Migrant versus indigenous farmers. An analysis of factors affecting agricultural land use in the transitional agro-ecological zone of Ghana, 1984-2000

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Abstract

The transitional agro-ecological zone of Ghana (10,630 km^2) is the leading producer of grains, cereals and tubers. Located between the resource-endowed south and the impoverished north, it has attracted seasonal and permanent farm migrants mainly from northern Ghana, who now live side by side with the indigenous people. This paper examines the differences that exist between these groups with regard to factors affecting agricultural land use between 1984 and 2000. It utilizes information from a household survey undertaken in February 2002 among 786 farmers in 240 households in 12 communities. Results show that migrants had almost three times more cropped area, earned more from the sale of farm products, were more affluent, used more mechanized farming practices, and had extended into more agricultural lands compared to indigenous people. Furthermore, affluence predicted agricultural land use for both migrants and indigenous farmers in 1984, and household size and fallow period predicted agricultural land use for migrant and indigenous farmers respectively. In 2000, household size, land tenure arrangement, distance to farthest farm and household educational level predicted agricultural land use among migrants, while affluence, on-farm income, household size and tractor use predicted agricultural land use among indigenous farmers.

Keywords

Migrants, indigenous population, agricultural land use, Ghana

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Apart from the classical perception that the decision to migrate is mainly driven by economic factors (Sjaastad, 1962; Todaro, 1969; Harris and Todaro, 1970; Schwarz, 1976), some current studies have given basic reasons for why migration takes place and what choices and decision-making at destination areas are available to migrants (Townsend, 1997; Massey, 1998). Other studies have examined the migration-environment nexus and have generally concluded that changes in the environment have mainly occurred due to population increases at destination areas, which are precipitated by in-migration (Myers, 1997; Stone, 1997; Amacher et al., 1998; IUCN, 2000). At the heart of the migration-environment nexus is the role land tenure plays and recent studies have addressed this issue (Ostrom et al. 2000; Katon et al. 2001)

Migrants, sometimes described as 'colonist populations', have been responsible for a great deal of degradation in forest and agricultural land resources all over the world. They tend to be more aggressive in their farming practices compared with indigenous populations mainly because of insecurity of tenure. Several authors have demonstrated that intensive land use and land cover transformation have taken place in some regions of the world, notably the Amazon. In almost all of the cases, migrant settlers have played significant roles in the transformation. (Fernside 1986; Postel, 1988; Entwisle et al. 1998; Rindfuss et al. 1996; Wood and Skole, 1998; Uitamo and Nilsagard, 1999; Mulley and Unruh, 2004; Unruh et al. 2005).

In West Africa, the scenario has not been different and migrants have frequently colonized cash crop growing areas to the detriment of indigenous people. For example, in Côte d'Ivoire, migrants were used to stimulate the production of main cash crops such as coffee and cocoa, as indigenous farmers were slow to take up those crops. In Ghana, as a result of the cocoa boom in the 1960s, most of the forest areas in Ashanti, Eastern, Western and Brong Ahafo regions became important receiving areas for migrants (Hill, 1963). In a more recent study, Hill (1998) has described the migrant farmer as a 'capitalist' rather than a 'peasant', who buys land (or inherits it from those who

bought it before him) and conventionally uses the proceeds from one cocoa land to purchase others.

Furthermore, migrant farmers, who are mainly sharecroppers, have put enormous pressure on soil fertility to secure high yields in order to pay land rents (Benneh, 1997 and Gruhn et al. 2000). Farmers in such situations discount the future at very high rates, thereby reducing the incentive for long-term investments in improved soil fertility. Against this background, this paper assesses the differences that exist between migrant and indigenous farmers with regard to factors affecting agricultural land use. At the centre of the discussion is the following: Do migrants and indigenes respond to the same set of variables? If not, why not, and what are the motives and constraints faced by the two groups involved?

