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Effect of Land Rights Digitisation on the Investment Capacity and Food Security of Smallholder Farms in the Municipality of Seme-podji in Southeast Benin

Mègnongon Clément Léopold BABADJIHOU
Université d'Abomey-Calavi
Toundé Roméo Gislain KADJEGBIN
Sènangla Franco-Néo Camus DJESSONOU
francodjessonou@gmail.com

Université d'Abomey-Calavi

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EFFECT OF LAND RIGHTS DIGITISATION ON THE INVESTMENT CAPACITY AND FOOD SECURITY OF SMALLHOLDER FARMS IN THE MUNICIPALITY OF SEME-PODJI IN SOUTHEAST BENIN

Mègnongon Clément Léopold BABADJIHOU[1], Toundé Roméo Gislain KADJEGBIN [2] and *Sènangla Franco-Néo Camus DJESSONOU[3]

[1]*Multidisciplinary Doctoral School/University of Abomey-Calavi (UAC), Benin*
[2]*Laboratory for the Study of Urban and Regional Dynamics (UAC), Benin*
[3]*Pierre PAGNEY Laboratory at the University of Abomey-Calavi, Benin, Email: francodjessonou@gmail.com*

Abstract

Background: Land rights digitisation is a key means of safeguarding agricultural production and household food security. This study examines the effect of land rights digitisation on the investment capacity and food security of smallholding farms in the municipality of Sèmè-Podji.

Methods: A mixed-methods approach combining quantitative and qualitative research has been used. Documentary research and socio-anthropological investigations have been carried out to assess the impact of the digitisation of land rights on food security. Data analysis has been performed using SPSS 17.0, Stata 16 and ArcGIS 10.8.

Results: Findings show that state and local authorities have committed to addressing the shortcomings of the existing land administration system through the adoption of a new land policy in 2013 and the establishment of a unified, coherent, efficient and credible institutional framework (the National Agency for Land and Property). The districts of Aholouyèmè (32%), Tohouè (24%) and Djèrègbé (18%) benefit from private-sector-led agricultural land development projects. In 2020, farmers held 3,978 land titles, up from 456 in 2003, representing a 772% increase. This trend is reflected in the land digitisation project in Sèmè-Podji, with a view to identifying relevant and lasting solutions for the municipality. Sustainable investment (37% of respondents), access to credit and agricultural intensification (29%), the enhancement of heritage (24%) and the curbing of lawlessness (10%) are the effects of the digitisation of land rights on securing and incentivising agricultural production.

Keywords: Sèmè-Podji, digitalisation, food security, land reforms, land rights

Introduction

Land has always been recognized as a primary source of wealth, social status and power. It provides shelter, food and economic opportunities. It is the main source of income and employment in most developing countries (70–80% of their populations depend on agriculture) and is an increasingly scarce resource in urban areas [15]. Living on and using the land plays a central role in people's identity and also has strong spiritual and cultural associations. As such, land also plays a vital role in cultural, religious and legal terms [16]. In today's global context, marked by uncertainties surrounding land management, the impacts of climate change, the economic and financial crisis, and the volatility of agricultural and energy prices, nations' ability to ensure their food security is now more than ever a strategic priority [5]. This has been exacerbated by the global food crisis that has gripped the world since 2007. However, it offers Africa an opportunity to find long-term solutions to the spectre of hunger through the implementation of agriculture-led growth strategies. Around one billion people, or one sixth of the world's population, survive on less than US$1 a day, with 162 million of them living on less than $0.50 a day [6].

Private investment is a key part of food and nutrition security [4]. Land issues are therefore a major concern today, as evidenced by the resurgence of both overt and covert struggles over land in many parts of the developing world, from Chiapas in Mexico to Zimbabwe in southern Africa. Although Senegal is no exception to this trend, the ways in which it manifests itself there are different [17]. As agricultural investment has become more secure, land has turned

into a highly lucrative asset, since the risk of buying land and losing it is now lower. This has led to a land grab and numerous instances of land grabbing [10].

Agricultural producers have begun to adopt an individualistic approach. This has led to subsistence-level production only, and may be the reason why farmers are unable to build up stocks to cope with lean periods, thereby contributing to food insecurity [14]. Lands in West Africa are generally characterized by two distinct regimes: land held in public ownership (commonly referred to as the public domain) and private property, which comprises land owned by the state, local authorities or private individuals, and is subject to registration [12]. Over the past decade, West African countries have undertaken intensive efforts to reform their land policies, with support from international and bilateral organizations [18]. Inadequate and insecure land rights increase vulnerability, hunger and poverty and can lead to conflict and environmental degradation when competing users vie for control of these resources [9]. Land rights digitisation is drastically reshaping rural economies in Africa by securing capital and production. The digitisation of land registers drastically reduces land disputes, fostering a peaceful environment for farming. A reliable digital title deed serves as collateral for banks, facilitating access to credit for smallholders. This financing capacity enables the purchase of quality inputs, such as certified seeds and suitable fertilizers [1].

Land tenure security encourages long-term investment, mainly in irrigation systems to reduce dependence on rainfall. Digitalisation speeds up land transfer procedures, increasing the efficiency and attractiveness of the land market for agribusiness hubs. It enables accurate land mapping, helping investors to identify the most profitable crops for each area. Digital transparency limits the risk of land grabbing, thereby safeguarding the capital of vulnerable farmers. It also encourages the mechanization of farming by securing land use, thus increasing yields per hectare [3]. Increased local productivity reduces food dependency on costly foreign imports. Property information systems enable governments to better plan reserve areas for food sovereignty. Digitalisation eases product traceability, a major asset for export-oriented industries. It encourages the pooling of land into cooperatives, optimising production costs and logistics. The reduction in administrative delays brought about by digitalisation encourages young people and the diaspora to take up agricultural entrepreneurship [7].

