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Abstract

Given the extent of food insecurity among rural women and gender inequalities linked to land rights, this research examines the effect of women's land ownership on household food security in Benin. The data comes from the Global Analysis of Vulnerability and Food Security survey (AGVSA, 2017). The propensity score matching (PSM) method and endogenous switching regression are applied to a sample of approximately 6502 households, of which 21% (1366) of agricultural households included female landowners. The results estimated using the (ESR) method and the (PSM) method reveal a positive and significant effect of women's land ownership on household food security. Following the ESR and PSM method; the results reveal that the factors that significantly influence women's land ownership are age, household size, agricultural empowerment index, access to credit, and levels of "primary" and "at least" education. less secondary" and the household's housing status. Following the ESR method, the effect of transient heterogeneity is positive; which implies that the effect of land ownership on the food security index is significantly higher for women who have land than for those who do not. The potential effect of heterogeneity in the sample reveals that women who have land property would have a higher positive food security index than women who do not have it. The results indicate the very important role of land ownership by women in resolving food insecurity in rural Benin. Given our results and to improve the level of household food security in Africa and more precisely in Benin, political decision-makers will have to favor and encourage many women to acquire not only land but also large areas of land through applicable policies and reforms. Then, political decision-makers must also put in place communication systems to encourage more women's access to agricultural inputs and the practice of irrigation. Finally, decision-makers must increase access to credit for women.

***Keywords**:* Landownership, women, food security, PSM, ESR, Benin.

JEL Classification : C34, D13, Q15

1. Introduction

Policy actors and researchers acknowledge that the agricultural sector contributes to food security, poverty reduction, and growth, in many developing countries (FAO, 2012a; World Bank et al., 2008). Many studies that have analyzed national policies and programmes aiming at meeting food needs in developing countries highlight the important role of women in agricultural production and food security (Chapoto and al., 2011; FAO, 2012a). According to the Food and Agriculture Organization of the United Nations (FAO, 2012b), reducing the constraints faced by women farmers such as land, credit, fertilizers, new technologies, and extension services could increase farm yields by 20-30%. This would have led to increased total agricultural production in developing countries, such as Benin, from 2.5 to 4% (World Bank, 2012; FAO, 2012b). In the real sense, this increase could result in a 12% to 17% reduction in the number of people suffering from hunger in the world which is between 100 and 150 million people (World Bank, 2012; FAO, 2012b). As a result, women's access to arable land in quantity and quality, as well as the strength and extent of land rights, have a significant impact on the current and long-term food and economic well-being of rural households. Alessandra (2013) shows also that women's empowerment in agriculture has become a frequently cited goal of rural development, aimed at reducing household vulnerability to poverty and food insecurity. It is considered an essential way to provide the most vulnerable households with the means to their livelihood strategies and food security.

When women have secure property rights, including rights in the land they cultivate, they gain improved status which leads to greater influence over household decisions. Such influence is significant because women are more likely than men to make decisions that improve the household's welfare, including decisions regarding food and nutrition needs (FAO, 2012a). In Nepal, research demonstrated that the likelihood that a child is severely underweight is reduced by half if the child's mother owns the land (Allendorf, 2007). Another study conducted in Central America found that in some countries, women with land rights are more likely to have control over household income (Katz and Chamorro, 2002). The conclusion of most of the studies is that access to land would strengthen women's economic status and give them the possibility to control the income and investment made in agriculture. This can reduce the vulnerability to food insecurity in households. As a result, the theme of our research is the effect of land ownership by women on household food security in Benin.

The State of Food Security and Nutrition in the World 2021 report estimates that 720 million to 811 million people faced hunger in 2020 – 161 million more than in 2019. Nearly 2.37 billion people lacked access to adequate food in 2020 – that's 320 million more people in just one year. Nearly 12% of the world's population (928 million people) was in a situation of severe food insecurity in 2020, i.e. 148 million more than in 2019. No region of the world was spared. Of the total number of undernourished people (768 million) in 2020, more than half (418 million) live in Asia, more than a third (282 million) in Africa and 8% (60 million) in Latin America and the Caribbean. All sub-regions of Africa, Latin America, and the Caribbean, and most sub-regions of Asia, show an increase in the prevalence of undernourishment in 2020 compared to 2019, with the highest increase being observed in West Africa. Globally and in every region, the prevalence of food insecurity is higher among women than among men (FAO, 2021).

This same State of Food Security and Nutrition in the World 2021 report highlights that the number of people affected by hunger in the world continued to increase during the year 2020, which was clouded by the COVID-19 pandemic. After remaining roughly stable from 2014 to 2019, the prevalence of undernourishment increased from 8.4% in 2019 to around 9.9% in 2020, making it more difficult to achieve the “hunger zero” goal by 2030. The estimate for 2020 ranges from 9.2 to 10.4%, depending on the assumptions made to take account of uncertainties. About one in five people (21% of the population) faced hunger in Africa in 2020, more than double that of any other region. This represents an increase of 3 percentage points in one year. Next come Latin America and the Caribbean (9.1%) and Asia (9.0%), with increases of 2.0 and 1.1 percentage points from 2019 to 2020. Compared to 2019, 46 million more people were affected by hunger in Africa in 2020, almost 57 million more in Asia, and around 14 million more in Latin America and the Caribbean. Globally, the gender gap in the prevalence of moderate to severe food insecurity widened further during the year of the COVID-19 pandemic, with food insecurity being 10% higher among women than among men in 2020, compared to 6% in 2019 (FAO, 2021).

In Benin, the agricultural sector is a strategic weight in the social and economic tissue of the country, in terms of contribution to job creation, income generation, and the creation of goods and services. More than 60% of the male workers and 36% of the female workers are involved in an agricultural profession. For example, in Benin, the agricultural sector occupies at least 70% of the labor force, contributes nearly 36% of GDP formation, and provides about 88% of Benin's export earnings (MAEP, 2018). However, production remains dominated by small farms with an estimated average area of 1.7

hectares on which an average of 7 people live. About 34% of farms cover less than one hectare. Only 5% of farms in the South and 20% in northern Benin cover more than 5 hectares. Of the 11 million hectares of gross land available, just under 60% are suitable for agriculture (MAEP, 2011). However, food insecurity is still a concern in Benin. The study on the Comprehensive Food Security and Vulnerability Analysis (AGVSA, 2017) showed that 10% of the population investigated were food insecure. About 74% of households in food insecurity belong to the poorest household groups in the population. They spend more than 65% of their budget on their food costs (AGVSA, 2017). Rural households are more affected by food insecurity (12% moderate and 1% severe) than urban households (7% moderate). There is slightly more food insecurity among female-headed households (12%) than their male counterparts (9%), especially in rural areas (AGVSA, 2017). The reasons that may explain why food insecurity is higher in female-headed households include low agricultural productivity, limited non-agricultural empowerment, discrimination in land ownership, and inadequate or poor access to agricultural inputs.