The paper incorporates concepts from the multiplicative and mediating perspective of the population-environment nexus. The former states that population interacts in multiplicative ways with other factors, such as levels of consumption and technology, to have an impact on the environment. One of the most frequently used multiplier approaches is the "IPAT" equation. In the "IPAT" equation, total environmental impacts (I) are seen as a product of population size (P), the level of affluence or per capita consumption (A), and the level of technology (T). The "IPAT" equation implies that although population, consumption or technology might be considered independent causes of environmental impact, it is their combined effect that is of most interest (Ehrlich and Holdren, 1971 & 1974; Harrison, 1992; Commoner, 1992). Multiplicative variables in this paper include affluence (measured by household ownership of livestock, namely cattle, sheep and goats, ownership of household consumer durables including cars, motorcycles, bicycles, televisions, and radios, as well as on- and off-farm income) and technology (use of tractor, inorganic fertilizer, the practice of land fallow and agricultural extensification).

The mediating perspective emphasizes that social, cultural and institutional factors play a mediating role in determining population-environment relationships. Social scientists are inclined to consider the impact of social, cultural and institutional factors on population-environment relationships, and much recent research implicitly or explicitly reflects this viewpoint (Blaikie and Brookfield, 1987 and Bilsborrow, 1992). Mediating variables considered in this paper are the educational background of household members, the proportion of major farmers in the household (occupational background), land tenure arrangement and distance to farms.

Migrants and the transitional agro-ecological zone

The transitional agro-ecological zone is so named because it is located between the forest and savannah vegetative zones of southern and northern Ghana. The zone covers an area of 10,630 km, with a population of 544,131 in 2000 mainly in the Brong-Ahafo and Ashanti regions of Ghana, and is the leading producer of grains, cereals and tubers in Ghana. In recent times, commercial tree crops like cashews have become popular. Variations in climatic and vegetative conditions have rendered the transitional zone and the southern part of Ghana more favourable for farming compared to the north. For example, northern Ghana experiences the single maximum rainfall regime. This implies that areas within this rainfall regime experience only one rainy season from about May to August, followed by a long dry season. Northern Ghana experiences a mean annual rainfall of 115 centimetres (Dickson and Benneh, 1995). The transitional zone, however, experiences a double maximum rainfall regime with two rainy or wet seasons. The two rainfall regimes occur from May to August and from September to October, with a mean annual rainfall of 143 centimetres.

With regard to vegetation, t he north belongs to the mid-dry savannah vegetation type in Ghana and is characterized by few and scattered trees such as the baobab (*Adansonia digitata*), locust bean tree (*Parkia biglobosa*), acacias (*Acacia spp.*) and the sheanut tree (*Butyrospermum parkii*), which have adapted to the environment. Marked changes in the plant life of northern Ghana are experienced during different seasons of the year. During the rainy season, the vegetation in the district is very green. Trees blossom and grasses shoot up very quickly. However, immediately after the rains recede, leaves begin to change colour from green to yellow and trees begin to shed their leaves. Regular burning, the grazing of livestock and cultivation have left only few trees still standing and rendered the vegetation open and dominated by short grasses. However, the vegetation in the transitional zone is wet savannah and it is composed of short branching trees, many less than 15 metres high, which do not usually form a closed canopy and are often widely scattered.

As a result of the conditions mentioned, migrants from northern Ghana have moved over the years to the transitional zone mainly to farm (Manshard, 1961). Migrants, who are in three categories, are made up of Mole-Dagbani, Gurma, Grusi, and Mande-Busanga ethnic groups. The first category consists of those who migrate to the transitional zone during the minor farming season in northern Ghana to

farm. This category of migrants stays in the transitional zone until the major farming season in northern Ghana and then migrates back to the north. The second group with southern Ghana as their final destination, however, transits in the transitional zone to farm, earn more money and continue their journey down south. The final group is migrants who are unable to continue their journey to the south, and therefore end up settling permanently in the transitional zone. All these categories of migrants from northern Ghana mainly live with relations in the transitional zone.