The online land registry helps to curb illegal land grabbing, thereby preserving areas used for grazing and market gardening. Digital rights management helps to prevent conflicts between farmers and herders over access to resources. It specifically safeguards women's rights, as women play a key role in food security but are often excluded from traditional land tenure systems [11]. Land tenure stability enables the introduction of agricultural insurance, protecting investments against climate shocks. Digital monitoring of land use helps combat deforestation and soil degradation. Effective collection of digital land taxes provides local authorities with income to finance rural access roads for agricultural purposes. Digitalisation is turning land from a mere social asset into a powerful economic lever for feeding the African continent [13]. Land rights digitalisation in Sèmè-Podji, a strategic area situated between Cotonou and Nigeria, represents a major turning point for territorial governance. This process, led by the National Agency for Land and Property (ANDF), directly influences the pillars of local food security. Land registration provides security for farmers, offering them the visibility needed to invest sustainably and increase their yields. During times of crisis, this title deed becomes a strategic financial lever that strengthens rural households’ resilience.

Methods

Site analysis and study site selection

The municipality of Sèmè-Podji is located between 6°22'30'' and 6°27'30'' north latitude, and between 2°31'30'' and 2°42'0'' east longitude. It is bordered to the north-west by Lake Nokoué, to the north-east by Porto-Novo Lagoon, to the south by the Atlantic Ocean, to the east by the Federal Republic of Nigeria and to the west by the municipality of Cotonou (Fig. 1). The municipality of Sèmè-Podji covers an area of 250 km² and is made of six (06) districts, namely: Agblangandan, Ekpè, Sèmè-Podji, Djèrègbé, Tohouè and Aholouyèmè [2]. This geographical location of the study area has facilitated human settlement and the expansion of land-related activities. The municipality of Sèmè-Podji forms part of the flat coastal zone with uniform relief and no marked terrain features. It is a low-lying, sandy area bounded in its northern part by a series of lakes and lagoons. The landform is an accumulation landform consisting of glacis and ancient and recent coastal ridges. With a very gentle slope (altitude ranging from 6.78 to 27.31 m), the geographical area of the municipality of Sèmè-Podji consists of a series of coastal ridges, separated by marshy depressions that generally slope towards the south-east. These form glacis from a geomorphological perspective, primarily due to the gentle, uniform slope that characterizes them [2]. Furthermore, 7% of the study area has an altitude of between 2 and 6 metres; 24% has an altitude of between 6 and 10 metres. In addition, 9% have an altitude of between 11 and 15 metres. This is a coastal, marshy area featuring many basins and valleys, dominated by terrain varying in places between approximately 0 and 6 metres in altitude. These morphological units generally have low altitudes, reflecting a relatively flat terrain. The landscape is a feature that offers no major constraints to settlement in the commune of Sèmè-Podji and is conducive to land use and agricultural activities. The type of soil is another key factor in agricultural production in the commune of Sèmè-Podji. Soils are divided into four groups: ferruginous soils (46.15%), ferrallitic soils (15.38%), hydromorphic soils (30.76%) and raw mineral soils (7.69%). Farmland suitability varies according to the type of soil present. Agricultural production relies heavily on the physical characteristics of the soil, especially its ability to retain and transmit water. Indeed, the land provides a substrate and a nutritional environment for plants in agricultural production.

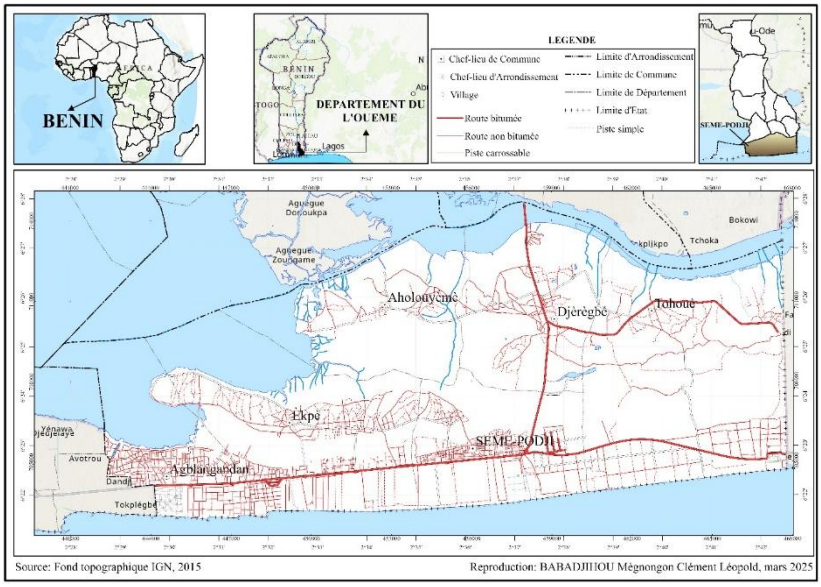


Fig.1 : Location and administrative divisions of the municipality of Sèmè-Podji

Data analysis

Empirical data and information relating to land tenure dynamics and farm dynamics, as well as the effects of land reforms on food security, have been collected after determining a clearly defined sample. Located in the department of Ouémé, the municipality of Sèmè-Podji is divided into several districts, each with its own distinct characteristics. These administrative subdivisions play an important role in the local management and development of the municipality. The districts of the municipality of Sèmè-Podji are generally designated according to geographical, historical and socio-economic criteria. The main districts of the municipality of Sèmè-Podji are: Sèmè-Podji Centre, Agblangandan, Ekpè, Tohouè, Aholouyèmè and Djèrègbé. Thirty-eight (38) villages or urban neighbourhoods within the six (6) districts selected for this research have been visited. The fieldwork phase involved conducting interviews with stakeholders involved in land reforms, enabling their views on the subject matter to be gathered. These interviews have been carried out using questionnaires and interview guides. The key stakeholders involved in the survey phase were landowners, farmers, chartered surveyors, and selected public prosecutors and judges. To conduct the socio-anthropological investigations, it has been necessary to determine a sample. All districts of the municipality of Sèmè-Podji have been included due to the importance of land management and food security in most of the villages to be visited. The target population has been identified using D. Schwartz's formula (1995). The quota method has been used to specify the number of individuals in each category of stakeholders interviewed in each locality. In total, 261 people took part in individual interviews during the fieldwork.

