnessing

Performance of each of the following components of the Sine Hoe frame and the Super Eco Seeder should be recorded when the equipment is in use:

1. The 225mm Sing mouldboard plough. The soils in the rice growing areas are heavier than upland soils and therefore require greater draught power. The use of a 150mm single mouldboard plough needing less draught should therefore be considered.
2. The opening coulter of the Super Eco seeder creates high resistance in upland soils and in order to reduce this resistance a type of coulter with a streamlined shape and which cuts the soil more gradually could be used to reduce the draught to pull the seeder.
3. Comparative trials should be made of the Super Eco seeding plate and other types to determine the optimum number of holes for a satisfactory plant population.
4. The introduction of improved ploughing and seeding techniques should go hand in hand with the introduction of the technologies required for harvesting and processing the crops produced. In the past when the large-scale rice production schemes were launched, implements for land clearance and for primary cultivation and sowing were provided. Serious bottlenecks occurred as thousands of ha of land were harvested by hand and the crops thus harvested could not be processed. This resulted in severe crop losses. So, whilst efforts are being made to diversify the use of draught animal power for production of food crops, all the stages of production should be considered.

Certain developments which are likely to widen the scope for the use of draught animal power at the farm level are:

(a) Research and development schemes introduced by the Department of Agricultural Research Services.

(b) Restructuring of the credit unit of the Gambia Co-operative Societies and the members of the societies being given farm inputs such as implements with other plates with fewer holes so that comparisons between the seed rates can be made to determine the seeding plate that would give the desired plant population.

c) Improvement of harnesses. The 16cm nominal size double neck yoke in use in upland conditions for ploughing and planting, has been used in this country for 12 years and has not been improved. As the draught requirement to pull either a seeder or a plough through the soils in rice fields is greater, trials should be carried out comparing the neck yoke with the collar harness in terms of pulling efficiency using oxen.

Conclusion

In the Gambia, the constraints to diversification of the use of animal traction technology, in rice-growing areas, cannot be easily removed. A gradual and thorough development of the hydromorphic areas, mangrove swamps, tidal swamps and the rain-fed inland valleys must be adapted and should be accompanied by a systematic transfer of the available technologies (in the multi-purpose animal-drawn implement packages) to rice-framers and more credit facilities given to them. This if done will greatly influence the use of draught animal technology leading to greater productivity. Past experience has shown that the use of animal traction technology for food production is more sustainable than the use of large capital intensive schemes.

Résumé

Cette étude traite de l'introduction de matériel polyvalent à traction bovine en Gambie en 1975, de l'expérimentation dont il a fait l'objet, de son évaluation et de son adoption pour la plupart des cultures sèches telles que le maïs, le mil, le sorgho, le coton, l'arachide et le niébé. Les technologies proposées n'ayant pas été adoptées par les cultivateurs de riz, les raisons de cette non-adoption sont examinées et des méthodologies pluridisciplinaires de recherche et de diffusion des technologies proposées dans les régions rizicoles sont présentées.