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Land Tenure Insecurity as an Investment Incentive: The Case of Migrant Cocoa Farmers and Settlers in Ivory Coast.*

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Abstract. This study sets forth a positive relationship between tenure insecurity and investments over different time horizons among cocoa farmers in Ivory Coast. This positive relationship stands in stark contrast to results found in many related studies. We argue this difference stems from the type of crops considered and, in particular, whether one considers annual and/or perennial crops. Given that cultivating perennial crops such as cocoa requires large upfront investments over a long period of time, it is of paramount importance to retain control over the land in the long run, especially when the trees reach full maturity. According to some theoretical arguments, investing is a way to retain such control when the farmer does not have administrative rights. Our results show that cocoa farmers whose status remains precarious in terms of tenure security (migrants) have a higher propensity to invest, especially when the tree is about to yield substantially. This study thus underlines the need to account for the life cycle of crops and the associated revenue streams when assessing the relationship between tenure (in-)security and investment.

JEL classification: Q15, O13, O17, O55, D23

Keywords: Tenure security, investment time horizons, crop life cycle, outsiders, Ivory Coast.

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1 Introduction

The absence of formal ownership rights over land, as well as the tenure security which they provide, has been blamed for the low levels of investments in agriculture in Sub-Saharan Africa and for a missed Green Revolution. Theoretical literature provides strong arguments supporting the detrimental role played by the absence of formal property rights on investment incentives. Despite the prima facie logic, empirical research on the topic has somewhat struggled to concur for many reasons, not to mention measurement issues[1].

First, formal property rights are very rare in this part of the world and many attempts to set them up have failed. For instance, Ivory Coast passed a law in 1998 aiming at converting customary rights into formal rights; yet, in 2009, 98% of land transactions were carried out within the customary framework (McCallin and Montemurro, 2009). Second, the absence of formal property rights is thought of as necessarily leading to land tenure insecurity. This does not account for the security granted by customary rights which seem to be more operative than formal legal rights in providing it. Furthermore, since customary rights are more often than not dependent upon investments made, the relationship between tenure security and investment incentives is bi-directional. Studies accounting for this simultaneity between tenure security and investment reach extremely heterogenous conclusions that emphasize the context-dependent nature of such a relationship in Sub-Saharan Africa[2]. Yet, those mixed results could be somewhat sorted according to (a) the visible nature of investments since the more visible, the greater the security they provide, (b) productive and security-enhancing investments, and finally (c) the time horizon of the investments, since overall, the effect of tenure security appears more salient for long-term than for short-term investments.

We add that the product life cycle ought to be taken into account. Our study shows that among a sample of 1,188 cocoa producers in Ivory Coast, internal and external migrants, collectively referred to as outsiders, enjoy less tenure security than natives and yet they invest more in their plantations. At this stage, it is interesting to note that this result is opposite that found by Fenske (2010) in the case of Ivory Coast, but with annual crops and fallow as investment: outsiders leave their land fallow for shorter periods of time. After ruling out the potential effect of unobservable characteristics linked with the outsider status, we argue that this divergence originates in the difference in the kinds of crops considered, whether annual or perennial.

The distinction between perennial and annual crops is of paramount importance as both types exhibit very dissimilar product life cycles and thus generate different income streams over different time horizons. Yet, few studies, if any, insist on this difference and, to the best of our knowledge, none of them relates the product life cycle to the propensity to invest.

[1] See, among others, Besley (1995), Brasselle et al. (2002), Place (2009), and Fenske (2011).

[2] Place (2009), as a conclusion to a comprehensive literature review, writes "that the testing of various relationships of the economic model of property rights in African agriculture has generated mixed results. The most direct relationship, between tenure security and land investments, shows positive effects in many cases, but no effect in others and even that there may be reverse causality in yet others. This strongly suggests that context is important in conditioning the effects of land tenure."

Based on an original survey which was specifically designed to analyze the investment behaviour of cocoa farmers, we show that short- and medium-term investments are positively associated with tenure insecurity and even more so as the trees reach full maturity. One possible explanation for this positive relationship can be found in the models developed by Banerjee and Ghatak (2004) or Abdulai et al. (2011) where farmers who enjoy less tenure security may find it valuable to invest in exchange for an extended tenure arrangement which will secure a stream of future revenues. Farmers invest in order to retain control over their plantations in the next periods and, more specifically, they do so when plantations are about to yield substantially. That is when returns are about to turn positive and losses from potential eviction would be at their peak. Our results precisely show that the greater tendency by outsiders to invest compared to natives is mostly restricted to the subsample of plantations that are reaching their full production stage.

The positive relationship we find among cocoa farmers between tenure insecurity and a propensity to invest is at odds with the results found in the case of annual crops. Perennial and annual crops do not generate similar income streams. While the payback period for the latter is at least one year, it takes three years for a cocoa tree to start bearing fruits, and an additional six to seven years to reach full maturity and the highest yield, which could last for at least ten years[3]. As far as annuals are concerned, eviction only jeopardizes income for a year or so, while in the case of perennials, the closer to maturity the plantation, the higher the loss associated with a potential eviction: many years of investment and efforts would be forgone should the tenant be evicted. Thus, retaining control over the land is more important for farmers of perennial crops and it becomes even more important as the crop life cycle extends. Therefore, one way to secure tenancy over the next period is to invest, and the threat of eviction may act as a stronger investment incentive for perennial than for annual crops.

This study emphasizes the importance of accounting for the crop life cycle when assessing the link between tenure security and investment. Previous studies have rarely underlined this point which we believe to be crucial, as losses from eviction would thus greatly differ, and so would the role of security. The rest of the paper is organized as follows: Section 2 provides some elements about the development of cocoa production in Ivory Coast which are relevant for the discussion. Section 3 presents the data and our measures of investments and tenure security. Section 4 lays out the empirical strategy, while Section 5 discusses the results, and Section 6 sets out our conclusions.

2 Context

In Ivory Coast, as in many Sub-Saharan African countries, land is owned collectively; it is sacred and thus inalienable. Where having access to land is concerned, one must distinguish between possession which implies limited exploitation rights, or usufruct, and ownership, which is understood as the rights of transfer and administration, that is the right to define the rights of others

[3]The average life span of a cocoa tree is forty years. The fruit-bearing activity of a cocoa tree as a function of its age has an inverted-U shape. This is what we refer to as the product or tree life cycle.

