The Impact of Property Land Rights on the Production of Paddy Rice in the Tillabéry, Niamey and Dosso Regions of Niger

By

Maman Nafiou Malam Maman
and
Boubacar Soumana
Abdou Moumouni University, Niger

AERC Research Paper 229
African Economic Research Consortium, Nairobi
January 2011
THIS RESEARCH STUDY was supported by a grant from the African Economic

Research Consortium. The findings, opinions and recommendations are those of the authors, however, and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 - City Square
Nairobi 00200, Kenya

Printed by: Modern Lithographic (K) Ltd.
PO Box 52810 – City Square
Nairobi 00200, Kenya

ISBN 978-9966-023-01-8

Contents

List of tables

Abstract

Food security is one of the major challenges that countries like Niger must take up. Of all the cooperatives set up in Niger, those dealing with rice production, which are the subject of the present study, are the most interesting from the point of view of peasant organizations. In this respect, farmed land belongs to the state which distributes irrigated plots to beneficiaries who are owner farmers, often identified through a socioeconomic survey. The present study, while showing that being a tenant has a positive and significant impact on rice production, argues for greater and more responsible involvement of the state through an autonomous rice board charged with renting land for rice production. The study recommends avenues for achieving food security by increasing the production of rice through increasing the land area for irrigation and allotting land for rice growing to those who can farm it.

Key words: Sharecropping, tenant farming, farming, irrigation, Niger River

Acknowledgements

We are very grateful to the African Economic Research Consortium (AERC) for supporting this study under its thematic grant scheme, and to its staff for the very efficient way they facilitated the research. Earlier drafts of this study benefited from comments and suggestions made during the AERC's biannual research workshops and we would, therefore, like to gratefully acknowledge the resource persons, the researchers and other participants who contributed to shaping this paper. The findings, interpretations, views, conclusions and policy recommendations are ours and any flaws in the study remain our responsibility.

1. Introduction

Niger, a former French colony, attained its independence on 3 August 1960. The country is bordered by Algeria and Libya to the north, Nigeria and Benin to the south, Chad to the east, and Burkina Faso and Mali to the west. It has a total surface area of 1,267,000 sq km, 12% of which is arable (for subsistence farming). It currently has a population of 12.5 million people living in seven regions and the capital city, Niamey. Its annual natural growth rate is 3.3%.

Niger is an arid and landlocked country. For example, Niamey is more than 1,000km from the nearest sea port, Cotonou (in Benin). In addition, the country enjoys only one rainy season a year which, in the best of cases, lasts for three months (from June to August) and a long dry season for the remaining nine months, with average temperatures of higher than 30°C. The cumulative rainfall never exceeds 1,000 millimetres and decreases as one goes from the south to the north where, in some places and some years, it does not rain at all. The country gets water from two permanent water courses, which are seriously threatened by sandbanks: The Niger River in the extreme west, which runs over 550km, and Lake Chad on a small portion of the country in the east.

Millet is the staple food for the bulk of Niger's population and is largely grown during the rainy season over the entire southern strip of the country. Also grown here are sorghum and some cash crops like groundnuts and the *niébé* are also grown. In the 1970s, Niger was the second largest producer of groundnuts in Africa after Senegal. Except for the cash crops, which are sold on the local market or exported to Nigeria, agriculture in Niger remains at the traditional subsistence level. Rare are the years during which Niger can be said to have a surplus cereals produce. In fact, the FAO has always classified Niger among those experiencing food shortage as rainfall is generally unpredictable and thus food production hinges on erratic weather conditions.

All the same, Niger has an ideal climate for animal breeding in the north during the rainy season and in the south after the harvest. The livestock in Niger is composed of sheep, cattle and goats. Before the long drought of 1973-1974 and 1983-1984, which considerably depleted Niger's livestock, the country used to supply countries like Côte d'Ivoire with meat. Today, Niger exports cattle on the hoof to Nigeria and its neighbours to the north, often informally. Like agriculture, animal breeding is a traditional, family activity and is more of a cultural heritage than a profit-making activity. Pastoral activities are dominated by the Fulani, and Touareg nomads.

Overall, unpredictable weather conditions make individual families, and the country at large, vulnerable to all sorts of crises. Tough weather conditions, a high rate of population increase, a decline in soil fertility and the depletion of natural resources (water, land, pasture, forests) have considerably contributed to increasing the vulnerability of the Niger population. Furthermore, Niger does not have enough control over its potential sources of income revenues from its mining products which are controlled by the country's external partners and depend on the fluctuations in the exchange rate.

For the purposes of comparison, it should be noted that Niger's economy during the 1990-2000 decade was characterized by a low level of growth — with an average annual rate of 1.9%[1] — a life expectancy of 44.4 years, an adult literacy rate of 14.4% (for people aged 15 and above)[2], a combined rate of primary, secondary and tertiary education enrolment of 21%, and a per capita GDP of US$835 in terms of purchasing power parity (UNDP, 2005). The result of all this was a low human development index (HDI) of 0.281, that had Niger classified by the UNDP as the 177th of 177 countries reviewed in 2003.[3] This HDI, which reflects a lack of progress in terms of human development, was coupled with a Human Poverty Index (HPI-1) of 64.4% (UNDP, 2005). The fight against poverty can only be won through targeting the right populations, notably rural ones, whose living conditions have to be improved through appropriate policies, particularly those related to agriculture.

After all, the survival of more than 80% of Niger's population hinges on agriculture, which is practised in the traditional way and only in one-third of the country along the southern strip, as the rest of the country is a desert. In addition, agricultural production in Niger is heavily dependent on unpredictable weather conditions.

Despite all these obstacles, agriculture contributes the most to the country's GDP: Its share was estimated at 61% of the GDP growth rate in 2001, 43% in 2002 and 11% in 2003[4].

But what are Niger's various primary products? They are: Millet, sorghum, paddy rice, maize, *fonio, niébé*, and *voandzou*. Table 1 presents the production of these products over the years.

Table 1: Trends in the national agricultural production (in thousand tonnes)

	2000	2001	2002	2003	2004
Millet	1,679.2	2,358.7	2,504.0	2,744.9	2,037.7
Sorghum	370.7	663.6	636.3	757.6	599.5
Paddy rice	62.9	70.2	81.7	69.3	18.4
Maize	3.9	2.3	1.5	2.2	4.0
Fonio	0.6	1.3	1.5	1.4	0.4
Niébé	262.7	509.5	612.3	549	339.5
Voandzou	6.0	5.7	15.9	5.5	9.8

Source: National Institute of Statistics (2005:163).

Table 1 shows millet as the principal product in Niger's agriculture. As such, it is the staple food. In 2004, it was farmed over 5,604,400ha (along the country's southern strip)[5], which corresponds to 364kg/ha. The table also shows that production varied from year to year. This fluctuation was due to the amount of rainfall recorded and sometimes to destruction by locusts, migratory birds and rodents among others.

It should also be pointed out that *niébé* and *voandzou* are legumes and are grown more as cash crops than food crops. Traditionally, the farmers stock the two crops with the aim of using them to either buy cereals for sowing or for food or to finance agricultural work.

Generally speaking, Niger's agriculture revolves around irrigation and dry crop farming. However, since the latter is not always guaranteed because of unpredictable weather conditions, food self-sufficiency depends on irrigation. The irrigation promotion policy advocated in Niger's rural development plans and programmes (e.g., the 1987-1991 Plan for Economic and Social Development) was implemented through the setting up of irrigated plots of land and an out-of-season farming policy initiated in 1984. While out-of-season farming was done by individuals, irrigated plots of land were used by cooperatives. It is worth mentioning that rice is the main crop grown on these irrigated plots.

Table 2: Data on paddy rice production from 2000 to 2004

	2000	2001	2002	2003	2004
Quantity of rice produced (in thousand tonnes)	62.9	70.2	81.7	69.3	18.4
Area farmed (1,000 hectares)	18.2	5.5	10.0	5.9	8.4
Yield (kg/ha)	3,456	12,764	8,170	11,746	2,190

Source: National Institute of Statistics (INS) (2005:163)

According to Table 2, rice production increased from 2000 to 2002, and tumbled in 2004, as a result of the floods that hit the country (INS, 2005), while the amount of land farmed was uneven over those years. The national rice production falls far below the country's demand hence the need for rice imports, as Table 3 shows.

Table 3: Rice imports

Year	Imports in tonnes	Value of imports in CFA francs
1995	39,645	7,422,537,000
1996	51,566	10,233,253,000
1997	94,896	17,858,929,000
1998	92,985	20,410,119,000
1999	83,400	14,938,673,720
2000	89,954	17,197,925,123
2001	161,600	28,993,919,914
2002	204,481	33,162,784,803
2003	146,822	20,202,705,338
2004	142,798	22,947,326,616
2005	300,333	48,074,136,541

Source: INS (2005)

The volume of rice imports soared over a period of 10 years: It increased almost tenfold from 1995 to 2005. This shows not only how much Niger's population depends on rice, but also how little of it is produced in the country. The country spends tens of billions of CFA francs to import rice, money that could be used to develop the country and get the population out of poverty. However, the same population must produce rice competitively and ensure irrigated plots for growing rice are better managed.

Mismanagements of these plots is traced to the legal status of the farmed land. Producers who have benefited from developed land allotted to cooperatives by the government do not consider themselves owners of the land and cannot guarantee the suitability of this land. That is why the effort towards food self-sufficiency through irrigation must be based on the promotion of private irrigation. Since Niger exploits only 30% of its potentially irrigable land, is it not possible to promote private irrigation by developing the land for the people who do not have the financial means to develop it?

The aim of this study is to highlight the impact of owning land on the production of paddy rice as opposed to the impact of renting land for rice production. The specific objectives of this study include to identify the determinants of rice production (soil quality, size of the plot of land, fertilizers, etc.) and to check whether these determinants are the same in the three regions.