West Africa is the part of the continent where inequalities between men and women are among the strongest. Women, who represent 80% of the agricultural workforce, themselves estimated at 60% of the population, suffer inequalities and discrimination in their family, community, and economic life, particularly about access and control over productive resources (AU and FAO, 2018). Social norms and cultural barriers are slowing progress in access to land underway in West Africa. For the past two decades, governments, international development organizations, donors, and civil society through projects have intensively advocated for women's access to rural land in West Africa. On the ground, progress has been seen in many countries (Ghebru, 2019). However, research results have also shown that, although women can legally access land in some countries, the types of land they access are very often far away from their places of residence, their land is less fertile and less secure than land controlled by men, particularly in rural areas (Uchendu et al., 2022). As evidenced by the situation of women in times of inheritance, the plots of land that women obtain or inherit are often relatively more difficult to exploit compared to those of men. In sum, patriarchal land tenure, entrenched beliefs, and social and cultural norms prevent women from accessing secure land (Doghle et al., 2019).

Women represent 51.2% of the population in Benin according to the fourth General Population and Housing Census (RGPH4, 2013). According to the typology report in 2014 of the Enhanced Integrated Framework programs, approximately 56% of the female population lives in rural areas where living

conditions remain difficult. Yet, significant inequalities still exist and are in disfavour of women in the agriculture sector and especially in land ownership. Women mainly rent the land and those proposed to them are often of low quality, while land acquisition is 87% for men and 13% for women (Ghislaine, 2007). The government of Benin has understood this need for facilitating and safeguarding access to and use of land and strengthening women's economic empowerment in the agricultural and rural sector through the New Alliance for Food Security and Nutrition (Badiane and al., 2018). Several initiatives are being implemented with development partners to promote access to land ownership in rural Areas in Benin. Apart from this government policy with the agreement of the partners, there are laws established on the rights of land holdings in the National Assembly by deputies who also give the woman the right to access the land or to be heiress. But in practice, law enforcement is still a weakness. There is always marginalization concerning the texts, especially in rural areas (Quisumbing et al., 2003).

The existing gender inequality in access to and control over land and natural resources is an obstacle to the sustainable management of natural resources and socio-economic development. Land is one of the cornerstones of economic development on which farmers, pastoralists, and other communities base their livelihoods. Land is also a significant component of business assets, and this plays a significant role in business investment strategies. Thus, securing land rights can have a profound impact on food security and economic development. Land in rural areas is both a means of agricultural production, and livestock rearing and a place for gathering natural products that play an important role in local economies such as woodcutting, wild harvesting, grazing, fishing, hunting, etc. Furthermore, land is a source of identity and cultural heritage. An international comparison of agricultural census data shows that less than 20% of owners are women. The situation is particularly dramatic in West and Central Africa as well as in the Middle East and North Africa, where generally less than 10% of owners are women. In eastern and southern Africa and parts of Latin America, women seem to have slightly better access to land. In some countries, up to 30% of individual land titles are owned by women (FAO, 2011). Women have a central role to play in improving household food security because traditionally, they are producers, providers, and income earners for the well-being of their families. In Benin, however, farms are small and fragmented, productivity is low, and the country is highly dependent on grain imports. Women face severe discrimination in property rights and inheritance, which undermines their ability to participate effectively in programs focused on food security and nutrition development. In addition, women's ability to generate more production and therefore more

income has often been underestimated (AGVSA, 2017).

Land is an important source of security against food insecurity and poverty across the continent and developing world, and therefore unequal rights to land put women at a disadvantage, perpetuate poverty, and entrench gender inequality in Africa. Gender has become a critical issue in women's land rights because there is a direct relationship between accessing land resources, having secured land rights, achieved food security, and overcome poverty. In West Africa, women make up 80% of the agricultural labor force (AU and FAO, 2018). Therefore, improving women's access to and control over land is crucial to food security and socio-economic development in Africa, and particularly Benin. In this study, our research question is as follows: What is the effect of women's ownership of land on household food security in Benin?

Despite the existence of much work in the literature on agriculture and food security in Benin, the link between the dimensions of food security and land ownership is little discussed. In addition, there are few studies on the gender aspect. We can note research such as Dynamics of Female Entrepreneurship in Benin (Onibon, 2015) and analysis of the level of empowerment of women in agriculture in Benin (Doubogan, 2017). However, evidence on the link between women landowners and the dimensions of household food security is an area that has not been explored in the context of Benin. In addition, this research aims to determine the variables by which women landowners exert an influence on household food security in Benin, this goal is still absent in research in Benin. Thus, our research on the effect of women landowners on household food security is a research reference in our case study in Benin and in Africa. In doing so, the study will contribute to empirical literature in this domain. In addition, given the ampleness of the level of food insecurity among rural women and the gender inequalities related to land rights, it is urgent to conduct this research to inform public opinion in Benin and also in Africa on the benefits that would result from the rigorous consideration of women in agricultural strategies to combat food insecurity and improved conditions of the household in Benin and also in Africa considers the specifics of each country.

In addition, the study will provide information that could be useful to the work of the Government of Benin and its partners such as the World Food Programme (PAM) to facilitate the implementation and progress towards achieving SDG2 for the eradication of hunger, and the improvement of nutrition in Benin (PAM, 2018). The results of this study will show the importance of integrating women or not into development strategies and policies of agricultural income-generating activities to ensure household food security.

The objective of this research is therefore to analyze the effect of women's land ownership on household food security in Benin.

The remainder of this article is organized as follows. The second section proposes the conceptual framework of the study which traces the transmission mechanism of the effect of women landowners on household food security in Benin. The literature review is documented in the third section. The research methodology and database are described in the fourth section. The fifth section is devoted to the presentation of descriptive and econometric results. The discussion of the results is made in the sixth section. The conclusion and policy implications are presented in the last section.

2. The Conceptual Framework

Hunger has recently been the focus of the Benin government's agenda (PAM, 2018), so changes in agricultural production are expected to reduce the level of household food insecurity in Benin. The conceptual framework underlying this study is presented in the figure (Figure 1), which shows a process of schematic pathways through which land ownership by women would have a positive impact on food security index. The framework of this study assumes that the increased participation of landownership by women in agriculture could improve the status of household food security. As a woman who is the guarantor of the food security of her children and therefore of her household, she must have the agricultural inputs without difficulty, the most important of which is the land (Bob, 2002; Alessandra, 2013). This scheme shows three pathways that lead to an increase in household food production.

