Effect of land tenure on the adoption of sawah rice production technology in Nigeria and Ghana

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Abstract: This paper examined effect of land tenure on the adoption of sawah rice production technology in Nigeria and Ghana. A simple random sampling was used to select 80 farmers (45 adopters and 35 non–adopters) in Nigeria and 70 farmers (40 adopters and 30 non-adopters) in Ghana. Data were collected in December 2008 with a structured questionnaire in villages where sawah rice production technology had been introduced. The results show that in Nigeria, majority of the farmers are about 42 years of age, have quranic education, belong to farmers group, have 12 years farming experience, with inheritance as the main land tenure system. In Ghana, the mean age is about 45 years, having primary school education and the land tenure system is based on lease and sharecropping. In Nigeria, the percentages of fields in the categories of secured tenure (inheritance) were high among those fields where sawah technology was adopted while in Ghana, the percentages of fields in the categories of insecure tenure (lease, renting and sharecropping) were high among adopters. The results from the probit model showed that significant. variables include Purchase land(t=5.02) Inherit land (t=2.77) Tenancy period (t=-1.93) and Rent paid (-3.29) in Nigeria, and Ghana. It therefore implies that the issues of land tenurial right must properly be ascertained by farmers in order to enhance continuous adoption and sustained profit from sawah technology.

Key words: land tenure; adoption; sawah technology; rice; Nigeria; Ghana

1. Introduction

One of the challenges facing the developing world today is how limited environmental resources can sustainably support an ever-increasing global population, a challenge which puts into perspective the issue of land as an essential environmental resource for agricultural production and rural development. Over time, the vital role land plays in livelihoods sustenance has led societies to establish arrangements concerning its ownership and use. Land tenure involves the rules and procedures governing the rights, duties, liberties, and exposure of individuals and groups in the use of and control over land[1]. Issues of land tenure and land reform are often at the centre of debates over how best to develop the rural sector and meet the needs of the population. Moreover, land tenure issues are vital with respect to rural social unrest and environmental degradation. Generally, the pattern and efficiency of land-use system prevailing in a particular area is influenced by the systems of land tenure.

African customary land tenurial systems are often characterized by the inalienability of land. Fields are to a varying degree controlled by the extended family and influenced by community-level decisions. In many parts of West Africa, individuals have private user rights on the products from cultivation but do not have private ownership of land in terms of the ability to sell land. The most common land tenure system found in sub-Saharan Africa is community-based ownership where individuals belonging to a particular community have access and use rights to land which is held in trust by the community. Rights to different types of land are typically accorded to individual households or groups. Modes through which individuals have access to land in West Africa include inheritance, gift, purchasing, renting, pledging, sharecropping, and renting[2]. In

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many African countries, national legislation has formally provided for legal title to be granted to landholders to register ownership and land transfers. In practice, formal land titling, commercial land exchange, and the use of land as collateral are typically effective only in urban areas[1]. In rural areas of tropical agriculture where land is abundant, these practices tend to be either nonexistent or just emerging.

In Ghana, land is either communally owned, family owned, or individually owned such that family and individually owned lands are normally passed on to the succeeding generations through an elaborate system of inheritance which is an integral part of the culture. This has led to the fragmentation of land holdings among heirs resulting in gradual reduction in the size of individual holdings. The net result is strict tenurial controls with negative implications for agricultural development. Most of the land cultivated by farmers is under the ultimate control of a paramount chief and is allocated locally through a matrilineage leadership. Other forms of ownership/ contracts over land exist such as renting and sharecropping, but land allocated through the inheritance is the dominant form of land tenure. As a consequence, "people's ability to exercise claims to land remains closely linked to membership in social networks and participation in both formal and informal political processes[3]. The acquisition of a determinable title in a plot of land by a farmer requires continuous occupation although this does not confer absolute ownership[4]. Other farmers, usually migrants, lease lands for farming and unlike indigenes, do not have a right in communal lands. They acquire land by outright purchase, gift, tenancy, caretaker or labor arrangements. Leaseholds take two forms: sharecropping and annual land rental payment. Sometimes land rental payment is small or merely symbiotic. Leaseholds are restrictive and do not offer any security of land tenure to the farmers[5].