The overal hypothesis is that owning a plot of land for rice production increases this production. This suggests that being an owner of a piece of land is more important than being a tenant, even for a large investor. The specific hypotheses relate to the expected signs of socioeconomic variables. One such hypothesis is that the developed land and the physical capital are significantly and positively correlated with the annual and seasonal rice production. Another hypothesis is that labour, as represented by the number of labourers employed by rice farmers, has a negative effect on rice production because of the small size of the plots of land for growing rice.

2. Literature review

Several authors have written about agriculture, either linking it to human capital (see Gurgand, 1993) or trying to determine the effect of quantitative inputs on output (see Mundlak et al., 2002). Gurgand (1993) has highlighted the fact that in Côte d'Ivoire education was not found to contribute to an increase in productivity, which is contrary to the theory of human capital that posits a positive relationship between level of education and productivity. The limitation of Gurgand's study lies in the fact that it did not take into account sociological factors like the strict dependency in the execution of orders given by a father and his sons irrespective of their age. According to Mundlak et al. (2002), the introduction of new, high-yield varieties of cereals in the 1960s, known as the green revolution, clearly changed the nature of food supplies in Asia and other countries. Mundlak et al. (2002) looked at the consequences of growth in agriculture in Indonesia, Thailand and the Philippines. Despite geographical proximity, similar climatic conditions and other shared features, the gains in productivity, together with income, were found to be significant at 5% of confidence level different in the three countries. The authors measured the differences in income and analysed the main reasons for them. These reasons were found to be related to new technologies, fertilizers, land and capital. For example, appropriate technology was found to lead to changes in the use of factors and public and private investment. The authors found that the accumulation of factors played an important role in increasing yields and that the accumulation of investments, through a policy of human capital and public infrastructure, was an important source of productivity gains. They concluded that the policies alleviating the constraints on the markets, and which foster public investment in human capital and infrastructure, offered the best chances of enhancing agricultural production.

This study was inspired by the two factors mentioned above and sought to determine the effect of both quantitative and qualitative inputs. However, it is clear that the emphasis can be laid on the contribution of human capital, even though the results of the Gurgand (1993) study can also be observed in Niger, a country with sociological features similar to Côte d'Ivoire's. The results of this study will enable us to take a stance on Gurgand (1993) and Mundlak et al. (2002) studies.

Minten, Randrianarisoa and Zeller (2002), Robilliard (1998), Khaldi (1998), Reardon et al. (1996), and Schiff and Montenegro (1995) have studied the relationship between the size of the agricultural farm and production. Khaldi (1998) observed that in Tunisia small farms make up two-thirds of all the agricultural farms in the country: 343,000 of the 471,000 (73%) agricultural farms in Tunisia are less than 10ha. However, rural integrated development has shown that a small farm can not only become viable again, but also constitute a vector of social progress and economic growth, provided that the farm in question is well managed and sustained and that the way it is farmed is suited to the local ecological and climatic conditions and enables the farmers to get an income comparable to what they would get from other sectors. Popularization, supply and commercialization are the basic requirements for the success of agricultural development and investment policies. Khaldi's study highlights the importance of owning a small farm, however small it may be. However, Khaldi was not able to carry out a simulation in order to measure the effect of an increase in the number of farms, something we were able to do in the present study.

Soumana (2006) showed an existing positive correlation between the amount of rice produced in Niger and farming practices, especially the time of transplanting and that of the first weeding. The same type of correlation was found between the land farmed and production. However, unlike our study, neither Soumana's study nor the literature described above presented the issue of production in terms of the mode of land farming: The present study looked at the impact of various modes of farming on rice production.

From the classical to the contemporary economists, the mode of land farming has been accorded special attention. In this respect, classical economists[6] (Turgot, 1770; Smith, 1776; Sismondi, 1819; Mill, 1848) dealt with the model of farming by the tenant in the sense that they looked at sharecropping from an evolutionist perspective in which slavery, serfdom, paying rent in kind and farm rent succeeded each other in a context of imperfect markets. On the other hand, neoclassical authors[7] posited the existence of perfect markets. In the Marshall (1971) model, the tenant farmer seeks to maximize his profit within the framework of an economy characterized by competitive markets. The sharing of the product, the wage which the sharecropper tenant might get from the labour market and the amount of land on the market are exogenous variables. The tenant farmer chooses the quantity and the intensity of the work done, while the owner does not have any means of control over this work. In such a case, sharecropping corresponds to a mode of land farming that is economically inefficient, compared with farming by the owner and farming by the tenant. Such a model explains only the inefficiency of sharecropping in comparison with the other forms of tenure, as it only takes into account the optimization by the tenant farmer and ignores that by the owner.

Cheung 's(1969) model unlike Marshall's (1971), optimized the land owner's behaviour. It takes land and labour as the production factors and the rate of sharing of the product and the amount of land allotted by the owner to the tenant farmer as endogenous variables. The owner can then control the amount of work done by the sharecropping farmer, which renders sharecropping efficient, since the allocation of factors and the distribution of income are identical from one model of farming to the other, provided that the terms of the contract are respected. This model is close to tenant farming. However, the model relies only on the owner's ability to unilaterally fix the terms of the contract and to control the tenant farmer's work. Moreover, it does not account for the existence of sharecropping, as all the modes of land farming are equivalent in terms of economic efficiency, use of factors and sharing of the product. Neoclassical models have limitations related to risks, information asymmetries, market imperfection, and transaction costs, all of which have been taken into account in the contemporary literature (Colin, 1995).

Sharecropping was successively seen as a means to share risks (Stiglitz, 1974; Braverman and Stiglitz, 1986; Manfredo and Leuthold, 1999; Aggarwal, 2007), an incentive system (Alfranca and Huffman, 2003); a tool for selecting tenant farmers (Aggarwal, 1999); a way to make up for market imperfection (Glaeser, 1995; McCann and Easter, 1999; Rao, 1971); and, finally, as an arrangement for enabling a reduction in transaction costs (Chew, 1998; Heintzelman and Salant, 2004).

With regard to the relationship between sharecropping and risk sharing, the former is conceived of as a system of risk distribution and transfer. If the land owner is indifferent to risk while the potential tenant farmer manifests risk aversion, the land will be farmed by the owner by giving a paid contract to the tenant farmer. But if the owner manifests risk aversion while the tenant farmer is indifferent to risk, the two will go for a farm-renting contract. Finally, if the two partners both manifest risk aversion, they will go for a sharecropping system, whereby the risk will be shared proportionally to the share of the products. However, this type of analysis has limitations, especially when risk sharing is linked only to production. All in all, risk sharing alone is considered an insufficient determinant of sharecropping. It is thus imperative to bring in other elements like market imperfection.

Sharecropping is often considered a lesser incentive than tenant farming, since the tenant farmer gets only a fraction of the marginal product. Nevertheless, sharecropping is seen as playing an important incentive role in situations of great uncertainty, but the need to share the risk does not allow one to opt for tenant farming, which is a more effective incentive system. Moreover, the imperfections of the rural labour market can also explain the usefulness of sharecropping for both the potential tenant farmer and the land owner, because a market of imperfect labour cannot guarantee sure and stable employment for the tenant farmer for the entire farming season or enable the land owner to get paid-employees when needed. Thus, factoring in market imperfections causes one to consider sharecropping as a mode of farming that ensures the full use of certain factors (hitching up, labour) and reduces the risks that go with having access to these factors.

That said, rarely is land ownership total nor land rights absolute. The laws that grant property rights are often complex and involve several jurisdictional authorities. Land property rights can thus be considered a range of rights rather than an absolute control over a land resource. Holding a property right on a resource does not necessarily mean holding all the rights. A property right that has no attached restriction leaves room for someone else to have rights on the same resource. Usually it is the state that imposes restrictions on certain behaviours, but they can also be imposed by other structures (the family, the group one belongs to, religion, etc.).

The state is the principal land owner or majority shareholder in land ownership in many countries in Africa, the former Soviet Union and in some countries in southeast Asia. There are multiple reasons for that, some of which are historical and others ideological, like the need to avoid concentration of land property in the hands of a few or speculation. However, in practice, the state has usually not been able to manage its land properties. While many countries have undertaken land reforms, few have succeeded.

Land reform has its origin in Europe in the 18th century, with the voluntary sale of land to poor farmers. In the 20th century, land reform was turned into a concept that was based on coercion from the state. In general, coercive land reform has led to disappointing results and has not contributed to poverty reduction. There are exceptions, though: East Asia in the 1950s, the first phase of land reform in Zimbabwe, and some aspects of the land reform carried out in the Philippines in the past decades (FAO, 2001).

The same study by the FAO specifies that a coercive land reform is intrinsically a disruptive process that can lead to long-term negative effects on the institutional credibility of a country. This will generally apply to a reform carried out against the backdrop of political upheaval or violent conflict. We believe that in order to make the reform less disruptive, and render it more effective in reducing poverty, new approaches, which would bring in elements of the market into the land reform process, should be tried.

The land issue can best be analysed in the context in which it arises. Reference will be made to the experiences of industrialized countries to illustrate the fact that land policies and structures put in place were based on economic criteria. In liberal economies, policies of land regulation and agricultural development took, as the reference, a basic economic unit, namely a farm; and social units, namely the farmers and/or their family (Bessaoud, 2005).

In all countries, property rights, user rights, and forms of ownership and use of land and management of production have been key issues at the socioeconomic level. That is why one must think of ways of ensuring land security. The basic principle of achieving land security consists in not challenging the already existing laws, regulations and procedures. Legislation can define the general framework for a country's land policy (Bessaoud, 2005) while seminars would be conducted to clarify the rules. One thing that should be clarified is how to stabilize the rules and principles that will have to take into account the local context while enjoying state recognition (CID, 2001).