The indigenous people, on the other hand, mainly belong to the Akan ethnic group (Asante, Boron and Ahafo). They engage in subsistence farming to support income earned from the sale of non-farm products. Indigenous people also work in the professional, technical, administrative, managerial, and service occupational sectors. There is some migration among indigenous people as well, mainly to Accra, the capital of Ghana, and to Europe and the United States of America.

Land tenure laws operating in the transitional zone are the same as for the Akan ethnic group. An individual (male) establishes his right over the use of land by being the first to bring that piece of land under cultivation. As long as he continues to use the land or is able to show evidence of his previous occupation, no one, not even the chief, can take away that tract of land from him (Benneh, 1970). Once an individual establishes his right over a piece of land, no person can farm on that piece of land without his permission. He cannot sell that piece of land to another person, although land can be pledged during financial difficulties, or for share-cropping.

Before the transitional zone became an important tobacco and yam producing area in the 1950s, it was relatively easy for a migrant farmer to acquire land for cultivation. The chief of a village or the head of a landowning group made a free grant of land. The migrant would normally have stayed with a family in a village for about a year and have demonstrated good character throughout the period. The migrant continued to use his tract of land as long as his conduct was satisfactory to the chiefs and elders. With the development of cash-crop farming, land acquired economic value and it was no longer given free of charge to migrant farmers. Migrant farmers now pay a consideration fee, "aseda", an annual tribute to the chief, and rent to the local tax collector.

Materials and methods

The paper uses information from a household survey undertaken in February 2002 among 98 and 142 migrant and indigenous households respectively, and a total of 786 (374 migrant and 412 indigenous) farmers in the Ejura-Sekyedumase district (representing the transitional agro-ecological zone) of Ghana. The field work included a retrospective study as well, and respondents were asked questions related to the past. For, example, the period when household consumer durables were acquired and previous livestock ownership was determined. Also, the first time a farmer used a particular input (tractor, inorganic fertilizer, etc.) on the farm was also ascertained. Other questions that related to the past included land tenure arrangements, fallow periods, household size, and occupation. All these variables were referenced to 1984 (the period of the last population census in Ghana) to allow for comparison with the 2000 data. A structured and open-ended questionnaire was employed in the study, administered through direct interviews with the respondents. This technique was employed because the majority of the respondents had no formal education. Extension workers for the Ghana Ministry of Food and Agriulture (MOFA) were mainly responsible for the administration of the questionnaire.

With regard to the sampling procedure used, the 2000 Ghana Population and Housing Census Report on communities was the basis for the selected communities used in the study. Most of the communities in the transitional zone were very small in size as far as their populations were concerned. For example, about 97% of all localities in the Ejura-Sekyedumase district had populations of less than 800 in 2000.

A criterion (settlements with a population of more than 800) was used to select the study areas. Twelve settlements in the district qualified and were selected for the study. The communities include Ejura, Sekyedumase, Anyinasu, Dromankuma, Frante, Kasei, Hiawoanwu, Aframso, Drobon, Nkwanta, Ashakoko and Bonyon. Twenty households were randomly selected from each of the settlements. Every farmer in a selected household was interviewed. Information from the survey was used to determine migrant and indigenous households. A multiple regression model was used in the study to assess factors that affected agricultural land utilization. The enter method was used, the regression equation is specified below, and the description of variables and how they were measured are presented in Table 1.

$$CA_{ij} = \alpha + ß_1 AL_i + ß_2 AG_i \ldots ß_n ED_i + \varepsilon_i$$

The study area

The transitional agro-ecological zone shown in Figure 1 with a population of 544,131 in 2000 mainly in the Brong-Ahafo and Ashanti regions of Ghana (GSS, 2002) is the study area used. The major urban areas in the zone are Ejura, Techiman, Nkoranza and Atebubu, all major farming areas in Ghana. The zone, which was originally forested, has lost most of its cover and is now a derived savannah.

