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AFTER 10 YEARS OF LAND REFORM IN MADAGASCAR:

IS THE PROCESS OF LAND CERTIFICATION IS MASSIVE AND INCLUSIVE?

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Abstract

The Malagasy reform ongoing since 2005 belongs to a new generation of land reforms in Africa. Two major innovations have emerged: decentralized land management through the creation of local land offices at commune level and land certification. The land reform objective is to overcome the pitfalls of the former land titling system and to provide tenure security to a majority of households thanks to a low cost, easy and participatory registration process. However, contrary to similar land reform in other African countries such as Ethiopia or Rwanda, land certification is "on demand" and not based on a systematic demarcation process. Is the Malagasy certification really massive and inclusive? To explore this issue, the paper analyzes the evolution and the determinants of land certificates demand. It puts a special emphasis on the forms of offer (promotional campaigns) and its impacts on the level and distribution of demand for land certificates. Policy implications to foster inclusivity and local and offices sustainability are debated. The paper uses first-hand data that were collected through two specially designed survey conducted on a large sample of rural households in 2011 and 2015 (1 834 with 1 551 households in panel) in nine communes of Madagascar.

Key Words: Inclusive, Land Certification, Madagascar, Massive,

1. Introduction

From 1990 to 2000, numerous land reforms based on the sole promotion of individual and freehold tenure and the implementation of a land administration system providing formal tenure security did not reach their initial objectives and expected effects (Lavigne Delville dir., 1998; Alden Wily, 2003). Some reform projects even failed or were abandoned before being implemented (Colin et al., 2009; Ali et al., 2014).

Large differences existed among these land reforms, not only in their legal basis (institutions, rules and legal registration system) but also in the way they were implemented. In most cases, legal documents were delivered on users' demand and not on a systematic basis. This did not benefit to any sizable share of poor land owners (Deininger et al., 2008). On the contrary, it gave the better-off, better-informed, better-socially endowed or those who were born in the village and had been living there on a permanent basis the opportunity to legalize their rights without informing and getting the other land right owners' or users' approval (Benjaminsen et al., 2008; Deininger and Feder, 2009; Colin et al., 2009). Land reforms thus led to the active or passive exclusion of numerous rights holders: *inter alia* women, foreign born or cattle herders (Toulmin et al., 2004).

Since 2000, the new paradigm of land reforms has been to accompany the gradual evolution of land tenure through the legal recognition of existing landholders' rights (Bruce et al., 1994) and the decentralization of land management (Lavigne-Delville dir., 1998). The most advanced reforms so far have been the ones implemented in Ethiopia and in Rwanda based on systematic demarcation and land certificate delivery (Deininger et al., 2008; Ali et al., 2011). The Malagasy reform, which started in 2005 also belongs to this new generation of land reforms in Africa. Two major innovations have *inter alia* emerged: (i) decentralized land management through the creation of local land offices at commune level; and (ii) land certification, which enables individuals to register private property provided the community agrees on the legitimacy of the claimed rights.

The Malagasy land reform objectives are to overcome the pitfalls of the former land titling system that has mainly benefited to economic and political elites (Jacoby and Minten, 2006) and to provide tenure security to a majority of households thanks to a low cost, easy and participatory registration process (Teyssier et al., 1998). However, contrary to similar land reforms in other African countries such as Ethiopia or Rwanda (Deininger et al., 2008; Ali et al., 2016), land certification is "on demand" and not based on a systematic demarcation process. Then, a crucial stake in terms of development is to assess whether the Malagasy certification is really massive and inclusive or the preserve of the elites. To explore this issue, this paper analyzes the evolution and the determinants of farmers' demand for land certificates over the 2008-2016 period. In addition to testing the impact of various household and plot characteristics that are likely to influence the propensity to certificate one's land, it assesses the impact of information and promotional campaigns through their effects on prices.

From a methodological standpoint, this paper uses three sources of data: (i) qualitative and in-depth interviews at the local level, (ii) monthly data on land certificate demand for all communes equipped with a local land office (LLO); and (iii) first-hand panel data that were collected through an *ad hoc* survey that has been conducted in 2011 and 2015 among 1,860 farm households in four regions and nine *communes* of Madagascar. In order to investigate the determinants of land certification at the plot level and to assess in particular the role of price in this process, it uses a survival analysis. It does so because the data reveal strong variations in the time taken by farmers to certify their land (from a

few months to several years) suggesting that land certification follows a dynamic process which is influenced by the timing of information diffusion, but also perhaps by risk aversion, or the presence of peer effects.

Since the beginning of the land reform, more than 200,000 land certificates have been delivered across the country. This is substantial and much more important than the number of land titles that has been delivered since the independence of the Malagasy State 60 years ago – and also much more important than similar "on demand" registration programs in other African countries. Even so, the demand for land certificate is not massive compared to the number of family farms (about 2.5 million) and agricultural plots (estimated at around 6 million). In addition, the demand is declining every year at the national level. But the demand is also very contrasted according to the communes and irregular and interspersed by picks at local level, echoing promotional and informational campaigns (which translate into lower prices and better information in the targeted villages). Our results underline that these campaigns had a positive effect on the level and the distribution of demand. Far from being the preserve of the elite, certification actually seems relatively accessible to a large panel of households that are heterogeneous in terms of their wealth, level of education and origin– although better-off and better-educated households do tend to use more local handwritten documents (*petits papiers*) and legal processes to secure their land rights (more certificates and titles). Quite unexpectedly, both the descriptive statistics and the estimation results from the duration model underline that poor households and women were more likely to apply for a land certificate during the second period of the reform when the global demand was decreasing and the promotional campaigns were over. This confirms on quantitative grounds that, in addition to a classical/common behavior regarding the adoption of an institutional innovation, there are two main reasons why people apply for certificates (Burnod et al., 2014). Firstly, landowners apply for certificates as an opportunistic response to information and promotional campaigns in villages (72% of certificates in areas covered by the PECF survey were delivered during these campaigns) and this was a more systematic strategy among better-off households. Secondly and later in the period, landowners submit an application for certification due to their proactive desire to reaffirm their ownership rights, and those who do it later are mostly poor households and women in order to fend off concrete threats. Either way, certificates make their holders feel that they have greater security of tenure, for them and notably for the future generations.

In terms of land policy recommendations, this suggests that renewing promotional campaigns for land certification can be useful to increase and enlarge again the level and distribution of demand. This may moreover compensate for the low demand currently observed.

The rest of the paper is structured as follows. Section 2 describes the land tenure reform and its enforcement. It discusses, based on land observatory data at the national level, how both the context and the implementation modalities (in terms of financial and technical support provided to each LLO, for *e.g.*, or in terms of promotional campaigns, etc.) have had an impact on the relative success or failure of LLOs. Section 3 presents the *ad hoc* survey that we conducted in order to assess the impact of the reform and some descriptive statistics of the data. Section 4 analyses the level and distribution of land certificate demand, as well as its evolution over time at the commune level. It then compares the characteristics of certificate applicants and non-applicants, of early and late certificate applicants, and of beneficiaries from the promotional campaigns and non-beneficiaries. It also contrasts the characteristics of plots that have been certified with the characteristics of plots that have not. Section

5 presents and discusses the estimation results from duration models. Section 6 finally concludes with some policy recommendations.

2. The Malagasy land reform

2.1. Objectives and implementation

The Malagasy land reform which has been ongoing since 2005 was a pioneer in the new generation of land reforms. It was aimed at giving legal standing to local land rights and at decentralizing land management (Teyssier *et al*., 2009). Indeed, the 2005 land law stipulates that untitled but occupied land is no longer the property of the state but the property of the occupants. The new land policy also breaks the legal, political and institutional monopoly previously held by the land administration. This represents a major step forward in terms of decentralization, giving local governments' (*Communes* in French) new competences to register land rights in local land offices (LLOs) (Teyssier et al., 2009). The *Communes*, through a local land registry office equipped with appropriate maps (*guichet foncier*), can legalize private property rights and issue individual or collective land certificates (*certificat foncier*). Land certificate, as land title, entitles the owner to all transactions including sale, inheritance, long-term lease, and mortgage. Certification, based on local, public and contestable procedures, is not systematic but engaged on landowners' demand. It can only recognize existing rights and not attribute new ones.