West African Economic and Monetary Union (also known by its French acronym, UEMOA) and the CILSS (Comité Inter-Etate pour la Lutte contre la Sécheresse au Sahel meaning Permanent Inter-State Committee for Drought Control in the Sahel) have tried to encourage the developing of land policies within member states with a view to designing a subregional charter to consider major concerns and offer solutions which cannot be found within the borders of individual countries. Unfortunately, competing institutional jurisdictions between the ministerial departments in charge of natural resources make matters even more complicated for the Sahel countries. There is, thus, a need to solve the institutional competition in designing and implementing land policies. In the case of Niger, the land policy is the responsibility of an inter-ministerial body that is charged with collating the views from different ministries with a view to achieving a common and shared stance on the land issue. In any case, the Niger government has been unable to ensure a proximity management of the land issue.

In Niger, there is a gradual move from the customary chief's exclusive authority over communal land towards a legal system whereby this chief keeps only a simple moral authority over communal land. This means that the chief no longer has the right to redistribute communal land. This right has been granted, by law, to land commissions composed of representatives from the various segments of the population who use land resources, among them the customary chiefs.

The significance of land in Africa in general and in the Sahel region in particular cannot be overemphasized. Land: (a) is an economic property since it is the basis of agricultural and pastoral activities for most of the population; (b) has a cultural dimension to the extent that each person identifies himself or herself with a given village or territory; (c) has a social dimension since it is one of those rare goods that are transferable from one generation to another through inheritance; (d) has a spiritual dimension since it is commonly accepted that each human being comes from the earth and will return to the earth; (e) it has a political significance because it serves as the basis for any territorial power. Such a multidimensional function gives the land a sacred nature for African populations who usually identify it with some deity (Mamalo, 2005).

Contemporary authors have taken a stance on the determinants of the mode of farming by the tenant. The present study is different in that it takes into account the determinants of production, not only in a system of farming by the tenant, but also in that of farming by the owner. Indeed, our study seeks to identify the determinants of production by the mode of farming.

3. Research methodology

The study accounts for the quantity of rice produced in the Tillabéry, Niamey and Dosso regions of Niger using a series of socioeconomic variables. The sample of farmers used in the study was selected randomly. It is important to clarify that various categories of farmers make up the rice-producing population in Niger. First, public servants who grow rice principally to make money. Since they have more money than the rest of the population, they rent land which they have farmed using paid labourers.

Secondly, farmers who either inherited the land on which they grow rice or bought it. They grow rice more for subsistence than for making money. More notably, it is assumed that the output function is of the following form (Minten, Randrianarisoa and Zeller, 2002):

$$Y = g\ (T, M, K, L, R, D) \tag{1}$$

The variables on the right include clusters of modifiers of technology (T) such as irrigation infrastructure and access to extension work; a cluster of variables related to access to markets of inputs and agricultural products (M) (infrastructure, access to farming inputs); a cluster of variables related to capital (K) (existence of [formal and informal] savings groups and micro-credit institutions); variables that measure access to land (L); a cluster of risk factors (R) (frequency of floods, rice diseases); and a cluster of variables related to the quality of soil and the specificity of the area (D). All these factors can be summarized as labour and capital factors in order to obtain a CES function such as the following:

$$Yt = F(Kt, Lt, Bt, \lambda, \delta) = [\delta(B_t.K_t)^{-\lambda} + (1\text{-}\delta)\ (A_t\ .L_t)^{-\lambda}]^{-1/\lambda} \tag{2}$$

where *Yt*[8] is a measure of real production of the economy, *Kt* the stock of the capital used at time *t*, and *Lt* the amount of the labour factor used (measured in hours spent working). The terms A_t and *Bt* represent the specific effectiveness with which each of these factors has been used or, in other words, the state of the technology specific to each of these. As a result, the term A_t represents the effective amount of the labour factor used, an amount which increases as the technology specific to this factor increases for a given quantity *Lt*. The parameter δ is related to the share of the factors labour and capital in real production, while the parameter λ is related to the substitution elasticity among production factors.

Certain conditions apply to the parameters of the function F( ), that is $0<\delta<1$ and $-1<\lambda \neq 0$. The substitution elasticity is given by the equation $\sigma = \dfrac{1}{1+\lambda}$.

The usual assumptions about the marginal productivity of K and L also apply, that is:

$$\frac{\partial F(.)}{\partial j} > 0 \quad \text{and} \quad \frac{\partial^2 F(.)}{\partial j^2} < 0 \quad \text{for } j = K; L.$$

It can be observed that the production function presented in (2) is linearly homogeneous and thus presents constant returns to scale. The CES formulation can be used to represent technology that ensures increasing or decreasing returns to scale.

The advantage of using a CES formulation for the production function lies in the fact that it is flexible and encompasses several other functional forms, depending on the value of the parameter λ.

First, the linear fo[...] factors labour and capital are perfect substitutes) is obtained by taking $\lim_{\lambda \to (-1)} F(\cdot)$. In this case, the substitution elasticity is infinite. Then, the Leontief fixed [...]nulation (of perfectly complementary goods) is obtained by evaluating $\lim_{\lambda \to (\infty)} F(\cdot)$. In this case, the su[...]ticity is nil. Finally, the Cobb-Douglas formulation is obtained by taking $\lim_{\lambda \to (0)} F(\cdot)$. In this last case, the substitution elasticity is unitary.

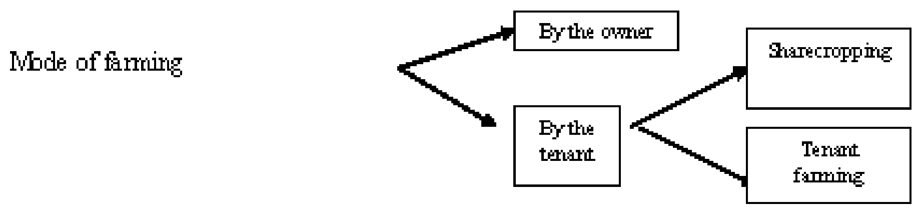
However, the CES function does not enable one to isolate the impact of possessing land or the effect of land surface on rice production, which is allowed by the Cobb-Douglas or the translog function. A test[9] becomes thus necessary in order to use the appropriate functional form.

Further, as the variable "ownership of a plot of land" was likely to be endogenous, the Hausman test was carried out to check this possible endogeneity.

Furthermore, a dummy variable taking into account the regional specificity was introduced to verify whether the determinants varied according to regions.

Finally, the variable "ownership of a plot of land" is, in the entire analysis, a dummy variable taking on the following values: 0 = owner; 1 = tenant.

The following was the farming mode adopted in this study:



Sharecropping was observed on private farms, that is, those that did not belong to a cooperative, while tenant farming was observed to be the mode of farming on the irrigated plots of land managed by cooperatives.

Data were collected from 725 farmers randomly selected from the Dosso, Tillabéry and Niamey regions of Niger. Details are given in the section about descriptive statistics.

Since the survey was done through one visit on one of the two annual periods when rice is harvested, retrospective questions were asked.[10]

The data were analysed using appropriate software for descriptive statistics and econometric analysis.

4. Results of the study

Distribution of the sample by region

The study was conducted in three rice-producing regions of Niger. According to Table 4, they are, in terms of the quantity produced, Tillabéry, Niamey and Gaya (Dosso). In each region, the plots of land chosen for the study were located within a 10km radius of the town. The size of the sample used in this study was composed of at least 7% of the farms in the area of study. In all, 725 farmers were surveyed, 15.3% of whom were drawn from Gaya, 58.3% from Niamey, and 26.2% from Tillabéry.

Table 4: Distribution of rice farmers by region

Region	Name of the area	Number of farmers	Number of the people surveyed	Proportion of the people surveyed (%)	Their proportion in the size of the sample (%)
Dosso	Gaya-Amont Tara	804	111	13.8	15.3
Niamey	Saga Saguia Aval	3,176	424	13.3	58.5
Tillabéry	Daibéri Daikaina Diambala Toula	1,474	190	12.9	26.2

Distribution of rice farmers according to the mode of farming

The mode of farming can be by the owner or by the tenant. It was observed that a majority (81.7%) of rice farmers were plot owners. As indicated in Table 5, the mode of land allocation was essentially through a request addressed to the cooperative. It is worth noting here that even the plots of land acquired through inheritance were allocated by the cooperative.

Table 5: Proportion of rice farmers according to the mode of farming

	Region			Total
The various aspects of the mode of farming by	Dosso	Niamey	Tillabéry	

	the tenant				
Mode of farming	By the owner	84.1	71.7	85.5	81.7
	By the tenant	15.9	28.3	14.5	18.3
Mode of allocation	Request to the cooperative	52.2	55.9	78.7	68.6
	Inheritance	31.9	24.5	18.0	21.8
	Purchase	0	0	1.7	1.0
	Renting	0	1.1	0.2	0.4
	Loan	12.4	1.1	0.9	2.8
	Other	3.5	17.6	0.5	5.4

Distribution of rice farmers according to the level of education

The level of education and gender

While plots of land are farmed by men and women, the latter make up only 2.2% of all the rice farmers (Table 6). The distribution of rice farmers according to the level of education shows that illiterate farmers and those at a level lower than the CFEPD are the majority.

Table 6: Distribution of rice farmers according to the level of education and gender

Farmer's identity		Region			Total
		Dosso	Niamey	Tillabéry	
Gender	Male	87.6	100	99.5	97.8
	Female	12.6	00	0.5	2.2
	Total	100	100	100	100
Level of education	Lower than the CFEPD	50.9	22.8	27.7	30
	Higher than the CFEPD but lower than the BEPC	3.6	22.2	8.5	11.4
	Higher than the BEPC but lower than or equal to the BAC	1.8	7.9	0.2	2.5
	Koranic education	10.9	12.2	27.7	21.1
	Illiterate	15.5	30.7	29.1	27.5
	Literate through literacy programme	15.5	1.1	1.9	3.7
	Other	1.8	3.2	4.7	3.9

CFEPD[11], BEPC[12], BAC[13]

Level of education and farmer's status

The bulk of rice farmers in Niger are illiterate and those with a level of education that is lower than the CFEPD. On the whole, tenants have a higher level of education than the growers (Table 7).