(see, for instance, Schlager and Ostrom (1992) or Place and Hazell (1993)). At the local level, this distinction translates into the identification of two groups of farmers: those who occupy and manage the land and those who live on it. The difference between these two groups is embodied in the fact that the former underwent an appropriation ritual in the presence of the headman which conferred collective land ownership. This ritual is unique and cannot be repeated. Newcomers who were not part of the original ritual would therefore only be granted exploitation rights by undergoing a set of symbolic integration rites (Legré, 2003)[4]. Thus, although newcomers and their descendants have been provided rights over the land they cultivate, the tenure security they enjoy is not as indisputable as that experienced by the descendants of the group which underwent the original appropriation ritual. Therefore, an important component of tenure security is whether or not farmers cultivate land in their ancestors' village. If they do, they will be referred to as natives as opposed to outsiders, a group encompassing both internal and external migrants. Being a native, or an internal or external migrant is referred to as status.

During the colonial and post colonial eras, these customs evolved as both the colonizer and the independent state endeavoured to bring about changes in the customary law. In the 60s and 70s (i.e. right after independence), the government of Ivory Coast oscillated back and forth between attempts to purge customary rights and their recognition. This has led to a superposition of modern and customary law land rights which makes the management of rural land extremely confusing, creating conflicts as soon as the land is saturated, in particular when outsiders are concerned[5]. As mentioned above, a law was passed in December 1998 provisionally recognizing customary rights, before transforming individual rights into formal and private rights. However, its implementation faced the reluctance of traditional authorities, as well as that of a large swathe of the rural population owing to certain measures of the aforementioned law, notably legal ambiguities concerning the transformation of customary rights into property titles for Ivorians, and into long-term leases for non-Ivorians. This law exemplifies the potential for conflict over land and the more precarious position of outsiders compared to natives in these disputes. This opposition between village natives, Ivorians from other villages, and non-Ivorians, and the heterogeneity in the rights they enjoy stems from (a) the customs governing land access (which distinguish between those who underwent the appropriation ritual or their descendants, those who performed the integration rights or their descendants, and those who were only granted exploitation rights), and (b) the historical development of cocoa production in Ivory Coast.

[4]In Ivory Coast, land access for outsiders has been granted through the "tutorat" system. Chauveau (2000) describes it as follows (authors' translation): "According to this agrarian agreement which is typical of the "moral economy" of African peasant societies, anyone who benefits from a transfer of land rights, or even a land sale, contracts a permanent debt of acknowledgement vis-à-vis their tutor who becomes their father or boss. This is the case even if the newcomer has resources and income which are nothing like those of the smallholder who transfers the land. This acknowledgement is shown by a normally symbolic counter-performance carried out when the exploitation rights are transferred... The institutionalisation of this acknowledgement owed to the tutor, which is passed on from one generation to the next, is accepted by migrants as long as the tutor's demands remain reasonable."

[5]For example, take the case of a member of a native family X, who returns from the town where he has failed to be successful on the labour market, and claims his property rights for the land ** which ** an outsider family Y has been exploiting, sometimes for more than one generation. The outsider may assert that he has bought the land once and for all, while the native will maintain that the outsider was merely conceded exploitation rights. By challenging the nature of these land transfers, land disputes spread like wildfire.

Cocoa production was introduced in Ivory Coast by French colonialists at the end of the 19^{th} century in the eastern part of the country, along the border with Ghana. Then, cocoa plantations were developed westward by clearing the virgin forest, depending on soil quality, as the eastern and center-west parts of the country were the most favorable to cocoa cultivation. Due to this settlement movement, there are three cocoa belts. The first one is located in the eastern part of the country where most plantations were established between 1955 and 1975. The second one was developed mainly between 1965 and 1985 in the center-west region, while the last one is located in the south west region and started in the 1980s. This westward colonization movement was accompanied by three migration waves. Migratory waves were encouraged by the voluntarist policies of President Houphouët-Boigny, who aimed at developing forestry income in the south-west and west. In our sample, more than three quarters of the smallholders surveyed who settled in a village before 1960 are natives. Among those who settled between 1960 and 1980, about two thirds are outsiders: one third are natives and one third are internal migrants. However, the native smallholder households that settled after 1980 once again become proportionately more numerous compared with outsiders (44% versus 76%). This trend reversal is due to the worsening of the economic crisis and the government's return-to-the-land policy which was designed to occupy those youths whose insertion into urban life had failed. Eventually, cocoa production spread from favorable agro-climatic conditions in the eastern part of the country to less favorable ones in the west, a movement which was accompanied by very different settlement patterns. It is necessary to account for the history and specific characteristics of these zones in our analysis.

3 Data

The data come from a survey sponsored and designed by the International Institute for Research in Tropical Agriculture (IIRTA) and carried out in 2002 by the École nationale de la statistique et de l'économie appliquée (ENSEA, Abidjan). The survey was specifically designed to study cocoa production and the agronomic practices of planters. The population from which the sample was drawn accounts for 80% of cocoa growers[6] and covers the entire territory on which Ivorian cocoa plantations can be found. Given the primary focus of the survey on cocoa production, it provides very detailed information on plantations and agronomic practices. To the best of our knowledge, some of our variables, such as the age of a plantation or the vegetation cover prior to the set up of a plantation, have never been used. Thus, the effect of the crop life cycle, for instance, lies outside the scope of many studies, while we believe it to be highly relevant, as argued in Section 1. Information is provided on 1,781 plots operated by 1,188 smallholder households spread over 126 villages. 532 household heads are native, 354 are internal migrants, and 302 are external migrants. Despite the primary focus on cocoa cultivation, the survey also provides information on other agricultural activities.

[6]The 1999 Census estimated Ivory Coast had about 500,000 cocoa farmers.

3.1 Assessment of Land Tenure Security

Our data do not include a direct measure of land tenure security. They provide information about the mode of acquisition, which has often been used either as a proxy or as an instrument for tenure security. Table 1 presents the frequencies for each mode of acquisition: land may either have been inherited (60% of the cases) or purchased (32%). Nearly three quarters of the plantations were created by the farmer. The term "purchased" encompasses very different situations. It includes incomplete sales, such as a grant under the tutorat system; land given in exchange for labour, or emphyteutic leases which were once widely used in the center-west and represent a largely incomplete sale, as the buyer is deemed to be permanently indebted to the seller; and more occasionally pure market transactions. On the other hand, inheritance is a mode of acquisition that largely depends on status and is governed by social hierarchy. Having inherited land does not prevent disputes, as other family members may consider themselves as legitimate beneficiaries. Finally, having carved a plantation out of virgin forest is often recognized as providing additional rights. Despite the disparity in situations summarized by these terms, it is fair to assume that having inherited land does provide greater security than having purchased it and definitely more security than the "other" category that encompasses gifts, planting on declassified forest, renting, and sharecropping [7].

