

Farmer social variables influencing the adoption of agricultural innovations in Sierra Leone

by

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Introduction

Gabriel Tarde, an eminent rural sociologist who has devoted most of his intellectual career to the study of innovation diffusion, once said:

Our problem is to learn why given one hundred innovations conceived at the same time, ten will spread abroad, while ninety will be forgotten.

Another prominent scholar in this field stated that:

The advantages of modern agricultural science and technology have yet to effectively reach at least a billion small farmers throughout the world. (Leagans, 1985)

These statements are very pertinent today. In order to find answers to these and similar issues, an increasing number of rural sociologists in many countries of the world have continued to expand the frontiers of knowledge in the field of innovation diffusion and adoption. The aim of this presentation is to share with you our understanding of this problem as it relates to Sierra Leonean farmers.

Adoption of innovations is a function of inter-related dimensions of the farmers' environment. This comprises many related factors including those that are technical, political, educational, institutional, social, physical, industrial, economic, religious, infrastructural and those which relate to communications. The

cause of low productivity in agriculture may be traced to a combination of these factors. However, the main concern of this paper is to explore the effect of one of these essential elements, namely the social dimension. This paper therefore aims at outlining some of the social factors that could be associated with the behaviour of Sierra Leonean farmers to the adoption of agricultural innovations in general, and the use of ox traction in particular. The paper focuses on the following specific aspects:

- The historical background of ox traction and its development to the present time in Sierra Leone.
- The role and importance of ox traction in agricultural/rural development.
- The potential challenges of ox traction.
- Some of the highlights of empirical research results on the adoption of agricultural innovations.
- Summary implications and recommendations for future research efforts.

In preparing this paper, I have drawn heavily on my experiences about the social characteristics of oxen farmers in Sierra Leone and how these relate to the use of ox traction and its associated agricultural innovations. Reference is made to research findings in other countries also. The reason for the strong bias for Sierra Leonean farmers' characteristics is that it makes it possible for me to narrow down the discussion of the problem and provide useful learning experiences relevant to this workshop.

History and development of ox traction in Sierra Leone

Plowing with oxen was first introduced into Sierra Leone around the Mabole valley in 1928 and has continued ever since. The influential Mandingo people who had settled in this part of the country for over seventy years had shown great interest in the use of ox plows since they were introduced into the area by some Mandingo migrants from Guinea about 55 years ago. In order to extend the area under cultivation on the Mabole valley and to introduce improved plows and promote farming among the Mandingoes, the Department of Agriculture initiated the whole Mabole valley plowing scheme in 1950. The scheme which included the supply of plows and oxen on loan to some members of a progressive farming community was frequently stated by official sources in Sierra Leone to result in increases in farm size (Gboku, 1983). In fact, in 1950, the Director of Agriculture categorically stated that all ox traction operation were successful. Unfortunately, it is not clear what specific information led to the assumptions of success and profitability.

Apart from the Mabole Valley plowing scheme, ox plowing schemes have also been tried in other parts of Sierra Leone including Bonthe, Rokupr and Koinadugu. Most of these latter schemes failed because of two major factors. Firstly there were general apathy and a lack of interest on the part of the farmers. Secondly there were mounting arrears of loans to the District Council which the farmers could not repay (Gboku, 1983).

The success of the Mabole valley scheme on the other hand depended to a large extent on the following factors:

- The suppression of the domestic slaves of the Limba tribe by the Mandingo tribe with consequent shortages of labour for agricultural activities.

- The Mandingoes were a cattle-owning tribe who understood how to look after their animals.
- Most of the inhabitants of the Mabole valley made their livelihood by trading in diamonds rather than farming. This caused labour shortages on the farms as youths migrated to mining areas.

Notwithstanding the above determining factors of the success of the Mabole valley scheme, the Mandingo ox owners faced practical problems among which were:

- Lack of suitable animals for draft purposes.
- Lack of plows that combined suitability and durability.
- Lack of knowledge among non-cattle farmers of how to take proper care of their oxen.
- Lack of training facilities for oxen farmers.
- Lack of adequate finance to support the scheme.
- Attack of animals by diseases. (Gboku, 1983).