The first LLOs were inaugurated in 2006.[1] In 2017, about 10 years later, a total of 510 LLOs has been set up – which means that one *commune* out of 3 is equipped with a LLO at the country level.. While a few of them emerged autonomously, the vast majority (97%) was set up only when funding became available (with costs ranging from €12,000 to €30,000 per office). However, once set up, most LLOs started operating autonomously when international funding was withdrawn two years into the initiative due to the political crisis [2009-2014]. Despite the crisis and thanks to the funding provided by the international aid, the number of LLOs increased steadily and today, they stand as a proof that the process has gone well beyond the pilot stage (Figure 1). Since their creation, some have fared better than others: 75% have proved resilient[2] (even though half of them encountered problems)[3] while the 25% remaining ones have ceased operating (DR GFD and OF, 2016 data). Officials in charge of implementing the reform often blame LLOs' operational problems on delayed technical support and lack of training. However, their fortunes are also shaped by the availability of funding and the *commune*'s financial health: it costs around $US2,500 to $US3,500 (about 15% to 20% of the communal budget) a year to run a land office (Andrianirina et al, 2013). *Communes* have not been allocated the resources they need to exercise their new competences, and users have to bear a much greater

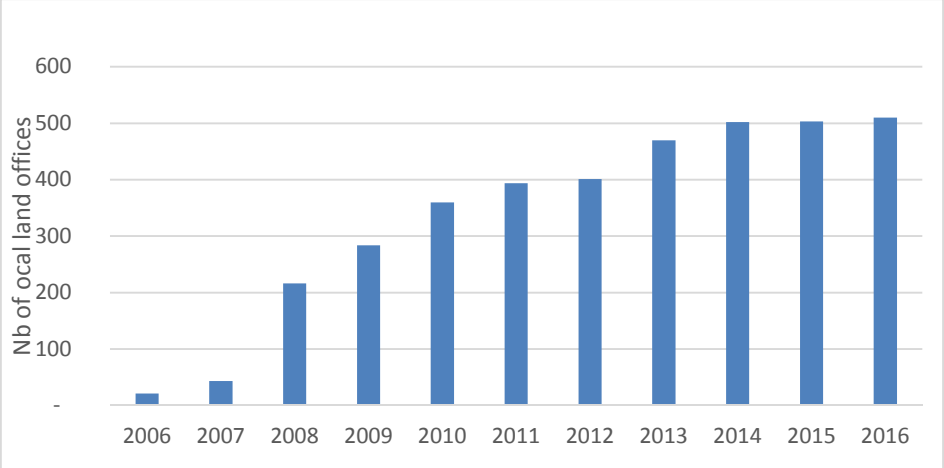
[1] To investigate global trends in the creation of local land offices and the demand for land certificates, we use the data collected on a regular basis by the Malagasy Land Observatory (MLO) at the national level. Since the beginning of the land reform indeed, one of MLO's tasks has been to monitor key indicators such as the number and localization of local land offices, the number of land certificates requested and issued, etc. (www.observatoire-foncier.mg).

[2] These offices have survived thanks to bridged funding (from thematic donor projects), self-funding (from local taxation), by raising the price of the certificates, and by reducing their activities (cutting staff from two to one, paying them part-time wages, reducing their opening hours and authorising agents to carry out various tasks in the town hall – taxation, secretariat, etc.).

[3] Opening on an *ad hoc* basis, lacking an operating budget, dealing with files in dribs and drabs, experiencing virtually no demand for new certificates.

proportion of the costs of certification than is the case with land title registration (Andrianirina-Ratsialonana, 2009). The successes and problems in LLOs are thus largely determined by the municipal team's level of motivation and information/promotional campaigns, which seem to be both the cause and effect of the lack /success of social demand for legal formalisation.

Figure 1 : Annual evolution of LLOs' creation



Source: Malagasy Land Observatory (?)

2.2. Level and distribution of land certificate demand at the national level

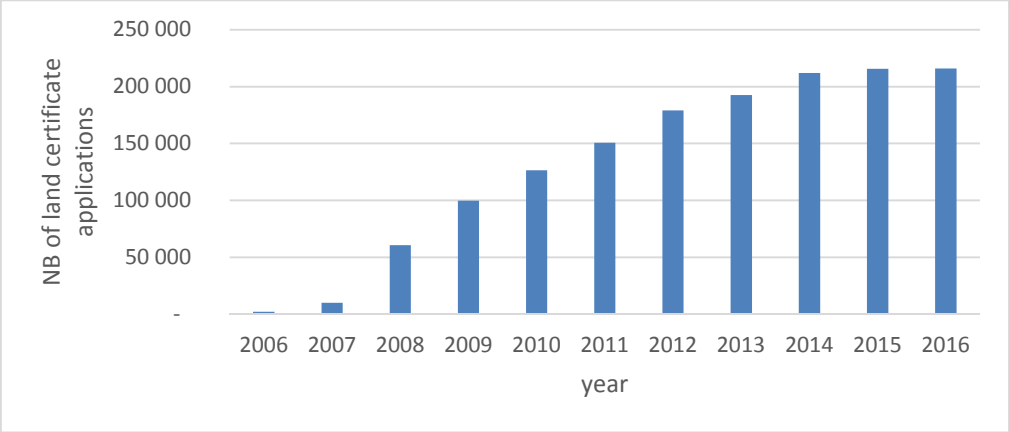
Based on the premise that land certificates were cheap and that the whole procedure to get them was fast and easy, both the promoters and financial backers of the reform expected the demand for certification to be high.[4] The take-up rates of the early years of 2008 and 2009 during which many LLOs were created proved them right but the longer-term trend has been much more sluggish, with a grand total of around 216,000 requests for certification and 116,000 certificates delivered by the end of 2016 (**Erreur ! Source du renvoi introuvable.**). Nonetheless, this number is much higher than the number of land titles delivered over the same period[5] – and also compared to the results of "on demand" registration programs in other countries (see Niger: Diarra et Monimart, 2006; Ivory Coast: Kouame, 2015; Malawi: Holden et al., 2006; Peters and Kambewa, 2007). Even so, the demand for land certificates is not massive compared to the number of family farms (about 3 million) and agricultural plots (estimated at more than 6 million[6]). In addition, the demand has been declining every year at the national level: while the number of applications increased by 6100% between 2007 and 2009 (from 2.061 to 126.539 applications), it almost stabilized from 2014 onwards.

[4] Certificates cost 50 times less than titles ($US15 in rural context and $US30 in urban context compared with $US500-700) and can be obtained ten times more quickly (in 6 to 18 months rather than 6 to 10 years).

[5] Over the same period, the State land services delivered by the means of registration an average of 1,500 land titles per year (www.observatoire-foncier.mg).

[6] The last agricultural census was in 2004-2005 and estimated the number of farms at 2.5 million. Today, this number is likely to be higher than 3 million (Sourisseau et al., 2015). Based on the assumption that each farm owns between 2 and 3 plots on average, the total number of plots could range between 6 and 9 million.

Figure 2 : Annual evolution of land certificate demand



Source: Malagasy Land Observatory (?)

However, there are marked differences between communes and when disaggregated at the locality level, general trends are found to be much more irregular, with sudden and transitory picks resulting from promotional and informational campaigns. These campaigns were orchestrated to boost the demand for land certification and consisted in sending LLO agents into the villages to promote the reform and emphasize the opportunity to get land certificates at much reduced prices (depending on the commune, prices ranged between $US1 and $USD6 during the campaigns against an average of $US15 in normal times). Most of the promotional campaigns occurred before 2011, when donors were able to subsidize them through development projects

As is clear from the data collected by the Malagasy Land Observatory, these campaigns have played a major role by providing both information on the land reform and incentives to farmers. But the contrasted patterns in certification rates observed both inter- and intra-regionally call for a more in-depth analysis of the determinants of land certification to which we now turn.

3. The data

3.1. The PEFC survey

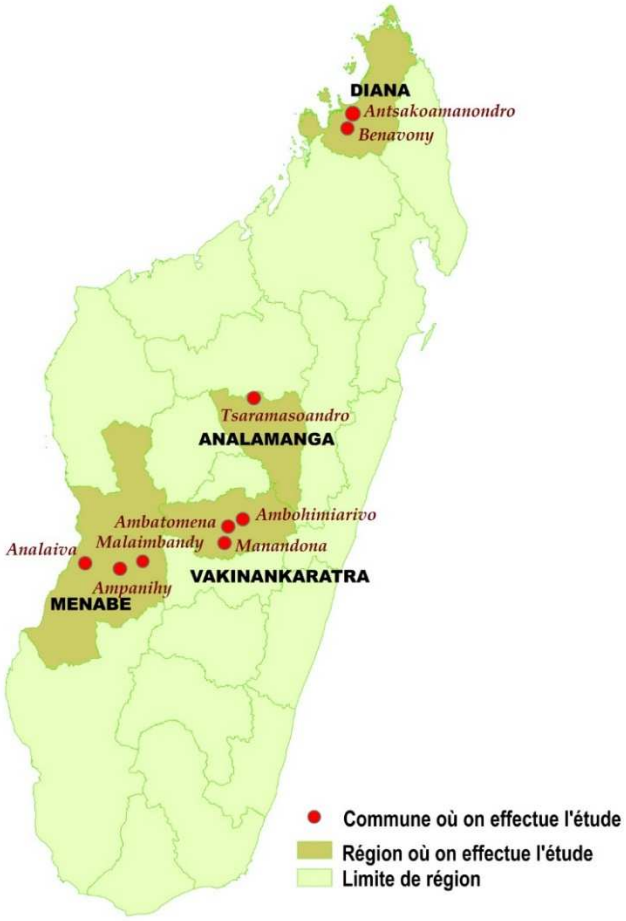
To identify the determinants of land certification at the household and plot levels, we use first-hand data that were collected through two waves of an *ad hoc* survey, the PECF ("*Perception et Effets de la Certification Foncière"*) survey, conducted in October 2011 and in November 2015 on a large sample of 1,862 rural households residing in four regions and nine *communes* of Madagascar (see Figure 3). Both waves of the survey focuses on the perception and the effects of the land reform at the household level.