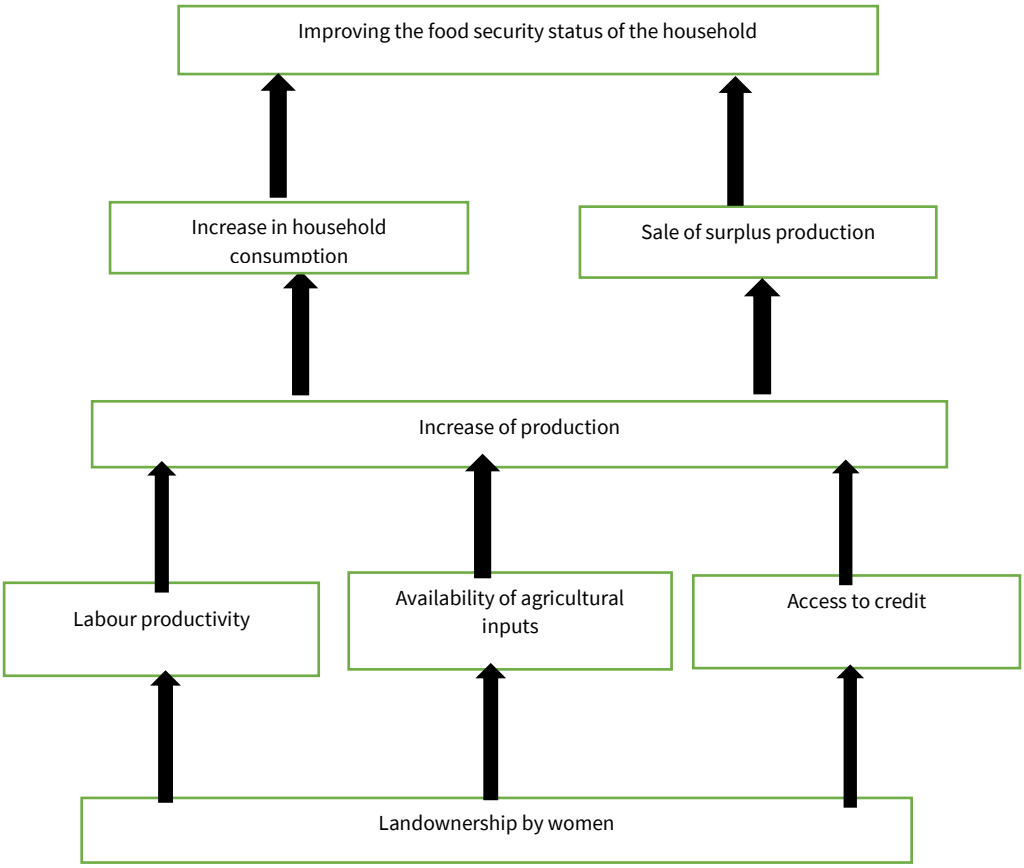
The first pathway forwards the idea that land ownership by women is positively correlated with increasing household output through increased labor productivity (Baiphethi et Jacobs, 2009). In this first pathway, landownership by women produce food for their household food consumption and it is assumed that household food production practices have the potential to directly improve the diversity and quality of food for the household all year round (Behrman, 1997; LaFave et Thomas, 2014). This increase in household food production has a direct and positive effect on household food consumption which has itself a positive effect on household food security.

The second pathway explains that land ownership by women increases household food production through intensive use of agricultural inputs such as seeds, fertilizers, irrigation, and the availability of a large area of land if possible, which is likely to increase household food production (Asitik et Abu, 2020; Wei et al., 2021).

The third pathway to increase household food production is access to credit through the availability of land, which is an important asset in the acquisition of loans. This path allows women landowners to obtain loans that they could invest mainly in agriculture through the acquisition of agricultural inputs and other agricultural goods to increase household food production.

Faced with this increase in production through this different pathway, women have two possibilities. One is to allocate part of household food production to ensure the food of the household, and the other possibility is to bring part of the household food production to the market for the sale of the agricultural surplus. This second possibility, which involves the sale of the agricultural surplus, leads to an increase in income and has an indirect and positive effect on household food consumption. The first possibility has a direct and positive effect on household food consumption. Landownership by women is also positively correlated with the diversity of household food consumption through income that can be generated by food sales in various markets that can be used to buy food and other non-food goods for the household (ActionAid International, 2011). In another era, with increased opportunities for access to and participation in markets, women in the agricultural household will instead specialize in the crops they can sell in markets and buy the food consumed by the household. This route is an indirect link between the increase in agricultural production and household food security. The main thing is the diversification of agricultural production through landownership by women in the resolution of the state of food insecurity of household.

<u>Figure 1</u>: Mechanism of transmission of the effect of landownership by women on household food security



3. Literature review

This section includes, on the one hand, definitions of key concepts related to our research theme, and, on the other hand, reviews the theoretical and empirical research conducted in connection with this theme.

Definition of concepts

Food security:

Food security is defined as a situation in which all people have sustainable physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002; Pinto et Rolo, 2015). Food security exists when all people have the physical, social, and economic opportunity always to obtain sufficient, safe, and nutritious food to meet their dietary needs and preferences for leading healthy and active lives[1]; formal definition of the concept of food security according to the Committee on World Food Security. This definition has been adopted by international consensus since the World Food Summit was held in Rome in 1996. Food security is traditionally considered to have four dimensions or "pillars": access (ability to produce one's food and therefore to have the means to make, or ability to buy food and therefore to have sufficient purchasing power to do so); availability (sufficient quantities of food, whether from domestic production, stocks, imports or subsidies); quality (of food and diets from the nutritional, health, but also social-cultural points of view) and stability (of access capacities and therefore of prices and purchasing power, availability and quality of foods and diets).

Food Security Index:

The Consolidated Food Security Indicator Approach (CARI) approach was developed by the World Food Programme to understand food security in all its dimensions. This approach allows food security indicators to be combined systematically and transparently to establish an explicit classification of households. The Food Security Index examines the fundamental issues of food accessibility, availability, quality, and security. It therefore combines this ensemble of food security indicators into a single indicator called the Food Security Index, which presents the overall status of the population's food security (AGVSA, 2017). The Food Security Index is therefore constructed from current food consumption (in our study this is the food consumption score); an

[1] Food and Agriculture Organization of the United Nations, The Conference voted Brunei Darussalam, Singapore and South Sudan to join. [archive]

indicator measuring economic vulnerability (i.e. the share of food expenditure) and the indicator of livelihood-based survival strategies (AGVSA, 2017). This composite (or synthetic) food security score combines proxy indicators of food security and takes into account the two key dimensions of food security and the livelihood-based survival strategy indicator: (i) short-term state, for which the food consumption score is the key indicator, (ii) long-term access whose adaptability is measured against the share of food expenditure (an indicator measuring economic vulnerability) and (iii) asset depletion, adaptation strategies and/or household asset base (the indicator of survival strategies based on livelihoods). Based on CARI, each household surveyed is classified according to a composite food security index (Food Security Index) in four (04) categories: food secure, marginally food secure, moderately food insecure, and severe food insecure.