With the establishment of the Work Oxen Project, many of the above problems have been eradicated while efforts are under way to combat the others. From 1977/78 to the present, the Ministry of Agriculture and Forestry Work Oxen Project has been working in cooperation with Njala University College and, with the support of British and French technical personnel, has carried out research on the use of draft animals and ox-drawn equipment. It has published its findings and initiated pilot extension programmes in cooperation with other projects and institutions (Starkey, 1981; Allagnat and Koroma, 1984). For instance, the Pecotool plows which combine durability and efficiency are now manufactured in the Project's workshop at Rolako while the Project's extension agents currently assist farmers in the training of their oxen teams.

The role and importance of ox traction in rural development

The importance of ox traction as a means of accelerating social and economic development in less developed countries is too well known to require much elaboration here. With the recent inception of the Work Oxen Project in Sierra Leone for instance, animal traction has gradually re-emerged as a topic in development policy and technical discussion after a long time of neglect as a relic of bygone days. With the present increase in the cost of conventional types of oil-based energy already having disastrous consequences for Sierra Leone, it could be speculated that the use of animal traction as an alternative source of energy in the future will continue to be of enormous importance for many agricultural holdings in the country.

While animal traction has been gradually replaced by engine power in most industrialized nations, it cannot be neglected in countries which are less developed in economic terms. Agricultural mechanization involving engine power farming has always been under severe criticism in developing countries. Some of the objections may be listed as follows:

- The nature of the tropical environment which has not lent itself in most areas to mechanical cultivation.
 - High initial and running costs.
 - High foreign exchange cost.
 - Poor maintenance facilities as a result of lack of trained personnel.
 - Dependence on fossil fuel.
 - Farmers' inability to hire tractors.
 - Mechanization is not suitable for fragmented and inaccessible holdings. It is conducive for use only on big farms.
 - Mechanization increases productivity of labour but not necessarily farm productivity per unit of land area.
 - Mechanization may be profitable for individual landowners but not for society.
- Appropriate technology is not available for developing countries to allow them to benefit fully from mechanization.
 - Mechanization may lead to erosion problems thus rendering opened land unproductive within a very short time.
 - Mechanization displaces labour and destroys employment. It encourages migration of labour from rural areas. Agriculture must be a reservoir to absorb the growing population, and thus mechanization must not be introduced as it reduces the job opportunities in agriculture. (Makajuola, 1977).

It would be frivolous to brush these criticisms aside since they contain elements of truth in varying degrees. However, few people would deny that the agriculture programmes in many developing countries, whatever the degree of mechanization, have been largely ineffective in terms of economic growth and social welfare. Against the background of this dilemma, the main concern should not be whether mechanization or the absence of it provides a more viable approach to agricultural development. More relevant is the problem of how to achieve a type of mechanization that has both real and widespread social and economic impact.

The potential and challenges of ox traction

Considering this complex mixture of problems and conflicting arguments connected with engine power farming, the use of animal power is one of the more attractive alternative energy sources. Work bulls can be used on small farms by peasant farmers who constitute over 70% of the population. The utilization of animal power is less taxing and perhaps more effective when compared with the use of human muscles. The power source is particularly applicable to the needs of small farmers in the Northern Province of Sierra Leone. This is because the power requirements are suitable for their small-sized farms and the technology is

adapted to the technical skills of farmers. Moreover there is easy access to work bulls and the accompanying equipment, and farmers in that part of the country have a tradition of keeping cattle.

The use of animal power, however, has its limitations. The major ones can be summarized as follows:

- It is limited to tsetse-free areas like the Northern Province of Sierra Leone.
- The cost of buying and maintaining the work bulls is becoming prohibitive. If the feeding of the work bulls is done properly, the value of work output may be barely enough to pay for the cost of feeding (Makajoula, 1977). This makes it uneconomical for the farmer to keep work bulls properly fed.
- The peak of the season's work with respect to the use of animal power comes at the end of the dry season. The dry season is usually a period of shortage of food for livestock consumption. In practice, the animals are not usually well fed during the dry season and are therefore weak and ill-prepared for the heavy work which follows the beginning of the rainy season. During the rainy season and harvest period when the animals get better food there is little work for them to do.
- There is a shortage of beef animals in the country and butchers have to compete with farmers for the available animals that can otherwise be trained for use as agricultural work bulls.
- Animal-powered equipment for various harvesting and post-harvest handling and processing separations is not easily available. There is, therefore, the need to use other power sources for these operations.
- High cost for draft animals usually goes far beyond the means of the average farmer.
- Smallholdings are scattered over large areas without adequate access to the road system.
- Poverty, low level of production, shortage of capital, and insecurity of income make agricultural investment difficult.
- Difficult land tenure systems resulting in fragmentation of holdings into irregular-shaped individual farms.
- The practice of mixed cropping in which different types of crops are grown on the same plot simultaneously, making the use of some agricultural equipment difficult.
- The traditional hand hoe technology is not easily adapted to the use of animal traction.
- Prevalence of cattle diseases makes the use of work animals risky.
- There is a need for a breed of cattle that is adapted to local conditions which can be used for milk and beef production as well as for draft purposes.

