LAND TENURE SYSTEMS AND MIGRANT CULTIVATORS IN WEST AFRICA'S LOWLANDS: WHAT EFFECTS DO THEY HAVE ON THE INTENSIFICATION OF LOWLAND RICE PRODUCTION?

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Abstract

Demand for rice in West Africa has been growing at 5.6% a year, not only driven by population growth but also due to a shift in diet away from traditional coarse grains caused by urbanization. The gap between regional supply and demand for rice has been increasing. As a result rice imports mainly from Asian countries reached an average of 2.6 million tones in the early 1990s. Under these circumstances, domestic rice production is also being encouraged, particularly in lowland ecology because it has higher potential yield thanks to water availability. To compete with cheap imported rice, however, the domestic production need to be more productive through intensification.

We surveyed about 300 lowlands around Bouaké, the second largest city in Côte d'Ivoire located in the center of the country. First this paper deals with the issue of evolution of land ownership in lowlands. We found that lowlands owned individually are located in remote area with low population pressure, while lowlands owned by individuals are located near cities with high population pressure. That is, demand for lowlands has induced individualized ownership.

Then, with respect to the intensification of lowland rice production, this paper focuses on water control technologies, such as bunds and canals, because the single most important biophysical constraint to lowland intensification is lack of water control. We found that the individualization of lowland ownership has a positive effect on the adoption of water control technologies compared with collective, village ownership. It was also found that market access has a positive significant effect on the technology adoption. With respect to the effect of tenure security on the technology adoption, although we could not show a direct evidence, it was suggested that the rent payment requirement in the case of individual ownership secures tenants' land use rights compared with the case of collective ownership, which is more like open access for indigenous cultivators.

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1 Introduction

Demand for rice in West Africa has been growing at 5.6% a year, not only driven by population growth but also due to a shift in diet away from traditional coarse grains caused by urbanization (WARDA, 1997). The gap between regional supply and demand for rice has been increasing. As a result rice imports reached an average of 2.6 million tons in the early 1990s. This has raised concern about the future food security in this region and policymakers in each country are taking measures to enhance rice production.

The lowland ecology, inland valley bottoms and their hydromorphic fringe areas, occupy an estimated between 20 million and 50 million hectares in West Africa depending on the estimation, but only 10 to 25% of lowlands in West Africa are under cultivation and the current rice yield in rainfed lowlands is about 1-1.5 tons per hectare (WARDA, 1998). That is, there are huge potentials for expansion as well as intensification of rice production in lowland ecology. The single most important biophysical constraint to lowland development is lack of water control. Hence investment in simple water control measures, such as bunds and canals, is a critical precondition for the intensification of lowland rice production. It is generally considered that such investment done by small holders is affected by land tenure systems since they determine the security of the investment. A number of empirical studies on this issue have been done in sub-Saharan Africa, but the causal relationship between tenure security and investment has not always identified (for example, Migot-Adholla and Bruce, 1993, Place and Hazell, 1993 and Sjaastad and Bromley, 1997). However, land tenure systems in West Africa's lowlands have not been well investigated yet, nor their effects on the investment. This is why this study started.

2 Study Site and Data Collection

We selected the Bandama Valley region in central Côte d'Ivoire for our study site. Bouaké, the second largest city in Côte d'Ivoire, is located in the center of this region and acts as the interface between the interior and coastal regions. All the traffics going from the coast to the interior, Sahelian countries (Mali, Burkina Faso, and Niger) passes through Bouaké and thus it plays an essential role in the distribution of food products, not only locally but also in the sub-region. Agroecologically also this region is situated in the transitional zone between the humid forest zone and the savanna zone, and hence cacao, an important cash crop in the

humid forest zone, does not grow well and cotton, an important cash crop in the savanna zone, does not grow well either. Rice in lowlands is one of a few significant cash crops in this region.