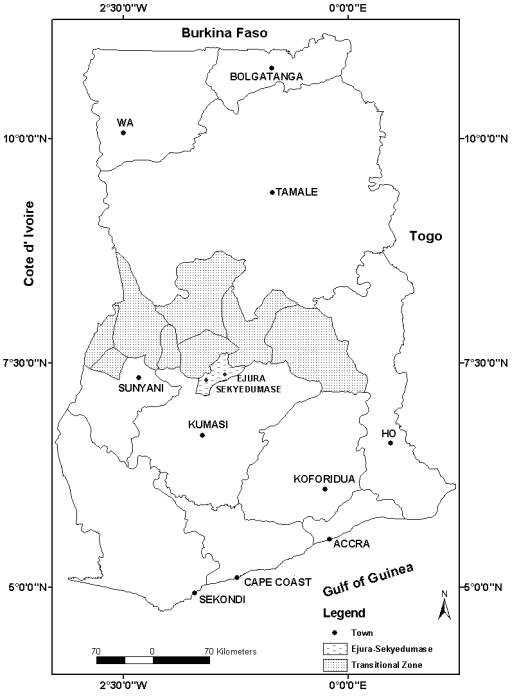

Figure 1. *Location of the transitional agro-ecological zone and the study area.*

Food crop production in the transitional agro-ecological zone

The two regions that constitute the transitional zone, i.e, Ashanti and Brong Ahafo, were, respectively, the second and third leading producers of maize in Ghana in the 1990s and early 2000s. Between them, the two regions produced an average of 328,000 metric tonnes of maize per annum, representing 34% of the total maize production of Ghana, i.e. 978,000 metric tonnes in the 1990s and early 2000s. The Brong Ahafo region also consistently recorded the highest yam production in Ghana during the same period. Combined with Ashanti's production, the two regions produced an average of 42% of the total yam produced in Ghana per annum within the period mentioned. Although the Eastern region was the highest producer of plantain in the 1990s, the region was surpassed by the Ashanti region in 2000.

Further, the Brong Ahafo region was the second cassava producer for the period, although it experienced a sharp decline between 1997 and 1998. Cassava production, however, picked up again in 1999 and a consistent growth in production was recorded in 2000 and 2001. Finally, the Ashanti region recorded the highest cocoyam production for most of the period from the 1990s to the early 2000. As shown in Table 2, maize, yam, cassava and vegetables are the most widely grown crops in the zone. A few of the farmers grow fruits and tree crops such as cocoa, oil palm, and cashews. Due to the fact that the zone has two rainfall regimes, maize, yam and cassava are planted during the major rainy season and cowpea and vegetables are planted during the minor season.

Results and discussions

Mediating variables

Table 3 shows that there are more migrants (48%) with no formal education compared to indigenous people (39%). This situation is to be expected, since the primary reason for most migration is economic (Massey, 1998). Migrants may have abandoned their educational pursuit upon reaching their destination in order to maximize the time they had to spend on economic activities. Also, the majority of the population i.e. 83% and 70% migrants, and 88% and 71% indigenous people for 1984 and 2000 respectively, had farming as their major occupation, indicating that farming is the major occupation in the transitional zone.

There was almost a universal ownership of farm lands among indigenous people. However, the fact that 1% of indigenous people rented land to farm in 2000 suggests that the situation is changing gradually. Migrants were mainly tenant farmers, renting land from the indigenous people. However, about half of all migrants owned farmland, either as gifts or because the migrant farmer was the first to cultivate that piece of land. Finally, more migrants (9%) travelled a distance of 10 kilometres or more to their farthest farms compared to indigenous farmers (6%). This is due to the fact that indigenous farmers, who are the owners of the land, prefer farmlands that are close to their houses.