Adepoju et al. (2015) researched the role of women in household food security in Nigeria. Their objective is to determine the factors that influence household food security. To be able to use a logit model, these authors separated the food security index into two groups, the group of food secure households which takes the value 0, and the group of food insecurity households which takes the value 1. In addition, Agada and Igbokwe (2016) analyzed the influence of food culture and practices on household food security in north-central Nigeria. They also assigned a probability of a value of 1 to food-secure households and a probability of a value of 0 to food-insecurity households to be able to use a logit regression model. To execute the switching regression model, the outcome variable must be either continuous, binary, or ordinal categorical interval. The food security index is neither continuous nor at intervals. It is categorical but not ordinal. It then provides us with the option of a binary outcome variable. To implement this switching regression model in our study with a non-ordinal categorical outcome variable, we also need to categorize households into two groups with the use of the switch_probit command in Stata which recommends that the treatment and outcome variables should be binary.

In our study, to obtain a binary variable, the outcome variable which is household food security index is thus classified into two (02) groups. Since the household food security index is already calculated in the database, we have just created a binary variable by putting in the first group of households identified as being food security and the second group of households in a state of food insecurity. The group of food-secure households is composed of strictly food-secure households and marginal food-secure households. The group of food insecurity households consists of households with moderate and severe food insecurity.

* Food secure: household able to meet essential food and non-food needs without resorting to atypical coping strategies (AGVSA, 2017).

* Marginally food secure: a household that has just adequate food consumption without resorting to irreversible coping strategies. The household cannot afford some essential non-food expenses (AGVSA, 2017).

* Moderately food insecure: a household that has poor food consumption; or that cannot meet its minimum food needs without resorting to irreversible coping strategies (AGVSA, 2017).

* Severe food insecure: a household that has a very deficient food consumption; or that experiences a very significant loss of its livelihood seating that will lead to significant deficits in its food consumption; or worse i.e. a household that experiences a very significant loss of its means of subsistence that will lead to very significant deficits in its food consumption (AGVSA, 2017).

Women landowners:

Women landowners include urban and rural women who own land in their households (AGVSA, 2017). They have the capacity and the skill to cultivate the land they have in their possession either individually, with their children, or by soliciting labor in case the area of the land is too large. They have the decision-making power and management over all the fruits from the agricultural production of their land according to Article 42 of Law No. 2017-15 which governs the Land and State Code in Benin. The types of crops produced include sorghum, maize, millet, cassava, beans/cowpeas, yams, vegetable crops (such as tomato, carrot, chili, and onion), rice, sesame, sweet potato, potato, groundnuts, plantain banana, voandzou/peas, okra, soybean, taro, pineapple, and other vegetables. However, women landowners tend to specialize in producing specific crops, including maize, sorghum, cassava, yam, millet, vegetable crops (like tomato, carrot, chili, and onion), groundnuts, and soybeans (AGVSA, 2017).

There is no information on the quality of land that women landowners own and how they own it. However, according to the Global Vulnerability and Food Security Analysis (AGVSA) survey, there are five modes of access to land. Indeed, the main modes of household access to land are: land ownership (by purchase, gift, or inheritance), family ownership, tenant of land, sharecropping, and borrowed land (AGVSA, 2017).

Land and State Code of Benin:

According to Art.4 of the Land and State Code of Law No. 2017-15, the land tenure regime in force in the Republic of Benin is that of the confirmation of land rights determined by provisions of Title III of this Code. It governs all rural, peri-urban and urban land and is based on an adversarial procedure for the

confirmation of land rights that leads to the issuance of a land title. This procedure for the confirmation of land rights focuses on in urban and peri-urban areas, the confirmation of rights based on documents of presumption of land ownership or a final justice decision, in rural areas, on the confirmation of rights from documents of presumption of land ownership, the register of beneficiaries of the rural land plan or a final justice decision. The land title is a document of proof of land ownership issued after an adversarial procedure of confirmation of land rights or at the end of the realization of a rural land plan. Land law is the set of rules applicable to property and its dismemberment as well as to the natural resources related to it when the object is the land. As for the right of use, it is the dismemberment of the right of ownership conferring on its holder the right to use land and to receive the fruits thereof within the limits of his needs and those of his family.

The property right confers on its holder the use, enjoyment, and free disposal of the property, which is the subject of the property right, in the most absolute manner if he does not make use of it prohibited by laws and regulations (Art.42).

Thus, in the light of the articles defined above, women landowners have decision-making power and management over all the fruits of agricultural production of their land (s).

Socio-cultural context related to access and control of land by women in the agricultural sector in Benin

According to the report of Bimonthly Information Bulletin of Regional Observatory of Rural Land in West Africa (ORFAO) produced in February 2022; in Benin, only 20 women out of 130 heirs counted during the field survey (i.e. 15.2%) are heirs and have access to land. The areas inherited by the latter are relatively smaller than those obtained by men. In addition, their inheritance is accompanied, in most cases, by restrictive measures on their rights such as the impossibility of transmission to descendants, or sale subject to conditions. To carry out their agricultural activities, women have access to land by usufruct (48.7%) and by rental (76.5%). Through these methods, they gain access to small plots of land, the size of which is between less than 0.25 and 2 ha, which they exploit in a certain land insecurity that does not allow them to adopt sustainable improvement techniques for their production. They are then content with low yields despite the multiple needs they have to satisfy.

This same ORFAO report (2022) reports that the lack of formalization of the land agreements concluded is more frequent among women than among men. This is also another cultural factor that does not secure women's rights because it exposes them to potential challenges in the transactions in which

they are involved. Apart from social and cultural factors, the poverty of women is a handicap for their access to land through purchase, which gives the owner control over the property he has acquired. This explains why this mode remains the almost exclusive prerogative of men, as indicated by the statistical data in all countries. The processes for resolving land disputes, which are unfavorable (as far as customary authorities are concerned, which refer to unequal customs for women) or inaccessible (as far as state authorities are concerned), also have a share of responsibility for men's and women's unequal access to land. Rural women do not often go to justice for fear of being frowned upon by their society. When they have to deal with a third party, they resort to their husbands who settle the problem amicably or often advise them to drop all proceedings.