The data collected from the sample have been analyzed manually and processed using Excel 2016 to produce the illustrative figures. These data have been analyzed using SPSS 17.0 and STATA 16. These software packages are used to calculate central and dispersion measures (standard deviation, arithmetic mean) as well as to produce the various figures. Survey results have been quantified based on the actual score for each section of the questionnaire. The number of responses per question type has been expressed using the statistical protocol in [2]:

$$P_1 = \frac{n}{N} \text{ X } 100 \text{ ;}$$

where n is the number of households with positive responses and N is the sample size at the municipal level.
The Formal Land Title Coverage Rate (FLTCR) is the ratio of officially registered land, land titles or concession deeds [1]. The formal land tenure coverage rate measures the proportion of agricultural land or plots that are legally registered and for which a title deed (such as a Land Title or Land Ownership Certificate) has been issued [13]. It is the counterpart to the informal tenure rate and indicates the level of security of land rights. The formula is:

$$\text{TCF} = \frac{\text{Number of agricultural plots with a land title}}{\text{Total number of plots recorded in the area}} \text{ X } 100$$

A low rate reflects high land insecurity, which limits long-term investment and access to credit. This data is vital for local and national authorities in identifying priority areas for agricultural projects and land tenure reform initiatives, and in assessing the effectiveness of public policies in this field.

Results

The digitisation of the land registry has enabled the implementation of the Land Information System and digital archiving. This innovation allows the land administration to establish a spatial database of both formal and informal properties. Land tenure is secured and made accessible through the development of an efficient land and state property information system

and the confirmation of land rights, which facilitates the administrative recognition of rights to a property. The government has established the cadastre. This is an official, cartographic, and textual record providing information on human land use, including boundaries. It also refers to the agency responsible for establishing and updating these records. The Land Registry handles all administrative and technical documents describing land ownership. It is a unified, computerized system of technical, fiscal, and legal records for all land within the national territory. The new code emphasizes digital technology. The ANDF has gone for a purely technological approach. Technicians draw on geographic information system (GIS) and global positioning system (GPS) technology. GIS is a new approach in land management. In fact, all cadastral maps must be created digitally. Any public or private applicant can access the data in real time or online. The code has legal implications for digital archiving. The ANDF has launched a modern website with innovative case tracking modules to implement the code (Fig. 2). The ANDF has digitized data with a view to gradually reducing manual processing. The platform identifies and secures the government's private estates and digitizes existing land titles. Landowners help digitize private property deeds. This has led to the development of an application for processing and managing land data. The application digitizes land titles. The ANDF designs a model based on community engagement, a consensus-based problem statement, the design of interventions with the involvement of all stakeholders, the implementation of interventions, the validation of processes, the evaluation of interventions, and the facilitation of dialogues regarding the results achieved, while upholding the land administration's role as the guarantor of land-related issues and engaging citizens in their land management.



Fig.2. Modern ANDF Website Interface
Source : *ANDF, 2025*

Land registry established in the municipality of Sèmè-Podji

The implementation of the land registry in Sèmè-Podji is an ongoing process that is seeing both significant progress and persistent challenges. Indeed, the municipality of Sèmè-Podji has launched a major operation to register plots of land in the national database, under the auspices of the National Land Registry Scaling-up Preparation Project (PPMEC). This initiative aims to strengthen land security and stimulate investment. As early as 2019, the municipality of Sèmè-Podji had initiated a partnership with ASToN for land digitisation (Sèmè-Podji Town Hall, 2024). Buyers and local residents are flocking to register in the database. According to 73% of landowners, this system helps to modernise the property market. The e-Foncier system has been rolled out in the municipality of Sèmè-Podji and has enabled the registration of 3,000 plots. This system aims to automate the processes of processing, monitoring and registering real estate

data for faster, more secure and transparent management. Likewise, the National Agency for Land and Property (ANDF) has set up BCDFs in municipalities, including Sèmè-Podji, to streamline procedures for users (requests for cadastral map extracts, land titles, etc.) and to manage the cadastre at local level. The municipality of Sèmè-Podji has embarked on a project to identify and secure its administrative reserves (municipal and state-owned land), with the mapping work entrusted to surveyor's office. This is vital for better management of public land assets.

The ASToN project in the municipality of Sèmè-Podji

The ASToN (African Smart Town Network) project is a French Development Agency (AFD) initiative aimed at supporting the digital transition of 12 African cities, including cities in Benin, to transform them into smart cities. This programme aims to help these cities use digital technologies to improve public administration, citizen participation and urban services, whilst promoting social inclusion and economic growth. The overall objective is to create smarter African cities by using digital technology to address specific urban challenges. The programme focuses on sharing experiences and knowledge, and empowering local teams to use digital tools. It follows the URBACT approach, a European initiative promoting integrated urban development. The three-year budget for ASToN totalled €2,995,000, funded by the AFD. In Benin, the ASToN project focuses on using digital technologies to improve local governance, citizen participation and urban services. Several towns in Benin, including Sèmè-Podji, are involved in the ASToN project. Indeed, ASToN has implemented initiatives such as computerizing property management in Sèmè-Podji, collecting taxes using digital platforms and promoting online citizen participation. The municipality of Sèmè-Podji has been identified as one of the cities involved in the ASToN network. Its involvement in this project is mainly focused on digitising its land management system. The municipality of Sèmè-Podji has focused on digitising its land management system. This is likely intended to improve the transparency, efficiency and security of land transactions, as well as to better manage the territory.

The ASToN-related activities carried out in Sèmè-Podji include participation in meetings and exchanges with other towns within the network, capacity-building for members of the AstON Local Support Committee (proficiency in Microsoft tools, technical design skills, facilitating conferences via Zoom, etc.), and the development of a Local Action Plan (LAP) to implement land digitisation. This project aims to modernise the management of land titles, land transactions and land-related data, thereby contributing to better local governance. The ASToN programme ran from 2019 to 2022 (Sèmè-Podji Town Hall, 2024). This entailed significant work on digitising the municipality's land records in Sèmè-Podji. The expected advantages of digitization include greater transparency and security in land transactions, a decline in land disputes, improved access to land information for citizens and investors, streamlined administrative processes related to land, and enhanced digital technology skills among local stakeholders. 81% of those surveyed felt that the ASToN programme had encouraged flexibility and the adaptation of solutions to local contexts. The digitisation of land records in Sèmè-Podji is one such initiative, seeking relevant and sustainable solutions for the municipality.