Table 1: *Description of Variables and Aggregation method used in the Model*

Abbreviation	Variable	Description	Aggregation method
CA	Cropped area	Total cropped area by household (in hectares) – Dependent Variable	Mean
AL	Affluence (Livestock)	Household affluence (measured by ownership of livestock, i.e., cattle, sheep and goat)	Cattle ranked three, sheep, two and goat, one due to level of importance in community. Household score then determined based on ranking.
AG	Affluence (Consumer goods)	Household affluence (measured by ownership of Car, Motorcycle, Bicycle, TV & Radio)	Car ranked five, Motorcycle, four, bicycle, three, TV, two and radio, one. Household score determined based on ranking.
OF	Off-farm income	Monthly household income from off-farm activities	Mean
ON	On-farm income	Annual household income from sale of farm produce	Mean
HS	Household size	Number of household members	Absolute
MF	Major farmers	Proportion of major farmers in household	Percentage
LT	Land tenure arrangement	Land tenure system of household head, i.e., tenancy or ownership	Tenancy = 1, Ownership = 2
TR	Tractor use	Number of hours of tractor use per hectare of farmland by household	Mean
FE	Inorganic fertilizer use	Amount of inorganic fertilizer used by household per hectare (kgs)	Mean
FA	Fallow years allowed	Number of years allowed for land to fallow in household	Mean
DI	Distance to farthest farm	Household distance travelled to farthest farm	Mean
EX	Extensification	Extended farm lands within 5 years of survey (in hectares)	Mean
ED	Household educational level	Educational level of household members	No schooling ranked zero, primary/basic, one, JSS/middle, two, SSS/secondary, three and Tertiary ranked four. Mean household educational score determined

Multiplicative variables

Affluence

Migrant households earned on average one and a half times more money from the sale of farm produce in 2000 than indigenous households (see Table 4). This is because migrant farmers on average had almost three times more cropped area compared to indigenous farmers. The differentials in the two sets of variables, i.e., farm income and cropped area, amply demonstrate the economic motive of migrant farmers compared to indigenes: to maximize crop production and secure high yields in order to pay land rents. Added to this is, as already mentioned, the fact that an individual establishes his right over the use of land by being the first to bring that piece of land under cultivation. Migrant farmers may therefore clear land indiscriminately without necessarily cropping it to have a stake in the land. This could clearly be a strategy for contending with tenure insecurity. Furthermore, when all categories of consumer goods used to measure household affluence and livestock

Crops	Ejura-Sekyedumase
Maize	90
Cowpea	46
Groundnut	43
Sorghum/Millet	1
Tree Crop (Cotton, Cocoa, Tobacco, Oil Palm etc.)	9
Sweet Potatoes	0.3
Rice	8
Vegetables (Tomatoes, Pepper, Onion, Garden eggs)	52
Fruits	0.3
Cassava	53
Yam	59

Source: Field Survey 2002.

Table 2: *Percent of households that grow particular crops in the Ejura-Sekyedumase district, 2000*

Mediating variable	Migrant		Indigenous	
	1984	2000	1984	2000
Percent no schooling	-	48	-	39
Percent major farmers	83	70	88	71
Land tenure (percent ownership)	49	47	100	99
Percent who travelled 10 kms or more to farm	-	9	-	6

Source: Field Survey, 2002.

Table 3: *Selected mediating variables among migrant and indigenous households, 1984 & 2000.*

are considered, migrants owned more than indigenous people, the only exceptions being radio and television ownership in 1984. These further buttresses the issue of the economic motivation of migrant farmers compared to their indigenous counterparts.

Technology

The results in Table 5 show that the use of tractors on farms was higher for migrant farmers when compared to indigenous farmers, further confirming the migrant's status as a commercial farmer. The only exception was the use of inorganic fertilizer, which was slightly higher among indigenous farmers compared to migrant farmers in 1984. A possible explanation for this may be that the use of inorganic fertilizer for farming might have spread to indigenous farmers earlier than it did to migrant farmers.