- Regions and *communes* were first selected in a reasoned way in order to reflect the diversity of land tenure practices as well as the strong heterogeneity in certification rates between regions and *communes* (Table 1). Results described here on the first effects of the Malagasy land reform are representative of the 9 studied communes but not of the country as a whole;
- Within each chosen *commune*, the survey was based on open interviews, preliminary focus groups with various inhabitants and local representatives and on questionnaires with households (either the household head or his/her spouse);

- In 2011, within each *commune*, households were randomly selected, in such a way to ensure that at least one third of the sample households has certificates (or about to have one). The 2011 database is thus composed of 1,862 households among which 37% have at least one land certificate, and 7,697 plots of land among which 20% are certified or about to be;
- In 2015, 85% of the households were interviewed again (and the 15% missing ones were replaced). The 2015 sample is thus composed of 1,834 households (1,541 in the panel) and 7,868 plots. Results are weighted[7] in order to be representative at the *commune* level, using country-representative survey data taken from the National Agriculture Census (MinAgri, 2004) and the Land Observatory data, and an attrition coefficient has been calculated to adapt the 2011 weight to the 2015 re-contact rate; The questionnaire was designed so as to include various modules on land tenure practices, perception on tenure insecurity, modes of land rights validation (including documentation), conflicts, investment, and land transactions for all households' plots. It strongly benefited from previous in-depth qualitative interviews conducted either by the authors, the Land Observatory team, master and PhD students (Boué, 2013) and other researchers (Jacoby and Minten, 2006). A few new questions were added to the 2015 questionnaire. Also, all our results will be interpreted in light of the insights derived from qualitative interviews and analyses.

[7] Weighting is based on the ratio "number of household engaged in certification/ number of households".

Figure 3: Localization of studied *communes*



Source: Malagasy Land Observatory (2012)

Table 1: Local land offices (LLO) and communes characteristics in mid-2011 and 2015

Region Commune	LLO Date of creation	LLO "Age" in 2011	Total population in 2011	Nb. of households in 2011	Nb. of LC requested over the 2008- mid 2011 period	Nb. of LC delivered over the 2008- mid 2011 period	Demand rate	Regional score	Nb. of LC requested over the 2012 - 2015 period	Nb. of LC delivered over the 2012- 2015 period	Total nb. of LCrequested over the 2008-2015	Total nb. of LC delivered over the 2008-2015
Analamanga												
Tsaramasoandro	nov-09	2	13,410	1,916	179	120	0.09	(-)	222	118	538	286
Vakinankaratra												
Ambatomena	sept-08	3	25,694	3,670	648	557	0.18	(-)	53	107	127	305
Ambohimiarivo	août-08	3	12,435	1,553	689	289	0.33	(+/-)	163	153	652	446
Manandona	août-08	3	14,599	2,086	1870	1,494	0.90	(+)	87	550	2,237	2,013
Diana												
Antsakoamanondro	nov-08	3	11,174	1,862	249	80	0.13	(+/-)	340	73	721	177
Benavony	nov-08	3	3,062	502	253	102	0.50	(+)	1	6	280	174
Menabe												
Ampanihy	juil-08	3	15,931	2,923	654	567	0.22	(+/-)	95	107	893	858
Malaimbandy	nov-09	2	109,432	21,886	724	500	0.03	(-)	631	793	2,428	1,436
Analaiva	juil-08	3	22,348	4,368	987	752	0.23	(+/-)	73	16	1,089	919

Source: Malagasy Land Observatory.

3.2 Descriptive statistics

3.2.1 The demand for certificates and the role of promotional campaigns

As emphasized in the previous section, promotional campaigns significantly contributed to boost the demand for certification. This is sharply illustrated by the nine *communes* covered by the PECF survey. Table 2 first shows that among the 1,824 households covered by the second wave of the survey in 2015, 18% had requested a land certificate at least once: 10.9% had done so in the context of a promotional campaign and 7.1% outside this context. Most promotional campaigns took place before 2011; they were orchestrated by LLOs and funded by external donors. Depending on the motivation of LLO agents and available funding, some *communes* were more concerned than others. In the nine communes included on our survey, for *e.g.*, promotional campaigns have been much more intense and long in Antsakoamanondro and Anailava than in the three communes of Vakinankaratra (Ambatomena, Manandona and Ambohimiarivo) and in Tsaramasoandro in which no campaign has ever taken place. (Table 3). As is clear from the table, the number of requests for land certificates recorded at the LLO level shows that much more requests have been made during campaign years than in non-campaign ones.

Table 2 : Distribution of households applying for land certificate in/outside promotional campaigns

Households who applied for land certificate during promotional campaign	Households who applied for land certificate outside campaign	Households who did not apply	
10.9%	7.1%	82%	100%

Source: PECF, round 2, 2015 (n=1,824 households).

Table 3 : Dates of promotional campaigns and total number of requests for land certificates in each surveyed *commune*

	2008	2009	2010	2011	2012	2013	2014	2015
Antsakoamanondro								
Number of applications	x	125	21	235	322	18		
Campaigns?	Yes	Yes		Yes	Yes			
Benavony								
Number of applications	69	120	57	33	1	0	0	0
Campaigns?	Yes	Yes						
Analaiva								
Number of applications	352	379	123	162	34	9	18	12
Campaigns?	Yes	Yes	Yes	Yes				
Ampanihy								
Number of applications	507	258	24	9	25	16	33	21
Campaigns?	Yes	Yes						
Malaimbandy								
Number of applications	//	3	1,064	730	223	73	313	22
Campaigns?	//		Yes	Yes			Yes	
Ambatomena								
Number of applications	6	30	0	38	4	2	47	0
Campaigns?	Yes	Yes						
Manandona								
Number of applications	880	957	256	57	13	17	57	0
Campaigns?	Yes	Yes	Yes					
Ambohimiarivo								
Number of applications	217	272	0	0	54	31	68	10

Campaigns?	Yes	Yes						
Tsaramasoandro								
Number of applications	//	15	150	151	22	76	124	0
Campaigns?	//							

Source: Malagasy Land Observatory.

The impact of promotional campaigns appears even clearer in Figure A1 in Appendix, which shows the number of requests for land certificates every 4 months at the *commune* level. Each pick is concomitant to a promotional campaign.

Part of the success of the campaigns in boosting demand is due to the substantial price discounts that were associated to them (Table 4). Depending on the commune, prices ranged between $US1 and $USD6 during campaign years against an average of $USxxx in non-campaign ones. In the econometric analyses that follow, in which we model the time to request a land certificate, the impact of the campaigns will thus be assessed through their effect on prices.

Table 4 : Median costs of land certificate per commune in campaign and non-campaign years (in 1,000 of MGA)

	Median cost for delivered certificates	
	Discounted prices	**Normal prices**
Analamanga		
Tsaramasoandro	n.r.	41
Vakinankaratra		
Ambatomena	3	25
Ambohimiarivo	3	10
Manandona	3	6
Diana		
Antsakoamanondro	15	15
Benavony	15	20
Menabe		
Ampanihy	5	20
Malaimbandy	5	20
Analaiva	10	50
Total	**6**	**20**

Notes: In 2011, calculations are based on 1,182 plots which were certified over the2008-2011 period, XXX plots for the 2011-2015 period.

3.2.2 Demand distribution

Sample household and plot characteristics

Land assets. In Madagascar, the vast majority of farms are small and under 1 hectare (ha). In the nine studied communes, a minority is landless (4%). Indeed, 48% own between 2 and 3 plots and 38% have 4 or more plots (71% of the plots are smaller than 0.5 ha). Households farm themselves the majority of the plots (88% of the plots[8]). Next to housing, plots are mainly dedicated to rice production - the main production and food for all rural households (42% of the sample plots, 60% of the cultivated

[8] Temporary land transfers (sharecropping, leasing and also loan being part of mutual aid system) are notably frequent on rice plots (see Jacoby and Minten, 2006; Bellemare, 2011; Zombre, 2014).

sample plots)[9].

Land access. Households mostly access to land through inheritance (54.4% of the plots were inherited and 3.1% donated). They also strongly rely on land market (Jacoby and Minten, 2006; Sandron et al., 2008; Bellemare, 2011). In the PECF communes, 31.8% of the parcels were acquired through purchase10. The low percentage of appropriated/cleared plots (10.7%) as compared to the high percentage of purchased ones indicates that most of the land in the studied areas is already appropriated and reveals a process of space saturation. Men, women, couples or even families as a whole can own the land, but men, in line with inheritance, local and customary rules, are the main owners (46.9% of the plots are owned by men, 42% by couples, 10.6% by women and 0.4% by families).

Modes of land rights validation. Needless to say, land laws do not operate in a vacuum but, to rephrase Griffiths (1992), "*in a social field that is governed by laws, rules and conventions of different origins and that generates its own rules of the game*". Next to the legal authorities delivering land certificates and land titles, different local state or non-state authorities operate at the local level to legitimize and even formalize through written documents, different bundles of land rights or land transactions: descendants of royal families, elders, village chiefs, mayors, etc. (see *e.g.* Rakoto, 1995; Ottino, 1998; Leroy *et al*., 2006; Aubert *et al*., 2008; Omrane, 2008; Muttenzerg, 2010; Boue, 2013). In this context of institutional and normative pluralism, securing property rights requires a combination of rights validation at both local and state levels. In practice, Malagasy households combine various ways to secure land. The first one is through social recognition. The second one includes legal documents: either certificates or titles. The third one results from the local recording systems, the so-called "*petits papiers*" (Jacoby and Minten, 2006; Boue, 2013), used to secure transfers and validate rights in response to or imitation of administrative practices (cf. Lavigne Delville, 2003). These papers, which are handwritten documents, either stamped or not by local authorities, offer a first formalization of rights or more exactly, an "informal formalization of rights" (Mathieu, 2001)[11]. To give the general picture, 31% of the samplehouseholds have no document at all on all their plots (Table 5). The large majority (50.4 %) has at least one written document on one of its plots (i.e. has at least one *petit papier* or tax receipt). The legalization of rights only concerns a minority: 21.3% have at least one legal document on one of their plots: respectively 18.7% have applied to or possess at least one land certificate and 2.4% have one land title[12]. Of course, households can have documents on several of their plots.