Bisong et al[6] states that the basis of landholding in Nigeria is the family. Family heads grant land-use rights for food production to members, as well as to "strangers" who are found acceptable to the community at large. Grants of land made to the individual entitle him and his children after him to use the land. Neither the grantee nor his children may alienate rights in land, without the knowledge and agreement of the family head. When the occupier of the family land dies, his portion reverts to the family pool. A new member of the family automatically has a stake in family land from the time of birth. Land tenure in Nigeria can be classified into three main types, namely: communal, individual (private) and public (state). Communal land tenure systems are more common in areas with relatively low population density; individual landownership predominates in densely populated communities. Customary land tenure systems in Nigeria are related to family and inheritance systems, and are based on the concept of group ownership of absolute rights in land, with individuals acquiring usufructuary rights. Customary land rights establish the basis for access to land resources and the opportunity to use land for productive purposes. Public land tenure is not common in the rural communities of Nigeria despite the Land Use Decree (Act) of 1978 which vests the state governor or chairman of the local government area (LGA) with the power of granting customary right of occupancy to any person or organization for the use of land for agricultural, residential and other purposes[1].

Other means of acquiring land include pledging, sharecropping and borrowing. Pledging is a sort of indigenous mortgage through which an owner-occupier gives possession and use of land to a pledge creditor (pledgee) in return for a cash need[6]. The standard terms are that either the pledgee uses the land until the pledger pays back what he owes, or that the pledgee takes the benefit from the land as interest for a stipulated number of years in order to recover the money lent to the pledger. In the latter case, the pledgee cultivates only annual crops and does not make any major investment or put up any structures. If, however, the fixed number of years has passed and the pledger is

unable to pay back, the pledgee becomes the de facto owner of the land, and the pledger and his heirs are permanently dispossessed of the land.

2. Introduction of sawah rice production technology

Nigeria is the largest country in West Africa, with the largest rice producing area in Africa. Despite the potential for rice production and possible exportation, the potential has not been transformed into actual production[7]. Major constraints identified in past studies are poor soil fertility, poor water management and poor varieties. With the improved and research break through of IITA and WARDA, the constraint of poor varieties has been eliminated. However, the existing improved varieties need improved water management and soil fertility conditions before the expected yield can be realized.

In Ghana, potential area for small-scale irrigated sawah in Inland Valley Watershed is estimated as 700,000 hectares, representing 3% of total land area, 1-3% of Guinea Savanna Zone and 3-5% of Forest Zone. If flood plain, are included total potential area for irrigated sawah may reach up to one million hectares in Ghana. Wakatsuki[8] reported that the potential of sawah based rice farming is enormous in West Africa in order to stimulate the long awaited green revolution. This is predicated on the fact that the agro-ecological conditions of the core region of West Africa are quite similar to those of northeastern Thailand, which is one of the rice center in the country. Ten to twenty million ha of sawah can produce additional food for more than 300 million people in future. The sawah based rice farming can overcome soil fertility problems through the enhancement of the geological fertilization process, conserving water resources, and the high performance multi-functionality of the sawah type wetlands. The term sawah refers to leveled and bunded rice fields with inlet and outlet connecting irrigation and drainage. The main goal of sawah projects in West Africa by Japanese institutions is the development of sustainable production systems of the whole watershed, which allows intensification and diversification of the lowland production system and stabilizing improved production systems on the upland. Fashola et al[9] noted that the sawah system offers the best option for overcoming rice production constraints in Nigeria because of the utilization of the inland valleys which are reported to be high in fertility and enhances water management for rice production through pudding and the inlet and outlet canals for irrigation and drainage. Asubonteng[10] reported that sawah technique leads to high yields and sustainable production irrespective of fertilizer use.

In Nigeria, sawah based rice production started after preliminary basic research work on the suitability of inland valleys by Japanese researchers. A 1.5 ha field at Ejeti village was cultivated in 2001. In 2002 three farmers participated in Sawah Package program and the farmers increased to 14 and 18 in 2003 and 2004 respectively. In 2008, farmers have increased to 250. Similarly, there has been tremendous increase in the yield of farmers adopting sawah package on their rice farms. The 3 phases of the sawah development process in Ghana from 1997 till date are: Integrated Watershed Management of Inland Valleys by JICA- CRI (1997-2001); Sawah project by SRI-Shimane Univ. Kinki University Japan (2002-2004) and Inland Valley Rice Development Project by MOFA–ADB (2004-2009) with the goal of sustainable rice production[11].

Concern has been heightened by the observed low level of use of modern inputs by farmers in many developing countries, and by the observed increasing degradation of natural resources. However theories and empirical evidence on the role of land tenure are mixed. Smucker et al[12] indicated that there is no definitive relationship between tenure and technology adoption by peasants in Haiti; peasants are preoccupied more by political and economic insecurity than insecure tenure; and rather than tinkering with formalizing tenure, policy makers should prioritize other more

fundamental rural sector reforms. Majority of Haitian peasants claim land ownership through formal and informal procedures, but the question of whether peasants feel secure enough to adopt agricultural technologies and invest in their land is yet unanswered. Zhang and Owiredu[13] reported that the total amount of land owned and/or cultivated by farmers, and use of government extension services by the farmers have a significant positive influence on the adoption of plantation establishment in Ghana. Manyong and Houndékon14 noted that security over land was among the factors that significantly affect the adoption of technology, with a high marginal effect on the probability of adoption. The predominance of land tenure systems that provide secure property rights, namely the traditional acquisition of land through inheritance or gift mode and the gradual development of a land market, facilitated a quick spread of the Mucuna planted fallows in the southern part of Benin Republic[14]. Based on the foregoing this paper examines the effect of land tenure on the adoption of sawah rice production technology in Nigeria and Ghana.