Because of tenure insecurity migrant farmers were expected to practise less land fallow in order to maximize the economic returns on their farms. Ironically, the mean fallow year was slightly higher for migrants compared to indigenous farmers contrary to what was anticipated. A possible explanation for this may be that migrant farmers clear more land, although they do not necessarily cultivate it, in order to improve their tenure security. Also, the results in Table 5 show that migrants farmed on new agricultural lands that were generally twice as large as those of indigenous farmers. This indicates that migrants practised agricultural extensification more than indigenous farmers.

Household size and cropped area

In 1984, migrant households had an average size of 6.4 persons compared to only 4.1 persons for indigenous households (Table 6). In 2000, the pattern remained the same, with migrant households having an average of 9.8 persons compared to 6.4 persons for indigenous households. The size of migrant households in 1984 (6.9 persons) was almost the same as indigenous households (6.9 persons) in 2000, a period of almost two decades. Larger migrant household sizes do not necessarily mean that

Affluence	Migrant		Indigenous	
Income	1984	2000	1984	2000
Mean annual farm income (000000s Cedis)	-	4	-	6
Mean monthly off-farm income (000000s Cedis)	-	0.1	-	0.2
Consumer Goods				
Percent bicycle ownership	3.0	22.5	3.0	16.8
Percent car ownership	0.0	1.7	0.0	0.4
Percent motorcycle ownership	0.4	0.9	0.0	0.1
Percent radio ownership	2.2	33.0	4.0	29.0
Percent television ownership	0.4	11.0	0.6	9.7
Livestock				
Mean cattle per household	5.2	3.7	4.5	1.1
Mean sheep per household	21.6	9.6	12.6	7.7
Mean goats per household	17.5	9.5	11.7	8.2
Mean livestock per household	14.8	7.6	9.6	5.7

Table 4: *Affluence among migrant and indigenous households, 1984 & 2000*

Source: Field Survey, 2002.
Note: 1 Euro = 5,500 Ghanaian Cedis at time of interview.

Farming practices and implements	Migrant		Indigenous	
	1984	2000	1984	2000
Mean household hours spent by tractor on farm per hectare	6.2	14.0	5.8	11.4
Mean household inorganic fertilizer used per hectare (kg)	185	275	190	210
Mean fallow years per household	1.6	1.2	1.4	1.1
Mean household new farms within last 5 years (hectares) - Extensification	-	2.2	-	1.0

Table 5: *Technological farming practices and implements used among migrant and indigenous people, 1984 and 2000*

Source: Field Survey, 2002.

there are more migrants than indigenes in the derived savannah zone. It means that migrants live in crowded households and settlements mainly due to the fact that new migrants put up with more established family relations. Migrant households may also have had larger household sizes because household members are used as labour on farms. With regard to cropped area, migrant households had larger cropped areas compared to indige-

Farming practices and implements	Migrant		Indigenous	
	1984	2000	1984	2000
Mean household size	6.4	9.8	4.1	6.9
Mean household cropped area (hectare)	6.9	9.6	3.1	3.6

Table 6: *Household size and cropped area for migrant and indigenous households, 1984 and 2000*

nous people. In 2000 migrants had almost three times more cropped area compared to indigenous farmers. This is due to the fact that migrants are mainly commercial farmers and indigenous farmers are subsistence farmers.

Factors affecting agricultural land use among migrant and indigenous farmers

Household affluence (livestock and consumer goods) and household size predicted agricultural land use among migrant households in 1984 (Table 7). The analysis shows that migrant households were wealthier due to the sale of farm produce, and it reflected on the total agricultural land they put under cultivation. Also, each additional person added to the migrant households' increased cropped area, and this could imply that as far back as 1984, population pressure was being felt on agricultural land among migrant households due to their larger sizes.