Theoretical review

The economic theory of property rights is a branch of economic analysis of law concerned with the economic consequences of property rights. This theory was formed when the need to question the effect of forms of ownership, and more generally of institutional forms, on the functioning of the economy arose. It was constructed to show the superiority of private property systems over all forms of collective property. In the context of an economic study of property rights, the relevant definition may be significantly different from the legal definition in force in the given economic, legal, and social system. Hart and Moore (1990) thus emphasize that the theory of property rights can be presented as a general theory of social relations and institutions. On a legal basis, we can say that property rights are defined based on three attributes: the right to use this asset (usus); the right to earn income (fructus); and the right to definitively transfer it to a third party (abusus). To more precisely define property rights, we must focus on two dimensions, the right to residual yield and the right to control. Indeed, holding the property right over an asset means holding the right to the residual yield resulting from production or, in other words, benefiting from the profit. The person entitled to this return is, in the case of firm analysis, the owner of the company. But there is also the right to residual control the right to make all decisions concerning the use of the asset with the sole limit of legal or contractual specifications.

Certainly, notions of property rights were sometimes mentioned in the economic literature before Coase's (1960) article, “The Problem of Social Costs.” Thus, insightful economists have suggested that property rights come in different forms, which can influence outcomes. Much of the early work on property rights focused on identifying differences in the outcomes—that is, the allocation efficiency—of alternative systems of property rights. This literature also addresses the emergence and transformation of property rights (Demsetz, 1967), the connectivity of property rights in systems (Alchian, 1965), and their

links with law, norms, and customs (Demsetz, 1964). By the late 1960s, it would be justified to consider “property rights economics” as a demonstrably successful approach. Thus, in a 1972 review article, Furubotn and Pejovich stated that “property rights analysis offers a new and useful way of approaching economic problems. Substantial progress has already been made, and the literature testifies to continued vitality and the promise of future achievements.

Older literature on property rights generally defines property rights as the right to exercise choices over productive resources and to retain income derived from their use (Alchian, 1965). In other words, at the heart of the economic notion of property rights is effective control (Barzel, 1997). For example, Demsetz (1967) places much emphasis on the rights of exclusion and alienation as relevant criteria of private property in their work on property rights systems. In this work, owners are the individuals who can exercise these rights (Demsetz, 1967). However, it is interesting to note that these authors change their understanding of ownership when they analyze business organization and corporate governance, where owners are defined as those individuals possessing control rights or rights to residual income.

Coase (1960) explicitly discusses land as a factor of production. He emphasizes that a landowner's rights are not unlimited. It is not always possible for him to even move the land to another location. For example, by wearing it, and even if he can exclude certain people from the use of “his” land, this may not be the case for others. For example, certain people may have the right to cross the territory. Additionally, it may or may not be possible to erect certain types of buildings, grow certain crops, or use drainage systems on the land. This doesn't just happen because of government regulation. This would also be true under common law. This would be true in any system of law. A system in which the rights of individuals were unlimited would be a system in which there would be no rights to acquire.

The understanding of property rights has evolved since Coase (1960). For example, Demsetz (1964) and Alchian (1965) went beyond Coase's (1960) emphasis on use rights, defining property rights as the right of individuals to use, derive income from, and alienate assets, a definition corresponding to the partition of Roman law between usus, fructus, and abusus, respectively. The relationship with property law was also debated. It has become increasingly common that property rights can be meaningfully analyzed separately from legal considerations, so some scholars speak of "economic rights", e.g. Barzel (1997). Some scholars have argued that property rights can exist in the absence of the state, that is, under completely anarchic conditions (Bush and Mayer, 1974; Umbeck, 1981). Physical force or strong social norms can guarantee de

facto control over the uses and revenues of a resource. Finally, property rights theorists have argued that, from an economic perspective, property rights can be understood in terms of value and that agents seek to maximize the value of the control they hold over assets.

North (1990) establishes a close link between the notions of secure property rights and credible commitment. Property rights are said to be guaranteed when the State can make a credible commitment to respect them. The settlement associated with the Glorious Revolution is an example of a historical event that created the conditions conducive to the emergence of social and political trust, thus making credible engagement possible. In broader political terms, a credible commitment is a promise by the sovereign to exercise its powers by predetermined rules or rules developed by the parties as they reach an agreement to meet their respective interests. In this sense, a credible commitment can be considered equivalent to the notions of constitutionalism or the rule of law. According to North (1990), the essence of property is the right to exclude. This notion has been criticized as legalistic and oblivious to the fact that property rights are social relations. Congost (2003) and other scholars argue that North's legalistic notion of property excludes a broader analysis of property rights from a socio-economic perspective, such as social inequality and income distribution.

Some observers question North's emphasis on the impact of the Glorious Revolution on property rights. Indeed, long before the Glorious Revolution, the notion of property was invoked in England to distinguish the rights of kings from those of individuals. McCloskey (2010) notes that property rights have been respected in England for many centuries, dating back to the Magna Carta of 1215. Although most critics agree that the Glorious Revolution brought greater security to some owners, such as state creditors, not all forms of property were equally secure. Indeed, as noted by Daunton (2010), North's argument about the security of property rights does not take into account the massive transfer of land in Scotland from clans to powerful landowners, the displacement of Irish landowners by English settlers, or the restricted rights of peasants in England. Although land ownership rights are generally protected against third-party or government interference, land has been expropriated for a variety of purposes, mainly related to public utility projects such as canals, docks, and water systems water supply.

Empirical review

Women make essential contributions to agriculture and rural livelihoods. While their access to productive resources, such as land and capital, is often constrained, yet women play a large role in food crop production (Chapoto et al., 2011). Women are restricted in their access to productive resources such as land, agricultural inputs, and extension services. Particularly land, a major input in agricultural production, is disproportionately controlled by men in all regions of the world (Carmen et Magdalena, 2003; Quisumbing et al., 2003). Abrahamsson (2013) shows that in Zambia the difference between men and women in access to land is structural and is the result of unequal access to resources, which have given men more power and influence. There are significant gender gaps in ownership of assets, especially about land, its control, and decision-making about its use (FOWODE, 2012). Women farmers cannot easily access land because of the costs involved, cultural norms, and overlapping land rights (FOWODE, 2012). Women-headed households have low levels of cultivatable land compared to men-headed households (FOWODE, 2012; Hill et Vigneri, 2014). Land tenure insecurity is widespread for women, as men tend to own the land and exclude widows from ownership (Alinyo and Leahy, 2012; FOWODE, 2012).