3. Materials and methods

The study was carried out in Nigeria and Ghana, and covered 12 fields in Nigeria with 80 farmers (45 adopters and 35 non –adopters) In Ghana 11 fields in 5 villages (Adugyama, Biemso No. 1, Biemso No. 2, Fediyeya and Attakrom) were covered with 70 farmers (40 adopters and 30 non-adopters). The field locations in Ghana are in the Ahafo Ano South district. Ghana is located on West Africa's Gulf of Guinea only a few degrees north of the Equator on Latitude: 5 degrees, 36 minutes north, Longitude: 0 degrees, 10 minutes east. This area, known as the "Ashanti," produces most of the country's cocoa, minerals, and timber. The climate is tropical with two distinct rainy seasons in the south-May-June and August-September; in the north, the rainy seasons tend to merge. The choice was necessitated by the fact that all sawah development projects have concentrated on the Ahafo Ano South districts. Kumasi is a major town neighboring the project sites and major watersheds in the area. In Nigeria, most of the fields covered are in Bida area of Niger state, while a village (Pampaida) was covered in Kaduna state and Akure in Ondo state. Villages covered in Bida area include Shabamaliki, Ejeti, Ekapagi, Nasarafu, Etsuzegi and Gadza. Bida, has a clayey loamy, sandy soil, under the guinea savannah ecology and is 137 m above sea level and lies on longitude 6°01′E and latitude 9°06′N in Niger State of Nigeria. Data were collected in December 2008 in all the villages where sawah rice production technology had been introduced and adopters and non-adopters of sawah technology were interviewed. A structured questionnaire with a reliability coefficient of 0.85 was used to elicit information on socio-economic characteristics, land tenure status and farm characteristics. Descriptive statistics was used to describe the data while probit model was used to analyze the adoption of sawah technology with particular reference to the effects of land tenure systems on the spread of the technology. A binary dependent variable, while the independent variables are in the multiple continuous and categorical variables makes probit a suitable choice for this empirical analysis[15-16]. The choice of explanatory variables (socio-economic and farm characteristics) was based on literature on past studies and the characteristics found among the respondents. The relationship between the probability of use variable Pi and its determinants q is given as: $Pi=\beta qi+\mu i$, where $P_i=1$ for $X_i \geq Z$; i=1,2 .....,n; qi is a vector of explanatory variables and β is the vector of parameters. The probit model computes the maximum likelihood estimator of β given the non- linear probability distribution of the random error μi. The dependent variable Pi is a dichotomous variable which is 1 when a farmer adopt sawah technology and 0 if otherwise. The explanatory variables are: X1=dummy variable for land purchase

(Yes=1, No=0), X2 dummy variable for land inheritance (Yes=1, No=0); X3=Tenancy period in years; X4=rent paid in Naira (for Nigeria) and Cedies (Ghana), X5=dummy variable for sawah knowledge (knowledgeable=1, others=0), X6=dummy variable for sawah information (contact with project staff=1, others=0), X7=Field size in acres, X8=Age in years, X9=dummy variable for educational level (educated=1, not educated=0); X10=dummy variable for membership of farmers group (member=1, others=0), and X11=Household size as number of persons

4. Results

The socio-economic characteristics of the respondents covered in this study were presented in Table 1. Table 2 presents the distribution of cultivated fields according to tenure status while Table 3 the determinants of the effect of land tenure on sawah technology adoption.

Table 1 Socio-economic characteristics of respondents

Socio-economic/farming characteristics	Description	
	Nigeria	Ghana
Age	Mean=41.96	Mean=44.70
Educational level	Predominantly Quranic	Predominantly primary school
Membership of Farmer group	Predominantly members	Predominantly members
Farming experience	Mean=12 years	Mean=16 years
Land tenure system	Predominantly Inheritance	Predominantly lease
Tenancy period	Mean=2.92 years	Mean=1.5 years
Rent rate	Mean=₦2000	Mean=150GHc
Share cropping	Predominantly owners	Predominantly sharecroppers
Farming system	Rice based	Cocoa and oil palm based
Culture	Nupe based	Ashanti/Zongo based
Household size	Mean=4.6	Mean=7.2