Therefore, based on the migration history and traditions in land granting in Ivory Coast discussed in Section 2 and in accordance with Fenske (2010), we argue that a farmer's status is a good proxy for tenure security. In the sample used, 45% of the farmers are natives and 55% are outsiders (30% internal migrants and 25% external migrants). Naturally, natives who farm their ancestors' land enjoy the highest degree of land tenure security, while internal migrants are arguably slightly less exposed to eviction threats than external migrants. Using the farmers' status as a proxy for tenure security helps avoiding a simultaneity bias.

As can be seen from Table 1, the modes of acquisition are largely correlated with a farmer's status. Natives have mostly inherited land, while outsiders, whether internal or external migrants, have mostly purchased it. Moreover, as Goldstein and Udry (2008) have shown in the case of Ghana, smallholders' ability to let land lie fallow for a long time (i.e., to make an optimal investment) depends on their socio-political influence within the community, which directly influences the likelihood of being evicted. Status measured as native, internal, or external migrants is expected to be a good indicator of tenure security for that reason as well.

We therefore have three sets of variables capturing land tenure security: (a) acquisition mode, (b) status, and (c) whether the plantation was created by the operator. We argue that all three kinds of security measures do not depend on current investment levels, and are therefore

[7] As Place (2009) puts it: "...studies from all parts of Africa indicate that inheritance is the chief mode of land acquisition and is accompanied by strong, long-lasting private rights (e.g., Bruce and Migot-Adholla, 1994). Furthermore, other forms of permanent land acquisition such as purchase and gift are also common in some locations" and their associated rights are more often than not respected. However, Place (2009) also adds that "regardless of the method of land acquisition, the tenure security of migrants can be tenuous as when natives assert ancestral rights to land that they claim was improperly transferred from the group. There are many examples of this in West Africa where civil conflict has sometimes ensued (e.g. Cotula, 2007)".

immune to reverse causality, mainly owing to the time elapsed between acquisition and current investments (on average 15 years). Given that all three measures of tenure security are a set of dummies, in order to bring as much clarity to the results as possible, we define a benchmark scenario that presumably will lead to the highest degree of tenure security. Indeed, a native who inherited and created a plantation will presumably enjoy the maximum level of security. All the other effects will be interpreted in contrast to that scenario. The data also include information about farmers' settlement date in a village, which can be part of an individual's social influence. It seems reasonable to assume that the longer the time spent in a village, the more secure the individual's right, especially for outsiders. This information will also be used to capture tenure security.

3.2 Investments over Different Time Horizons

Our data include information about six types of investments with different time horizons. Short-term investments include the spread of fertilizers, mostly manure, and the use of herbicides. Medium-term investments include the clearing of unwanted sprouts and weeds and the spread of fungicides and/or insecticides. The provision of shade is considered as a medium- to long-term investment. Cocoa trees are especially sensitive to both pest and virus attacks, and, more specifically, to that of mirids, as well as to so-called cocoa HIV (Swollen Shoot), respectively. The best way to protect trees against these bugs is to spray insecticides and to provide sufficient shade which is not too dense, specifically, at the early stage of the development of the cocoa tree. Otherwise, the yield decreases substantially within the year and beyond, eventually leading to the death of the tree.

Planting trees is often recognized as a common way to assert one's rights over a plot of land. Yet, planting fruit trees (e.g. plantain banana) in cocoa plantations should not be viewed that way, as the planting of cocoa trees already plays that part. Planting fruit trees should be considered as an investment whose aim is solely to protect the plantation against parasites. As a result, the voluntary maintenance or creation of shade is considered as a specific long-term investment. However, in the case of shade maintenance, the level of investment may be extremely different depending on whether the plantation was carved out of forest or whether it was created on land that was left fallow for a short period of time. Although the shade variable only takes the value one when the shade was created or *voluntarily* maintained (i.e. when the shade provision was intentional), we also control for the previous vegetation cover in order to neutralize the effect. The use of fertilizers and herbicides are all binary variables, while the number of insecticide or fungicide sprays, as well as the number of clearings over the last 12 months take discrete ordinal values. Tables 2 and 3 present summary statistics for the whole sample, as well as per social group or status.

The difference in the average levels of investments made by natives and migrants is always significant for a 99% level of confidence, except in the case of shade for which it is only significant for a 90% level of confidence. Whatever the type of investment, migrants invest on average significantly more than natives and, more often than not, external migrants invest more than

internal ones[8]. Since we assume that external migrants have less secure rights than internal ones and definitely less than natives, these raw statistics point to a positive role played by tenure insecurity on the propensity to invest. Yet, these differences in investment patterns may stem from a wide variety of other factors starting with location. Given what was said in Section 2, outsiders have mainly settled in the center and south-west of Ivory Coast where physiographic characteristics may have an effect on the level of investment required. Similarly, given that migrants mainly settled between 1960 and 1980, the age of their plantations may be significantly different from that of natives and the stage of the life cycle of the plantation may have an impact on investments. For instance, some investments such as shade provision or clearings may be more crucial during the early development stage of trees. Our empirical strategy aims at neutralizing the effects of status correlates that are not linked with tenure security.

4 Empirical Strategy

All our investment variables are both discrete and binary except the one indicating the use of fungicide and insecticide, as it is measured through the number of sprays and the number of clearing of weeds and unwanted sprouts. In the case of the recourse to fungicide, the variable has been changed from ordinal to binary, as only 8% of the sample take on strictly positive values, and half of that take a value greater than 1 and up to 4.

Whenever dependent variables are binary, the analysis uses a probit model, while for the other measures it resorts to an ordered probit estimation technique. Let $Investment^*_{i,j}$ be the latent continuous measure of investment made by farmer j on plot i, and defined by:

$$Investment^*_{i,j} = \delta + \alpha X_i + \gamma X_j + FE_r + \varepsilon_{i,j}, \tag{1}$$

where X_i denotes a set of plot characteristics, namely, the mode of acquisition, whether the plantation was created, the age of the plantation, and its quadratic form in order to capture the effect of the tree life cycle, the area of the plot, and the initial vegetation cover. X_j represents a vector of farmers' characteristics including first and foremost their status, the number of years they have been residing in a village, their age, gender, and level of education, and the proportion of income derived from cocoa growing to capture specialization effects. It also includes the number of men aged between 18-54 in the household to account for accessible labour force. Summary statistics for the independent variables are presented in Tables 10 and 11 in the Appendix. FE_r are four regional fixed effects to account for the differences in soil quality and the development of cocoa cultivation as discussed in Section 2. Standard errors are clustered at the farmer level to avoid correlation among disturbance terms arising from the use of variables both at the aggregated farmer level and at the plot level (Moulton, 1990).