We selected 11 contiguous sous-prefectures out of 19 sous-prefectures in the Bandama Valley region: Botro, Bouaké, Brobo, Diabo, Djébonoua, Katiola, Sakassou, Béoumi, Bodokro, Dabakala and Boniérédougou. We obtained the village list of the 1988 census for each sous-prefecture from the National Institute of Statistics in Bouaké, and randomly selected 179 from 857 villages in the list. The number of villages sampled in each sous-prefecture was determined so that it would be proportional to the total number of villages in each sous-prefecture (sampling rate was about 21 percent). From December 1999 to May 2001, we visited all the 179 sampled villages several times to collect village level information on lowland use as well as village characteristics by means of group interview of responsible people.

3 Results of Survey

3.1 Use of Lowlands

Of the 179 sample villages 157 villages have access to at least one lowland, and 83 of them used the lowlands for cultivation during the 2000/2001 cropping season. The total number of lowlands accessible from the 157 villages is 317. Rice cultivation in lowlands is not a new practice in some parts of West Africa, but in the Bandama Valley region the indigenous people do not have a tradition of lowland rice production. In most villages it was introduced after the 1960s under the government policy favorable to rice production. According to our survey, 115 lowlands of the 317 lowlands were used for rice cultivation in the 2000/2001 cropping season and 38 lowlands were used for vegetable production (27 of them produce both rice and vegetables). We found that in many lowlands cultivators have given up rice production: in as many as 262 lowlands out of 317 rice has ever been grown in the past. This implies that rice cultivation has been given up in 147 lowlands by the year 2000.

3.2 Land Ownership in Lowlands

As is well known, land cannot be private property in most parts of sub-Saharan Africa and hence there are few “real” land owners whose land is registered and/or who have established a title. However, there are authorities that manage the allocation of land in each village and use-right holders are well recognized by villagers in general. We use the term “land owner” in our analysis to indicate who controls the use of lowlands.

Among the 262 sample lowlands where rice has ever been grown, 17 lowlands have been improved by dam irrigation projects and/or are claimed to be owned by the government. We eliminate them from the following analyses. Remaining 245 lowlands can be classified largely into two types of land ownership: village collective ownership and individualized ownership. Because rice cultivators are not the owner of lowlands in most cases, they are considered as tenants. The collective ownership includes the case of village common property and the case of ownership by a village chief. In either case, the chief controls land allocation, but the chief is not considered to be a private owner because the power is given to the position of chief. On the other hand, in the case of individualized ownership land is managed by individual persons (household head or extended family head) as if private property. In this case land is inherited within an extended family.

Because the two types of ownership is informal, their origin is not very clear. But villagers usually can distinguish them clearly. Almost all villages in this region were created about 200 and 300 years ago when people migrated from the east or from the north. According to villagers, most of the upland was divided and allocated to each family when they created the village. Therefore, upland is considered to have been individualized from the beginning, and in fact there is no collective ownership on upland in this region except for some special areas, such as sacred forests. On the other hand, villagers say that lowland was kept as a common property because villagers were not interested in cultivation in lowland and sometimes because lowland was an important source of water for villagers. Since then, some lowlands are still owned collectively even after rice cultivation, while other lowlands have been individualized like uplands after rice cultivation. According to villagers that cultivate rice in a collectively-owned lowland, they are intentionally keeping the lowland as a common property so that every one has an equal opportunity to cultivate a part of it. But this kind of collective action cannot be observed everywhere. The village ownership and village chief ownership are observed only in lowlands in this region probably because lowlands had not been utilized until recently by indigenous people.