In the light of these problems, it would appear that animal power may soon become unsuitable and uneconomical to use. Consequently, one can only see animal power serving a transitory role as an introduction to the more suitable mechanical power which will put agriculture in this country in a better state. However, the criticisms advanced against engine power with regard to developing countries are even more difficult issues to face than those problems highlighted under animal traction. Hence the improvement of the limitations of ox traction constitutes the supreme task that should be taken up by the Work Oxen Project, if any meaningful increase in the output of food crop production is to be realized in the near future. Thus it is advisable to formulate future objectives in line with the issues raised, and to examine extension methods that can meet such objectives.

Social features of farmers and the adoption of innovations

The social characteristics of farmers influence the acceptance and use of agricultural innovations. Agricultural innovations can be taken to mean new ideas, methods, practices and tech-

nological improvements in agriculture which confer on it relative advantages over those ideas, methods and practices which are replaced (Alao, 1980). Ox traction and its associated technologies fall under this definition and in the following sections research findings on farmers' social features relating to the adoption of animal power in Sierra Leone will be reviewed.

An overwhelming proportion of adoption studies have used a bivariate analytical approach in predicting adoption behaviour of farmers. This involves the use of several independent variables to predict adoption of a given agricultural innovation. The focus of such studies centres of farmers' attributes as a major predictor on determinant of their adoption behaviour. Among the studies conducted in Sierra Leone are those of Gboku (1981, 1983, 1985) and Bangura (1983).

Age

All the above studies have shown that the mean age of Sierra Leonean farmers is between 45 and 55 years. Within the Work Oxen Project zone, the majority (56%) of the farmers were between 36 and 55 years. Only 18% of them were between 26 and 35 years, while few (13%) were of advanced age (about 65 years). This has serious implications for the adoption of agricultural innovations. In the first instance, those farmers of advanced age who may be willing and ready to accept new ideas do not have the physical ability to sustain the rigorous and arduous tasks required by the agricultural profession. On the other hand the younger farmers by tradition regard the older ones with respect because the latter possess and control most of the family resources that can be converted into economic units on the farm. Since the older farmers fear taking the risk of investing the available resources in farming, and because the younger ones could not afford these resources, the latter are often tempted to migrate to mining and urban areas to seek a livelihood thereby leaving the farm

base weak. Studies in Sierra Leone have however discovered no association between age and adoption behaviour of farmers. This finding is peculiar to Sierra Leone and a few other developing countries.

Education and literacy

A high proportion of our farming population is illiterate as very few have received formal education. Over 90% illiteracy was encountered among the farmers of the Mabolé Valley area during an exploratory survey (Gboku, Allagnat and Koroma, 1983). Because of this, formal education during the subsequent survey was measured in terms of whether farmers ever went to school, rather than quantifying their years of schooling. Using this measure only 3% of the farmers ever went to school. One possibility is that since the adoption of farm practices requires certain managerial skills which are often gained through education, it might be expected that as the educational level of the family increases, adoption of innovative farm practices will increase. However among the Mabolé Valley farmers, no significant relationship was discovered between adoption and education (Gboku, 1983).

Family size

It is ironic that in the rural settings of developing countries farmers produce large families in their efforts to assure themselves food, but this hampers the very solution they seek. Among the Mandingo ox owners an average family size of 19 was recorded. Family size which is defined to include the number of wives and the number of children that are available to contribute to family labour has a positive relationship with the adoption of agricultural innovations by farmers (Gboku, 1983).