Table 2 Distribution of cultivated fields according to tenure status

Land tenure status	Nigeria		Ghana	
	Adopters	Non adopters	Adopters	Non adopters
Inheritance	30 (66.67)	20 (57.14)	5 (12.50)	10 (33.33)
Lease	5 (11.11)	5 (14.29)	4 (10.00)	0 (0)
Renting	5(11.11)	5 (14.29)	15 (37.50)	10(33.33)
Sharecropping	5(11.11)	5 (14.29)	15(37.50)	10(33.33)
Purchasing	0 (0)	0 (0)	1 (2.50)	0(0)
Total	45 (100)	35 (100)	40 (100)	30

Table 3 Parameter estimates from probit regression model

Variables	Nigeria	Ghana
	Coeff./S.E.	Coeff./S.E
Purchase land	5.02	9.22
Inherit land	2.77	2.32
Tenancy period	-1.93	-2.57
Rent paid	-3.29	-10.63
Sawah knowledge	2.59	2.85
Sawah information	2.54	5.96
Field size	1.34	-0.082

(to be continued)

Age	-3.35	-2.45
Educational level	-0.73	-4.84
Membership of Farmer group	-0.80	-0.016
Household size	2.79	14.74
Intercept	-2.55	-18.16
Pearson Goodness-of-Fit Chi Square	112.72	309.26
dF	78	68
p	0.00	0.000

5. Discussions

Table 1 combines their personal and farm characteristics. The table shows that in Nigeria, majority of the farmers are about 42 years of age having quranic form of education, belonging to at least one farmers group and have been farming for about 12 years. The land tenure system is predominantly through inheritance, while those on hired the land have an average period of about 3 years as the tenancy period with a rent rate of ₦2000 per month.

Respondents are predominantly Nupe with rice as the most preferred crop for production as rooted in their culture. In Ghana, the mean age is about 45 years with most farmers having attended primary school, and belonging to farmers groups. There is an average of 16 years in terms of farming experience and land tenure system based on lease and sharecropping.

The distribution of the fields by tenurial system for adoption versus non-adoption categories is presented in Table 2. In Nigeria, percentages of fields in the categories of secure tenure (inheritance) were high among those fields where sawah technology was adopted and among non-adopter. This shows that the dissemination of sawah technology should be intensified so that more rice farmers could adopt the technology. It also implies that tenurial rights may not hinder the adoption of sawah technology but other factors that would influence farmers' adoption decision. In Ghana, the percentages of fields in the categories of insecure tenure (lease, renting and sharecropping) were high among those fields where sawah technology was adopted and non-adopters. This may be due to the fact that majority of rice farmers are migrant farmers from the northern part of the country, who had come to the southern part and the strong matrilineal land tenurial rights in the study area. The tenural rights notwithstanding, adoption of sawah technology is higher among rice farmers in Ghana. The results from the probit model in Table 3 showed that the coefficients for the variables on security over land are all significant. In Nigeria, these are Purchase land (t=5.02) Inherit land (t=2.77) Tenancy period (t=-1.93) and Rent paid (-3.29) and in Ghana a similar trend is observed for Purchase land (t=9.22) Inherit land (t=2.32) Tenancy period (t=-2.57) and Rent paid (-10.63). The sign for each coefficient is consistent with the expectation; that is, the probability of adopting the sawah technology increases if the plot is acquired through inheritance, by purchasing, having long tenancy period and if the rent paid is low. The inverse relationship explains the length of tenancy period and the amount of rent paid on plot. The negative sign on the coefficients implies that insecure tenure is somewhat of a constraint to the adoption of sawah technology. Other variables in the model show that 4 were significant for Nigeria (knowledge, information, age and household size) while 5 were recorded for Ghana (knowledge, information, age, educational level and household size). An increase in farmers' knowledge of sawah, information on sawah and household size will lead to higher adoption of sawah technology. This may be attributed to the fact that increased information and knowledge will lead to higher competence among farmers and in terms of household size, more hands will be available to help in the time-bound activities.

Age is however inversely related to the adoption of sawah technology in both countries, which shows that as farmers get older the probability of adopting sawah technology will decrease. This may be connected with the strenuous demand of the activities.

6. Conclusion

Land tenurial rights impacts substantially on the adoption of sawah technology, particularly land development in the first year do not encourage opening of new lands for sawah technology every planting season. The pattern of adoption is skewed toward farmers that have land security. A further analysis revealed that the profitability is reduced for farmers without land security. Importantly variables on security over land (Purchase land, inherit land, Tenancy period and Rent paid) are all significant in Nigeria and Ghana. Similarly important socioeconomic variables affecting adoption are knowledge, information, age, educational level and household size. It therefore implies that the issues of land tenurial right must be properly ascertained by farmers in order to enhance continuous adoption and sustained profit from sawah technology.

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