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[9] Pastures, as they are most of the time collectively managed, were not systematically declared. We do not take them in account in the following analysis even if they are crucial for herders.

[10] In 2001, at the national level, 16% of the land was acquired through this way (Minten and Razafaindraibe, 2003). As the process is cumulative, it is coherent to observe ten years later a higher rate of purchased plots.

[11] "Formalization" means here the use of any type of land documents, "informal formalization" means the use of written documents, "legalization" being restricting to the delivery of legal written documents, i.e. titles or certificates. The *petits papiers* are handwritten documents accompanying transactions (sales, inheritances and donations). They can also attest property, notably, on the basis of the improvement principle (*principe de mise en valeur*). They are signed by both parties to the transaction and/or possibly other witnesses (family members or others). Some are signed and/or stamped by a representative of local state authorities (head of village, mayor, etc.). In addition to this rich diversity of land documents, sometimes people also consider land tax receipts as a proof of ownership. Strictly speaking, *Petits papiers* and tax receipts have not legal validity but they can act as a first proof of property in case of conflicts (Rochegude, 2001; Aubert et al., 2006).

[12] There are strong inter commune variations, ranging from 3 to 30% for certificates and from 0.1% to 4.4% for titles.

Table 5: Household distribution (in %): nb. of owned plots, documentation

Number of plots per household	Percent	Cumulative Percent
0	4.0	4.0
1	9.1	13.1
2	16.9	30.0
3	21.6	51.6
4	13.2	64.8
5	9.5	74.3
6 to 9	19.0	93.3
10 and more	6.6	100.0
Total (on 1834 households)	100.0	
Max level of documentation per household *		
No documentation	**31.2**	
"Petits papiers" or/and tax receipt	50.4	
Land certificate	18.7	
Title	2.4	
Total (out of 1,760 households)	100.0	

* The more complex and costly level of formalization at the farm level is selected (complex in terms of administrative procedure)

Table 6 : Plots distribution (in %): modes of right validation

Documentation	
None	43.5
Simple "petit papier'	22.8
Stamped "petit papier"	10.1
Tax receipt	13.7
Land certificate	8.9
Title	1.1
Total	100.0

Observations 7,868 plots

*Only the mode stated as "principal" by the interviewee is considered here.

Table 7 : Plots distribution (in %): area, land use, access, identity

Variables	Percent
Plot area	
Less than 0.5 ha	71.4
0.5 to 1 ha	16.8
1 to 1.5 ha	3.8
1.5 to 2 ha	3.0
2 to 5 ha	4.3
More than 5 ha	0.7
Total	100.0
Land use	
Housing	22.2
Mixed (housing and crops)	2.4
Rice	42.1
Annual crops other than rice	27.8
Perennial crop	2.0
Others (pastures, fallow, etc.)	3.4
Total	100.0
Land access	
Sale market	31.8
Inheritance	54.4
Donation	3.1
Development – cleared plot (*solam-pangady*)	10.7
Total	100.0
Landowner Identity	
Mister	46.9
Miss	10.6
Couple	42.0
Family	0.4
Others	0.1
Total	100.0

Observations 7,868 plots

Household characteristics of land certificate applicants

- Contrasting early- and late-applicants

In order to investigate whether all households tend to be included in the process of land certification or not, the next paragraphs and tables not only expose differences between households who have requested a land certificate and those who have not but also, thanks to the 2011 and 2015 data sets, the differences between early- and late applicants (Table 8).

Certification actually seems relatively accessible to a large panel of households whatever their relative wealth, level of education, age, origin and gender. Poor landowners and uneducated ones are indeed found in the pool of applicants, even though individuals who are richer (or, say, less poor[13]), more educated or older applied earlier. Regarding gender issue, female household heads requested a land certificate in greater proportion than male household heads in the early years after the reform and even more so later on. By contrast, no significant difference is found in the proportion of applicants between natives and migrants (about 22% for each category). Nonetheless, migrants whose ethnic group is in the minority in the commune of residence (often state agents or traders belonging to the elites) were over-represented among early-applicants while migrants sharing the same ethnic group as the natives (rural people that migrated and settled for wedding or agriculture purposes), were over-represented among late-applicants. The same holds true for individuals who belong to the intermediary and lowest wealth categories, as well as for those who never attended school or are led by young head (30 to 40 years). These results are interesting on equity grounds, because they suggest that in the long-term, the certification process has been quite inclusive. At first sight, they are also not fully in line with what could be expected. Indeed, most of the promotional campaigns were organized right after the start of the reform, in years 2008 and 2009. Because they consisted in substantial price reductions (by up to 90% in some communes) and large information diffusion, they were expected to result in higher take-up rates than in normal times, especially among vulnerable households. For this specific group, it is actually the opposite that happened, since they are found to be over-represented among late-applicants. This suggests that price is far from being the only factor influencing demand.

Table 8 : Distribution of households depending on whether and when they certified their land, by main characteristics (in %)

	Percentages in column				Percentages in line			
	First wave	**Second wave**	**Did not certify**	**Total**	**First wave**	**Second wave**	**Did not certify**	**Total**
Poverty status								
Poorest	18.3	**32.1**	40.0	37.0	4.6	**10.5**	84.9	100.0
Intermediary	31.1	32.7	34.6	34.0	8.5	11.6	79.9	100.0
Richest/ Less poor	**50.6**	**35.2**	25.5	29.0	16.3	14.7	69.0	100.0
Total	100.0	100.0	100.0	100.0				
Education								
No school	14.7	**26.5**	24.8	24.1	5.7	**13.3**	81	100.0
Primary school	50.4	39.9	52.7	50.9	9.24	9.47	81.28	100.0

[13] In this paper, poverty (or wealth) is measured by a score computed using a Principal Component Analysis and including various household asset Indicators (Filmer and Pritchett, 2001)). Terciles were computed at the commune level, so that the lowest tercile of commune A may not be comparable to the lowest tercile of commune B.

Secondary school	**20.9**	**18.0**	14.7	15.7	12.5	13.86	73.64	100.0
Tertiary school	**14.0**	**15.6**	7.8	9.4	14.03	20.16	65.81	100.0
Total	100.0	100.0	100.0	100.0	9.35	12.08	78.57	100.0
Age of head								
20-30	2.9	1.1	8.2	6.8	4.0	1.9	94.2	100.0
30-40	14.1	**33.8**	21.0	21.8	6.1	**18.7**	75.2	100.0
40-50	**24.1**	16.4	20.6	20.4	11.1	9.7	79.3	100.0
50-60	**31.6**	25.9	25.1	25.8	11.4	12.2	76.4	100.0
60 and +	**27.3**	22.8	25.3	25.2	10.1	11.0	78.9	100.0
Total	100.0	100.0	100.0	100.0				
Migration status								
Migrant minority	20.6	10.6	15.4	15.3	12.6	8.4	**79.0**	100.0
Migrant majority	8.4	26.5	18.0	18.1	4.3	17.7	**78.0**	100.0
Native	70.9	62.9	66.7	66.6	10.0	11.4	**78.6**	100.0
Total	100.0	100.0	100.0	100.0				
Sex of head								
Female	**12.9**	**22.5**	8.5	10.6	**11.3**	**25.5**	63.2	100.0
Male	87.2	77.6	91.5	89.4	9.1	10.5	80.4	100.0
Total	100.0	100.0	100.0	100.0				

Source: PECF survey, Rounds 1 and 2.

- Participants and non-participants in promotional campaigns

To confirm the difference between early- and late-applicants, the 2015 dataset gives us the opportunity to better study the difference between those households who applied for a land certificate during a promotional campaign – mainly implemented during the first period – and those who applied out of these campaigns (Table 9).

Promotional campaigns gave incentives to a large panel of households in terms of wealth, level of education, age, origin and gender. Indeed, 60% of those who applied did it during these campaigns. However, it also sharply appears that richer (or less poor), more educated and older individuals were relatively more reactive to seize the promotional opportunity. Interestingly enough, female household heads were very reactive to apply for both during and outside promotional campaigns. These statistics underline that poorer, less educated and younger households have been more reluctant to try this institutional innovation during the first years of the land reform, probably because they are generally found to be more risk-averse.

Table 9 : Distribution of households who certified/did not certify during/outside promotional campaigns, by main characteristics (in %)

	Percentages in column				**Percentages in line**			
	Certified		**Did not certify**	**Total**	**Certified**		**Did not certify**	**Total**
	with promo.	**w/o promo.**			**with promo.**	**w/o promo.**		
Poverty status								
Poorest	21.2	24.8	42.7	39.1	5.9	4.6	89.5	100.0
Intermediary	31.8	37.2	33.9	33.9	10.2	7.9	81.9	100.0
Richest/ Less poor	47.0	38.0	23.4	27.0	18.9	10.1	71.0	100.0
Total	100.0	100.0	100.0	100.0				
Education								

No school	15.9	22.6	24.0	23.0	7.5	7.1	85.4	100.0
Primary school	42.0	46.4	50.2	49.1	9.3	6.8	83.9	100.0
Secondary school	26.4	11.7	18.4	18.8	15.3	4.5	80.3	100.0
Tertiary school	15.7	19.3	7.4	9.1	20.9	10.2	69.0	100.0
Total	100.0	100.0	100.0	100.0				
Age of HH head								
20-30	0.9	0.4	7.8	6.5	1.6	0.5	98.0	100.0
30-40	23.3	12.9	24.5	23.5	10.8	4.0	85.3	100.0
40-50	29.6	22.8	23.0	23.7	13.6	6.9	79.5	100.0
50-60	19.3	36.2	22.4	23.1	9.1	11.3	79.6	100.0
60 and +	26.9	27.6	22.4	23.3	12.6	8.5	78.9	100.0
Total	100.0	100.0	100.0	100.0				
Migration status								
Migrant minority	10.1	11.5	7.4	8.0	13.7	10.3	76.0	100.0
Migrant majority	23.1	26.4	22.2	22.6	11.1	8.4	80.5	100.0
Native	66.8	62.1	70.4	69.4	10.5	6.4	83.1	100.0
	100.0	100.0	100.0	100.0				
Sex of HH head								
Female	19.1	18.5	10.5	12.0	17.3	11.1	71.6	100.0
Male	80.9	81.5	89.5	88.0	10.0	6.7	83.3	100.0
	100.0	100.0	100.0	100.0				

Source: PECF survey, Rounds 1 and 2.