Land registration in the municipality of Sèmè-Podji

Land registration is an official and legal recording of land ownership rights with a competent authority (land registry, land registry office). It is an administrative registration procedure through which the State recognises and guarantees the existence of an individual right of private ownership. It supersedes all prior rights [11]. Following preliminary operations to demarcate and mark out a plot of land, the land registration system entails recording, in the land registers held by the land administration, under an account opened specifically for the property, all the rights attached to it. The first mechanism for registering presumed properties in the municipality of Sèmè-Podji is the confirmation of sales agreements. The certification procedure involves the mayor signing the agreements, thereby enabling the transactions to be dated and recorded in the

municipal registers of public property (plate 1). Plate 1 shows the registration plates in Sèmè-Okun and Sèmè-Kraké. The registration of plots transforms informal possession into a formal property right, offering a multitude of economic, social and legal benefits that contribute to sustainable development and the stability of societies.

The lack of land registration creates uncertainty and disputes, and hinders investment and economic development. The land registration system fosters the gradual transition from customary land rights to private ownership. Land registration offers a number of benefits. These include protection against disputes and encroachment (32% of respondents to the survey), bank guarantees (24%), clarity of boundaries (18%), facilitation of sale and transfer (16%) and incentives for investment (10%). Registration grants a permanent and unassailable land title (Fig. 3). It protects the owner against abusive claims, dispossession and boundary disputes, which are common in areas with informal or ambiguous land rights. The land title is the legal proof of ownership. It makes property rights enforceable against all parties, so that no one can legally challenge the registered owner's title. Registration usually involves accurate surveying of the plot, which clearly delineates property boundaries and prevents encroachment. A registered plot can be used as collateral or security for bank loans. Financial institutions are more reluctant to grant loans to landowners without a secure land title, as this reduces their risk. The land security provided by registration encourages landowners to invest in their land (land improvements, infrastructure, quality agricultural inputs, equipment). In fact, they are more motivated to improve their land's productivity if they are assured that their investments will not be lost due to eviction or legal disputes. The system's effectiveness lies in the accuracy and reliability of information regarding both the location and boundaries of each property and the individuals with legal rights on the property concerned.

Land registration coverage rate has risen from 14% in 1990 to 49% in 2024. Consequently, the registration of land titles has experienced exponential growth. Land registration offers the advantage of being guaranteed by the State through land registry services, responsible for maintaining land records and recording any subsequent changes affecting property rights relating to the property. Its main effect is the issuance of a private land title that is enforceable against all parties. Indeed, the land title is the document issued by the administrative authority that officialises the existence of a right or rights over a piece of land (Fig. 4).