The observed variable $Investment_{i,j}$ is either binary or ordinal. On the one hand, whenever

[8]The average levels of investment for internal migrants significantly differ from those of external migrants for at least a 90% level of confidence, except for shade provision and the number of fungicide sprays.

$Investment_{i,j}$ is binary, the model estimates

$$P(Investment_{i,j} = 1) = F(Investment^*_{i,j}), \tag{2}$$

where F is the standard normal cumulative distribution function.

On the other hand, whenever the dependent variable is ordinal, $Investment_{i,j}$ is the observed ordinal variable so that for the z^{th} outcome, $Investment_{i,j} = z$ for $z = 0, ..., 6$. It is determined from the model as follows:

$$Investment_{i,j} = \begin{cases} 1 & if \quad Investment^*_{i,j} \leq \mu_1 \\ z & if \quad \mu_{z-1} < Investment^*_{i,j} \leq \mu_z \\ 6 & if \quad \mu_5 < Investment^*_{i,j}, \end{cases}$$

where μ_z are thresholds to be estimated together with the coefficients. Thus, the probability for each ordinal outcome is

$$\begin{aligned} &P[Investment_{i,j} = 1] = F(\mu_1 - Investment^*_{i,j}) \\ &.... \\ &P[Investment_{i,j} = z] = F(\mu_z - Investment^*_{i,j}) - F(\mu_{z-1} - Investment^*_{i,j}) \\ &... \\ &P[Investment_{i,j} = 6] = 1 - F(\mu_{z-1} - Investment^*_{i,j}). \end{aligned}$$

In this system of equations and as noted in Section 3.1, the outsider status captures tenure security together with the aforementioned variables: mode of acquisition, plantation creation (or not), and the number of years of residence in a village (community). Yet, a relationship between the propensity to invest and status could stem from outsiders' unobservable specific characteristics which are correlated with status. For instance, individuals who have decided to migrate, especially from a neighboring country, might exhibit a lower aversion to risk for instance, or a more entrepreneurial spirit that will also affect their likelihood to undertake investments. Unfortunately, the limited number of plots per farmer (1.9 on average) and our interest in the effect of a farmer's status prevent us from using farmer fixed effects that would allow getting rid of farmers' unobservable characteristics[9]. Nevertheless, should unobservables be of some relevance, the outsider status would not capture tenure security as such but rather those characteristics. In order to test this hypothesis, we estimate the following equation for plot i operated by farmer j resorting to OLS:

$$\begin{aligned} Yield_{i,j} =& \alpha + \beta Investments_i + \gamma Acquisition_i + \theta Created_i + \rho Z_i \\ &+ \delta_1 External\, Migrants_j + \delta_2 Internal\, Migrants_j + \pi X_j \\ &+ FE_r + \varepsilon_{i,j}, \end{aligned} \tag{3}$$

where $Yield_{i,j}$ is the yearly production in kilograms per hectare, $Investments_i$ is the vector of

[9]The previous literature has identified these unobservable characteristics as a potential source of endogeneity bias and has addressed the issue by including farmer fixed effects (see, among others, Goldstein and Udry (2008)).

investments as defined above, $Acquisition_i$ is the set of acquisition modes, $Created_i$ is a binary variable indicating whether the plantation was created, and Z_i is a set of plot characteristics such as plantation age in its simple and quadratic forms, its area, and the initial vegetation cover. X_j is a set of planter characteristics such as the number of years of residence in the village, the age, gender, education of the household head, and the share of income derived from cocoa production. This vector also includes the number of males between 18 and 54 years old in the household, as well as a vector of equipment owned by the planter. These last two variables are rough proxies for, respectively, labour and capital used on the plantation.

Given (3), we could expect outsider status to have an influence on yield under two sets of circumstances: (a) either status does proxy for tenure security and tenure security has an effect on yield aside from the one running through investment, or (b) status does capture different agronomic practices or other unobservables, in which case δ_1 and δ_2 should appear significant. The absence of an outsider status effect on yield would provide some discredit to both arguments.

5 Results

Table 4 displays the effects on six short- to medium-term investments of land tenure security as approximated by the farmer's status, the acquisition mode of the plot, and whether the plantation was created or not. As mentioned above, the base scenario is a native who has inherited and created the plantation, as all these factors are expected to result in the highest degree of tenure security. On the one hand, as can be seen from Table 4, being an external migrant significantly increases the likelihood of investing in all types of investment, while being an internal migrant increases the likelihood of using fertilizers, the number of fungicide sprays and shade provision. On the other hand, the mode of acquisition is rarely significant, probably because of a high degree of collinearity with status (see Table 1), except for the number of insecticide sprays categorized as a medium-term investment when the plantation has been purchased (although those sales are more often than not incomplete as explained previously) and created by the farmer (see column (5)). Having created or not the plantation does not seem to have a sound relationship with investment, except when the farmer purchased an already existing plantation (see, again, column (5)). ** The ** number of years spent in the village could also indirectly measure social influence which will, in turn, affect tenure security and, as such, investment behaviour. However, its effect is not found to be significant on any investment category. One may argue that the effect of the period of residence in the village should be conditioned on being an outsider. Estimations similar to those in Table 4 were run interacting migrant status and the number of years of residence in the village. The interacted term is never significant[10].

The results from Table 4 also show a significant reverse U-shape relationship between all the investments considered, except shade and plantation age. This result is important in two respects. First, given what has been said about successive migratory waves, it shows that outsiders do not invest more because their plantations are younger. Second, and more importantly, the

[10]Estimates are available upon request.

product life cycle is a major driver of investments and the effect of this variable has rarely been taken into account. The effect of the plantation age further stresses the difference we underlined between annual and perennial crops.

Overall, one could conclude that, despite controlling for many other factors, having more precarious rights, as outsiders do, is associated with a higher propensity to undertake short- and medium-term investments. Among all three measures of tenure security, the farmer's status is the most relevant. It may be the case that status does not, or at least not only, capture tenure security but rather some specific characteristics. Indeed, previous research shows that planting trees is a way to assert rights and to secure land tenure. Assuming all cocoa farmers enjoy some security, why are outsiders more prone to investing than natives? Either they enjoy relatively less security, or their status captures shared unobservable features. In order to test this idea, we estimate Equation (3). The results are displayed in Table 5. Controlling for investments over different time horizons and other plot characteristics (e.g. tree life cycle and plantation area), the outsider status is not significantly correlated with yield. As a matter of fact, none of the measures for tenure security used so far are significantly correlated with yield[11]. Therefore, it appears quite unlikely that outsiders capture specific agronomic practices, as status has no significant relationship with yield besides the one running through investment. We can have some confidence that status mainly captures tenure security as we initially assumed.