Table 7: Level of education according to the rice farmer's status

Rice farmer's status	Level of education							Total
	Lower than or equal to the CFEPD	Higher than the CFEPD but lower than or equal to the BEPC	Higher than the BEPC but lower than or equal to the BAC	Koranic education	Illiterate	Literate through literacy programme	Other	
Owner	26.7%	4.9%	2.5%	17.1%	22.7%	3.8%	3.9%	81.6%
Tenant	3.3%	6.5%	.0%	4.0%	4.5%	.0%	.0%	18.4%
Total	30.1%	11.4%	2.5%	21.2%	27.2%	3.8%	3.9%	100.0%

The system of farming plots of land for rice-growing

Niger has put in place structures to support the rice farmers operating within a cooperative system. Unfortunately, due to these structures' inability to achieve their mission and their lack of transparency in the management of cooperatives, for many rice farmers cooperatives have nothing (85.6% are independent, Table 8) to do with the government structures.

Table 8: Rice farmers' knowledge of partners

Nature of relationship	Partners			
Depending on growers	ONAHA	RINI	CA	Government
Dependent	65.8	61.2	45.2	14.4
Independent	34.2	38.8	54.8	85.6

Analysis of production systems

In the present study, production systems are defined as a combination of factors of production and methods of intervention. Whether it is in an agricultural approach or an economic one, the analysis of production systems offers elements that account for production.

Appraisal of farming operations

Ploughing and harrowing

Ploughing, which is the first operation in farming a plot of land, is usually done using a plough. In this respect, we can say that farming is mechanized at 94.3% (Table 9). The popularized new techniques of harrowing have only been adopted by 42.7% of the farmers. Ploughing is rather shallow and some farmers still use traditional techniques.

Table 9: Distribution of rice farmers according to the type of farming equipment used

Farming equipment	Region	Total

		Dosso	Niamey	Tillabéry	
Farming equipment for ploughing	Hoe	12.6	3.7	4.6	5.7
	Plough	87.4	96.3	95.4	94.3
	Motorized cultivator	0	0	0	0
Farming equipment for harrowing	Hoe	15.9	41.4	50.7	42.7
	Harrow	84.1	58.6	49.3	57.3

Watering

In the growing of rice, watering influences yield. Watering varies according to the vegetative stage of the plant. Unfortunately, very few farmers are aware of this, and so disregard it. This behaviour can be explained by the fact that water seems to be a limiting factor. For example, farmers watered their plants every week because water was not enough at the first watering (Table 10). Droughts were observed in 59.1% of the cases.

Table 10: Distribution of rice farmers according to the amount of water used in watering

Amount of water used in watering		Region			Average
		Dosso	Niamey	Tillabéry	
Level	20cm	6.4	16.1	20.8	14.43
	10cm	82.6	64.6	56.9	68.03
	Less than 10cm	11.0	11.8	13.7	12.26
	Depends on the vegetative stage of the plant	0	1.8	5.1	2.3
Frequency	Once a week	54.2	89.9	95.3	88.9
	Twice a week	45.8	10.1	4.7	11.1
Drought spells	Yes	45.7	59.9	59.1	54.9
	No	54.3	40.1	40.9	45.1

Transplanting and observing the farming calendar

The transplanting calendar was found not to have been observed by 34.9% of growers (Table 11). On this issue, the Tillabéry region came first, followed by Niamey. According to the people surveyed, this non-observance happens usually during the rainy season, a period during which there is competition between growing rice and growing dry crops.

Table 11: Proportion of observance and non-observance of the farming calendar by rice farmers

Rice transplanting calendar	Rice farmers' region			Total
	Dosso	Tillabéry	Niamey	
Observed	74.8%	61.4%	56.9%	62.4%

Not observed	23.4%	38.4%	34.1%	34.9%
No response	1.8%	.2%	9.0%	2.6%
Total	100.0%	100.0%	100.0%	100.0%

Weeding and observance of the farming calendar

Weeding should be done three times. However, very few rice farmers adhere to this and blame it on the delay in getting fertilizers, in addition to the competition from dry crops.

Reaping and threshing

When asked whether their ready-to-harvest crops had been damaged by rain, some farmers said yes. It is clear from this that harvest periods are not observed, which leads to the loss of a good deal of their produce. Threshing takes place within a week of harvesting, which makes winnowing easier and reduces the amount of broken rice.

Production factors

Fertilizers and workforce

For more than 70% of rice farmers, enrichment of plots of land relies on the use of fertilizers. The formula of combining fertilizers, which is advocated by researchers, is used by a few rice farmers. Organic manure is used only in the Tillabéry region. Unfortunately, very few farmers are capable of paying for this; the majority have to seek loans to be able to buy it. The supply of fertilizers is one of the impediments to adequate production. In this respect, the government seems to have abdicated its responsibility; its supply board rarely supplies any fertilizer. Regarding the workforce, it is largely supplied by the family.

Table 12: Proportion of use of fertilizers and workforce

Fertilizers		**Proportion by region**		
		Dosso	**Niamey**	**Tillabéry**
Nature	Chemical	85.6	88.4	74.5
	Organic	0	0	0.7
	Chemical and organic	14.4	11.6	24.8
Supply mode	Govt aid	1.8	8	0.2
	Bought on credit	81.4	72.9	93.4
	Bought by cash	16.8	19.1	5.0
	Other	0	0	1.4
Nature of the workforce	Members of the family	71.1	60.9	46.9
	Paid workers	28.9	39.4	53.1

When the workforce is viewed from the point of ownership status, the majority of owners of land for rice growing spend between CFAF10,000 and CFAF50,000, while the majority of tenants spend CFAF10,000 at most (Table 13). This discrepancy is due to the non-rational use by the land owners, who mobilize a strong workforce from the family. The discrepancy is greater during the rainy season, when there is competition for workforce between the two types of crop farming (i.e., dry and irrigated).

Table 13: Distribution of rice farmers according to their status and type of workforce

Farmer's status	Amount of money spent on the workforce					
	0-10,000	10,000-50,000	50,000-100,000	100,000-150,000	150,000-300, 000	Total
Rainy season						
Owner (%)	27.1	43.4	18.9	6.9	3.7	100
Tenant (%)	47.3	22.6	3.8	26.3	00	100
Dry season						
Owner (%)	30.9	37.9	26.3	2.9	3.7	100
Tenant (%)	47.7	22.6	25.3	14.4	00	100

Distribution of rice farmers according to the amount of capital invested and their status

The distribution of farmers according to the amount of capital invested shows that the tenants are more inclined to invest beyond CFAF100,000 (Table 14). For instance, it was found that more than 40% of tenants invested CFAF100,000 and above during the rainy season against only 15% of owners.

Table 14: Distribution of rice farmers according to the amount of capital invested and their status

Farmer's	Amount of invested capital									
status	0-10,000	10,000-50,000	50,000-100,000	100,000-200,000	200,000-300,000	300,000-400,000	400,000-500,000	500,000-745,000	More than 745,000	Total
Owner (%)	8.5	8.9	21.2	42.9	9.6	1.3	1	6.1	0.5	100%
Tenant (%)	31.5	19.2	10.6	6.8	6	22	3	0.6	0	100%

Farmer's	Amount of invested capital					
status	0-10,000	10,000-50,000	50,000-100,000	100,000-150,000	150,000-300,000	More than 300,000	Total
Rainy season							
Owner (%)	15.4	14.9	54.7	8.6	3.2	3.2	100
Tenant (%)	35.6	15.9	6.8	12.7	26	3	100
Dry season							
Owner (%)	20.9	15.9	44.3	11.9	3.7	4.2	100
Tenant (%)	47.7	14.4	9.8	3	22	3.1	100

Economic analysis of rice production

Average yields in the different regions

Plots of land allocated to rice growing vary from 0.20ha to 0.50ha. On average, the farmed area is 0.43ha, while yields are satisfactory only in the Niamey region. The varieties of rice farmed (namely IR 15 and BG 90) can produce yields of five tonnes per hectare. Table 15 shows the expected agricultural performance by hectare.

Table 15: Average yields according to regions in 2007

Rice-growing area	Average surface area (in ha)	Average yield during the dry season (in tonnes/ha)	Average yield during the dry season (in tonnes/ha)	Average yield by harvest (in tonnes/ha)
Dosso	0.46	2.73	2.75	2.75
Niamey	0.44	4.36	4.01	4.18
Tillabéry	0.39	3.80	3.54	3.67
Total	0.43	3.63	3.43	3.53

Production costs by operations and by region

In the rice-producing process (Table 16), there are operations during which the work force is quite important. These are the transplanting and weeding stages which, in most cases, are conducted by paid temporary workforce. Dues and fertilizer costs are the largest expenses.