Plate 1: Signs indicating two alleged owners in Sèmè-Okun and Sèmè-Kraké

Shooting: *Babadjihou, january 2025*

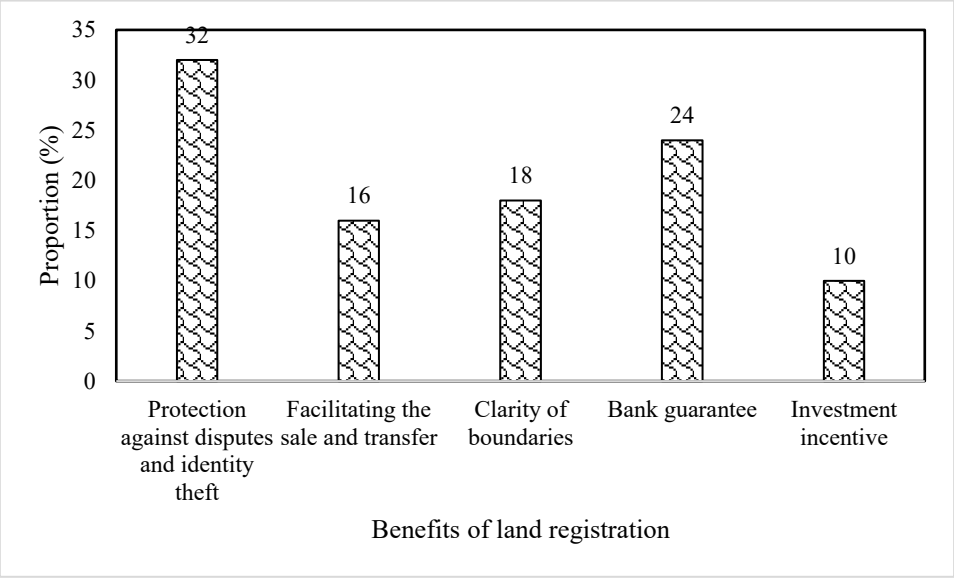


Fig.3 Benefits of registering properties in the municipality of Sèmè-Podji

Source *: Municipality of Sèmè-Podji, january 2025*

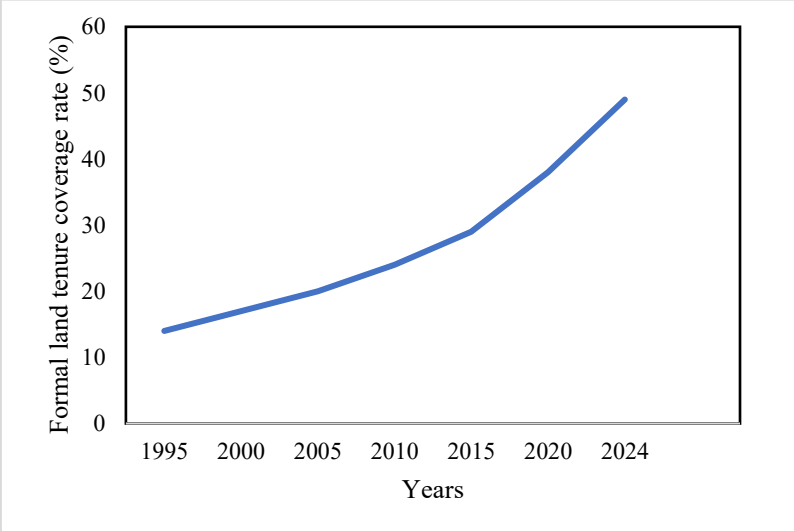


Fig.4 Formal land tenure coverage in the municipality of Sèmè-Podji

Source: *field survey, january 2025*

Effects of digitisation on land titles in the municipality of Sèmè-Podji

The district of Ekpè has the highest proportion of land titles, followed by the districts of Tohouè, Djèrègbé and Agblangandan. A land title grants its holder all the legal rights associated with ownership, including the right to transfer ownership. The land title is the only legal document granting full private ownership of a plot of land. Land without title deeds therefore constitutes the (at least potential) private domain of the State (Fig. 5). The number of land titles among farmers has risen from 456 in 2010 to 3,978 in 2024, representing a growth rate of 77.36%. Thus, there has been an increase in the registration of land titles for farmers. The issuance of land titles remained an extremely marginal practice in the municipality of Sèmè-Podji prior to the land reform (Fig. 6). Likewise, 67% of the districts in the municipality of Sèmè-Podji have a moderate number of registered plots (Tohouè, Sèmè-Podji, Djèrègbé and Ekpè), 16% have a high number of registered plots and 17% have a low number of registered plots (Aholouyèmè). Registration is the sole form of private ownership. It is an administrative procedure which creates the right (Fig. 7). Thus, the land title is that resulting from land registration and therefore corresponds to an individual private property right. In the municipality of Sèmè-Podji, the overall registration process has enabled more people to secure land tenure and ownership. The

registration of plots enables the collection of land tax (35% of respondents to the survey), the development of land markets (26%), the improvement of urban and rural management (21%), the stabilisation of incomes (10%) and the assurance of household resilience (8%). Registration facilitates property transactions (sales, rentals, inheritances). It simplifies the process, reduces transaction costs and increases transparency, thereby contributing to a dynamic land market and the efficient allocation of land (Fig. 8). Land registration and the resulting land registry provide authorities with accurate information on land distribution, land use and land ownership. This data is vital for urban and rural planning, land-use planning, the development of infrastructure (roads, schools, hospitals) and the sustainable management of natural resources. An effective land registration system enables governments to better identify landowners and levy property tax more fairly and efficiently, thereby contributing to the revenue of central and local government. For farmers, land security through registration reduces uncertainty and allows them to plan long-term investments to increase their production and income. In times of economic shocks, a registered plot of land can serve as an asset to secure financial support, thereby strengthening household resilience, particularly in rural areas. In the Republic of Benin, both the culmination and the outcome of all these reforms lie in the establishment of a legal, regulatory and institutional framework adapted to modern and specific requirements, taking into account customs and land management practices.

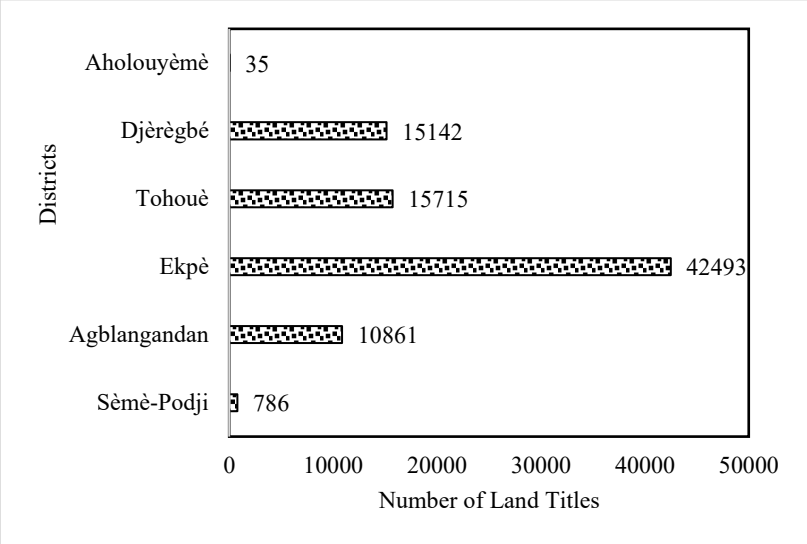


Fig.5 Trends in the number of land titles registered by district in the municipality of Sèmè-Podji
Source : *Field survey, may 2025*

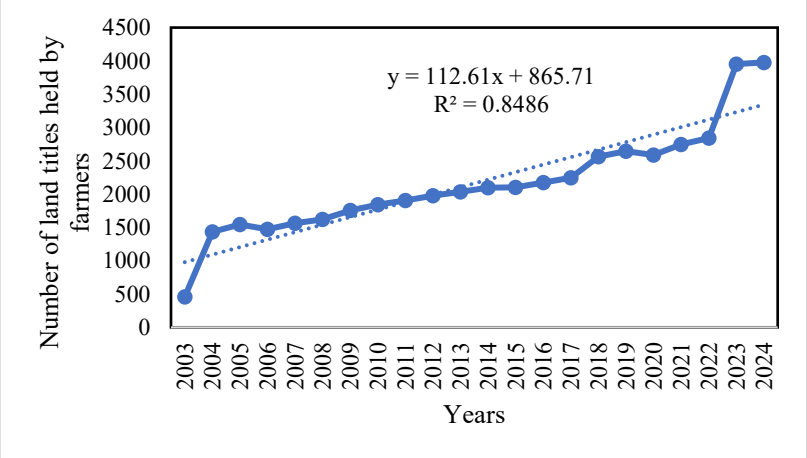


Fig.6 Evolution of Land Titles held by farmers between 2003 and 2024 in the municipality of Sèmè-Podji

