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Research paper

Assessing the diversity of smallholder rice farms production strategies in Sierra Leone

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SUMMARY

In Sierra Leone, several international organizations are trying to help the government improve the productivity of its rice farms, which currently have the lowest rice yields in West Africa. However, the various programmes attempting to increase rice production, and consequently rice self-sufficient food production, are handicapped by an absence of thorough studies explaining the way rice farmers take the available socio-economic, technical and natural production factors into account when making their decisions. The purpose of the current article is to assess rice production performance on smallholder rice farms in Sierra Leone. To achieve this goal, an agronomic and socio-economic survey was carried out among 180 rice farmers in the district of Bombali in Northern Sierra Leone. The survey, combined with a specific statistical analysis, made it possible to assess production strategies for rice farms according to various discriminant parameters (family size and composition, fallow duration, seeding density, labour availability, ecosystems, share of oil palm, distance from field to farm. . .).

This analysis revealed that the rice smallholder farms that perform best are those growing rice under two ecosystems together with oil palm. Those farms have more income to purchase rice seed in years when production is low or if they have large families to feed. However, subsistence rice farms with one exclusive ecosystem will probably not be sustainable and they will not be able to satisfy their households' future rice needs.

1. Introduction

Twelve years after the end of its civil war (1991-2001), Sierra Leone is still ranked as the third poorest country in the world [1].

Agriculture is an important aspect of its economy, providing 56% of its GDP and employing 2/3 of the rural population [2]. In this context, rice farmers mainly produce rice for their own consumption [3]. This means that smallholder rice farms are very vulnerable to fluctuations in the amounts of rice produced. Rice yields by small farmers in Sierra Leone are the lowest and most variable of all the countries in West Africa [4,5]. There even is considerable variability between rice farmers using similar growing practices [2].

In Sierra Leone, rice is generally grown without either fertilisers or irrigation [6]. Field-clearing, sowing, transplanting, weeding and harvesting are all carried out without mechanization [7]. This means that rice production is very vulnerable to the availability of labour and the initial fertility of the soil [8–11]. The question of soil fertility is of particular importance for the upland ecosystem which is highly dependent on the duration of the fallow period [12].

Other determining factors, such as the availability and quality of seed, could also explain low and variable yields [13]. It has often been noted that the proportions of rice grains stored as seed, sold, or consumed by the growers vary according to the structure of the farms and households (size of family, needs in terms of vegetables, storage capacity for seed, etc.) [2]

Traditionally, farms have often consisted of a single plot of upland rice [14]. Since the end of the war and the massive return of displaced populations, there is no longer enough uplands for all,

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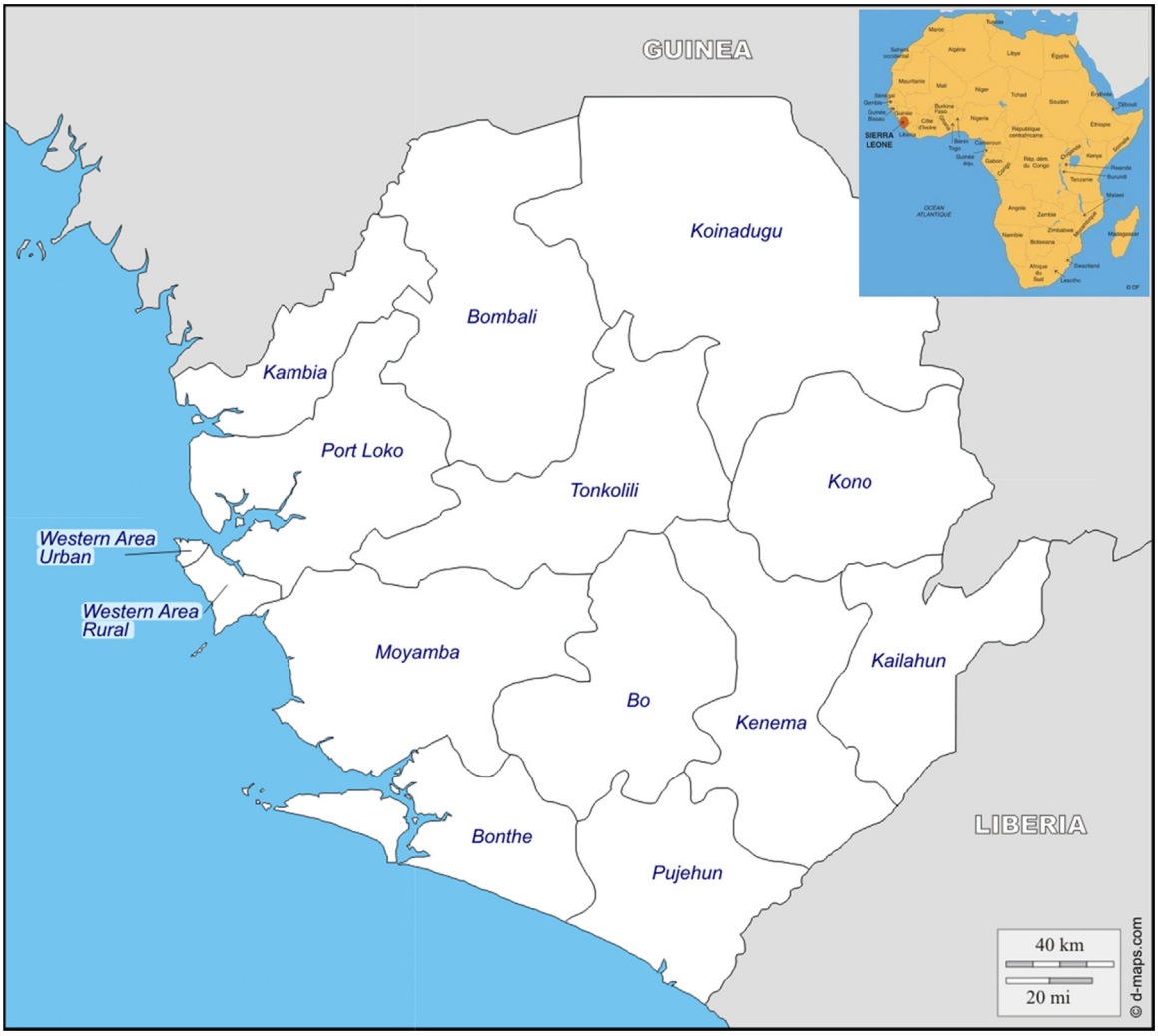