Going back to the results displayed in Table 4, outsiders who purchased and created their plantations thus appear to have a higher propensity to invest, especially in the medium term. This result is at odds with the conclusions drawn from previous studies, as many of them either find that land tenure insecurity is irrelevant for investments in tree crops (see, among others, Udry (2012)), or that it has mixed results depending on the visible nature of the investments, or their time horizons. A widely used example of investment influenced by tenure security is fallow. Many studies[12] have found that farmers who do not enjoy tenure security leave a smaller proportion of land fallow and for a shorter period of time.

In order to make sure that our results do not come from data or context peculiarities, we correlate fallow length with farmer characteristics. Unfortunately, our data set does not provide information about fallow by plot, but rather about the set of plots belonging to the farmer, including those where other crops than cocoa are grown[13]. This prevents us from establishing correlations of fallow length with characteristics other than those of the farmer. Table 6 presents the estimates. Being a migrant is significantly associated with shorter fallow and such a relationship is in accordance with the results found by previous studies. This provides some reassurance about the soundness of our data and suggests that the gap between our results and those found in the literature is related to the crop being grown, in our case, cocoa.

[11] Plantation size exhibits a significant and negative relationship with yield, which is a well-established fact of the literature in the context of developing countries.

[12] See, for instance, Place and Otsuka (2002), Goldstein and Udry (2008), and Fenske (2010).

[13] On average 60% of the land owned is dedicated to perennial crops, while 13% is dedicated to food crops, the rest being forest or land left fallow.

Previous studies claim that the question of tenure security is not so relevant as far as tree crops are concerned, as planting trees provides guarantees against eviction. Yet, our results clearly show that those who enjoy less security do invest more in their cocoa plantations. Although farming tree crops provides security, our results suggest that such a feeling of security may not be equally shared depending on social status. Moreover, previous studies insist on the nature of the investment undertaken, in order to provide consistency to extremely heterogenous results. For instance, visible investments are positively associated with tenure insecurity as they are a way to assert rights. Tenure security may mainly affect long-term investments rather than short-term ones. Here, the results show that not only does tenure security matter even in the case of tree crops, but it also has an impact on invisible and short-term investments. We argue that this is due to the types of crops considered and their associated revenue streams. Previous studies have rarely paid close attention to the types of crops in which farmers were investing. Yet, cash flows in perennial and seasonal crop production are widely different. While perennial crops require large and long upfront investment as trees only bear fruit after a couple of years, seasonal crops provide returns in a much shorter time frame. Therefore, a perennial crop farmer who is evicted, especially right before the full production stage, faces much greater losses than a farmer cultivating annual crops. This is the sort of argument developed by Banerjee and Ghatak (2004), leading them to the conclusion that the threat of eviction and the tenure insecurity implied serve as an investment incentive. Abdulai et al. (2011) also develop the same kind of argument. Tenants or sharecroppers may find it valuable to make short- or medium-term investments in order to retain control over the land in the following periods. Our results go in that direction, since groups that enjoy less tenure security, such as external migrants, do invest more.

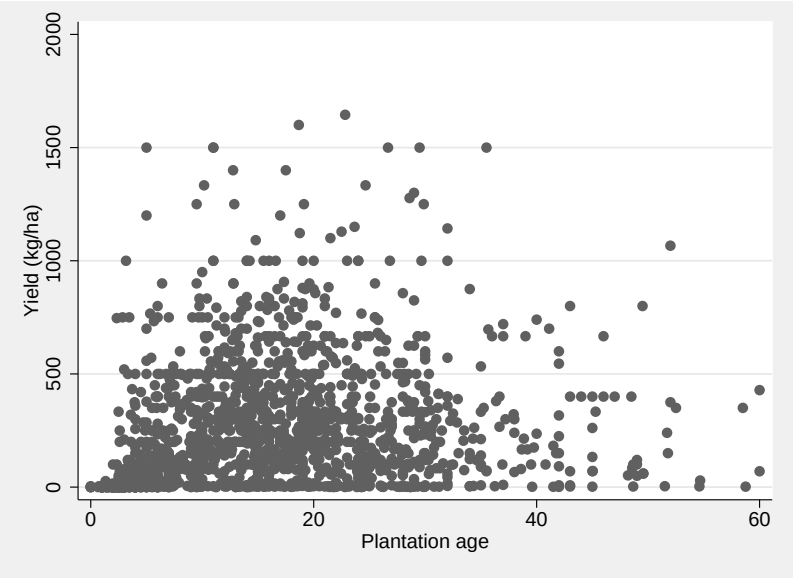
In order to further test this idea, we estimate Equation (2) on three subsamples: one where production is on the rise, one where it reaches full maturity, and one where production is declining. Should we be right in assuming that outsiders invest more because eviction threats serve as an incentive, the latter should be much stronger right before the maturity stage of the production cycle since farmers have not yet recovered the cost incurred during the early years of the cycle. Therefore, we would expect a much stronger relationship between status and investment on the subsample where the maximum yield is to be achieved, while controlling by the plantation age, and not so much thereafter.

Figure 1 plots the age of the plantations and their respective yields. The sample is split in three according to the plantation age quantile. The first quantile comprises plantations in the early stage of development, aged between zero and ten years. The second quantile contains plantations aged between ten and twenty, a stage of full maturity, while the last quantile corresponds to plantations that are over twenty years old and exhibit a declining yield.

It should be noted that all the investments considered are incurred at every stage of the tree life cycle, except shade which is provided by fruit trees planted or maintained at the start of the plantation[14]. However, the results associated with plantation age in Table 4 show that the

[14]While the survey asks about the use of, for instance, herbicides or fungicides over the last 12 years, it only

Figure 1: Correlation yields and ** crop ** life cycle



propensity to invest increases when the plantation reaches its full production potential, holding measures of tenure security constant. We now wish to show that holding plantation age constant, the difference between natives' and outsiders' investment patterns intensifies when the plantation is at a stage of full maturity. Equation (2) is estimated over the three subsamples and the results are presented in Table 7, 8, and 9 for each plantation age tercile, respectively.