Table 16: Production costs by operation and by region

Farming operation		Region			Average
		Dosso	Niamey	Tillabéry	
Ploughing	Dry season	5,839.51	4,298.80	3,894.31	4,677.54
	Rainy season	6,780.00	5,254.72	4,228.00	5,420.91
	Average by season	6,309.75	2,628.09	4,061.155	5,049.225
Harrowing	Dry season	4,870.37	3,948.19	3,663.55	4,160.70
	Rainy season	5,840.00	4,546.88	3,706.42	4,697.77
	Average by season	5,355.185	4,247.535	3,684.985	4,429.235
Transplanting	Dry season	6,122.81	6,758.57	6,201.5	6,360.96
	Rainy season	6,433.96	7,394.59	6,525.18	6,784.58
	Average by season	6,278.385	7,076.58	6,363.34	6,572.77
Weeding	Dry season	6,625	9,318.71	7,423.27	7,788.99
	Rainy season	29,631.58	9,697.14	7,873.81	15,734.18
	Average by season	18,128.29	9,507.92	7,648.54	11,761.59
Caretaking	Dry season	21,741.94	24,548.7	22,419.35	23,303.33
	Rainy season	7,037.04	9,504.83	15,714.29	10,752.05
	Average by season	14,389.49	17,026.77	19,066.82	17,027.69

continued next page

Table 16 Continued

Farming operation		Region			Average
		Dosso	Niamey	Tillabéry	
Fertilizers	Dry season	21,774.51	41,929.89	35,884.35	33,196.25
	Rainy season	20,619.65	42,850.28	38,031.54	33,833.82

	Average by season	21,197.08	42,390.08	36,957.94	33,515.03
Pesticides	Dry season	7,381.82	11,853.09	8,692.65	9,309.18
	Rainy season	7,352.94	11,580.73	8,637.14	9,190.27
	Average by season	7,367.38	11,716.91	8,664.9	9,249.72
Reaping	Dry season	8,095.24	12,285.45	8,677.97	9,686.22
	Rainy season	6,529.41	12,941.91	8,446.43	9,305.92
	Average by season	7,312.32	12,852.67	8,562.2	9,496.07
Threshing	Dry season	15,248.97	12,763.44	9,743.51	12,585.3
	Rainy season	52,468.75	12,870.11	11,533.33	25,624.06
	Average by season	33,858.86	12,816.77	10,638.42	19,104.68
Transport	Dry season	4,354.55	8,135.26	8,846.94	7,112.25
	Rainy season	4,683.33	9,102.16	12,879.59	8,888.36
	Average by season	4,518.94	8,618.71	10,863.26	8,000.30
Dues	Dry season	24,549.71	62,064.77	46,355.04	44,623.17
	Rainy season	27,935.75	68,617.99	39,620.15	45,391.3
	Average by season	26,242.73	65,341.38	42,987.59	45,007.23
Other	Dry season	19,882.94	6,159.09	22,215	16,085.68
	Rainy season	0	30,000	0	10,000
	Average by season	9,941.47	18,079.54	11,108	13,042.84

Distribution of rice farmers according to their capacity to pay dues and to their level of satisfaction

Production enables the farmers to pay their dues, which is the most expensive component of his or her expenses (Table 17). However, this production is not used to cover household food needs.

Table 17: Distribution of rice farmers according to their capacity to pay dues and to their level of satisfaction

Appraisal of economic gains		Frequency	Proportion
Payment of dues	Has dues to pay	25	3.4
	No dues to pay	700	96.6
Satisfaction of their needs	Satisfied	248	34.2
	Not satisfied	477	65.8

Opportunities

Availability of non-farmed land and needs in plots of land

The results of our study show that there are opportunities for sustaining a policy for promoting rice production in Niger: Land for growing rice is still available and there is desire on the part of the population to engage in this activity (Table 18). Land is more available in the Niamey and Gaya regions than Tillabery.

Table 18: Availability of non-farmed land and needs in plots of land

Availability of land and expression of need for a plot of land		Region		
		Dosso	Niamey	Tillabéry
Land is available	Yes	77.5	77.6	56.6
	No	22.5	22.4	43.4
Number of plots of land	One	39.4	60.2	67.8
	More	60.6	38.7	32.0
Expressed needs	Yes	94.4	84.8	84.8
	No	5.6	15.2	15.2

Availability of workforce in rice farmers' opinions

People are even ready to farm the land from outside their own locality. There is an available workforce for this, a workforce composed mainly of young people and foreigners (Tables 19 and 20).

Table 19: Rice farmers' opinions about the availability of workforce

Elements of appraisal of the workforce		Region		
		Dosso	Niamey	Tillabéry
People accept to work outside their locality	Yes	81.7	90.79	87.07
	No	18.3	9.21	12.93
People accept to be employers	Yes	96.7	83.6	55.6
	No	3.3	16.4	44.4

Table 20: Rice farmers' opinions about the availability of reserve workforce

Reserve workforce	Frequency	Proportion
Anybody	622	85.8
Young person	100	13.8
Other	3	1.4
Total		

Estimation of the share of contribution to the development of new plots of land

While the results of our study show that there is still non-farmed land and that people have expressed the need to develop this land, it is important to highlight the populations' will to support a policy of developing new plots of land. The surveyed people can contribute about 20% of the funding needed for this development (Table 21).

Table 21: Estimation of the share of contribution to the development of new plots of land

% of funding	Proportion of rice farmers by region		
	Dosso	Niamey	Tillabéry

0	0	1.04	4.7
Less than 5	0	7.3	11.32
5	1.76	11.97	9.2
10	7.0	7.81	16.5
15	0	8.33	3.06
20	31.9	18.8	21.46
25	0	8.33	1.65
30	0	0	4.5
40	0	1.04	4.95
50	48.67	7.3	5.9
No answer	17.67	28.08	16.76

Econometric analysis

This consists in estimating function (1) depending on whether it has a translog form:

$$LogY_i = \alpha_1 LogK_i + \alpha_2 LogL_i + \frac{1}{2}\alpha_3 Lok_i * LogK_i + \frac{1}{2}\alpha_4 LogL_i * LogL_i + \alpha_5 Lok_i LogL_i + \alpha_6 LogZ_i + \frac{1}{2}\alpha_7 LogZ_i * LogZ_i + \alpha_8 D_i + \xi_i \qquad (3)$$

or a Cobb-Douglas:

$$LogY_i = \beta_1 LogK_i + \beta_2 LogL_i + \beta_3 LogZ_i + \beta_4 D_i + \theta_i \qquad (4)$$

In (3) and (4), K represents capital, that is, all that enables a farmer to produce rice; L represents labour; Z represents the size, in hectares, of a plot of land; D is a dummy variable which takes the value 1 when the rice farmer is not the owner of the plot of land, and 0 when the farmer is the owner; α_i and β_i are the parameters to be estimated, ξ and θ are the usual terms of errors, for (3) and (4), respectively.

The advantage of using both of these functional forms is that it enables us to avoid a priori restrictions on production technology. Indeed, the Cobb-Douglas type of function has a restriction that has to do with the constancy of yields to scale. To test this restriction, another more flexible form, labelled "translog", was used.

In order to choose an appropriate functional form, we used the LR[14] test which led to the following conclusion: chi^2_{read} (4) = 9.49 < $chi^2_{computed}$ (4) = 19.86 for alpha level = 0.05, which implies that the Cobb-Douglas functional form (Equation 4) should be preferred to the translog functional form. On the basis of this appropriate choice, two categories of results can be achieved: Results of an invariable nature, that is, results involving socio-economic variables, which are not dependent on agricultural policy. For example, if we assumed that rice production per plot of land was big for a male farmer, it would not be possible to transform all the possible female farmers into male ones. In other words, such results will never vary with gender.

The second category is that of results that are likely to serve as the basis for a policy of improving rice production in order to achieve food self-sufficiency, which would also contribute to a reduction in Niger's rice imports.

Before presenting those results, it is equally important to make sure that explanatory variables are really exogenous. To this end, we set out to test the endogeneity of the variable "rice farmer's status". If this variable turns out to be endogenous, the method of the ordinary least squares produces non-convergent estimators; in this case, there is a need to use double least squares in order to get unbiased and convergent estimators. If the variable turns out to be non-endogenous, the ordinary least squares method is enough.

To test endogeneity, we used Hausman (1978) test. This test consists in computing the regression of the variable "rice farmer's status", which is assumed to be endogenous, in relation to the other explanatory variables of model (4) in order to deduce the residue from them. This residue is reintroduced into model (4) in lieu of rice farmer's status, alongside the other explanatory variables. We estimated this new equation to check the significance of the residue: If the residue was found to be significant, then the variable assumed to be endogenous was indeed endogenous. In this case, the instrumental variable method was used. If it was not significant, the ordinary least squares method was enough to estimate Equation 4.

The results of the test are given in annex B. They show that the variable "rice farmer's status" was indeed found to be endogenous. This was established using the instrumental variable method. In this connection, we used, as instruments, the variables related to the ownership of animals (goats and donkeys) instead of the variable "rice farmer's status". These instruments were found to be strongly correlated with the rice farmer's status (see the table in annex B, III).

Finally, the variable "region" was used to take into account the impact of the characteristics of a region on rice production. We wanted to check whether being the region of Tillabéry or that of Dosso had the same impact on rice production as that of being the region of Niamey.

The results are summarized in Table 22.

From model (I), where the annual rice production is explained, it transpires that the variables capital, labour, surface area and region have a significant, at least in 10% confidence level, effect on rice production in Niger. This suggests that all resources mobilized beforehand have a positive and significant effect on the annual production of rice in the country; in fact, a 1% increase in these resources leads to a 0.41% increase in production. This finding corroborates many other empirical results (Minten, Randrianarisoa and Zeller, 2002); besides, it is not counterintuitive.

Table 22: Determinants of the annual and seasonal rice production (2 SLS)

Econometric variable	Coefficients		
	(I) Annual production	(II) Dry season production	(III) Rainy season production

Log capital	0.41 (11.12)***	0.34 (7.40)***	0.46 (11.06)***
Log labour	-0.06 (-1.65)*	-0.08 (-1.69)*	-0.06 (-1.52)
Log surface area	0.21 (8.01)***	0.19 (5.87)***	0.22 (7.32)***
Being a tenant[15]	0.05 (0.20)	-0.29 (-0.98)	0.54 (2.04)**
Dosso region	0.09 (1.72)*	0.05 (0.74)	0.16 (2.50)**
Tillabéry region	0.05 (1.32)	0.04 (0.77)	0.07 (1.50)
Constant	2.50 (6.01)***	-1.34 (-2.58)***	-3.29 (-7.00)***
Adjusted R^2 F N	35.4065.02725	8.2029.39725	32.0065.73725

*** significant at the 1% level; **significant at the 5% level; *significant at the 10% level
Source: Computations by the authors

An increase in the area of land allocated to rice farming also has a positive impact on production: A 1% increase in land leads to a 0.21% increase in production. This finding speaks in favour of having bigger plots of land for rice growing.

On the other hand, the variable "labour" had a slightly significant negative impact on annual rice production. This counterintuitive finding can be explained by the nature of the variable representing the labour factor: After all, since this variable has to do with the number of people employed by the rice farmer and since the plots of land farmed are usually small, it is only normal to expect a negative sign. The lesson here is that farmers should exercise cautioun when hiring many workers.