As shown in Table 1, the two types of ownership differ in the mode of access to land, namely how to obtain a permission to cultivate. For indigenous cultivators, they need to obtain a permission only from the land owners in three fourths of the individualized lowlands, while about 30 % of collective lowlands are open access to indigenes and about 70 % of collective lowlands require chief's permission. For migrant cultivators, on the other hand, there is no open access lowland. Chief's permission is required in the case of collective lowlands, while both chief's and owner's permissions are required in the case of individualized lowlands. The differences in the mode of access between the two types of ownership are statistically significant. Note that owner's permission is required in some collectively-owned lowlands

where no individual owners are supposed to exist. They are previous cultivators. Although they are not considered to be real owners by the villagers, they act as if they are owners. They may become individualized property, if there is no strong objection to individualization.

As mentioned above, most of rice cultivators are tenants and therefore they pay rent to the owner (either in cash or in kind). Although there is no formal contract, rent payment is sometimes obligatory. But in other case, rent payment is voluntary. The survey results are summarized in Table 2. Most of indigenous cultivators are not required to pay rent, but in one third of individualized lowlands even indigenous tenants have to pay rent to landowners. On the other hand, in the majority of the cases migrants have to pay rent to either landowners or village chief depending on the type of ownership. If obligatory rent payment is one of indicators of private property, the results imply that only one third of individualized lowlands can be considered to be private.

Table 3 compares collective ownership with individual ownership in terms of lowland characteristics, utilization as well as water control technologies. First, lowland size and water sources are not different between the two types of lowlands. Second, as for utilization, lowlands owned individually are more utilized for rice production in 2000. However, the number of years since the last rice cultivation do not differ significantly between the two: about 15 years on average. Third, water control technologies are more adopted in lowlands owned by individuals than in those owned by village.

Villages that have ever utilized lowlands for rice cultivation are classified into two in the way: one is those having collectively owned lowlands and the other is those having individually owned lowlands. The two types of villages are compared as shown in Table 4. In most villages villagers claim that they themselves started rice cultivation. It is revealed that villages with individualized lowlands have better access to the capital city of sous-prefecture and are more developed: more population, more migrants, earlier establishment of school and dispensary.

Tables 3 and 4 suggest that individualization of lowlands is significantly correlated with access to cities, population pressure, and influx of migrants. To test this relation more formally, a probit regression model for individualized ownership of lowlands is estimated. Because most of individualization of lowlands may have taken place after the introduction of rice cultivation in lowlands around 1970, exogenous or predetermined variables at the time of rice introduction are selected for the explanatory variables. However, as for population 1988 census data is used as a proxy for the past population due to the limitation of data availability. In addition, we assume that settlement of immigrants in a village started even before rice cultivation. The results are shown in Table 5. For this analysis, out of 245 lowlands that

have ever been utilized for rice cultivation, 10 lowlands are not included due to some missing data. As a result, the number of lowlands for the regression is 235 and the number of individualized lowlands is 164. As expected, village population and immigrants have a positive effect on the individualization of lowlands. Population pressure reduces the available uplands and hence immigrants who do not have the rights to access uplands tend to cultivate in lowlands where few indigenous cultivators are using. And the rice cultivation in lowlands, particularly done by migrants, is considered to have induced individualization. But neither the straight distance to sous-prefecture nor that to Bouaké has no significant effect on it. Villages that have been relocated by a dam construction project tend to have conflicts with indigenous villages over land use, and therefore they prefer collective ownership that allows every one to have access to land.

3.3 Water Control Technologies

Bunds and canals are considered as water control technologies in rainfed lowlands. In our sample lowlands, 67 out of 235 lowlands that have ever been used for rice cultivation are equipped with bunds, and 47 out of the 235 are equipped with canals (either for supply or drainage). And 41 of them have both bunds and canals. We identify the determinants of the water control technologies in probit regressions. We assume that the individualization of lowlands took place before the technology adoption, and therefore a binary dummy variable for the individualized ownership is added as one of the independent variables. Table 6 shows the results of the regression analyses. First of all, individualized ownership has a significant positive effect on the adoption of water control technologies. In addition, access to cities has a significantly positive effect on the water control technology adoption, indicated by the negative significant signs for the distance to sous-prefecture and Bouaké. This finding is consistent with the stylized view on the agricultural intensification: population pressure and relative prices induce the intensification (for example: Boserup, 1965; Hayami and Rutten, 1985). Baoulé and Djimini, the majority of indigenes, are less likely to adopt water control technologies. That is, minor indigenes as well as immigrants adopt water control technologies more frequently than them. It is also found that villages relatively newly settled and/or villages whose origin is outside the region tend to adopt water control technologies. Both of the village characteristics are related migration, but we do not have enough information to explain those effects.