In rural communities in developing countries, land is the secure source of income for the poor (Osabuahien, 2014), as they can use it for agricultural activities, rent it, or sell it. These implications initially have positive impacts on the agricultural incomes of agricultural households, which can translate into increased food expenditure and food security. Undoubtedly, the promotion of women's access and control over land is closely associated with a better state of food security (Agarwal, 1997; Seymour, 2017). When women have secure land rights, they use land more efficiently and agricultural investments increase. They become more willing to adopt new agricultural technologies (Seymour, 2017). Furthermore, women are just as productive as men in agriculture when they both have access to the same level of resources (Peterman et al., 2011; Croppenstedt et al., 2013). About 80 percent of the world's food is produced by small-scale agriculture. Women make up an average of 43% of this agricultural labor force in developing countries, they are in the majority in some countries (Oxfam International, 2022). Yet, when it comes to agricultural inputs and services, the share going to women is meager. In this context, women are often found concentrated in subsistence agriculture and unpaid farmwork and excluded from more lucrative agricultural opportunities such as cash crop production. Men-headed households hold more than twice the size of women-headed households' land. Even when women-headed households have land, their level of asset depletion through

sales is much higher than men-headed households', because women-headed households lack viable income to meet their basic needs and resort to selling land (FOWODE, 2012).

Savath et al. (2014) observe the importance of land as an essential asset for rural livelihoods and nutritional security because of its importance in paving the way for the well-being of the households. In Nicaragua and Honduras, Katz and Chamorro (2002), found that families spend more on food when the women of the house own land. A study in Ghana showed that when women own a larger share of the household's farmland, families allocate a larger proportion of their household budget to food (Doss, 2006). Furthermore, when women own land, their food purchasing decisions are likely to benefit the household's food security and their children's nutritional status (World Bank et al., 2008). Santos et al. (2014) indicate that land rights have a direct link to the increasing food production and food security of households. Empowering rural women to produce more food for local consumption and local markets is believed to be the best path to reducing household vulnerability to poverty and food insecurity by increasing agricultural incomes and food availability (Baiphethi and Jacobs, 2009). This argument has been advanced because women play key roles in the achievement of all 4 pillars of food security in rural areas, as producers of food, income earners, and caretakers of household food and nutrition security (Bob, 2002; Alessandra, 2013). By empowering women in agriculture, rural households can have sustainable ways of feeding themselves and get income from selling the surplus produced, thereby becoming less vulnerable to both poverty and food insecurity (ActionAid International, 2011). Women's 'empowerment in agriculture' is one of the most important dimensions of empowerment for rural women as rural households are largely dependent on agriculture for their livelihoods which, in turn, is crucial for reducing household vulnerability to food insecurity (Sraboni et al., 2014; Sharaunga et al., 2015).

In Bangladesh, accounting for potential endogeneity of empowerment, Sraboni et al. (2014) found that increased female empowerment in agriculture is positively associated with calorie availability and dietary diversity at the household level. They point out that forms of agriculture that are more favorable to women are more favorable to food security at the household level. A preliminary study of a land purchase program in the Indian state of Andhra Pradesh, which provided beneficiaries with plots of land of up to one acre, found that beneficiary households experienced significantly higher levels of food security: 76% of beneficiary households reported having two meals a day, compared to only 50-57% of non-beneficiary households (Prosterman et al., 2009). In Kipushi, Arsène et al. (2015) showed that more men, or 34% access

land by inheritance, while most women, or 47.8% access it by a donation from the village chief. Data analyzed by the OECD Development Centre show that countries where women lack rights or opportunities to own land have on average 60% more malnourished children than countries where women have some or equal access to land (OECD, 2012). Women's land rights are found to promote development by empowering women, increasing productivity, and improving welfare (Allendorf, 2007).

Moreover, studies have found that increases in female landholdings are associated with increases in household food expenditure (Katz and Chamorro, 2002). When women own land, their children are less likely to be severely underweight (Allendorf, 2007). There is a positive relationship between the number of assets, including land, which a woman possesses at the time of marriage and the share of household expenditures devoted to food (Quisumbing and Maluccio, 2003). Abebaw et al. (2010) using a propensity score matching method to control for differences before the intervention, examined the impact on household dietary calorie intake of an integrated food security program (IFSP), which had been implemented in northwestern Ethiopia by two non-governmental organizations. The estimated results provide evidence that IFSP has a positive and statistically significant effect on dietary calorie intake. In particular, the IFSP increased physical dietary caloric intake by 30% among beneficiary households. However, we also found that the IFSP has a different impact depending on family size, land ownership, and gender of the household head. Asitik and Abu (2020) used extended probit regression with endogenous treatment to account for potential endogeneity of empowerment and food security and found that when women have access to cultivable land, their households have fewer chances of having severe or moderate hunger. Empirical analysis indicates that women's access to legal and family rights in households increases their bargaining power over resource use and food choices, which significantly and negatively reduces their food insecurity (Wei et al., 2021).

Sharaunga et al. (2015) used the Household Food Insecurity Access Scale (HFIAS) to identify the food security status of 300 primary female-headed households in Msinga, South Africa. Finally, the Ordered Logit model was used to identify the dimensions of women's empowerment that influenced their household food security status. It was found that households headed by women with higher levels of economic agency, and physical capital empowerment (including the land) were more likely to be food security. They have found also that women's empowerment in agriculture reduces the likelihood that their households will be vulnerable to food uncertainty. Harris-Fry et al. (2015) use multinomial logistic regression to measure the relationship

between selected determinants of household food security and months of adequate household food provisioning. Among the determinants found are landownership, and women's literacy, all significantly reduced the risk of food insecurity. Furthermore, Tossou and Igue (2022) analyzed the effect of women's agricultural empowerment on the household food security index in Benin. Their results showed that the women's agricultural empowerment index, including the land they own is positively correlated with the household food security index. Thus, the likelihood of a household being food secure increases when women's empowerment in agriculture increases. Women's agricultural empowerment increases the household food security index by 3.97 percentage points. Their results also revealed that the level of education of women and the area of sown land increase the household food security index. On the other hand, Harris-Fry et al. (2020) showed that women's share of land owned did not increase the percentage of household budget spent on food.

Given the above literature, a study is carried out on the effect of women's agricultural empowerment on household food security in Benin. Land is one of the agricultural assets included in the agricultural empowerment of women. In addition, access and appropriation of land by women in rural areas in Benin still constitutes a challenge to be met to this day. In addition, the majority of people experiencing food insecurity in Benin are rural women. Thus, the contribution of this current study is that it considers land as the essential and main asset to make women autonomous in rural areas. This explains this study which focuses on the effect of women landowners on household food security in Benin, which justifies the contribution and importance of this study. This article also provides information on the factors that significantly influence women's land ownership and household food security in Benin.