3.2.3. Characteristics of certified and non-certified plots

In the same vein, the 2015 dataset allows a comparison of plots depending on whether and how security rights have been validated (Table 10). In terms of plot area, plots of smaller size are slightly over-represented among plots with a tax receipt, while plots of larger size are clearly over-represented among certified plots. No clear pattern in terms of plot area appears for plots without any documentation. With regards land use, rice plots, which are generally the most valuable plots in terms of crop production and food security, and perennial crop or woody plots, which are often remote plots without clear demarcation, are over-represented among certified plots. Contrasted patterns in terms of rights' validation are found on acquired and inherited plots. While rights on the former are found to be attested by various types of documents (either *petits papiers* or certificates), there is no written proof of rights on the latter, excepted tax receipts for some of them. This may be due to the complexity of rights distribution. But people who inherited part of their land may also be reluctant to formalize their rights because they fear that it could raise conflictual issues. From this point of view, a tax receipt

is a good compromise because it is a way to secure rights without necessitating any clarification on who is the owner. With regards tenure, plots that are leased-out are found to be over-represented among certified plots. This is quite intuitive, as certification rules out the possibility for the tenant to claim the land. In addition, leased-out plots are generally rice plots that have been acquired through the market, two characteristics that have been found to be correlated with certification–see supra. Last, females are found to own less plots than males, but in the meantime, they are found to be more prone to secure their land rights through certification. Female landowners did indeed request a certificate in greater proportion than male landowners, in both periods but especially more so during the second one (Table 11).

Table 10: distribution of owned plots (in %) per modes of right validation and area, land use, land access, land tenure and landowner identity

	No documen-tation	Simple Petit papier	Stamped Petit papier	Tax receipt	Certi-ficate	Title	Total
Plot area							
Less than 0.5 ha	44.6	22.8	9.5	14.4	7.8	0.9	100.0
0.5 to 1 ha	40.1	23.0	13.2	12.4	10.2	1.1	100.0
1 to 1.5 ha	33.4	25.5	16.8	13.9	9.7	0.7	100.0
1.5 to 2 ha	35.2	26.2	6.4	11.6	19.6	1.1	100.0
2 to 5 ha	56.0	17.0	5.2	9.6	10.2	2.0	100.0
More than 5 ha	24.8	20.3	5.4	2.8	36.9	9.9	100.0
Land use							
Housing	51.8	21.3	9.2	10.0	6.9	0.8	100.0
Mixed	33.8	10.6	9.7	30.5	11.5	3.9	100.0
Rice	36.2	25.8	10.5	13.9	12.7	1.0	100.0
Annual crops other than rice	51.1	19.0	9.1	14.8	5.1	0.9	100.0
Perennial crop	26.8	19.4	20.1	22.4	9.2	2.1	100.0
Pastures	6.7	63.0	23.5		3.6	3.1	100.0
Fallow land	45.9	43.2	2.1	3.3	3.5	2.0	100.0
Wood plot	38.7	24.5	10.3	15.5	8.8	2.2	100.0
Other	14.3	11.6	61.4	7.5	3.1	2.0	100.0
Land access							
Sale market	9.2	54.6	17.0	7.1	11.3	0.7	100.0
Inheritance	57.9	7.5	7.4	17.7	8.2	1.3	100.0
Donation	60.4	8.3	13.0	11.2	6.9	0.1	100.0
Development	67.4	9.8	2.4	13.3	6.1	1.1	100.0
Land tenure							
Cultivate	43.7	22.7	10.1	13.9	8.6	1.0	100.0
Indirect	37.4	23.9	10.1	9.1	17.0	2.5	100.0
Landowner Identity							
Mister	52.3	19.7	6.1	13.2	7.6	1.1	100.0
Miss	41.7	18.7	11.7	12.4	**14.8**	0.8	100.0
Couple	33.9	27.5	14.1	14.3	9.0	1.1	100.0
Family	44.8	0.0	12.8	33.0	7.0	2.4	100.0
Others	86.3	0.0	0.0	0.0	13.7	0.0	100.0
Total	**43.5**	**22.8**	**10.1**	**13.7**	**8.9**	**1.1**	**100.0**

Source : PECF survey (n=7,868 plots).

Table 11 : Distribution of plots depending on whether and when they were certified, by owner identity

Owner	Certified during first wave	Certified during second wave	Not certified	All
Mister	2.2	5.8	92.0	100.0
Miss	4.6	13.0	82.4	100.0
Couple	6.7	3.1	90.2	100.0
Family	0.5	6.6	93.0	100.0

Source : PECF survey (n=7,868 plots).

4. Econometric analyses

In this section, we estimate the determinants of certification through duration models in which we analyze the time elapsed between the establishment of a LLO in a commune and the request for a land certificate at the plot-level, given commune, household and plot characteristics. Our main objective is to investigate whether all households tend to be included in the process of land certification or not, and to identify the reasons for non-certification (from budget constraint to incomplete range of rights) and of early vs. late certification, together with the impact of promotional campaigns and of differentiated price in the process.

4.1. Choice of duration models

In the case of Madagascar's land reform, looking at the time to request for a land certificate instead of simply looking at certification as a binary choice (*i.e.* whether to certify or not) appears particularly relevant for at least two reasons. First, since under this reform, certification is "on demand", learning more about how much time is needed for information to circulate, and for different types of farmers to making up their mind and deciding whether to ask for a certificate or not, is valuable. It informs us about the potential outreach of the reform among different groups of farmers, and gives us information on those that may request for a land certificate in the future. The literature on the diffusion of innovations indeed shows that time matters (see Rodgers, 2001 ; Foster and Rosenzweig, 1995), and in particular that early- adopters differ from late ones in that they have access more rapidly to information, are more risk takers, while late adopters need more time to get information, and to "learn from others". Thus, farmers' social networks, their level of risk aversion, are among some of the factors that help explain why some farmers apply faster than others, why some need time, and why others never apply. Analyzing the time to request for a land certificate thus provides insights on the obstacles faced by different groups of farmers. Duration models while rarely used to study land certification processes, are often used in the literature on technology adoption (see Abdulai and Huffman, 2005; Carletto et al., 2010 among others).

Second, the promotional campaigns conducted by different organizations after the first LLOs were created, have induced varying prices and information access, and thus certification conditions. From a policy point of view it is particularly interesting to find out whom have these campaigns reached and influenced, and to distinguish those who applied to a land certificate during campaign years from those who applied in non-campaign years. With this approach, we can also assess whether the campaigns have been inclusive or rather selective.

4.2. Model specification

In what follows, we run various plot-level regressions based on duration models using the 2011 and 2015 rounds of the PECF survey. Our aim is to analyse the factors explaining the time elapsed between the establishment of a LLO in a commune and the request for a certificate for a specific plot, given commune, household and plot characteristics.

More precisely, we estimate a Cox proportional hazard model that writes:

$$h_{ij}(t) = h_0(t)e^{\beta' X_{ij}}$$

where $h_{ij}(t)$ is the estimated hazard function, t is the time, $h_0(t)$ is baseline hazard function, X_{ij} are household and plot characteristics and β are the parameters to be estimated. The reference to "hazards" is used by analogy to the medical literature in which these models have been used and developed for studying the risks of dying or of facing a disease given patients' characteristics. These models thus allow to account for the existence of a time trend in the occurrence of an event, and of factors that accelerate or decelerate this occurence. The event we focus on here is the request of a land certificate.

In our case, $h_{ij}(t)$ represents the time elapsed between the establishment of a LLO in household i's commune, and the request for a land certificate made by the household i for his plot j. The baseline hazard, $h_0(t)$, is a function of time and is interpreted as the likelihood that a household applies for a certificate at time t when all characteristics are equal to 0 (Carletto et al., 2010).

We rely on Cox's semi-parametric method for estimating the model, meaning that we do not directly estimate $h_0(t)$ nor do we give it a specific distribution. The proportional hazard model however assumes that the effects estimated are constant over time. When this is not the case the estimates are biased and misleading (Bellera et al., 2010). The proportionality assumption must therefore be tested and when violated, the variability of the effects in time must be addressed.

Following descriptive results and the literature on the determinants of certification, we include in the model various plot and household characteristics likely to explain the timing to certification. First of all, we only focus on the plots that are owned by one or several household member, as only those can be certified by him.