Social participation

Sierra Leonean farmers who participate actively in the life of the community through mem-

bership and leadership of social organizations such as farmers' cooperatives, thrift and credit societies and rotary credit (osusu) adopt more agricultural innovations than those who do not. This assertion is supported by the findings of Gboku (1983, 1985) and Bangura (1983).

Farm size

Agricultural production in rural Sierra Leone is based on smallholder farming. The average farm size of the farmers is in the range of 1.2-2.8 hectares. The implication here is that since holdings appear very small, farm production will not be high. This means that average farm income will be quite low and most individuals in farm families will live on the low incomes from these farms. Based on the average family size of 19 among the Mandingo ox owners and the mean farm area of 3.1 ha, the mean area per individual in the family is 0.16 ha. Assuming these individuals contribute some work to the farm operations, the areas actually cultivated by the individuals are very small, which makes one wonder whether farming of this kind can take up most of people's time. Farm size was found to be significantly related to the adoption of agricultural innovations by farmers (Gboku, 1983, 1985). This implies that larger farm size means more resources and a greater ability to take the risk involved in the adoption of innovations.

Dependence on farming

Almost all subsistence farmers engage in activities secondary to agriculture such as trading, tailoring, teaching, blacksmithing or local administration (including chieftom duties). This makes it obvious that the kind of farming practised by the farmers does not take up all of their time. Research findings in Sierra Leone (Gboku, 1983, 1985) discovered no significant relation between adoption and degree of dependence on farming.

Extension contact

One of the most important institutions created to serve the needs of farmers is the agricultural extension service. The main function of this service is to serve as a linkage between research agencies and farmers. In spite of the relatively small ratio of trained extension staff to farmers in Sierra Leone which is estimated at 1:1400 farm families, the extension agents are the most important source of information to farmers on agricultural innovations. However, research findings in Sierra Leone have reported low contacts between farmers and the extension agents (Lakoh, 1978; Gboku, 1985). Even where agent-farmer contacts were reported, such contacts in most cases were not for agriculturally related discussions (Gboku, 1983; Lakoh, 1978). A significant relationship between extension contact and adoption of agricultural innovations by farmers has been reported (Gboku, 1985; Bangura, 1983).

Social structure

What people do by tradition is mainly determined by the organization of the society and its culture. Social structure as used here is the way society is organized into families, clans, tribes, communities, clubs, etc. It is important to understand the structure of the society in which one is working, to know who makes the decisions; who are the people of real influence who deal with land allocation and what are the factors causing the division of people into groups. Many mistakes have been made in implementing development programmes in the past through lack of knowledge of village social structure or through ignoring its existence. According to the views of Linton in the 1950s, if we know what a society's culture is including its particular system of values and attitudes, we can predict with a fairly high degree of probability whether the bulk of its members will welcome or resist a particular innovation. The position of the above statement has been backed by many researchers. For instance, in a

study of the influence of locality groups on the adoption of new farm practices in 47 Washington townships in USA, it was concluded that the social structure of culture of locality groups is the major factor influencing the adoption of new farm practices (Ven Den Ban, 1960). This study discovered that a farmer with a high level of education, on a large farm with high net worth, but living in a township of low level adoption, adopted fewer new agricultural practices than a similar person living in a high level adoption township. The differential rate in the level of adoption was attributed to religious differences.

In more recent times, Fliegel's study of agricultural innovations in Indian villages also showed that high adoption villages have the following characteristics: relatively high level of living; lack of factionalism and disputes; presence of formal social organizations; several religious structures and a diversity of religious tradition in the village; and the presence of a number of voluntary organizations. In Nigeria, several village factors such as absence of major personal, political and tribal conflicts, presence of peace-loving tribes and agriculturally orientated people, participation in social activities, availability of social amenities as well as access to roads and market facilities have been considered to be positively related to adoption (Clark and Akinbode, 1968). Another study in Nigeria has also concluded that community structure exerts contextual influence on all other dimensions of explanatory variables in adoption study such as size of farm, innovation proneness, social participation, mass media exposure, and cosmopolitan influences (Alao, 1980).

It is unfortunate that adoption research is still at its embryonic stage and hence has not focused on structural and contextual variables as recognized dimensions of study. However, the following learning experiences among the Mandingo ox owners is worth presenting to members of this workshop.