Because those water control technologies are investment done by cultivators, land tenure security is considered to have influence on the adoption of those technologies. Note that in our study site it is not the land owners but tenants cultivators who invest in water control technologies in lowlands. And it is not clear if individual ownership gives more security to cultivators so that it induces more investment. However, because of the rent payment

requirement in the case of individual ownership as shown in Table 2, tenants' land use rights seem to be secured by the landowners as far as the tenants pay rent. On the other hand, in the case of collective ownership, it is more like open access particularly for indigenous cultivators, and hence land tenure may be less secure. Unfortunately, our village survey does not allow us to examine the relationship between the ownership and tenure security rigorously.

4 Conclusions

This paper explores the factors affecting the individualization of lowland ownership in central Côte d'Ivoire, then examines the effect of individualized ownership on the adoption of water control technologies. First we found that the size of village population and the existence of immigrants have a positive effect on the individualization of lowlands. Market access also seem to be positively correlated with the individualization, but the probit analysis failed to show a significant effect of the straight distance to sous-prefecture or that to Bouaké. Then we found that the individualization of lowland ownership has a positive effect on the adoption of water control technologies compared with collective, village ownership. It was also found that market access has a positive significant effect on the technology adoption. This finding is consistent with the stylized view on the agricultural intensification. With respect to the effect of tenure security on the technology adoption, although we could not show a direct evidence, it was suggested that the rent payment requirement in the case of individual ownership secures tenants' land use rights compared with the case of collective ownership, which is more like open access for indigenous cultivators. We will examine the effect of tenure security on the technology adoption more rigorously, particularly focusing on the different between indigenous cultivators and migrants, using data that have been already collected from individual cultivators and landowners.

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Table 1 Mode of Access to Lowlands

	Individually Owned Lowlands (n=172)	Collectively Owned Lowlands (n=73)	Pearson's Chi-square [1)]
For Indigenous Cultivators			
open access	11 (6.4%)	21 (28.8%)	22.6***
permission from the chief	10 (5.8%)	47 (64.4%)	98.4***
permission from the owner	124 (72.1%)	2 (2.7%)	98.7***
permission from the both	27 (15.7%)	3 (4.1%)	6.4**
For Migrant Cultivators			
open access	0	0	NA
permission from the chief	20 (23.8%)	64 (76.2%)	131***
permission from the owner	26 (15.1%)	2 (2.7%)	7.8***
permission from the both	126 (73.3%)	7 (9.6%)	83.7***

[1)] *** and ** indicate significance levels 1% and 5% respectively.

Table 2 Requirement of Rent Payment

	Individually Owned Lowlands (n=172)	Collectively Owned Lowlands (n=73)	Pearson's Chi-square [1)]
For Indigenous Cultivators			
obligatory payment to the chief	0	5 (6.8%)	12.0***
obligatory payment to the owner	52 (30.2%)	3 (4.1%)	20.1***
obligatory payment to the both	2 (1.2%)	0	0.856
voluntary payment to the chief	5 (2.9%)	28 (38.4%)	55.3***
voluntary payment to the owner	74 (43.0%)	8 (11.0%)	23.7***
voluntary payment to the both	2 (1.2%)	0	0.856
payment is rare	37 (21.5%)	29 (39.7%)	8.64***
For Migrant Cultivators			
obligatory payment to the chief	5 (2.9%)	49 (67.1%)	123***
obligatory payment to the owner	124 (72.1%)	7 (9.6%)	80.5***
obligatory payment to the both	7 (4.1%)	0	0.426
voluntary payment to the chief	5 (2.9%)	11 (15.1%)	3.06*
voluntary payment to the owner	27 (15.7%)	4 (5.5%)	4.84**
voluntary payment to the both	1 (0.6%)	0	0.426
payment is rare	3 (1.7%)	2 (2.7%)	0.254

[1)] ***, ** and * indicate significance levels 1%, 5%, and 10% respectively.