The last finding, though only slightly significant, is related to the impact of characteristics of regions. This impact was found to be positive, although only the characteristics of the Dosso region were found to be significantly positive. This is attributable to the fact that this region has more rice farmers who use modern techniques of rice farming, and on more fertile land. It is also in this same region that modern rice farming practices were observed on the irrigated plots. It was observed that the variable "rice farmer's status" did not discriminate between categories of farmers. This result means that both the owner of the land and the tenant use the land in the same manner. However, considering their differing initial investment, and, more importantly, considering the fact that the tenant uses the land only for a limited duration, it follows that if the tenant has made heavy investment on the land he or she will be inclined to overexploit it so as to get a quick return on the investment. Therefore, any possible difference between the two categories of rice farmers would be among seasonal determinants. That is why we tested models II and III, which are related to both the dry and the rainy season harvest.

The signs and variables of model II differ from those of model I only in their region-related characteristics: In the latter model, none of the regions has an impact on rice production during the dry season. During this season, the water of the Niger River recedes, which shows how in Niger water availability has a greater impact on rice production than the quality of the soil. This finding is in favour of a permanent watering system. However, this model does not bring out the effect of the status of the land on production, which is the concern of model III.

Model III stands out from the other two in several respects. It was observed that all the variables in model III had a positive effect on production. For example, a 1% increase in capital was found to lead to a 0.46% increase in rice production, while a 1% increase in the area of land farmed led to a 0.22% increase in rice production.

The variable "labour", which refers to the number of people mobilized to farm the plot of land, was not found to have an effect on rice production in the rainy season. This finding can be explained by the fact that during the dry season there is a substitution of sorts between the production of rice and that of rainfed crops, millet and sorghum, as a result of which few people are engaged full time in rice production. This observation is comparable to that made about the impact of the variable “capital” on investment.

As expected, the tenants, who in general invest more on the farmed land than the owners, and who overexploit it in order to get a quick return on investment, get higher yields which vary with the duration[16] of the farming lease.

With regard to region-related characteristics, it was observed that the combination of fertile soil and availability of water (in the rainy season) explained why being in the Dosso region had a positive and significant impact on rice production.

Finally, most of our indicators can benefit from a policy aimed at intensifying agricultural production in order to alleviate the food pressure that heavily weighs on the country. In this regard, model III suits best the hypotheses that were to be tested in our study.

Although our main hypothesis was disproved, we still realized that the state had a role to play. In this respect, the government must set up an independent board to be charged with the management of rice growing land. This board would start by ensuring that there is new irrigated land that can be leased to those willing to use it. However, there are two problems with state intervention: (a) transaction costs, and (b) governance.

For state intervention to be preferred by the market, its cost must be lower than that of its non-intervention, which is not obvious given the quality of non-market services offered. Since all the land belongs to the state, its intervention would be limited to using coercive power to get back the farmed land and, possibly, compensate those who would have farmed the land. The next stage, namely agreeing on the duration and the region of the lease, would be handled through a transparent contract between the board and the tenants on the basis of market rules.

Since the availability of water is indispensable, Niger’s current policy of building a dam at Kandadji will produce positive externalities for rice farmers who will produce more as long as they have a permanent access to water.

Finally, in order to facilitate access to initial investment, a number of activities can be undertaken to enable rice farmers to invest enough in their plots of land for maximum benefits.

5. Conclusion

7. See Colin (1995).

8. Here it represents the annual production of paddy rice in the three regions. LR = -2 (lnLc-lnLnc), which must follow a chi^2 at r degrees of freedom (r = number of constraints). Thus, if LR is higher than the chi^2 value found in the table at the chosen alpha level and at r degrees of freedom, the null hypothesis is rejected, which means that the restrictions have not been proved, and the conclusion is that the Cobb-Douglas specification offers a better model.

9. This is the likelihood ratio test. This compares the ratio of the constrained model (in this case the Cobb-Douglas model) with that of the non-constrained model (in this case the Translog model). If the constraint is valid, we must get Lc < Lnc where Lnc is the function of the likelihood of the non-constrained model and Lc that of the constrained model.

   LR = -2 (lnLc-lnLnc), which must follow a chi^2 at r degrees of freedom (r = number of constraints). Thus, if LR is higher than the chi^2 value found in the table at the chosen alpha level and at r degrees of freedom, the null hypothesis is rejected, which means that the restrictions have not been proved, and the conclusion is that the Cobb-Douglas specification offers a better model.

10. To illustrate, if one round of harvest took place last June and that the next will take place in December, when the survey takes place in December data about the June harvest will be asked retrospectively.

11. CFEPD: certificate de fin d’études du premier degré.

12. BEPC: brevet d’études du premier cycle.

13. BAC: baccalauréat.

14. See the gross results in the annex.

Niger has enormous potential in terms of irrigation. However, for this potential to be realized, the impact of land property rights on the production of rice — the main irrigated crop in Niger — must be emphasized.

The study analysed data from a survey conducted in three regions through which the Niger River flows, namely Tillabéry, Niamey, and Dosso. The initial hypothesis was that the ownership of a plot of land for rice farming had a positive effect on rice production. This was not confirmed by facts from the data. Instead, the data showed that the tenants, who invest relatively more on the plot of land than the owners, get higher yields from the rainy season harvest.

The study also identified other determinants of rice production. The size of the plot of land for rice growing and the amount of mobilized capital were found to have a positive effect, while the labour factor was found to have a significantly negative effect. This finding, which seems to be counterintuitive, can be explained by the fact that the high number of paid people employed by the rice farmer — which is the variable that represented labour — costs a lot of money.

On the basis of these findings, we put forward proposals for policies aimed at intensifying rice production in order to reduce Niger's dependence on rice imports ad achieve food self-sufficiency. In this respect, it is proposed that the government should get back the land initially leased and put it in the hands of an independent board to develop the land and manage it transparently in accordance with market regulations.

To be able to have preference for one agricultural policy aimed at reducing rice imports and/or achieving food self-sufficiency over another, it is imperative to carry out a cost-effectiveness analysis comparing the costs, including social costs (for example, in the case of expropriation) of implementing each contemplated policy.

Notes

1. See the comprehensive Poverty Reduction Strategy of January 2002.

2. This figure seems to be largely underestimated compared with the adult literacy rate computed on the model of QUIBB 2005 by the Niger National Institute of Statistics.

3. UNDP, 2005, World Human Development Report, p. 234.

4. National Institute of Statistics, Ministry of Finance (2005), "National Economic Accounts".

5. National Institute of Statistics (2005).

6. As quoted by Colin (1995).

Mamalo, A. 2005. *Consortium mondial sur la gestion des terres arides*. Communication

Manfredo, M.R. and L.M. Leuthold. 1999. "Value-at-risk analysis: A review and the potential for agricultural applications". *Review of Agricultural Economics*, 21(1):99-111.

Marshall A. 1971, " Principe d'économie politique", traduction française du texte de la quatrième édition anglaise, Paris Gordon et Breach.

McCann, L.M.J. and K.W. Easter. 1999. "Differences between farmer and agency attitudes regarding policies to reduce phosphorus pollution in the Minnesota River Basin". *Review of Agricultural Economics*, 21(1): 189-207.

Minten, B., C. Randrianarisoa and M. Zeller. 2002. " Niveau, Evolution, et Facteurs Déterminants des Rendements du Riz à Madagascar: Une Interprétation Basée sur des Données Communautaires",

Mundlak, Y., D.F. Larson and R. Butzer. 2002. "Determinants of agricultural growth in Indonesia, the Philippines, and Thailand". WPS 2803.

National Institute of Statistics. 2005. *National Economic Accounts*. Ministry of Finance..

15. The variable used as an instrument.

16. This issue, which for the time being is just a hypothesis, needs a deeper analysis for a clear response to it.

References

Aggarwal, R.M. 2007. "Role of risk sharing and transaction costs in contract choice: Theory and evidence from groundwater contracts". *Journal of Economic Behavior & Organization,* 63: 475–96.

Aggarwal, P. 1999. "Contractual structure in agriculture". *Journal of Economic Behavior & Organization,* 39: 293–325.

Alfranca, O. and W.E. Huffman. 2003. "Aggregate private R&D investments in agriculture: The role of incentives, public policies, and institutions". *Economic Development and Cultural Change, 52: 1-21*.

Bessaoud, O. 2005. " La sécurisation foncière en Algérie: Constats et propositions provisoires. Montpellier (France): CIHEAM-IAMM. Rencontre Internationale sur le Financement de l'Economie Algérienne.

Braverman, A. and J.E. Stiglitz. 1986. "Cost-sharing arrangements under sharecropping: Moral hazard, incentive flexibility, and risk". *American Journal of Agricultural Economics,* 68 (3): 642-52.

Cheung, S. 1969. *The Theory of Share Tenancy.* University of Chicago Press, Chicago.

Chew, T.A. 1998. "Transactional framework of sharecropping: Empirical evidence". *Agricultural Economics,* 18: 47-52.

Colin, J-P. 1995. "De Turgot à la nouvelle économie institutionnelle : Brève revue des théories économiques du métayage", *Économie rurale,* 228 (juilet-août): 28-34.

CID (International Cooperation and Development). 2001. *Droits fonciers délégués en Afrique de l'Ouest*.

Dasgupta, S., T. Knight and A. Love. 1999. "Evolution of agricultural land leasing models: A survey of the literature". *Review of Agricultural Economics*, 21 (1): 148-76.

FAO, 2005. *La politique de développement agricole: Concepts et expérience.*

Glaeser, E. 1995. "The incentives effects of property taxes on local governments". Working Paper No. 4987. NBER.

Gurgand, M. 1993. "Les effets de l'éducation sur la production agricole. Application à la Côte d'Ivoire". *Revue d'économie du développement,* 4: 37-54.

Khaldi, A. 1998. "Rôle de l'agriculture tunisienne dans le processus de développement et la lutte contre la pauvreté". Ministry of Agriculture, Tunisia.

Hausman, J.A. 1978. "Specification Tests in Econometrics". *Econometrica*, 46 (6): 1251–71.