Important findings from the Mabile Valley of Sierra Leone

Role of women in ox traction

Traditionally, some jobs are carried out by men and some by women. Each sex has customary duties in village life and agriculture. In the Mabile valley, virtually all the women had small farm plots of their own as well as providing much agricultural labour on the general farm at all times of the farming season. Women never owned oxen and neither did they operate ox teams. However they showed great interest in using oxen. All the wives of oxen owners reported using oxen on their own personal plots. The services were not on a hired basis even though they paid some compensation to the operators in kind (food, kola nuts, cigarettes) as most of the oxen operators were the husbands or children of the women. On the other hand, wives of non-oxen owners hired oxen teams for their personal plots just like their husbands did for the general farms.

Role of blacksmiths in ox traction

In any typical African rural setting, the blacksmith has always maintained his position as the main source of agricultural tools and weapons such as cutlasses, hoes, knives, axes and guns. In the Mabile valley, all the farmers contacted said they obtained their tools from the blacksmiths. In addition, 100% of the oxen owners reported the blacksmith as repairer of all major damage done to their plows. Because of the indispensable services of the blacksmiths, all operations on their farms are done by the farmers within reach of the blacksmith services. In addition to the agricultural labour offered, the farmers also construct the blacksmith's forge building and pay minimal charges for the repair of old tools and the manufacture of new ones. Such charges are negotiable.

The general position of farmers towards ox traction

Using the categories of households for ox owners, non-ox owners in ox villages, and non-ox owners in oxen villages, some differences in their characteristics were identified in the Ma-bole Valley:

- The oxen owners are all Mandingoes. They are generally more engaged in farming activities, and they have bigger farms often about 2.5 hectares with some of them owning very large farms of more than seven hectares. Among the ox owners the main differences between the two categories (those in ox villages and those in non-ox villages) are due to their origin within the Mandingo or Limba communities.
- The Mandingo non-ox owners have the same cultural and social background as the ox owners but due to lack of credit facilities, the former cannot afford to acquire their own oxen. They have smaller households and farms compared to the ox owners. Their family members are usually less actively involved in farming activities.
- The Limba non-ox owners, which includes in fact all the Limba farmers in the area, are characterised by their own cultural background, different social settlements, different customs and religions. They usually have small farms (1.2 ha), but the few of them who can get more labour have bigger farms (up to 4 ha).

Implications and suggestions for future research efforts

The importance of social factors among farming families for rural development and animal traction is quite clear. Each of the variables discussed in this paper has a direct effect on increased primary agricultural production and agriculturally related enterprises which may be of concern to rural development practitioners. Thus a clear understanding of each of these

factors is essential in the formulation of policies aimed at achieving major objectives of agricultural and rural development.

Family size is a factor that has to be considered when comparing household incomes, farm sizes and labour supply for agricultural production in different parts of rural areas. The size of the family indicates the potential labour force per farming family and the expected number of people to be fed.

Average age and age distribution of both the household heads and their families affect the level of productivity. The labour supply for agricultural production purposes is mainly from the rural farming families or household heads. Studies of traditional agriculture indicate that average age and age distribution among farming families have a direct bearing on the following:

- Availability of able-bodied persons for primary agricultural production.
- The level of risk aversion and ease of adoption of innovations.
- The degree of mobility of farmers, which determines the ease with which farmers can migrate from rural to urban areas or from high population density areas to low population density areas and apparent land surplus areas.
- The size of the farm, as the farmers tend to reduce area to what they can cope with in the event of diminishing family labour and either scarce, or costly, non-family labour. (Kireta-Katewu *et al.*, 1983)

Educational status of the farmers has a significant effect on their adoption of innovations since education sharpens the farmers' managerial abilities. Since the majority of the farmers have had no formal education, rural development programmes have to be careful in developing technological packages of agricultural transformation that are simple enough to be understood, accepted and put to use by the farmers. Nevertheless, farmers are likely to adopt

whatever technology is introduced if it proves profitable.

Since knowledge about recommended farm practices and evidence of their utility are available in the environment, adoption is expected to increase as contact with the environment increases. In this regard, the organization and participation of farmers in formal social groups such as group farms, farm cooperatives and farmers' credit unions are crucial for rural development programmes. Such social organizations, it is envisaged, will expose the farmers to contact with extension staff and other personal sources of farm information. Social organizations could also enhance the exchange of relevant ideas and so put farmers in a favourable position to accept and adopt innovations.

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