Source *: Field study, may 2025*

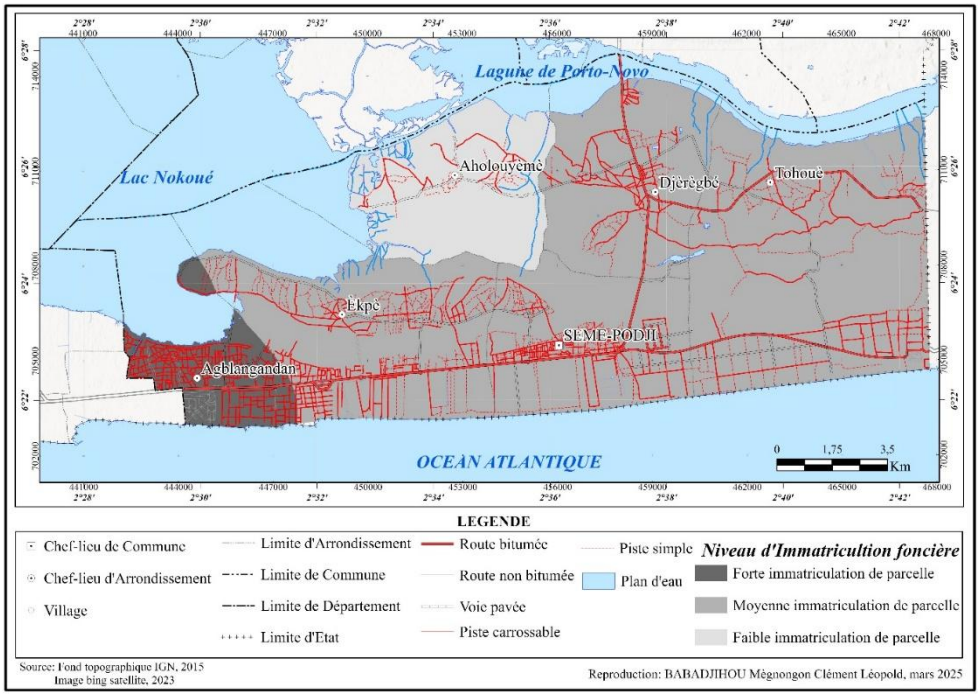


Fig.7 Mapping of registered plots in the municipality of Abomey-Calavi

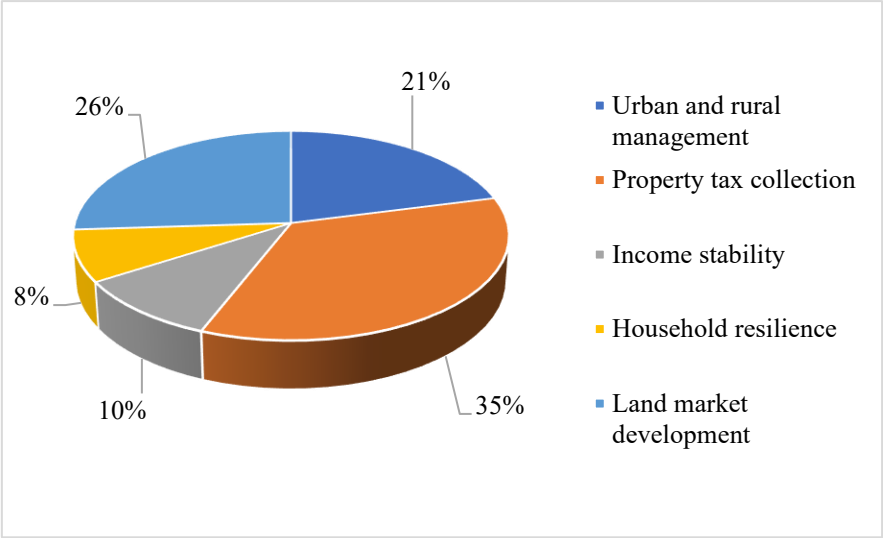


Fig.8 Benefits of land registration, as stated by the authorities in the municipality of Sèmè-Podji

Source: *Field survey, may 2025*

The impact of the digitisation of land rights on agricultural investment capacity in the municipality of Sèmè-Podji

Land titles serve as collateral for obtaining loans. An increase in the number of farmers with access to credit following the reform is an example of its financial impact. Secure property rights encourage long-term investment. Investment rates per farm ranged from 11% to 21% prior to the land reform in the municipality of Sèmè-Podji. Following the reforms, the investment rate rose to 43% in 2024. Thus, investment rates per farm have increased in the commune of Sèmè-Podji. A high investment rate implies significant modernisation and growth in agricultural production (Fig. 9). According to 76% of those surveyed, market gardening, sugarcane production and rice cultivation saw high investment rates in the municipality of Sèmè-Podji. The transition from paper land titles to a digital land registry reduces the risks of expropriation and land disputes, which are common in this area of high urban pressure. Farmers whose rights are digitally registered are guaranteed tenure of their land. This encourages them to invest in sustainable infrastructure (irrigation systems, storage facilities). Digitalisation makes it easier for financial institutions to recognize land titles. Land becomes collateral

(mortgage), enabling farmers to secure financing to boost their productivity. The municipality of Sèmè-Podji is undergoing rapid urbanisation. Digitisation enables better monitoring of land use. Thanks to the Land Information System (SIF), the authorities can better identify areas designated for agricultural use and limit their uncontrolled conversion into residential or industrial zones. By preserving the municipality's market garden land, digitalisation helps ensure a direct supply of fresh produce to the markets in Sèmè and Cotonou. Land disputes are often a major cause of crops being abandoned in Sèmè-Podji. The digital platform prevents multiple sales of the same plot. Less time spent in court means more time devoted to agricultural production. The clarity of digital data secures the transfer of land between generations, preventing excessive fragmentation that makes farming unprofitable. Digitally secured land increases in value. Digitally secured land increases in value. This might attract real estate investors who buy up land from smallholders, pushing the latter into food insecurity.