Heintzelman, M.D. and S.W. Salant. 2004. "A solution to the tragedy of the commons and a problem for anti-trust authorities". 2: 1-22.

Average water extraction	
• Used in agriculture	0.41 km^3/year
• Used by the industry	0.01 km^3/year
• Used at home	0.08 km^3/year
• Total	0.5 km^3/year
Total water extraction per person (1988)	69 m^3/person/year
Estimated irrigable potential	
• In the Niger River valley	140,000 ha
• In the rest of the country	130,000 ha
• Total	270,000 ha
Currently irrigated land	
• Formal irrigation with total control of water	12,000 ha
• Traditional irrigation with partial control of water	55,000 ha
• Irrigation using flood water with no control of water	12,000 ha
• Total	79,000 ha

Source: FAO, 1995.

Annex B: Choice of functional form and econometric results

The functional form

The translog form

reg lpsac lcap lkrecap ltrn lctrn ltrncp lsupfic lcsupfic lctair dosso tillaberi

Appendixes

Randrianarisoa, J.C. 2002. "Déterminants de la production riziculture des petites. et grandes exploitations agricoles: Cas des Hautes-Terres". Voir *http://www.ilo.cornell.edu/images/th2.4.pdf,* accédé le 7-10-2010.

Rao, C.H. 1971. "Uncertainty, entrepreneurship, and sharecropping in India". *The Journal of Political Economy,* 79(3): 578-95.

Reardon, T., V. Kelly, E.W. Crawford, T. Jayne, K. Savadogo and D.C. Clay. 1996. "Determinants of farm productivity in Africa: A synthesis of four case studies". International development papers, No. 22, Michigan State University.

Robilliard, A-S. 1998. "L'offre de riz des ménages agricoles malgaches Etude économétrique à partir d'enquêtes transversales". Working papers, DT/98/09.

Schiff, M. and C.E. Montenegro. 1995. "Aggregated agricultural supply response in developing country: A survey of selected issues". Policy Research working paper series, No. 1485.

Soumana, B. 2006. "Les déterminants du revenu et de la pauvreté au Niger". PhD thesis, University of Algiers.

Stiglitz, J.E. 1974. "Incentives and risk sharing in sharecropping". *The Review of Economic Studies,* 41(2): 219-55.

UNDP. 2005. "World Human Development Report".

Annex A: Data description

Table A1: A summary of irrigation in Niger

Annual average of renewable water resources	
• Internal	3.5 km^3/year
• External	29. km^3/year
• Total	32.5 km^3/year
Total renewable resources per person (1994)	3,675 m^3/person/year
Total reserve capacity	0.1 km^3

lsupfic	.1987522	.020975	9.48	0.000	.1575726	.2399319
lctair	.2103692	.0366612	5.74	0.000	.1383933	.2823452
dosso	.1164355	.0452784	2.57	0.010	.0275416	.2053294
tillaberi	.0704924	.0325818	2.16	0.031	.0065254	.1344594
_cons	2.506288	.4109442	6.10	0.000	1.699492	3.313084

est store cobb

The LR test for the choice of the appropriate form:

lrtest trans cobb
/* test on the basis of Chi2 to choose the functional form***/**

Likelihood-ratio test	LR chi2(4)	=	19.86
(Assumption: cobb nested in trans)	Prob > chi2	=	0.0005

d) Interpreting the result of the test:

We have: chi^2_{read} (4) = 10, < $chi^2_{computed}$ (4) = 19.86 for alpha level = 0.05, which means that the Cobb Douglas form is more appropriate than the translog from.

Taking endogeneity into account

The endogeneity test on the variable "rice farmer's status"

reg lctair lcap ltrn lsupfic dosso tillaberi

Source	SS	df	MS			
				Number of obs	=	725
				F(5, 719)	=	5.00
Model	3.62839738	5	.725679477	Prob > F	=	0.0002
Residual	104.338499	719	.145116132	R-squared	=	0.0336
				Adj R-squared	=	0.0269
Total	107.966897	724	.149125548	Root MSE	=	.38094

/the translog: non-constrained model ***/**

Source	SS	df	MS
Model	63.5591757	10	6.35591757
Residual	97.9680282	714	.137210123
Total	161.527204	724	.223103873

Number of obs	=	725
F(10, 714)	=	46.32
Prob > F	=	0.0000
R-squared	=	0.3935
Adj R-squared	=	0.3850
Root MSE	=	.37042

lpsac	Coef	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lcap	.98025	1.113404	0.88	0.379	-1.205686	3.166186
lkrecap	-.1076477	.0383793	-2.80	0.005	-.1829976	-.0322978
ltrn	-3.262963	1.002772	-3.25	0.001	-5.231697	-1.294228
lctrn	.0003961	.0486938	0.01	0.994	-.0952042	.0959963
ltrncp	.2496467	.082598	3.02	0.003	.0874827	.4118107
lsupfic	-.5842319	.2576776	-2.27	0.024	-1.090128	-.0783356
lcsupfic	.0955079	.0315202	3.03	0.003	.0336245	.1573913
lctair	.2029835	.0367237	5.53	0.000	.1308842	.2750828
dosso	.1343375	.046178	2.91	0.004	.0436765	.2249985
tillaberi	.071537	.032451	2.20	0.028	.0078263	.1352477
_cons	14.3874	8.691317	1.66	0.098	-2.676197	31.45099

. est store trans

The Cobb-Douglas form

. reg lpsac lcap ltrn lsupfic lctair dosso tillaberi
/constrained model****/**

Source	SS	df	MS
Model	60.8381558	6	10.1396926
Residual	100.689048	718	.140235443
Total	161.527204	724	.223103873

Number of obs	=	725
F(6, 718)	=	72.30
Prob > F	=	0.0000
R-squared	=	0.3766
Adj R-squared	=	0.3714
Root MSE	=	.37448

lpsac	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lcap	.4130609	.0349811	11.81	0.000	.3443835	.4817382
ltrn	-.0715936	.0348614	-2.05	0.040	-.1400361	-.0031511

	SS	df	MS		
Model	58.0466631	6	9.67444385	Prob > F	= 0.0000
Residual	103.480541	718	.144123316	R-squared	= 0.3594
				Adj R-squared	= 0.3540
Total	161.527204	724	.223103873	Root MSE	= .37964

lpsac	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lctair	.0468021	.2357627	0.20	0.843	-.4160646	.5096688
lcap	.4067717	.036575	11.12	0.000	.334965	.4785785
ltrn	-.062265	.0377533	-1.65	0.100	-.1363851	.0118551
lsupfic	.20945830261603		8.01	0.000	.1580985	.2608181
dosso	.0949758	.0551358	1.72	0.085	-.0132709	.2032225
tillaberi	.053684	.0407846	1.32	0.188	-.0263873	.1337554
_cons	2.503728	.4166177	6.01	0.000	1.685793	3.321662

Instrumented: lctair
Instruments: lcap ltrn lsupfic dosso tillaberi goats donkeys

For the dry season production

ivreg lsac1 lcap ltrn lsupfic dosso tillaberi (lctair=caprins asins)
/ the double ordinary least square: dry season **********/**

Instrumental variables (2SLS) regression

Source	SS	df	MS		
				Number of obs	= 725
				F(6, 718)	= 29.39
Model	15.8666788	6	2.64444647	Prob > F	= 0.0000
Residual	161.118844	718	.224399504	R-squared	= 0.0896
				Adj R-squared	= 0.0820
Total	176.985523	724	.244455142	Root MSE	= .47371

lsac1	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lctair	-.2871045	.2941839	-0.98	0.329	-.8646681	.290459
lcap	.3378674	.0456382	7.40	0.000	.2482672	.4274677
ltrn	-.0795033	.0471085	-1.69	0.092	-.1719901	.0129835
lsupfic	.1915708	.0326427	5.87	0.000	.1274842	.2556574
dosso	.0511898	.0687983	0.74	0.457	-.0838801	.1862597
tillaberi	.0392102	.0508909	0.77	0.441	-.0607026	.139123
_cons	-1.340272	.5198542	-2.58	0.010	-2.360888	-.3196558

Instrumented: lctair
Instruments: lcap ltrn lsupfic dosso tillaberi goats donkeys

For the rainy season production

ivreg lsac2 lcap ltrn lsupfic dosso tillaberi (lctair=goats donkeys)
/ the double ordinary least square:**
rainy season > ide********/**

Instrumental variables (2SLS) regression

Source	SS	df	MS		
				Number of obs	= 725
				F(6, 718)	= 65.73
Model	63.8759962	6	10.6459994	Prob > F	= 0.0000
Residual	132.305208	718	.184269093	R-squared	= 0.3256
				Adj R-squared	= 0.3200

lctair	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lcap	-.0384498	.0355557	-1.08	0.280	-.1082551	.0313556
ltrn	.0570318	.035399	1.61	0.108	-.012466	.1265297
lsupfic	.0654536	.0211968	3.09	0.002	.0238387	.1070686
dosso	-.1311979	.045799	-2.86	0.004	-.2211136	-.0412822
tillaberi	-.1027617	.0329216	-3.12	0.002	-.1673957	-.0381277
_cons	-.0156522	.4180338	-0.04	0.970	-.8363649	.8050606

.predict resid

reg lpsac lcap ltrn lsupfic resid dosso tillaberi, r

Linear regression

Number of obs	=	725
F(6, 718)	=	39.77
Prob > F	=	0.0000
R-squared	=	0.3766
Root MSE	=	.37448

lpsac	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lcap	.4049722	.0516591	7.84	0.000	.3035514	.5063931
ltrn	-.0595958	.0367479	-1.62	0.105	-.1317421	.0125504
lsupfic	.2125217	.0226944	9.36	0.000	.1679663	.257077
resid	.2103692	.0328512	6.40	0.000	.1458733	.2748652
dosso	.0888355	.0404969	2.19	0.029	.0093291	.1683419
tillaberi	.0488745	.0329555	1.48	0.139	-.0158261	.1135752
_cons	2.502995	.4770309	5.25	0.000	1.566453	3.439538