The results from these tables show that migrants resort significantly more than natives to fertilizers only when the plantation is at an early stage of development or has reached maturity, although this effect seems to be greater in the latter case. The results from columns (2) and (4) in Tables 7, 8, and 9 also show that migrants resort significantly more to herbicides and fungicide, but only when the plantation is reaching maturity. Indeed, although migrants invest significantly more than natives even at a later stage, coefficients are much larger for plantations of a high yielding age. External migrants also use more insecticide sprays than natives when the plantation has reached maturity or exhibits a declining yield, while internal migrants only do so in the second case. The results from column (6) of all three tables also show that tenure security is relevant to the provision of shade, except when the plantation exhibits a declining yield. Indeed, the Likelihood Ratio Chi-Square test displayed in column (6) of Table 9 shows that the set of explanatory variables, including those measuring tenure security, fail to account for the heterogeneity in the levels of shade provided to older plantations. Yet, the model is found relevant for younger plantations and the effect of tenure insecurity appears to be positive at the early stage of the product life cycle, as shown by the results from column (6) Table 7. This is consistent with the fact that shade is the only non-recurring investment along the life cycle of cocoa trees, as it is essential at the early stage of tree development.

asks about the average level of shade provided to the plantation without referring to the timing of such shade creation. Table 12 in the Appendix presents the occurrence of the investments for every quantile (i.e. every stage of the production cycle) as well as for the whole sample.

Overall, and despite some disparities, it seems that migrants and more particularly external ones invest more than natives when plantations approach their full production potential. Assuming that migrants enjoy less secure rights over the land they cultivate, it seems that this insecurity translates into higher investments mainly when the benefits are to be reaped, that is when a potential eviction would lead to greater losses. This provides some support to the theoretical argument provided by Banerjee and Ghatak (2004) according to which the threat of eviction could serve as an incentive to invest in order to retain control over the land.
As far as the other measures of tenure insecurity are concerned, such as the acquisition method, or operating a plantation that has not been created, it seems that they have ambiguous results. Having purchased the land, as opposed to having inherited it, is positively associated with the number of insecticide sprays in the first quantile or with the use of herbicides in the second quantile. The fact that the plantation has not been created is only relevant to the use of herbicides, and at early and mature stages of the plantations. Overall, having more precarious rights as measured by status has an unambiguous positive effect on investment, mainly for plantations reaching their full potential stage, while the effect of other measures of insecurity, such as having purchased or created the plantation is also positive, although barely significant as collinearity with status may be an issue.

6 Conclusions

We show that tenure insecurity as measured by a farmer's status (native versus outsider) is positively associated with short- or medium-term investments in cocoa cultivation. These results do not seem to be coming from farmers' unobservable characteristics. The relationship is much stronger when the plantation reaches maturity and its full production potential, which we interpret as a sign that tenure insecurity acts as an incentive for the farmer to retain control over the land at a crucial time of the tree life cycle.

The gap between our results and those of previous analyses emphasizes the need to account not only for the nature of the investment, whether visible or not, short- or long-term, but also for the production cycle, while assessing the link between tenure insecurity and investments. Nevertheless, we do concur with the overall conclusion reached by the literature that dismisses the lack of formal property rights as the main culprit for the lack of investment and, in turn, limited agricultural productivity in Sub-Saharan Africa.

Labour market inefficiencies could rather probably be more seriously blamed for constraining production potential. For instance, rubber plantations are increasingly replacing cocoa ones in Ivory Coast. Farmers, if asked about the reasons for this shift may primarily state that (a) rubber produces all year round and provides smallholder households with monthly sources of income, while cocoa is harvested twice a year, which puts income more at risk, and (b) while cocoa requires much manpower and, more specifically, hired seasonal labour, rubber production is less labour intensive, which implies resorting less to the labour market. Thus, market inefficiencies and, more particularly, those pertaining to the labour market, should be considered as a more serious hamper to agricultural expansion in this part of the world than incomplete land sales.

The now well-established negative relationship between yield and plantation size sends a signal which should guide our future research agenda.

Tables

Table 1: Acquisition mode per status

Acquisition mode	Whole sample		Natives		Internal migrants		External migrants	
	Nb obs	%	Nb obs	%	Nb obs	%	Nb obs	%
Inherited and created	790	44,6%	624	73,4%	130	25,6%	36	8,7%
Inherited	282	15,9%	174	20,5%	76	15,0%	32	7,8%
Purchased and created	525	29,7%	14	1,6%	241	47,4%	270	65,5%
Purchased	45	2,5%	8	0,9%	9	1,8%	28	6,8%
Gift	53	3,0%	1	0,1%	30	5,9%	22	5,3%
Declassified forest	46	2,6%	21	2,5%	15	3,0%	10	2,4%
Others (rented, pledged sharecropped)	29	1,6%	8	0,9%	7	1,4%	14	3,4%
Total	1770	100,0%	850	100,0%	508	100,0%	412	100,0%

Table 2: Investment frequencies per status - Binary variables

	Shade created or maintained		Use of fertilizers		Use of herbicides	
	Nb obs	%	Nb obs	%	Nb obs	%
Natives	82	9.7%	42	5.0%	9	1.1%
Internal Migrants	61	12.0%	84	16.7%	11	2.2%
External Migrants	52	12.7%	91	22.3%	18	4.4%
Whole sample	195	11.0%	217	12.41%	38	2.2%

Table 3: Investment frequencies per status - Ordinal variables

Number of fungicide sprays				
	Mean	Standard deviation	Min	Max
Whole sample	0.11	0.46	0	4
Natives	0.05	0.31	0	4
Internal migrants	0.19	0.61	0	4
External migrants	0.15	0.48	0	3
Number of insecticide sprays				
	Mean	Standard deviation	Min	Max
Whole sample	0.81	1.04	0	6
Natives	0.54	0.93	0	4
Internal migrants	0.98	1.08	0	4
External migrants	1.18	1.07	0	6
Number of clearings				
	Mean	Standard deviation	Min	Max
Whole sample	2.20	0.78	0	$\geq$5
Natives	2.07	0.82	0	$\geq$5
Internal migrants	2.21	0.74	0	4
External migrants	2.45	0.7	0	4