4. Research Methodology and Database

This section presents the database used in the estimates, the research methodology, and the definition of the variables used in this research.

The database

The data used come from the global analysis of vulnerability and food security (AGVSA) survey organized in July-August 2017 by the National Institute of Statistics of Benin in collaboration with the World Food Programme. It is a nationally representative survey at the departmental and residential levels. The number of households that were surveyed amounted to 14,952, of which 3,020 were female-headed households and 11,932 were male-headed households.

The survey collected information on household's demography characteristics, food consumption, agriculture and livestock, shocks, and household survival strategies. Section 7 of the questionnaire focuses on questions related to agriculture, specifically the questions about whether the household practiced subsistence farming or gardening during the last crop year 2016, and whether the women in the household owned their parcel of land. For this study, we will restrict the sample to the households that practiced agriculture during the last crop year 2016. About 6,502 households practiced agriculture during the last campaign before the survey. We focus on farm households where women in the household own land (1,366) and those in which household women are not (5,136). About 21% (1,366) of farm households had women owning land.

Theoretical framework for analysis

According to neoclassical theory, women own land if the land provides them with net economic benefits (Scherr, 2000; Kabunga, 2012). Thus, the analysis of women's land ownership is based on the principle of rationality of economic agents and particularly the hypothesis of maximizing utility. Otherwise, following the work of Kemeze et al. (2018), women's land adoption can be analyzed as part of the utility maximization theory. The rational behavior of the woman farmer leads her to own land that gives her more utility. Let U_{i1} be the utility derived from landownership and U_{i0} the utility that derives from non-landownership. The difference in utility between landownership and non-landownership is noted U_i. The woman in the household *i* will decide to be a landowner when it gives her greater utility than in the case of non-landownership. Mathematically, we will have:

$$U_i = U_{i1} - U_{i0} > 0 \qquad (1)$$

Since its utilities are not observable, this preference of choice of the women of a household can be represented by the latent variable A_i* for landownership:

$$A_i^* = \partial Z_i + \mu_i \quad (2)$$

$$A_i = \begin{cases} 1 & si \quad A_i* > 0 \\ 0 & si \quad A_i* < 0 \end{cases}$$

With A_i the landownership variable that takes the value 1 for land adopters and 0 for land non-adopter women, Z_i is a vector of characteristics of women of household supposed to influence the decision of landownership by women and μ_i the term error.

The outcome variable (household food security index) is considered a linear function of the binary variable of women's participation in landownership with the other explanatory variables.

The model of the impact of land ownership by women on household food security index is presented as follows:

$$Y_i = \delta_1 X_i + \delta_2 A_i + \varepsilon_i \quad (3)$$

With Y_i the household food security index i, $\boldsymbol{X_i}$ are the explanatory variables, δ_i are the parameters to be estimated, $\boldsymbol{\varepsilon}$ the error term.

Also, for the achievement of our results, we use endogeneous switching regression (ESR), because of the selection bias due to unobservable characteristics.

Method of analysis

To analyze the effect of landownership by women on household food security, we draw on the work of Ahimbisibwe et al. (2020) who used endogenous switching regression (ESR) to analyze the impact of an agricultural innovation platform on household well-being in Uganda. The advantage of ESR is that it simultaneously estimates the probability of ownership and its impact on food security. The ESR model consists of one treatment selection equation and two separate outcome equations for the outcome variable of interest that are conditional on the selection criterion.

The treatment selection equation is defined by a probit model. In our study, the ESR model consists of a probit model for both landownerships by women and household food security index. The type of treatment to be evaluated in our research is likely to be endogenous as it could be influenced by observable factors. Indeed, land ownership is voluntary and could depend on the decision of the women themselves. The choice to own an area of land regardless of the mode of access may not be random. Problems of selectivity can arise because a woman's choice to buy a certain area of land for example can be guided by unobserved factors. For example, a woman may own land by inheritance, gift,

or purchase according to certain criteria (eligibility) or unobserved factors. A woman's choice to own land in any way may also be guided by her motivation or ability to manage or her skill to cultivate the land, which is not observed. In such cases, these unobservable factors are also correlated with the household food security index. The resulting potential endogeneity can therefore bias coefficients estimated by Ordinary Least Squares if these endogeneity problems are ignored. We will nevertheless present the results of the propensity score matching method and the endogenous switching model for the comparison of results in the treatment of endogeneity. What motivates the use of endogenous switching regression (ESR) is that it allows for unbiased estimates. This model makes it possible to control for selection bias due to observable and non-observable factors (Lokshin et Sajaia, 2004; Asfaw et al., 2012). Thus, to obtain consistent estimators, our study also used the estimation by endogenous switching regression (ESR).

The endogenous switching regression involves separate estimates for the two groups of women: women landowners and women non-landowners. Therefore, landownership becomes the selection criterion indicating the regime (landowner or non-landowner) to which women belong. The pattern of participation in landownership is defined by equation (2).

Following this equation, the food security index of households is observed for both groups of women (Maddala, 1983; Asfaw *et al.,* 2012):

Regime 1: $Y_{1i} = \alpha_1 X_{1i} + \nu_{1i}$ (Participants) (4)

Regime 2: $Y_{2i} = \alpha_2 X_{2i} + \nu_{2i}$ (Non participants) (5)

Where Y_i is the household food security index i, X_i a vector of exogenous variables and ν_i is the term of random disturbance for each group.

Unobserved variables affecting the probability of landownership by women could also affect the household food security index so that the error terms in Equation (2) and Equations (4) and (5) can be correlated. To account for this, equations (2), (4), and (5) were estimated simultaneously using the maximum likelihood (ML) method. Indeed, Lokshin and Sajaia (2011) describe the switch_probit command, which implements the maximum method to fit the model of the binary choice with binary endogenous regressors. In addition, these approaches require potentially cumbersome adjustments to derive consistent standard errors. The switch_probit command, on the other hand, implements the full information ML method to simultaneously estimate the binary selection and the binary outcome parts of the model to yield consistent standard errors of the estimates. This approach relies on an assumption of joint

normality of the error terms in the selection and outcome equations. This technique remains an effective approach and also derives the average treatment effects: the average effects of treatment on the treated and the untreated and the marginal treatment effects.

The ESR model can be used to compare the expected outcomes of women landownership participants (a) and non-participants (b), as well as the expected outcomes in terms of household food security status in the case of counterfactuals (c) that beneficiaries have not adopted and (d) that non-beneficiaries have adopted (Di Falco et al., 2011). These measures are essential to explain the differences in household food security status outcomes between the two groups of women.