Table 3 Comparison of Lowland Characteristics by Ownership

	Lowlands Ever Utilized for Rice Production	Lowlands Owned Collectively	Lowlands Owned Individually	Significantly Different or Not [1)]
Lowland Characteristics				
Size of lowland (ha)	31.6	42.5	27.0	1.09
Water source: seasonal stream	197 (80.3%)	59 (80.8%)	138 (80.2%)	0.01
Water source: permanent	27 (11.0%)	11 (15.1%)	16 (9.3%)	1.74
Utilization of Lowlands				
Utilization Rate in 2000 (%)	11.8	7.6	13.6	2.05**
Rice grown in 2000 (# of	101 (41.2%)	17 (23.3%)	84 (48.8%)	13.8***
Years since the last rice	15.7	18.0	14.2	1.59
Water Control Technologies				
Canal (# of lowlands)	48 (19.6%)	8 (11.0%)	40 (23.3%)	4.92**
Bund (# of lowlands)	72 (29.4%)	13 (17.8%)	59 (34.3%)	5.72***
Number of Lowlands	245	73	172	

[1)] When two means are compared, the numbers in this column are t-statistics and when two proportions are compared, the numbers in this column are Pearson's Chi-square statistics. *** and ** indicate significance levels of 1% and 5% respectively.

Table 4 Comparison of Village Characteristics by Lowland Ownership

	Village Having Ever Utilized Lowlands for Rice Production	Village with Collective Lowlands	Village with Individualized Lowlands	Significantly Different or Not[1)]
Introduction of Rice Cultivation				
By indigenes (# of villages)	116 (87.9%)	39 (83.0%)	77 (90.6%)	1.65
By migrants (# of villages)	8 (6.1%)	5 (10.6%)	3 (3.6%)	2.03
By government (# of villages)	8 (6.1%)	3 (6.4%)	5 (5.9%)	0.01
Village Location				
Distance to sous-prefecture	12.6	13.5	12.1	1.11
Traveling time to	56.0	69.4	48.7	2.10**
Distance to Bouaké (km)	45.6	44.6	46.1	0.29
Traveling time to Bouaké (min)	81.0	88.3	76.9	1.17
Population				
Village population as of 1988	394	320	436	1.85*
Village of Baoulé (# of	103 (78.0%)	37 (78.0%)	66 (77.6%)	0.02
Village of Djimini (# of	22 (16.7%)	6 (12.8%)	16 (18.8%)	0.80
Village with minority (# of	20 (15.2%)	5 (10.6%)	15 (17.6%)	1.16
Number of immigrants	14.0	2.9	21.1	2.19**
Years since creation of the	263	265	262	0.12
Village origin in the same	111 (84.7%)	38 (82.6%)	73 (85.9%)	0.25
Village relocated by dam	5 (3.8%)	2 (4.3%)	3 (3.5%)	0.04
Village Facilities				
Primary school (# of villages)	74 (56.1%)	25 (58.2%)	49 (57.6%)	0.24
Years since primary school	15.7	11.3	18.1	2.29**
Dispensary (# of villages)	20 (15.2%)	4 (8.5%)	16 (18.8%)	2.50
Years since dispensary built	1.61	0.47	2.25	2.64***
Village with market (# of	15 (11.4%)	4 (8.5%)	11 (12.9%)	0.59
Village with shops (# of	71 (53.8%)	25 (53.2%)	46 (54.1%)	0.01
Number of Villages	132	47	85	

[1)] When two means are compared, the numbers in this column are t-statistics and when two proportions are compared, the numbers in this column are Pearson's Chi-square statistics. ***, ** and * indicate significance levels of 1%, 5% and 10% respectively.