At the household level, we expect both age and the education level of the head to influence the decision to certify, as they are linked to information access, to experience, and also to risk taking behavior. Also, age is relevant to grasp the range of land rights hold by the landowners, notably on inherited plots (children fully inherited only when both parents died and when sharing have been approved by all inheritors). The older the right holder is, the more probable he enjoys full private property on his plots. We also include variables measuring households' relative wealth within their commune by including wealth terciles described in section 3. Since the communes in the sample are relatively heterogeneous in terms of wealth, but also in terms of certification prices, we use within-commune terciles instead of the wealth index alone. Although the prices of certificates are relatively low compared to other forms for legal registration (through land titles), they may still constitute an obstacle for the poorest households (and they are more expensive than other forms of formalization through hand written documents). The wealth terciles, in addition to a variable measuring the price of certificates account for this effect. Wealth terciles capture also social ranking within the commune and may be correlated as well with information access and risk aversion.

Finally we include two variables capturing the migratory status of households. A first one indicates whether the household considers himself allochthon, meaning that it does not originate from the commune but was born in the village. A second one indicates whether the household moved in the commune recently or if the family is from the commune. Some migratory fluxes are indeed relatively old and some households, still considered as allochthones, have established in a commune for one or more generations. Yet they are not considered as autochthons, and following Malagasy tradition, they would still eventually return to be buried next to their ancestors. But their integration and rights over land in particular might differ from those of the autochthons, and also from those of the recent migrants. We believe that these two dimensions matter when studying demand for land certification.

Plot-level variables account for the type of plot, whether a rice field, a residence field, a plain field or another type of cultivated land, and the plot size. We also include a variable describing the mode of acquisition of the parcel by the household, whether it was inherited, purchased, given or cleared by the household, as we expect that the demand for certification will differ according to the degree of uncertainty attached to different modes of acquisition and thus of the perceived risk of losing right. The mode of acquisition of a parcel will indeed have an incidence the bundle of rights associated to the land and on also the perceived insecurity, as for different modes of acquisition, the number, identity and diversity of possible protesters of these rights also changes. For instance, the rights over inherited parcels may be better recognized within communities than the rights over a parcel recently purchased, and therefore the incentives for reinforcing ownership rights through certification may be higher for the purchased parcels.

The identity of the owner – and of the decision maker on a particular plot – whether Mister, Madam, both spouses or other members, is introduced in the model. We indeed expect that men and women, whose rights maybe be differently recognized, have different incentives for formalizing them (see for instance Goldstein and Udry, 2008 in Ghana). We also control for the existence and the types of other documents held by the owner: “petit papiers”, “quittance”, land title or none to test whether land certificates are perceived to be a complement to those existing documents – in such case we would expect a positive or non-significant coefficient – or whether certificates are demanded mostly when these documents are absent[14].

Finally we integrate in the model a variable measuring the price of the certificate in the communes at different times. For each commune, we consider two prices, as shown in Table 4: the price of the certificate during promotional campaigns, which is usually substantially lower than the price of the certificate proposed outside these campaigns. The variable is included as a time-varying covariate, defined for each commune, and for different periods, namely in- and off-campaign periods. This variable thus enables us to estimate to what extent have these campaigns influenced the certification demand in the communes under study.

4.3. Estimation of the time to certification and test of the proportional hazard assumption

Results from the Cox proportional hazard estimation are reported in Table 12. Column (1) provides the results of a multivariate conventional Cox regression model which relies on the proportional hazards

[14] Note that it is usually not possible to hold for a same parcel a certificate and a land title, but as we focus here on the request and not on the delivery of a certificate, it is possible to observe that a household has requested a certificate on a parcel tha was already title.

(PH) assumption. As is clear from this first column, the "risk", or likelihood of certification is increased for plots localized in lowlands compared to plots localized on other types of land, and for large compared to small plots. This result is coherent with the hypothesis that household chose to certify parcels with the highest economic value. It is by contrast much decreased for inherited, donated and cleared plots compared to purchased plots, for plots that are farmed by the owner compared to plots that are leased-out, and for plots for which rights are already secured by a land title, a *petit papier* or a tax receipt compared to plots for which there is no document at all. The identity of the plot's owner (*i.e.* whether the owner of the plot is the couple or the wife compared to Mister) is found to have no significant effect on the likelihood of certification in this first specification. With regards household characteristics, neither the education level of the household head nor his age is found to have any impact on the risk of certification. By contrast, both wealth and migration status do have an impact, with the risk of certification on a given plot being increased when the household belongs to the highest wealth tercile compared to the lowest one, and when it is composed of people presenting themselves as allochthons but who were born in the village compared to autochthons. Not surprisingly, the price to be paid to get a land certificate is also found to have an impact of the probability of certification: the higher the price, the lower the risk of certification all else equal.

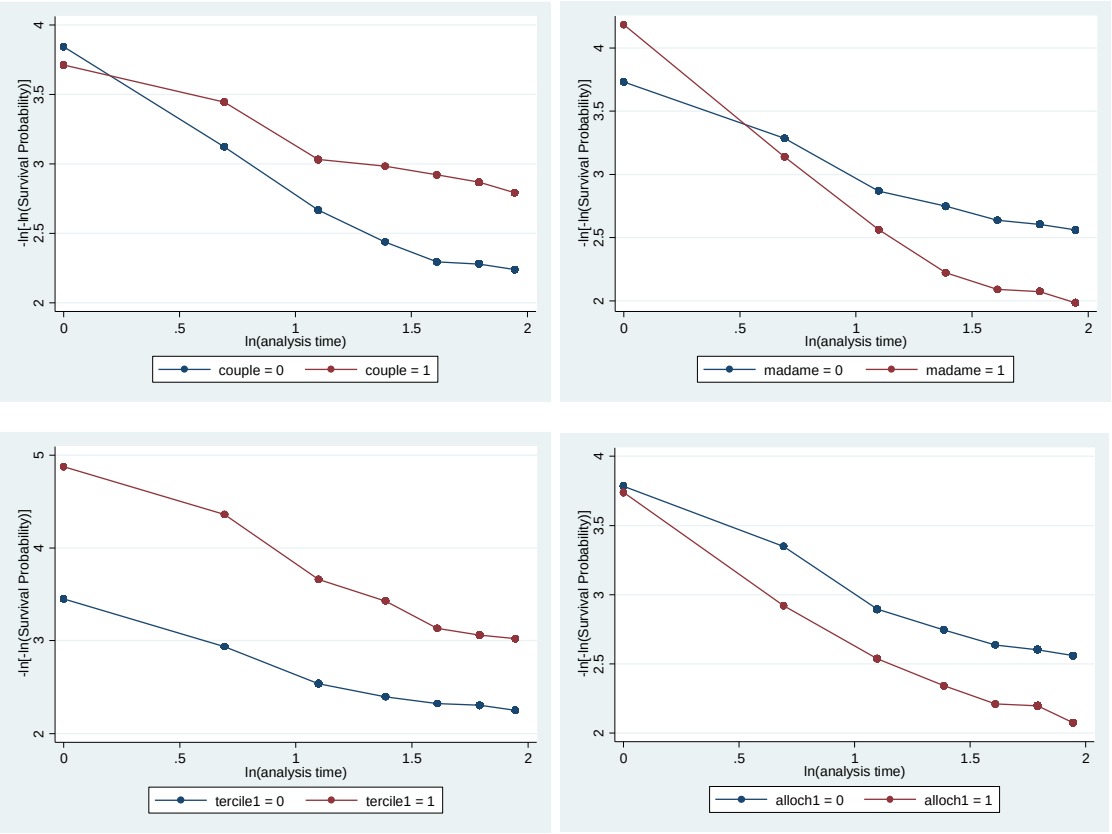
We nevertheless need to assess whether the assumption of proportional hazards holds in our analysis. To this end, we use two types of test, a graphical one, and a parametric one. For the graphical strategy, we apply a transformation of the Kaplan-Meier survival curves and plot the function *log(-log(S(t)))* as the function of the log survival time, in which *S(t)* is the survival probability, that is the probability that a plot remains not certified beyond some time t in our case. We can do so because most of our variables are categorical variables. If the plotted lines are reasonably parallel, the PH assumption has not been violated. As is clear from Figure 4, several variables are found to violate the PH assumption. This is notably the case of the variables relating to the identity of the plot's owner (Mister, Madam, couple or family), the wealth variable, and our dummies for whether the household is allochthon or autochthon. A single hazard ratio describing the effect of these variables is thus inappropriate. Graphical methods for checking the PH assumption do not, however, provide a formal diagnostic test, and call for other approaches.

We adopt Cox's approach and assess departure from non-proportionality by introducing interaction terms for the above-mentioned variables, that is time-dependent variables created by the product of our variables and time. Adding these interaction terms to the model, the hazard then becomes:

$$h_{ij}(t) = h_0(t)e^{\beta' X_{ij} + \gamma X \cdot f(t)}$$

If $\gamma > 0$ (resp. $\gamma < 0$), then the HR increases (resp. decreases) over time. Testing for non-proportionality of the hazards is equivalent to testing if γ is significantly different from 0. Results of this test are provided in column (2) of Table 12 which provides the results of a Cox model with time-by-covariate interactions. Overall, they confirm that the hazard ratios associated with the variables relating to the identity of the plot's owner (Mister, Madam, couple or family), the wealth variable, and our dummies for whether the household is allochthon or autochthon are not constant over time.

Figure 4. Graphical tests of the proportional hazard assumption. Log-log curves.



