

# Analysis on Technical Efficiency of Rice Farms and Its Influencing Factors in South-western of Niger

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**Abstract:** The present study focused on analyzing the technical efficiency of rice farms in southwest of Niger. The data from January to March 2015 survey of 148 ms in three districts of south-western of Niger were analyzed by using DEA-Tobit two-step method. In the first step, data envelopment analysis (DEA) was applied to estimate technical, pure technical and scale efficiency. In the second step, Tobit regression was used to identify factors affecting technical efficiency. The results showed that rice producers in southwest of Niger could reduce their inputs by 52% and still produce the same level of rice output. The Tobit regression showed that factors, such as farm size, experience in rice farming, membership of cooperative, main occupation and land ownership had a direct impact on technical efficiency.

**Key words:** efficiency, data envelopment analysis, Tobit model, rice farm

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## Introduction

The population of Niger continues to increase rapidly. Therefore, to advocated the nutritional needs of a highly growing population based on niche theory (Zhang and Wang, 2014), agricultural development is very important. It contributed for more than 46% to the gross domestic product (GDP) and the employed 80% of the population (UNDAP-NIGER, 2014). Rice is one of the major staple foods, but accounting for only 2.3% of the total cereal production. In Niger, the family-owned farm is the basic unit of agricultural production, and family members provide most of the labor. However, the current production scenario doesn't encourage on two accounts. Firstly, there has been an apparent decline in average rice yield due to land fragmentation. Secondly, for a potential

irrigable land of 24 000 hm<sup>2</sup>, only 20% is operated and 8 500 hm<sup>2</sup> has been managed for rice production (Sido *et al.*, 2011). So, rice production in Niger does not satisfy domestic demand. Total annual rice demand of the population of 15.5 million was 266 710 tones, whereas paddy production was 132 030 tones (Sido *et al.*, 2011). Since the total rice consumption was higher than the total rice production, rice must be imported. The successive programs launched to increase rice production had not been able to reduce the rice deficit. Policies did not help local rice producers secure a significant market share and rice imports had increased rapidly. Imported rice occupied more than half of agricultural imports and 70% of the total rice consumption (Sido *et al.*, 2011). This enormous (rice) imports to supplement the local production without doubts constitutes an enormous drain on the country's had earn foreign earning.

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Rice is cultivated in virtually the southwest of Niger which is located in Niamey, Tillabery and Dosso regions. Then, the area cultivated for rice appears small. Estimated of locally produced rice for year 2014 was 106 020 tones (Republic of Niger, 2015). The limited capacity of Niger rice economy to equal the domestic demand raised a member of pertinent questions both in policy circles and amongst researchers. For instances, why domestic rice production lagged behind the demands for the commodity in Niger. The core explanation was the resources use efficiency. Average yield of upland and lowland rain-fed rice production system in Niger was 0.1 to 1.5 ton·hm<sup>-2</sup>, while that of the irrigation system and water management system was 4.5 to 5 ton·hm<sup>-2</sup> (PAFRIZ, 2004). This average yield was low when compared with 3 ton·hm<sup>-2</sup> from upland and lowland system and 7 ton·hm<sup>-2</sup> from irrigation system in places like Cote d'Ivoire and Senegal (WARDA and NASER, 2001). It thus gave the impression that rice farmers in Niger weren't getting maximum return from the resources devoted to their enterprise. This paper therefore examined the efficiency levels of rice farmers from seven villages in southwest of Niger and the influencing factors that determined their efficiency levels.

## Materials and Methods

### Study area

This survey was conducted in three districts of southwestern Niger, during the period January-March, 2015. The first district which is Boboye lies between longitude 2°30' and 3° and latitude 12°30' and 13°. This district has a total population of over 253 070 inhabitants and a total land mass of 4 423 km<sup>2</sup>. The second district is Kollo which lies between longitude 1°30' and 2°55' and latitude 12°3' with a total population of 465 303 inhabitants and a total land mass of 9 804 km<sup>2</sup>. The third district is Say, lying between longitude 1° and 3° latitude 12° and 13°30'. Its total population is 174 211 and its total land mass is 14 430 km<sup>2</sup> (INS-Niger, 2012). The infrastructures of

the three districts are poorly developed. Agriculture is the main economic activity, exerted by more than 90% of the population in the area. As a common feature in the country, agricultural production in the study area is characterized by subsistence farming whereby rural household needs determine the scale of production. Crop production depends mainly on a 3-4 months raining seasons (July to October), followed by a long dry season. The average annual rainfall ranged between 350 to 450 mm. Small pieces of rice lands, generally inherited, are cultivated by individual owners or sub-owners using the traditional methods of farming systems. The most commonly used agricultural tools included hand tools, which are owned by almost all the households. Rice crop is grown for home consumption and only the surplus is sold in local market or to the cooperatives.

### Data collection

A random sampling approach was adopted, where questionnaires were administered through individual structured interviews with the heads of the households in seven (7) selected villages. A total number of 148 households were covered. The survey gathered qualitative and quantitative data pertaining to the productions, factors of production, social, demographic and economic aspects of the households. Information about the background of rice production characteristics (paddy quantity, farm size, seed, fertilizer, pesticide, labor and mechanization) and socio-economic characteristics of household head (age, level of education, main occupation, experience in rice farming and gender) were revealed.

### Statistical analysis

In this study, one output indicators and six input indicators were used in DEA model. We considered a paddy quantity (KG) as output and the inputs were land (a), pesticide (kg), fertilizer (kg), seed (kg), total labor used (man-day/farm) in rice farming from land preparation to harvest (both family and hired labor) and machinery for ploughing. Table 1 showed

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