Instrumentation

Choice of instruments: The correlation test

pwcorr psac lctair donkeys goats, star(0.05)

	psac	lctair	donkeys	goats
psac	1.0000			
lctair	0.2344*	1.0000		
donkeys	-0.0566	-0.0928*	1.0000	
goats	-0.0670	-0.0879*	-0.0541	1.0000

Econometric results for double ordinary least squares

For the total annual rice production

ivreg lpsac lcap ltrn lsupfic dosso tillaberi (lctair=goats donkeys)
/ the double ordinary least square:**
tot > ale********/**
Instrumental variables (2SLS) regression

Source	SS	df	MS		
				Number of obs =	725
				F(6,	718) =65.02

Total	196.181205	724	.270968515	Root MSE	=	.42927

lsac2	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
lctair	.5428303	.2665841	2.04	0.042	.0194528	1.066208
lcap	.4572989	.0413565	11.06	0.000	.3761048	.538493
ltrn	-.0646827	.0426888	-1.52	0.130	-.1484926	.0191271
lsupfic	.2166237	.0295803	7.32	0.000	.1585495	.2746978
dosso	.1558436	.0623438	2.50	0.013	.0334457	.2782414
tillaberi	.0693806	.0461164	1.50	0.133	-.0211585	.1599198
_cons	-3.296972	.4710824	-7.00	0.000	-4.221835	-2.372108

Instrumented: lctair
Instruments: lcap ltrn lsupfic dosso tillaberi goats donkeys

Other recent publications in the AERC Research Papers Series:

Extent and Determinants of Child Labour in Uganda, by Tom Mwebaze, Research Paper 167.

Oil Wealth and Economic Growth in Oil Exporting African Countries, by Olomola Philip Akanni, Research Paper 168.

Implications of Rainfall Shocks for Household Income and Consumption in Uganda, by John Bosco Asiimwe, Research Paper 169.

Relative Price Variability and Inflation: Evidence from the Agricultural Sector in Nigeria, by Obasi O. Ukoha, Research Paper 170.

A Modelling of Ghana's Inflation: 1960–2003, by Mathew Kofi Ocran, Research Paper 171.

The Determinants of School and Attainment in Ghana: A Gender Perspective, by Harry A. Sackey, Research Paper 172.

Private Returns to Education in Ghana: Implications for Investments in Schooling and Migration, by Harry A. Sackey, Research Paper 173.

Oil Wealth and Economic Growth in Oil Exporting African Countries, by Olomola Philip Akanni, Research Paper 174.

Private Investment Behaviour and Trade Policy Practice in Nigeria, by Dipo T. Busari and Phillip C. Omoke, Research Paper 175.

Determinants of the Capital Structure of Ghanaian Firms, by Joshua Abor, Research Paper 176.

Privatization and Enterprise Performance in Nigeria: Case Study of Some Privatized Enterprises, by Afeikhena Jerome, Research Paper 177.

Sources of Technical Efficiency among Smallholder Maize Farmers in Southern Malawi, by Ephraim W. Chirwa, Research Paper 178.

Technical Efficiency of Farmers Growing Rice in Northern Ghana, by Seidu Al-hassan, Research Paper 179.

Empirical Analysis of Tariff Line-Level Trade, Tariff Revenue and Welfare Effects of Reciprocity under an Economic Partnership Agreement with the EU: Evidence from Malawi and Tanzania, by Evious K. Zgovu and Josaphat P. Kweka, Research Paper 180.

Effect of Import Liberalization on Tariff Revenue in Ghana, by William Gabriel Brafu-Insaidoo and Camara Kwasi Obeng, Research Paper 181.

Distribution Impact of Public Spending in Cameroon: The Case of Health Care, by Bernadette Dia Kamgnia, Research Paper 182.

Social Welfare and Demand for Health Care in the Urban Areas of Côte d'Ivoire, by Arsène Kouadio, Vincent Monsan and Mamadou Gbongue, Research Paper 183.

Modelling the Inflation Process in Nigeria, by Olusanya E. Olubusoye and Rasheed Oyaromade, Research Paper 184.

Determinants of Expected Poverty Among Rural Households in Nigeria, by O.A. Oni and S.A. Yusuf, Research Paper 185.

Exchange Rate Volatility and Non-Traditional Exports Performance: Zambia, 1965–1999, by Anthony Musonda, Research Paper 186.

Macroeconomic Fluctuations in the West African Monetary Union: A Dynamic Structural Factor Model Approach, by Romain Houssa, Research Paper 187.

Price Reactions to Dividend Announcements on the Nigerian Stock Market, by Olatundun Janet Adelegan, Research Paper 188.

Does Corporate Leadership Matter? Evidence from Nigeria, by Olatundun Janet Adelegan, Research Paper 189.

Determinants of Child Labour and Schooling in the Native Cocoa Households of Côte d'Ivoire, by Guy Blaise Nkamleu, Research Paper 190.

Poverty and the Anthropometric Status of Children: A Comparative Analysis of Rural and Urban Household in Togo, by Kodjo Abalo, Research Paper 191.

Measuring Bank Efficiency in Developing Countries: The Case of the West African Economic and Monetary Union (WAEMU), by Sandrine Kablan, Research Paper 192.

Economic Liberalization, Monetary and Money Demand in Rwanda: 1980–2005, by Musoni J. Rutayisire, Research Paper 193.

Determinants of Employment in the Formal and Informal Sectors of the Urban Areas of Kenya, by Wambui R. Wamuthenya, Research Paper 194.

An Empirical Analysis of the Determinants of Food Imports in Congo, by Léonard Nkouka Safoulanitou and Mathias Marie Adrien Ndinga, Research Paper 195.

Supply Response, Risk and Institutional Change in Nigerian Agriculture, by Joshua Olusegun Ajetomobi, Research Paper 197.
Multidimensional Spatial Poverty Comparisons in Cameroon, by Aloysius Mom Njong, Research Paper 198.
Earnings and Employment Sector Choice in Kenya, by Robert Kivuti Nyaga, Research Paper 199.
Convergence and Economic Integration in Africa: the Case of the Franc Zone Countries, by Latif A.G. Dramani, Research Paper 200.
Analysis of Health Care Utilization in Côte d'Ivoire, by Alimatou Cisse, Research Paper 201.
Financial Sector Liberalization and Productivity Change in Uganda's Commercial Banking Sector, by Kenneth Alpha Egesa, Research Paper 202.
Competition and performace in Uganda's Banking System, by Adam Mugume, Research Paper 203.
Parallel Market Exchange Premiums and Customs and Excise Revenue in Nigeria, by Olumide S. Ayodele and Frances N. Obafemi, Research Paper 204.
Fiscal Reforms and Income Inequality in Senegal and Burkina Faso: A Comparative Study, by Mbaye Diene, Research Paper 205.
Factors Influencing Technical Efficiencies among Selected Wheat Farmers in Uasin Gishu District, Kenya, by James Njeru, Research Paper 206.
Exact Configuration of Poverty, Inequality and Polarization Trends in the Distribution of well-being in Cameroon, by Francis Menjo Baye, Research Paper 207.
Child Labour and Poverty Linkages: A Micro Analysis from Rural Malawian Data, by Levision S. Chiwaula, Research Paper 208.
The Determinants of Private Investment in Benin: A Panel Data Analysis, by Sosthène Ulrich Gnansounou, Research Paper 209.
Contingent Valuation in Community-Based Project Planning: The Case of Lake Bamendjim Fishery Restocking in Cameroon, by William M. Fonta et al., Research Paper 210.
Multidimensional Poverty in Cameroon: Determinants and Spatial Distribution, by Paul Ningaye et al., Research Paper 211.
What Drives Private Saving in Nigeria, by Tochukwu E. Nwachukwu and Peter Odigie, Research Paper 212.
Board Independence and Firm Financial Performance: Evidence from Nigeria, by Ahmadu U. Sanda et al., Research Paper 213.
Quality and Demand for Health Care in Rural Uganda: Evidence from 2002/03 Household Survey, by Darlison Kaija and Paul Okiira Okwi, Research Paper 214.
Capital Flight and its Determinants in the Franc Zone, by Ameth Saloum Ndiaye, Research Paper 215.
The Efficacy of Foreign Exchange Market Intervention in Malawi, by Kisukyabo Simwaka and Leslie Mkandawire, Research Paper 216.
The Determinants of Child Schooling in Nigeria, by Olanrewaju Olaniyan, Research Paper 217.
Influence of the Fiscal System on Income Distribution in Regions and Small Areas: Microsimulated CGE Model for Côte d'Ivoire, by Bédia F. Aka and Souleymane S. Diallo, Research Paper 218.
Asset Price Developments in an Emerging Stock Market:The Case of Mauritius, by Sunil K. Bundoo, Research Paper 219.
Intrahousehold Resource Allocation in Kenya, by Miriam Omolo, Research Paper 220.
Volatility of Resource Inflows and Domestic Investment in Cameroon, by Sunday A. Khan, Research Paper 221.
Efficiency Wage, Rent-sharing Theories and Wage Determination in the Manufacturing Sector in Nigeria, by Ben E. Aigbokhan, Research Paper 222.
Government Wage Review Policy and Public-Private Sector Wage Differential in Nigeria, by Alarudeen Aminu, Research Paper 223.
Rural Non-Farm Incomes and Poverty Reduction in Nigeria, by Awoyemi Taiwo Timothy, Research Paper 224.
What Do We Know After 15 Years of Using the United Nations Development Programme Human Development Index? By Jean Claude Saha, Research Paper 225.
Uncertainty and Investment Behaviour in the Democratic Republic of Congo, by Xavier Bitemo Ndiwulu and Jean-Papy Manika Manzongani, Research Paper 226.
An Analysis of Stock Market Anomalies and Momentum Strategies on the Stock Exchange of Mauritius, by S.K. Bundoo, Research Paper 227.
The Effect of Price Stability on Real Sector Performance in Ghana, by *Peter Quartey*, Research Paper 228.