Table 4: Main determinants of investments

	(1) Fertilizers	(2) Herbicide	(3) Nb Clearings	(4) Fungicide use	(5) Nb Insecticide	(6) Shade
External migrants	0.583***	0.484*	0.239*	0.653***	0.367***	0.347*
	(0.191)	(0.283)	(0.125)	(0.190)	(0.132)	(0.177)
Internal migrants	0.349**	0.154	-0.0160	0.645***	0.178	0.258*
	(0.166)	(0.251)	(0.104)	(0.163)	(0.113)	(0.152)
Purchased	0.0462	-0.0770	0.0968	0.0307	0.249**	-0.220
	(0.149)	(0.214)	(0.102)	(0.169)	(0.097)	(0.155)
Other acquisition method	0.245	0.298	0.321**	-0.648**	0.633***	-0.131
	(0.218)	(0.350)	(0.155)	(0.314)	(0.173)	(0.246)
Not created	0.0953	0.120	0.00601	0.145	-0.199*	0.154
	(0.164)	(0.245)	(0.095)	(0.153)	(0.104)	(0.146)
Plantation age	0.0620***	0.0544**	0.0178**	0.0528**	0.0412***	0.0143
	(0.020)	(0.024)	(0.008)	(0.021)	(0.010)	(0.012)
Plantation age^2	-0.00126***	-0.00108**	-0.000538***	-0.00102**	-0.000760***	-0.000202
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Plantation area	0.00858*	-0.0110	0.0101**	0.0103*	0.0186***	-0.00428
	(0.005)	(0.017)	(0.005)	(0.006)	(0.006)	(0.007)
Nb of years in the village	-0.00199	-0.00150	-0.00443	-0.00613	-0.00502	0.00183
	(0.005)	(0.007)	(0.003)	(0.006)	(0.003)	(0.004)
Income share from cocoa	-0.0278	-0.0359	-0.0215	-0.0560**	0.00745	-0.000781
	(0.022)	(0.029)	(0.015)	(0.026)	(0.016)	(0.019)
Nb of men (18-54)	0.0539**	0.0133	0.0161	-0.0117	0.0467***	0.0369
	(0.026)	(0.031)	(0.015)	(0.030)	(0.017)	(0.026)
Observations	1574	1561	1620	1592	1620	1582
chi2	105.9	39.52	129.8	60.27	230.0	33.62
p	2.54e-13	0.00574	2.83e-17	0.00000647	1.42e-36	0.0288

Notes: Standard errors in parentheses clustered at the household level with ***, **, and * respectively denoting significance at the 1%, 5%, and 10% levels. All equations include regional fixed effects (east, center-west, west, and south-west) as controls, as well as five dummies that account for the type of vegetation cover prior to the set-up of the plantation (e.g. forest, shrubby fallow, short fallow, savanna, and others), education fixed effects and dummies accounting for the gender and age of the household head. The base scenario defined by omitted categories is a native who has inherited and created the plantation.

Table 5: Correlates of yield (in kg/ha) - Equation (3)

	(1)	
	Yield (kg/ha)	
External migrants	-4.016	(29.605)
Internal migrants	36.11	(24.316)
Purchased	19.49	(22.709)
Other acquisition method	57.99	(43.987)
Not created	-25.21	(21.228)
Fungicide use	-26.85	(28.048)
Nb insecticide	44.71***	(9.715)
Nb clearings	14.97	(9.611)
Shade	-22.66	(24.237)
Fertilizers	72.51***	(24.069)
Herbicide	-12.26	(55.447)
Plantation age	16.70***	(1.828)
Plantation age^2	-0.279***	(0.041)
Plantation area	-5.127***	(1.067)
Nb of years in the village	0.631	(0.629)
Income share from cocoa	10.16***	(2.780)
Nb of men (18-54)	6.066	(4.262)
Observations	1408	
F	16.88	
p	1.89e-95	

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Standard errors in parentheses clustered at the household level with ***, **, and * respectively denoting significance at the 1%, 5%, and 10% levels. Equation (3) includes regional fixed effects (east, center-west, west, and south-west) as controls, as well as five dummies that account for the type of vegetation cover prior to the set-up of the plantation (e.g. forest, shrubby fallow, short fallow, savanna, and others), education fixed effects and dummies accounting for the gender and age of the household head. It also includes a set of dummies accounting for the equipment owned by the planter such as atomizer, nebulizer, sprayer, chain saw, wheelbarrow, hessian sack, tarpaulin, dibble, secateurs, etc. The base scenario defined by omitted categories is a native who has inherited and created the plantation.

Table 6: Estimates of correlates of fallow length

	(1)	
	Fallow length	
External migrants	-12.50***	(1.310)
Internal migrants	-5.130***	(1.262)
Nb of years in the village	0.0658	(0.040)
Head female	-1.857	(2.490)
Head age	-0.0119	(0.046)
No education	-1.848	(1.716)
Primary education	-1.827	(1.668)
Nb of men (18-54)	0.888***	(0.231)
Observations	1764	
F	24.03	
p	1.28e-46	

Notes: Standard errors in parentheses clustered at the household level with ***, **, and * respectively denoting significance at the 1%, 5%, and 10% levels. Equation includes regional fixed effects (east, center-west, west, and south-west). The omitted category is a native male head who received at least secondary education.

Table 7: Main determinants of investments - Plantation aged less than 10

	(1) Fertilizers	(2) Herbicide	(3) Nb Clearings	(4) Fungicide use	(5) Nb Insecticide	(6) Shade
main						
External Migrants	0.741**	-1.760	0.338	0.550	0.0687	0.671**
	(0.370)	(1.126)	(0.221)	(0.352)	(0.203)	(0.330)
Internal Migrants	0.132	-0.649	0.0629	0.602*	-0.114	0.337
	(0.335)	(0.754)	(0.172)	(0.309)	(0.175)	(0.248)
Purchased	0.100	-0.264	0.0420	0.0995	0.348**	0.0332
	(0.263)	(0.632)	(0.173)	(0.339)	(0.160)	(0.289)
Other acquisition method	-0.256	-	0.247	-	0.484	1.121**
	(0.570)	(.)	(0.293)	(.)	(0.392)	(0.564)
Not created	0.276	2.245***	0.130	0.108	0.163	-0.146
	(0.336)	(0.709)	(0.174)	(0.304)	(0.178)	(0.309)
Nb of years in the village	0.0146	-0.0304**	-0.00618	-0.0136	-0.00222	0.0196**
	(0.010)	(0.014)	(0.004)	(0.013)	(0.005)	(0.008)
Observations	504	382	532	507	532	516
chi2	35.66	719.6	.	38.47	419.0	32.26
p	0.0169	4.01e-141	.	0.00517	4.93e-75	0.0406

Notes: Standard errors in parentheses clustered at the household level with ***, **, and * respectively denoting significance at the 1%, 5%, and 10% levels. All equations include the same control variables as in Table 4 and they are not shown. Note that only 7% of the overall sample have accessed land through other acquisition methods (i.e. gifted, rented, pledged or sharecropped land). None of the individuals who accessed land through these methods and whose plantation is less than 10 years old have used either herbicide or fungicide, hence the absence of coefficients. The base scenario defined by omitted categories is a native who has inherited and created the plantation.