Fig. 1. Location of Sierra Leone and the Bombali district (www.d-maps.com).

and rice farmers find themselves compelled to grow in the lowlands to satisfy their family's rice needs [15]. Other rice farmers branch out into oil palm or Manioc, fairly profitable crops compared to rice [16]. This leads farmers today to think carefully about the importance of cash crops (oil palm, cassava) which compete with other food crops (legumes, sweet potatoes, beans, etc). The latter are certainly more resource-consuming (labour, land) and less productive, but play a significant part in the balanced diet of households.

Recently, several national and international projects have been launched to help Sierra Leone restructure its agriculture, and its rice production in particular (e.g. the European STABEX fund from 2007 to 2009). However, these projects are handicapped by the lack of any thorough characterization of current rice growing systems and their productivity by ecosystem (upland or lowland) and type of farm (with or without oil palm) [2]. Such characterization is necessary in order to identify main drivers of farmers' decisions making process depending on the main production factors, the different ecosystems (upland or lowland) and the surface area of each farm allocated to oil palms.

The purpose of the current article is to assess the performance of smallholder rice farms in northern Sierra-Leone. Its aim is to show how rice farmers make their choices depending on the ecosystems cultivated, the main production factors and the surface area allocated to oil palms. This study was carried out as part of the FSSIM-Africa (2009-2012) project aimed at developing a decision-support tool to help boost rice production in Sierra Leone [17].

2. Materials and methods

2.1. Description of the study area

The Bombali district covers 7985 Km^2, or 40% of the total surface area of the northern part of Sierra Leone [1]. The area receives considerable rainfall with average precipitation of about 2500 mm/year [18]. The rainy season lasts from June to November. The district has an estimated population of 435,000, each household having an average of seven people, and an average of 2.5 men and 4.5 women. Agricultural land is made up mostly of uplands (60 to 80%) and lowlands (20 to 40%) [19].

Agricultural activity in the district mainly consists of rice production. Bombali produces more rice than any other district in Sierra Leone and actually supplies rice for the entire country (Fig. 1).

In the two main ecosystems found in the district, soils are relatively homogenous in terms of organic matter and texture, which is often clayey. Upland soils are fairly shallow (ultisols and oxisols) with an average organic matter content of about 1% [20]. Oil palm and rice are the main upland crops.

The lowlands have deeper soil that also contains more organic matter (1.3% on average) [21]. However, the lowlands have three major disadvantages: the difficulty in working the land (Kayombo et al., 1993); the toxicity, in places, caused by iron [22] and the inability to produce vegetables and rice in this type of ecosystem (Erenstein, 2006).