Among indigenous households, the length of fallow and household affluence (livestock) predicted agricultural land use in 1984. The analysis shows that the more land indigenous farmers left to fallow, the less land area they had cropped. The fact that this scenario occurred among indigenes and not migrants further strengthens the point already mentioned that indigenous people are the owners and custodians of the land. Finally, none of the agricultural technological indicators (use of tractor and inorganic fertilizer) predicted agricultural land use among both groups in 1984. This gives a strong indication that innovations in mechanized forms of farming were not widespread in the transitional agro-ecological zone of Ghana, and simple subsistence forms of farming were still being practised, as the case may have been in other agro-ecological zones of Ghana.

In 2000, household size, the educational level of household members, distance to the farthest farm and land tenure predicted agricultural land use among migrants; while household size, tractor use, affluence (livestock) and on-farm income predicted agricultural land use among indigenous households. The results indicate that higher educational status attained by a migrant does not necessarily result in him/her taking up a non-farming occupation as expected. The evidence shows that the few highly educated migrants still prefer farming, possibly because it is lucrative.

The results further show that the fact that migrants travel longer distances to farms does not necessarily result in smaller cropped areas. This situation is clearly related to land inheritance and tenure and it was anticipated due to the fact that indigenous farmers may prefer farmlands closer to their homes. Since they are the custodians of the land, migrants may be left with no choice but to take up farmlands located far away from their homes. Furthermore, as already stated, migrants were mainly tenant farmers. However, the few (47%) who owned lands cropped on average almost 3.7 more hectares (9 acres) of farmland compared to their counterparts who rented land. Household size predicted agricultural land use among both migrant and indigenous farmers.

The use of tractors for farming, which were mainly hired, was a statistically significant predictor of agricultural land use among indigenous households in 2000. Thus, the use of technologically advanced forms of farming is gradually becoming prominent in the transitional agro-ecological zone even though it is not on a massive scale. It is surprising to note that income from on-farm activities does not predict agricultural land use among migrants, but rather among indigenous farmers. Enormous disparities existed between the income patterns from this source between the two groups. It was expected that at least income gained from the sale of farm produce would be channelled into farming among migrant farmers, but that is not the case. Indigenous farmers may instead have invested income from sale of farm products into their farming in 2000, although the effect was very marginal.

Temporal shifts in factors affecting agricultural land use

The two variables used to measure household affluence (livestock and consumer goods) predicted agricultural land use among migrants in 1984 but not in 2000. This may be because migrants were wealthier in 1984 compared to 2000. Also, household size, which may have been used as labour inputs on farms, predicted total agricultural land cropped among migrant households in both years. However, the number of household members put more pressure

Table 7: *Parameters of multiple regression models explaining factors affecting agricultural land use among migrant and indigenous households*

	Migrant 1984		Indigenous 1984		Migrant 2000		Indigenous 2000	
	Beta	**SE**	**Beta**	**SE**	**Beta**	**SE**	**Beta**	**SE**
Affluence (Livestock)	0.130***	0.047	0.075**	0.035	-0.024	0.041	0.100**	0.040
Affluence (Consumer goods)	0.008*	0.043	0.006	0.013	0.031	0.020	-0.001	0.005
Off-farm income	-	-	-	-	0.001	0.001	-0.001	0.001
On-farm income	-	-	-	-	0.001	0.001	0.001***	0.001
Household size	2.454***	0.666	0.085	0.366	1.446***	0.416	0.394**	0.173
Major farmers	0.158	0.112	-	-	0.090	0.082	0.027	0.017
Land tenure arrangement	1.271	4.566	-	-	8.943**	4.398	2.307	5.175
Tractor use	-0.003	0.120	0.007	0.032	0.049	0.072	0.024*	0.013
Inorganic fertilizer use	0.005	0.123	0.005	0.030	0.147	0.089	0.018	0.013
Fallow years allowed	-0.006	0.048	-0.031**	0.014	0.008	0.048	-0.013	0.010
Distance to farthest farm	-	-	-	-	2.556***	0.434	-0.022	0.144
Extensification	-	-	-	-	2.356	4.251	0.201	0.862
Household educational level	-	-	-	-	5.732*	3.127	0.907	0.711
Constant	-15.163	14.321	5.855	3.706	-37.883***	12.941	-4.890	10.631
Adjusted R^2	0.374		0.035		0.493		0.187	
n (households)	76		113		98		142	
n (farmers)	278		314		374		412	