Table 8: Main determinants of investments - Plantation aged between 10 and 20

	(1) Fertilizers	(2) Herbicide	(3) Nb Clearings	(4) Fungicide use	(5) Nb Insecticide	(6) Shade
main						
External Migrants	0.801***	5.154***	0.322	0.975***	0.448**	0.203
	(0.285)	(1.524)	(0.198)	(0.352)	(0.216)	(0.267)
Internal Migrants	0.551**	5.027***	0.0103	0.909***	0.225	0.145
	(0.271)	(1.478)	(0.175)	(0.332)	(0.195)	(0.256)
Purchased	0.0394	5.085***	0.146	0.0175	0.211	-0.0525
	(0.234)	(0.838)	(0.165)	(0.315)	(0.162)	(0.227)
Other acquisition method	-0.113	10.78***	0.164	-	0.416	-0.810**
	(0.379)	(1.128)	(0.261)	(.)	(0.289)	(0.385)
Not created	0.0529	-5.052***	0.0686	0.0172	-0.1000	0.808***
	(0.289)	(0.651)	(0.181)	(0.351)	(0.202)	(0.238)
Nb of years in the village	-0.0126*	0.0124	-0.00451	0.00529	-0.00817	-0.00138
	(0.008)	(0.021)	(0.005)	(0.008)	(0.006)	(0.007)
Observations	529	511	547	476	547	493
chi2	90.30	436.1	67.16	1003.1	105.4	39.27
p	6.58e-11	1.29e-80	0.00000184	1.50e-201	7.13e-13	0.00408

Notes: Standard errors in parentheses clustered at the household level with ***, **, and * respectively denoting significance at the 1%, 5%, and 10% levels. All equations include the same control variables as in Table 4 and they are not shown. Note that only 7% of the overall sample have accessed land through other acquisition methods (i.e. gifted, rented, pledged or sharecropped land). None of the individuals who accessed land through these methods and whose plantation is between 10 and 20 years old have used fungicide, hence the absence of coefficients. The base scenario defined by omitted categories is a native who has inherited and created the plantation.

Table 9: Main determinants of investments - Plantation aged more than 20

	(1) Fertilizers	(2) Herbicide	(3) Nb Clearings	(4) Fungicide use	(5) Nb Insecticide	(6) Shade
main						
External Migrants	0.324	0.971**	0.0890	0.476*	0.479**	0.327
	(0.269)	(0.421)	(0.211)	(0.287)	(0.211)	(0.243)
Internal Migrants	0.191	0.398	-0.0363	0.453*	0.366**	0.283
	(0.218)	(0.402)	(0.162)	(0.249)	(0.171)	(0.214)
Purchased	0.0175	-0.298	0.0117	0.0917	0.183	-0.643***
	(0.243)	(0.305)	(0.186)	(0.261)	(0.171)	(0.236)
Other acquisition method	0.365	0.0803	0.504*	-0.576	0.786***	-0.256
	(0.303)	(0.479)	(0.260)	(0.406)	(0.219)	(0.313)
Not created	0.194	0.0363	-0.00760	0.278	-0.442***	-0.205
	(0.273)	(0.381)	(0.153)	(0.248)	(0.170)	(0.245)
Nb of years in the village	-0.00727	0.00817	-0.00152	-0.00569	-0.00105	-0.00859
	(0.007)	(0.013)	(0.005)	(0.008)	(0.005)	(0.006)
Observations	535	506	541	535	541	534
chi2	76.66	45.45	69.68	68.38	119.0	20.58
p	2.90e-08	0.000592	0.000000744	0.000000334	2.63e-15	0.422

Notes: Standard errors in parentheses clustered at the household level with ***, **, and * respectively denoting significance at the 1%, 5%, and 10% levels. All equations include the same control variables as in Table 4 and they are not shown. The base scenario defined by omitted categories is a native who has inherited and created the plantation.

Appendix

Table 10: Summary statistics - Continuous variables

	Nb obs	Mean	Standard Deviation	Minimum	Maximum
Plantation					
Plantation age (years)	1667	15.65	10.92	0	60
Plantation area (Ha)	1781	3.59	6.45	0	150
Farmers					
Nb of years in the village	1177	27.12	18.29	0	87
Share income from cocoa (%)	1188	58.73	25.69	0	100
Nb of men (18-24)	1188	2.31	1.96	0	17
Head's age	1184	50.24	13.61	22	88

Table 11: Summary statistics - Discrete variables

	Nb of observations	% of sample
Status		
External Migrants	302	25.4%
Internal Migrants	354	29.8%
Natives	532	44.8%
Education		
None	688	57.9%
Primary	322	27.1%
Secondary	178	15.0%
Head's gender		
Female	49	4.1%
Male	1139	95.9%
Region		
East	395	22.2%
Center West	647	36.3%
West	250	14.0%
South-West	489	27.5%
Prior vegetation cover		
Forest	1234	71.4%
Shrubby fallow	343	19.8%
Fallow	117	6.8%
Savanna	20	1.2%
Others	14	0.8%

Table 12: Occurrence of investments

		First quantile	Second quantile	Third quantile	Overall sample
Shade provision					
	Yes	8,9%	10,8%	12,9%	10,9%
	No	91,1%	89,2%	87,1%	89,1%
Use of Fertilizers					
	Yes	6,4%	17,1%	14,3%	12,7%
	No	93,6%	82,9%	85,7%	87,3%
Use of Herbicide					
	Yes	1,3%	2,0%	3,5%	2,3%
	No	98,7%	98,0%	96,5%	97,7%
Use of Fungicide					
	Yes	4,9%	7,2%	9,2%	7,1%
	No	95,1%	92,8%	90,8%	92,9%
Nb of Insecticide Sprays					
	0	67,2%	43,5%	51,5%	54,0%
	1	16,2%	22,8%	21,0%	20,0%
	2	11,3%	23,8%	20,3%	18,5%
	3	3,8%	7,0%	5,6%	5,5%
	4	1,3%	2,9%	1,6%	1,9%
	6	0,2%	0,0%	0,0%	0,1%
Nb of Clearings					
	0	6,4%	1,7%	1,0%	2,9%
	1	12,4%	7,9%	11,8%	10,7%
	2	43,7%	50,4%	60,9%	51,7%
	3	33,6%	38,4%	25,1%	32,4%
	4	3,4%	1,6%	0,5%	1,9%
	5	0,5%	0,0%	0,7%	0,4%

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