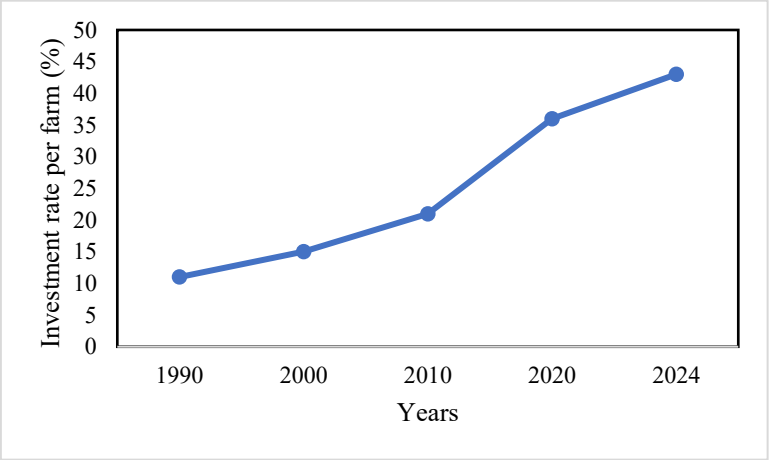


Fig.9 Investment rates by farm in the municipality of Sèmè-Podji

Source: *Field survey results, may 2025*

Impact of digitisation of land rights on security of tenure and incentives for agricultural production

For market gardeners and small-scale livestock farmers in Sèmè-Podji, digitalisation via the National Digital Land Registry offers protection against major risks. Indeed, sustainable investment (37% of those surveyed), access to credit and agricultural intensification (29%), the enhancement of assets (24%) and the curbing of lawlessness (10%) constitute the effects of the digitisation of land rights on securing and incentivising production (Fig. 10). By ensuring that the plot will not be subject to double-selling or dispossession, the producer dares to invest in infrastructure such as boreholes or fences. The digital title transforms the land into an asset, enabling rural families to move away from subsistence farming towards a more resilient market-oriented agriculture. The municipality of Sèmè-Podji is an area of high property speculation. Digitalisation has a mixed impact on food security. The Land Information System (SIF) helps to secure land use. Whilst the Urban Master Plan protects agricultural areas, digital technology makes it much easier for authorities to crack down on illegal housing developments. Bank and microfinance institutions view the digital land certificate as a solid guarantee. This credit enables farmers to purchase high-yield seeds and modernise farming techniques (particularly market gardening, which is widespread in the area), thereby increasing local food availability. However, land that is digitally secured is easier to sell to real estate developers. With no protective measures, smallholders may be tempted by immediate financial gain, thereby losing their means of food production in the long term. The leverage effect on investment has a direct impact on food availability and accessibility. The digitisation of land rights secures farms,

which promotes food availability. It ensures the stability of production cycles by reducing exposure to expropriation and conflict. It improves accessibility by increasing household incomes, enabling them to access a more varied diet (Table.1).

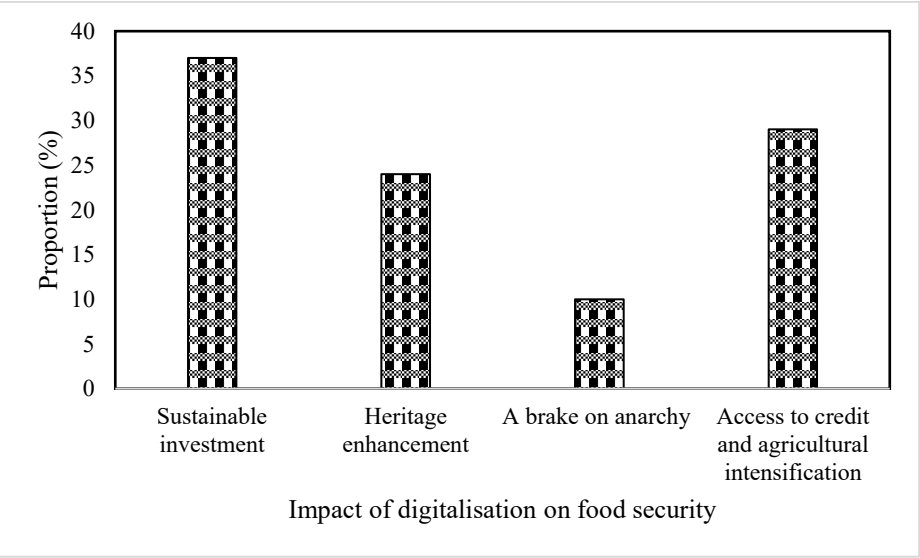


Fig.10 Impact of digitization of land rights on food security in the municipality of Sèmè-Podji
Source: *Field survey results, may 2025*

Table.1 Expected impact by borough

A cornerstone of food security	**Impact mechanism at Sèmè-Podji**	**Expected impact by borough**
Availability	Increased yields through technological investment and intensive farming.	- Sèmè-Podji Centre: Rise in Vegetable Production - Ekpé: improved crop yields -Agblangandan: crop diversification through land tenure security
Stability	Protection against sudden expropriation, enabling continuous production cycles, which are crucial for local market gardening.	-Tôgbè: sustainability of vegetable production cycles - Sèmè-Podji centre: land disputes reduction, stability of farms -Djèrègbé: sustaining agricultural activities without a break
Accessibility	Increased income from the sale surplus allowing households to buy a broader range of food.	- Sèmè-Kpodji Centre: improvement in household purchasing power - Agblangandan: greater access to local markets - Ekpé : Food diversification through agricultural income

Source: *Field survey, january 2025*

Challenges to the implementation of land reforms in the municipality of Sèmè-Podji

A number of constraints hinder the implementation of land reforms in the municipality of Sèmè-Podji.