**p<0.10; **p<0.05; ***p<0.01*
SE is Standard Error.

on agricultural land in 1984 than in 2000. An additional household member added to the family in 1984 resulted in half a hectare more of cropped land than in 2000.

With regard to land tenure arrangements, a number of migrants had acquired their own agricultural lands between 1984 and 2000, either as gifts or because the migrant farmer was the first to cultivate that piece of land. This land tenure arrangement may have resulted in the utilization of more agricultural lands by migrants. Finally, migrants increased their educational status considerably within the period; evidence shows for example that the proportion of females with formal education in the transitional zone generally increased from 63.6% in 1988 to 68.7% in 1998 (GSS, 1989 and 1999). However, migrants did not diversify into professional or managerial occupations but stuck to farming.

Unlike the situation with migrant households, household size put less pressure on agricultural land in 1984 than in 2000 among indigenous households. Tractor use on farms, which did not predict agricultural land use among indigenous households in 1984, predicted it in 2000. This may be indicative of the fact that technologi-

cally advanced techniques of farming are gradually gaining prominence in the transitional agro-ecological zone of Ghana. Finally, livestock ownership, a variable for measuring household affluence, predicted agricultural land use in both 1984 and 2000 among indigenous farmers. However, among migrant farmers, livestock ownership predicted agricultural land use in 1984 but not in 2000. This is strengthened by the fact that mean livestock ownership among migrant households decreased from 14.8 in 1984 to 7.6 in 2000 (see Table 4).

Conclusion

It has been argued that the decision to migrate is mainly driven by economic considerations, and studies that have examined the interrelationship between migration and environment have generally concluded that migrants are responsible for some of the land use/land cover transformation and degradation occurring globally. This paper examined the differentials in factors affecting agricultural land use among migrant and indigenous farmers; bringing out the motives and constraints of the two groups. Results show that migrant farmers respond to different sets of variables compared to the indigenes. For example, migrants had almost three times more cropped area, thus, earned more from the sale of farm products, and therefore more affluent. They also used more mechanized farming practices, and had extended into more agricultural lands compared to indigenous people mainly to secure high harvests in order to pay land rents, and all these factors are mainly driven by the issue of tenure insecurity. As long as tenure insecurity exists, migrant farmers will continue to engage in what is termed 'soil mining', which entails an increase in seed densities, application of small amounts of inorganic fertilizer, and the limited use of improved seed varieties for short-term gains, which results in degradation of the agro-ecosystem. This is certainly to the detriment of long-term sustainability. It is recommended that policy makers should take a critical look at the land tenure system operating in Ghana, especially that of the derived savannah agro-ecological zone to address issues of property rights and tenure insecurity.

Further research is needed to ascertain whether migrant farmers are indiscriminately clearing land to claim ownership of it as a result of the land tenure arrangement in the derived savannah zone, which states that an individual establishes his right over the use of land by being the first to bring that piece of land under cultivation.

Finally, the study has shown that the "IPAT" model can be useful in studying agricultural land utilization in the transitional agro-ecological zone of Ghana. This is due to the fact that the variables used to measure population, affluence and technology have been shown to play key roles in predicting agricultural land utilization in the selected district. It is therefore recommended that future studies on agricultural land use, especially in southern Ghana, should consider the role played by key variables in the "IPAT" model.

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