With regards the wealth variables, the parameters γ associated with interacted terms are negative, which suggests that the hazard ratios are decreasing over time. More precisely, the estimated hazard ratios for the variable taking the value 1 when the household belongs to the second wealth tercile (*wealth tercile 2*) are 2.4, 1.4 and 0.8 at respectively 1, 3 and 5 years. This means that the probability f certification for a plot owned by someone belonging to the second wealth tercile is 2.4 times higher than for a plot owned by someone of the first wealth tercile (who is poorer) after 1 year. However, the effect of wealth fades with time: five years after the establishment of a LLO in a commune, the risk of certification for a plot owned by someone belonging to the second wealth tercile is decreased compared to a plot owned by someone belonging to the first wealth tercile. The same holds true for the variable taking the value 1 when the household belongs to the third wealth tercile. The estimated hazard ratios for this variable are 3.3, 2.1, 1.4 and 0.9 at respectively 1, 3, 5 and 7 years. This suggests that the land certification process becomes more inclusive as time passes. While richer households were more likely than poorer ones to request a land certificate in the very first years after the start of the reform, poorer households have been catching up afterwards. The same holds true for plot owners who belong to the category "'Other owners" or "allochthons migrants": while the risk of certification for their plots was much decreased compared to the reference categories (namely "Mister" and "Autochthon" respectively) in the first three years, it has been increasing afterwards. Again, this suggests that those who initially remained outside of the certification process have managed to catch up after a while. This delayed response by some segments of land owners may be interpreted in different ways: first, because of the complexity in the distribution of land rights, some people may have had the feeling that they were not legitimate enough to request a land certificate. Second, people

could have been reluctant to request a land certificate because they initially feared that it would raise conflicts or did not trust local authorities. Last, some people could have remained outside the certification process because they were insufficiently informed about the reform and did not grasp the ins and outs of it. It thus took them a while to get informed and follow the early movers.

Table 12. Plot-level duration model, time to demand a land certificate. Semi-parametric Cox regression.

	(1)		(2)	
	Hazard ratio	Robust standard error	Hazard ratio	Robust standard error
Plot characteristics				
Localised in the lowland +	2.069***	(0.294)	2.058***	(0.295)
Residence plot +	1.521	(0.514)	1.554	(0.516)
Non-rice cultivated plot +	0.845	(0.281)	0.843	(0.277)
Past conflict +	0.551	(0.283)	0.557	(0.288)
Area (log)	1.217***	(0.0590)	1.218***	(0.0593)
Acquired through heritage +	0.261***	(0.0446)	0.270***	(0.0462)
Acquired through donation +	0.449***	(0.118)	0.457***	(0.118)
Acquired after clearing +	0.359***	(0.0785)	0.374***	(0.0826)
Owner is the couple +	0.889	(0.192)	1.761*	(0.564)
Owner is Madam +	1.384	(0.305)	1.062	(0.405)
Other owner +	1.301	(0.761)	0.191**	(0.128)
Farmed by owner +	0.727*	(0.133)	0.731*	(0.131)
Other document - title +	0.0286***	(0.0299)	0.0290***	(0.0302)
Other document - petit papier +	0.0326***	(0.0132)	0.0342***	(0.0135)
Other document - quittance +	0.0535***	(0.0299)	0.0537***	(0.0300)
Household characteristics				
Education level	1.143	(0.111)	1.139	(0.110)
Age	1.004	(0.00597)	1.004	(0.00592)
Wealth tercile 2 +	1.383	(0.306)	3.204***	(1.271)
Wealth tercile 3 +	2.096***	(0.486)	4.169***	(1.630)
Allochthon "Native" +	2.576***	(0.815)	4.040***	(1.521)
Allochthon "Migrant" +	0.519*	(0.176)	0.187***	(0.0871)
Commune dummy variables				
Vakinankaratra - Ambatomena +	1.503	(0.769)	1.157	(0.599)
Vakinankaratra - Ambohimiarivo +	1.421	(0.802)	0.932	(0.541)
Vakinankaratra - Manandona +	2.679	(1.611)	1.558	(0.903)
Diana - Antsakoamanondro +	4.719***	(2.125)	3.504***	(1.576)
Diana - Benavony +	7.041***	(3.081)	5.551***	(2.420)
Menabe - Ampanihy +	2.046	(0.947)	1.549	(0.720)
Menabe - Malimbandy +	1.455	(0.704)	1.094	(0.523)
Menabe - Analaiva +	2.601**	(1.102)	2.501**	(1.053)
Time varying covariate				
Price of certificate (log)	0.819***	(0.0538)	0.754***	(0.0506)
Time-by-covariate interactions				
Owner is the couple +		-	0.788**	(0.0904)
Owner is Madam +		-	1.092	(0.108)
Other owner +		-	1.651***	(0.271)
Wealth tercile 2 +		-	0.764**	(0.0834)
Wealth tercile 3 +		-	0.801*	(0.0954)
Allochthon "Native" +		-	0.791	(0.157)
Allochthon "Migrant" +		-	1.509**	(0.313)
Observations	5,389		5,389	

*** p<0.01, ** p<0.05, * p<0.1

Robust standard-errors clustered at the household-level in parentheses

+ indicate dummy variables (yes=1, no=0)

5. Conclusion

(To be completed)

- The earlier applicants, who are also the ones who benefited from low prices seized the opportunity to apply for certificates in response to information and promotional campaigns in villages.
- Promotional campaigns during the first years the reform strongly increased the level of demand reached very various profiles, but mainly the better off.
- The households who applied for certificate several years after the start of the reform did it in order to fend off concrete threats. These latter were mostly poor households and women.
- Renewing Promotional campaign might be an option:
  - to increase again the number of applications
  - and, as households are better informed and less risk averse, to give new opportunities of formalization for poor and vulnerable households
  - And then to favor a massive and inclusive land reform

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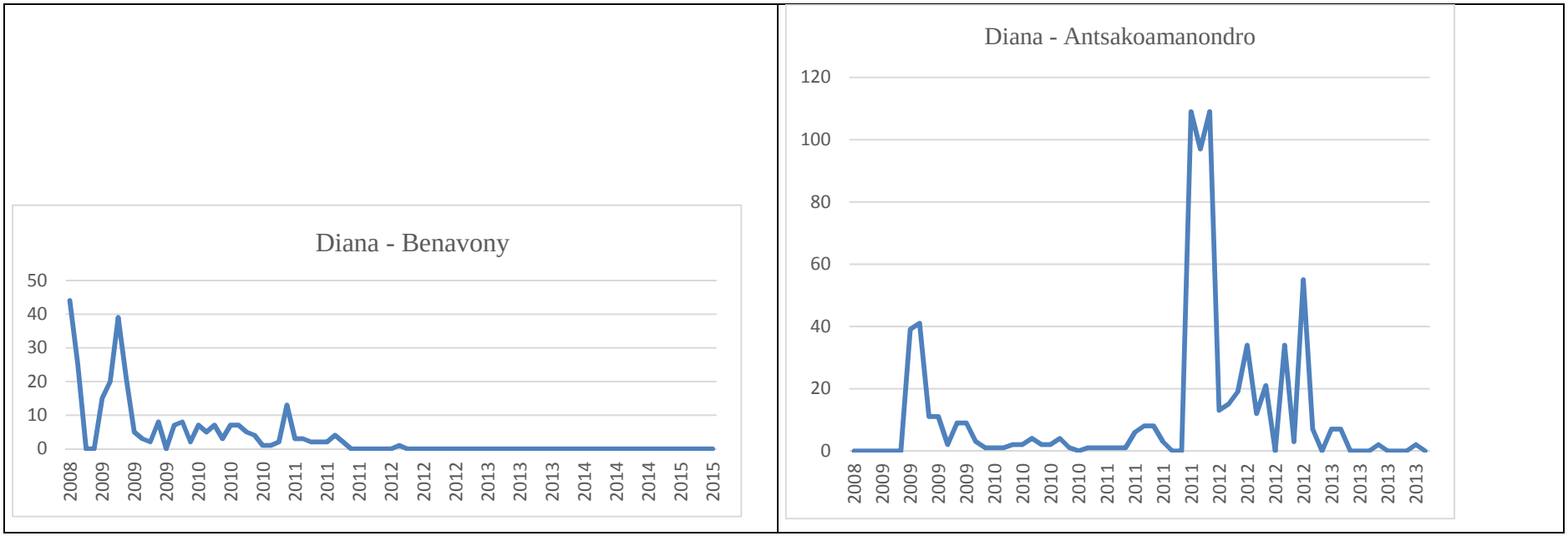
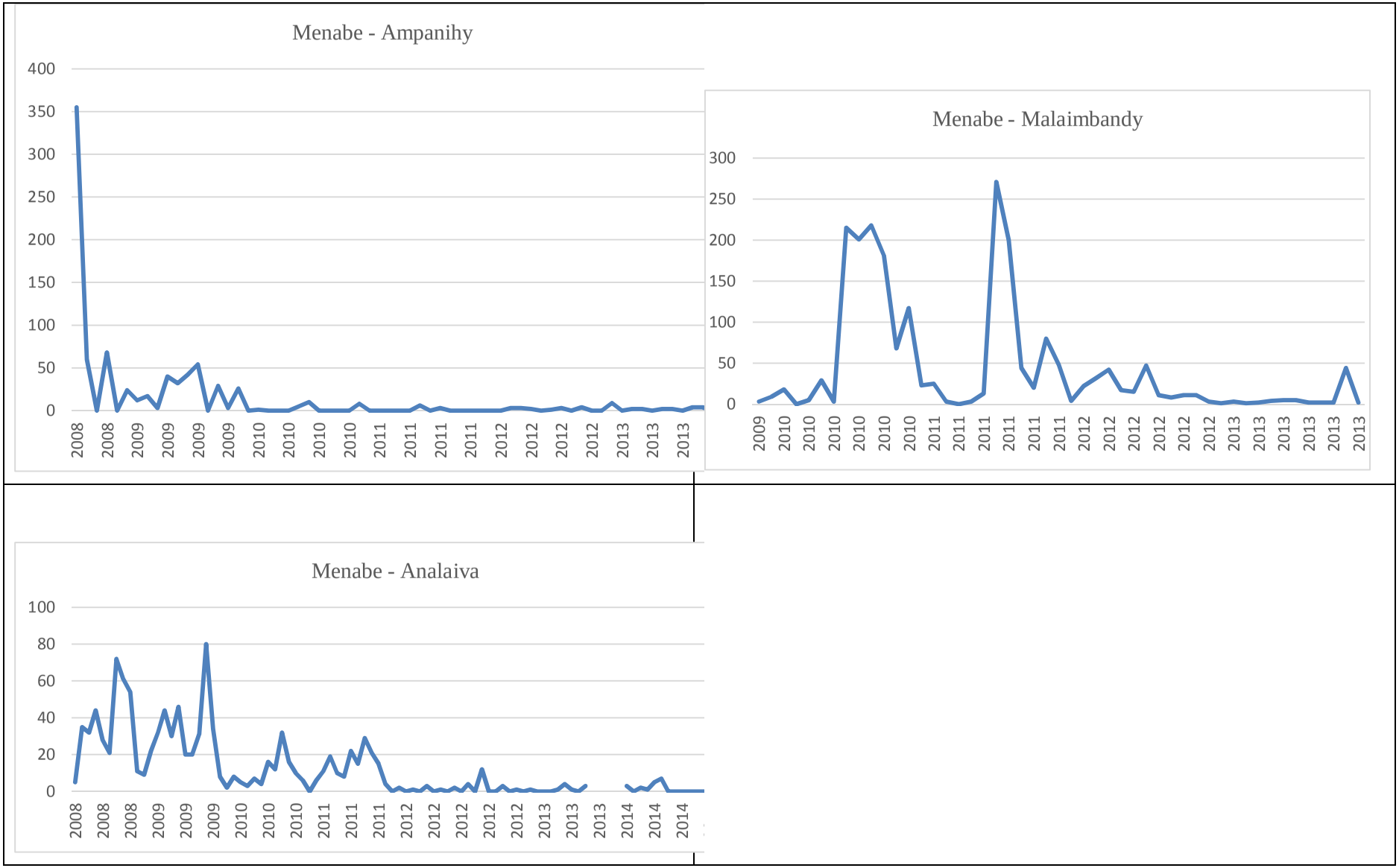
Appendix