Land registration seems to offer all the necessary safeguards to effectively protect individuals' land rights. However, local communities encounter difficulties when registering their plots. The high cost of the procedure (42%), the prevalence of land disputes (25%), the complexity of the procedure (16%), land encroachment (10%) and buyers' mistrust (7%) hamper the confirmation of land rights in the municipality of Sèmè-Podji (Fig. 11). The fees required for acquiring land titles are out of reach for vulnerable people in rural areas. This reality does not reflect the latter's cost of living. Notwithstanding efforts regarding land registration and digitisation, the

municipality of Sèmè-Podji remains burdened by many disputed land subdivision schemes (52 schemes since 1980, many of which are contentious). Such disputes, often stemming from a lack of transparency and questionable practices regarding the management of communal land reserves, impede the smooth integration of these plots into the digital land registry. The public's loss of trust, stemming from past land scandals and suspicions of misappropriation of land resources, makes it difficult to secure full buy-in for cadastral operations. Unless citizens actively cooperate, the collection of reliable data and the complete registration of plots may be compromised. Though plots are registered, the reliability and completeness of cadastral databases remain a challenge. Shortcomings or errors in the data collected lead to new disputes or hinder the issuance of unassailable land titles. Despite digital advances, 56% of the population, particularly the least informed or most vulnerable, still struggle to access and understand cadastral procedures. High land pressure in Sèmè-Podji, fuelled by speculation and rapid urbanisation, hinders the updating of the land registry and encourages attempts to evade regulations, making land management a constant challenge. As such, the municipality of Sèmè-Podji is at the heart of national efforts to modernise Benin's land registry and land management. Significant progress is being made, especially with the digitisation and registration of plots. Nevertheless, the municipality must overcome major challenges related to its history of land disputes, public mistrust and land pressure. The implementation of the land registry will depend on the authorities' ability to restore trust, ensure transparency and streamline access to land services for all citizens.

Given that GIS is a new concept in land administration, there is a significant shortfall in technical capacity. Thus, significant capacity-building is still required to train technicians on the use of information and communication technology tools. ANDF's equipment capacity is currently very limited. Land administration lacks adequate equipment to perform its duties effectively.

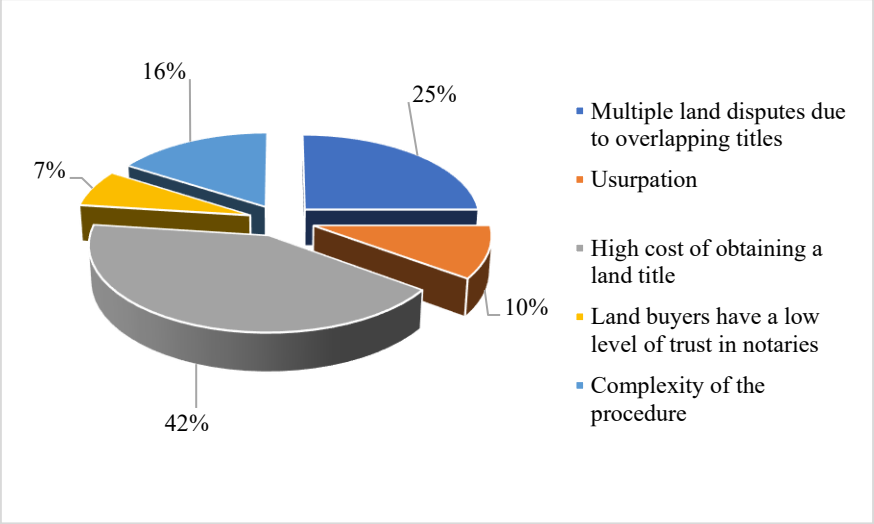


Fig.11 Prioritizing issues with land title access in the municipality of Sèmè-Podji
Source *: Field survey results, january 2025*

Discussion

Land tenure stability acts as a major financial catalyst in the municipality of Sèmè-Podji. Whilst investment rates per farm stagnated between 11% and 21% prior to the reform, the introduction of the digital land registry has boosted this figure to 43% by 2024. According to 76% of farmers, this modernisation drive is particularly benefiting the market gardening, sugarcane and rice sectors. The reform reduces uncertainty regarding land disputes and expropriation in this context of intense urban pressure by replacing paper records with a digital system. Financial institutions recognize the new land title as a valid security, enabling farmers to access credit to fund sustainable infrastructure, such as warehouses or irrigation systems. The Land Information System (SIF) provides the authorities with a tool to regulate uncontrolled urbanisation,

protecting the market gardening areas vital to supplying the markets in Sèmè and Cotonou. These findings are consistent with those of [1] and [13], showing that the land registry subsequently emerged as the solution, enshrined in the new Land and State Property Code Act of the Republic of Benin. It specifies that cadastres are established for land management and describes them not only as permanent, descriptive and evaluative inventories of land ownership, but also, and above all, as a tool for land security with three primary and main functions: technical, fiscal and legal.

The inclusion of the National Digital Land Registry in Sèmè-Podji acts as a bulwark against land insecurity, serving as a key driver for local agricultural development. Survey data shows that the effects of this digitisation are primarily reflected in the incentive for sustainable investment (37%), improved access to credit and intensification (29%), the enhancement of land value (24%) and regulation against land lawlessness (10%). The reform protects farmers by putting an end to the risks of land grabbing and double sales, allowing them to invest in major infrastructure (boreholes, fencing). Digital land titles thus turn land into ‘active capital’, helping the transition from subsistence farming to a resilient market-based agricultural system. Though there is still significant pressure from property development, the Land Information System (SIF) strengthens the implementation of the Master Urban Plan by curbing illegal housing developments. This improved security leads to greater food availability through technical modernisation, and increased accessibility due to rising incomes among rural households. These findings echo those of [8] and [16], highlighting that these areas are subject to intense property market pressure, whilst the digitisation of land rights is reshaping land tenure. The digital title, shifting from a simple resource for use to a genuine asset, offers rural families the necessary leverage to switch from subsistence farming to more resilient market-oriented production. This digital transition, however, has a mixed impact on food security: if it secures the farmer’s position, it also boosts the value of plots for speculation, making them more attractive for real estate development.

Conclusion

The municipality of Sèmè-Podji is currently undergoing significant land registration modernisation under the National Land Registry Scaling-up Preparation Project (PPMEC). Thanks to the e-Foncier system, 3,000 plots have already been digitally registered, ensuring more efficient and transparent management. The ASToN project has further strengthened this momentum between 2019 and 2022 by digitising local management and training municipal officials on digital tools. Land registration rates have increased significantly, with coverage rising from 14% in 1990 to 49% in 2024. This digital security turns land into ‘active capital’, shielding farmers from theft and double sales. Thanks to easier access to bank credit, the investment rate per farm has risen from 21% to 43%. In terms of food security, digitalisation secures production cycles and increases household incomes, thereby improving nutritional diversity. However, a challenge remains: increased land values could encourage smallholders to sell their plots to developers, threatening local production.

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