Table 5 Determinants of Individualized Ownership of Lowlands [1)]

Independent Variables	Coefficients
Intercept	-0.19 (0.21)
Lowland Characteristics	
Size of Lowland (100ha)	-0.15 (1.27)
Water Source is a Seasonal Stream	-0.44 (1.18)
Water Source is a Permanent Stream	-0.74 (1.67)*
Village Characteristics	
Distance (straight) to Sous-Prefecture (km)	-0.01 (0.56)
Distance (straight) to Bouaké (km)	-0.00 (0.42)
Origin is in the Same Region (dummy)	0.25 (0.97)
Years since Settlement (100 years)	-0.04 (0.45)
Relocated by a Project (dummy)	-1.28 (2.24)**
Population	
Village Population in 1988 (1000)	0.71 (2.20)**
Village of Baoulé (dummy)	0.94 (1.43)
Village of Djimini (dummy)	1.49 (1.97)**
Village of Other Indigenes (dummy)	0.42 (0.60)
Village with Immigrants (dummy)	0.58 (1.94)*
Total Number of Lowlands Ever Utilized for Rice	235
Number of Individualized Lowlands	164

[1)] Probit model is used for the estimation of coefficients. T-statistics are in the parentheses. ***, ** and * indicate significance levels 1%, 5% and 10% respectively.

Table 6 Determinants of Adoption of Water Control Technologies[1)]

Independent Variables	Bunds	Canals	Both Bunds and Canals
Intercept	0.56 (0.51)	-0.41 (0.37)	0.75 (0.51)
Individualized Ownership	0.76 (3.17)***	0.66 (2.48)**	0.59 (2.17)**
Lowland Characteristics			
Size of Lowland (100ha)	0.24 (1.78)*	0.17 (1.19)	0.21(1.54)
Water Source is a Seasonal Stream	1.97 (2.84)***	1.67 (2.37)**	2.05 (2.36)**
Water Source is a Permanent Stream	1.53 (2.14)**	0.71 (0.93)	1.08 (1.23)
Village Characteristics			
Distance to Sous-Prefecture (km)	-0.05 (2.90)***	-0.06 (2.70)***	-0.06 (2.88)***
Distance to Bouaké (km)	-0.00 (0.51)	-0.02 (2.27)**	-0.01 (1.19)
Origin is in the Same Region (dummy)	-0.46 (1.64)*	-0.54 (1.75)*	-0.67 (2.06)**
Years since Settlement (100 years)	-0.20 (2.32)**	-0.54 (0.54)	-0.00 (0.48)
Relocated by a Project (dummy)	-0.28 (0.38)	0.75 (0.93)	0.90 (1.08)
Population			
Village Population in 1988 (1000)	-0.15 (0.39)	-0.16 (0.38)	-0.31 (0.69)
Village of Baoulé (dummy)	-2.01 (2.84)***	-0.71 (1.04)	-2.18 (2.08)**
Village of Djimini (dummy)	-1.28 (1.83)*	-0.27 (0.37)	-2.89 (2.28)**
Village of Other Indigenes (dummy)	-0.74 (1.26)	1.87 (2.98)***	-0.49 (0.41)
Village with Immigrants (dummy)	-0.27 (0.88)	-0.16 (0.43)	-0.38 (0.98)
Total Number of Lowlands Ever Utilized for	235	235	235
Number of Lowlands with the Technology	67	47	41

[1)] Probit model is used for the estimation of coefficients. T-statistics are in the parentheses. ***, ** and * indicate significance levels 1%, 5% and 10% respectively.