Figure A1: Number of requests for land certicates in the 9 communes covered by the PECF survey, 2008-2016) Land 0bservatory Data




Menabe - Ampanihy
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200
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Menabe - Malaimbandy
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Menabe - Analaiva
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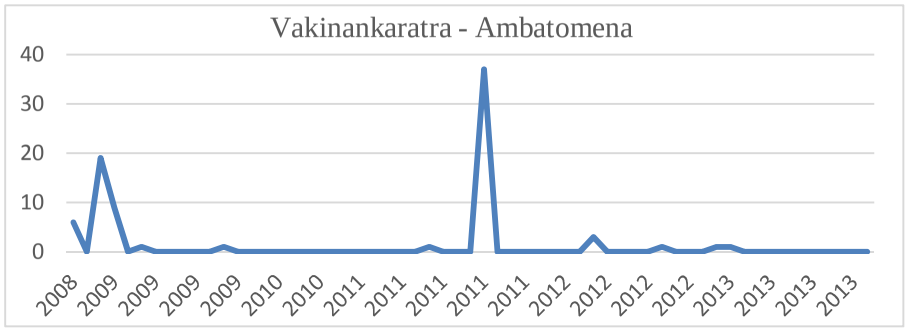
Vakinankaratra - Ambatomena
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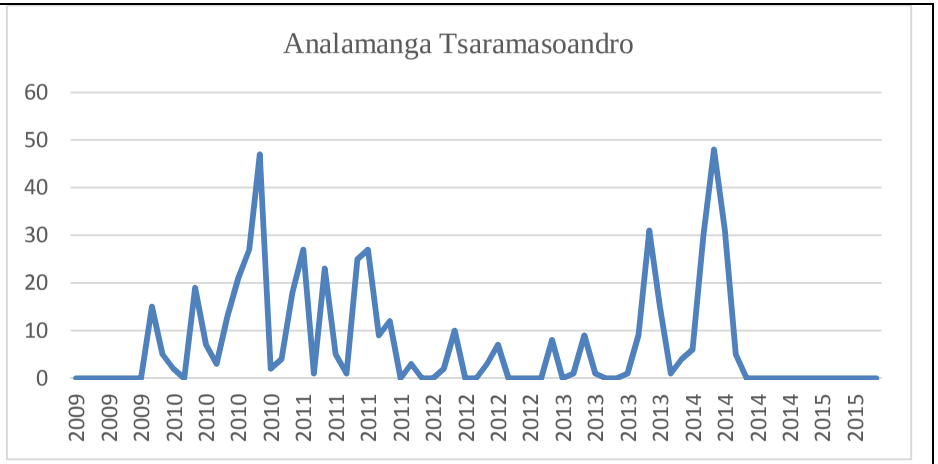
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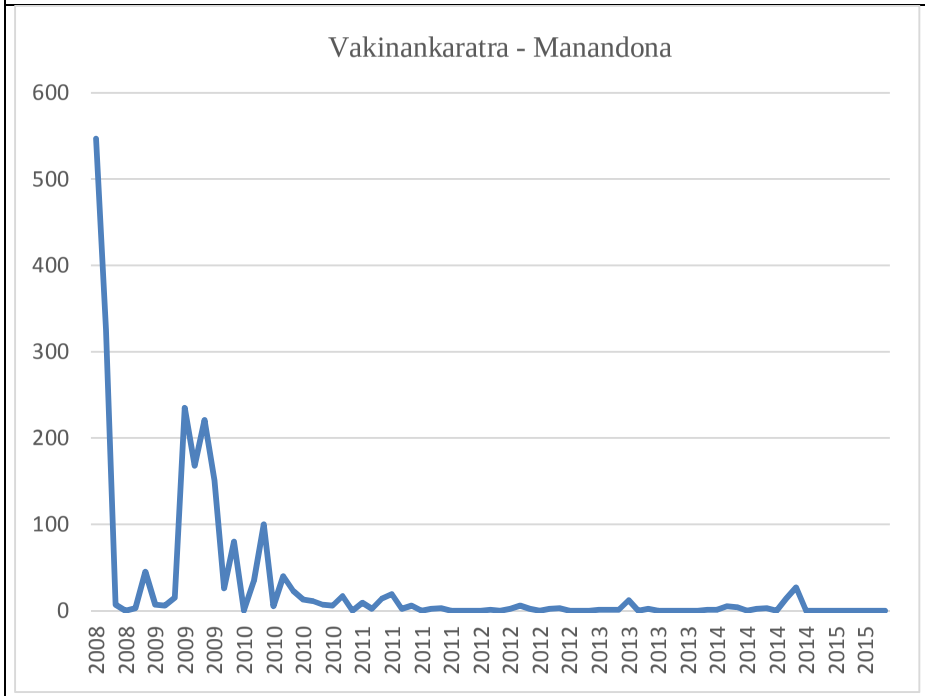
Vakinankaratra - Manandona
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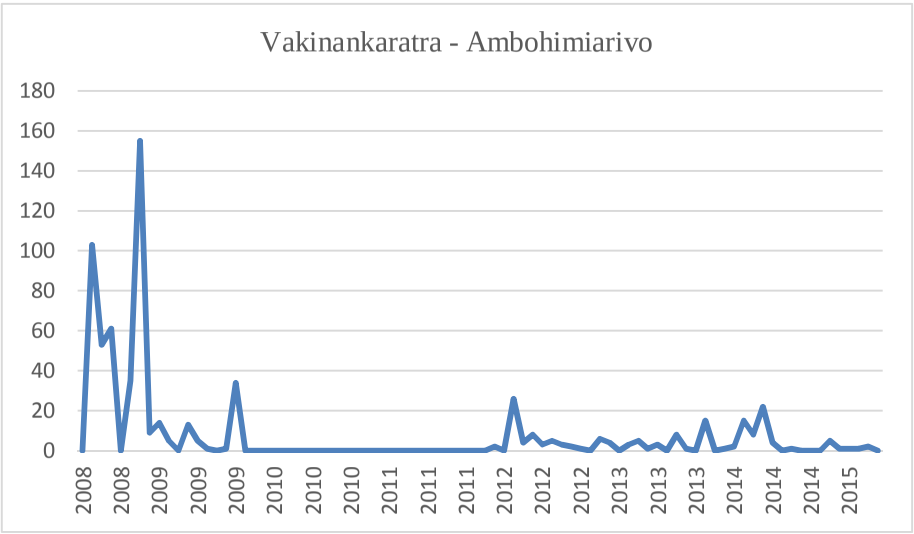
Vakinankaratra - Ambohimiarivo
180
160
140
120
100
80
60
40
20
0
2008 2008 2009 2009 2009 2010 2010 2010 2011 2011 2011 2012 2012 2012 2013 2013 2013 2014 2014 2014 2015