***Table 1:* Conditional Results, treatment, and heterogeneity effects**

Subgroups	**Decision**		**Treatment effects**
	Participants	**Non-participants**	
Participants	(a) E ($y_{1i}|Zi$ = 1)	(c) E ($y_{2i}|Zi$ = 1)	TT
Non participants	(d) E ($y_{1i}|Zi$ = 0)	(b) E ($y_{2i}|Z_i$ = 0)	TU
Heterogeneity effects	BH_1	BH_2	TH

Note: (a) and (b) represent the observed outcomes of household food security index; (c) and (d) represent the expected outcomes of household food security index of the counterfactual.

TT: Effect of treatment on the treated;

TU: Effect of treatment on the untreated;

BH_1: Basic heterogeneity effect for participants;

BH_2: Basic heterogeneity effect for non-participants;

TH: Transient heterogeneity effect.

The effect of treatment on the treatment group (TT) is expressed in equation (6) as the difference between cases (a) and (c):

$$TT = (y_{1i}|Z_i = 1) - (y_{2i}|Z_i = 1) \quad (6)$$

Similarly, the effect of treatment on the untreated is defined as follows:

$$TU = (y_{1i}|Z_i = 0) - (y_{2i}|Z_i = 0) \quad (7)$$

The study differentiates between treatment effects and the effects of baseline heterogeneity. The basic heterogeneity effect is expressed by equation (8) women who have adopted land. This represents the difference between cases (a) and (d):

$BH_1 = (y_{1i}|Z_i = 1) - E\ (y_{1i}|Z_i = 0)$ (8)

For non-participants, the basic heterogeneity effect can be expressed as the difference between cases (c) and (b):

$BH_2 = (y_{2i}|Z_i = 1) - E\ (y_{2i}|Z_i = 0)$ (9)

Finally, the effect of transitory heterogeneity is calculated (equation 10). This makes it possible to determine whether the impact of land ownership by women is more or less important for adopters of land and non-adopters of land compared to the counterfactual scenario.

$TH = TT - TU$ (10)

Women's agricultural empowerment and definition of study variables

The importance of women's land rights is critical to sustainable development. Women's land rights can empower women and benefit family food well-being. The agricultural empowerment argument argues that women's land rights are important because they will empower women (Malhotra and Schuler, 2002). Sources of agricultural empowerment are agricultural assets available to women that improve their household food security. Based on this understanding of agricultural empowerment, land ownership should act as a source of agricultural empowerment by increasing household food security (Agarwal, 1997; Haddad et al., 1998). One of the avenues through which women can enjoy agricultural empowerment is through land rights. Land is one of the essential assets for sustainable and efficient agriculture. Thus, land ownership by women is integral to their agricultural empowerment to ensure household food security. In addition, women's agricultural empowerment must also include agricultural equipment and inputs to take full advantage of the effect of this agricultural empowerment on household food security.

Since women in rural areas largely depend on agriculture for their livelihoods (Oxfam International, 2022), household vulnerability to food insecurity is greatly influenced by their level of empowerment in agriculture. Given the crucial role of women in food security and their contribution to it, any effort to reduce food insecurity in the world must consider the factors and constraints that affect women's ability to fulfill these roles and make these contributions toward removing constraints and building women's capacities. Some households may remain food insecure regardless of their access to, for example, irrigation because there are other correlates of household vulnerability to food insecurity including family size, lack of education,

training, and improvement in the use of inputs. These must also be to have a deep and lasting impact on food insecurity.

Therefore, the descriptions of the variables believed to influence food security and included in the empirical model are given in Table 1.

These variables include agricultural forms of female empowerment and other socio-economic characteristics of households. The socio-economic characteristics of the household that are likely to influence food security include household size, age of the woman in the household, level of education, and place of residence (Albert et al., 2004). Adepoju et al. (2015) found that household size and education influence household food security. Older female farmers would have gained experience, accumulated capital, land availability, or large family size. Tossou and Igue (2022) also found that the level of education of women and the area of cultivated land increased the household food security index.

The dimensions of women's empowerment in agriculture also include the practice of irrigation and the use of agricultural inputs that affect agricultural production. All these dimensions of women's agricultural empowerment influence sustainable agricultural productivity and reduce food insecurity (Quisumbing et al., 2001; Tossou and Igue, 2022). As a result, seeds, organic fertilizers, chemical fertilizers, herbicides, and insecticides are considered in our study agricultural inputs likely to increase agricultural production and thus reduce household food insecurity. All these assets of women's agricultural empowerment influence sustainable agricultural productivity. It should be remembered that an index linked to the agricultural empowerment of women has been calculated. The index calculated refers to the use of agricultural input by the woman in the household and the practice of irrigation. All these variables related to the use of different agricultural inputs and irrigation practices are binary.

The role of access to credit in household food security should also be examined. One of the main obstacles faced by women in the agricultural sector is the lack of access to credit for short-term working capital and medium-term capital investment. The majority of women farmers have low purchasing power, and this affects the continued use of agricultural inputs and the purchase of agricultural equipment. It has been hypothesized that women's access to and control of physical/material assets are negatively associated with the likelihood that a household will become vulnerable to food insecurity because these assets are essential for the pursuit of sustainable agricultural and off-farm livelihood strategies. These assets include ownership and control of land and areas of sown land (Uphoff, 2003). The areas of sown land are thus

considered agricultural assets and used among our explanatory variables (Tossou and Igue, 2022).

The variable used as an instrument reflects the housing status of the household or the type of home inhabited by the household. The housing status of the household takes two forms: family property and owner. The housing status of the household is a binary variable that takes the value 1 for the “owner” status and 0 for the “family property” status. Thus, some women live with their husbands on family property. Other women, on the other hand, live in houses owned by their husbands. Therefore, we hypothesize that this variable could influence women's decision to own land (relevance criterion) but is unlikely to have a direct effect on the household food security index (exogeneity criterion). Moreover, the fact that the woman in the household knows that she lives in a house where her husband owns or in a family property does not directly influence the household food security index. Such a woman’s household with this knowledge may not decide to own land for agricultural purposes in the household. This is what explains why it is not enough to know the state of your home to start exploiting it. In short, the status of the dwelling place of a woman in the household can influence her to become a landowner but does not directly influence the household food security index. The exogeneity hypothesis states that the instrument will only indirectly affect the food security index through its effect on the probability of owning land. Although this hypothesis cannot generally be tested, we can argue that the selected instruments can be considered exogenous.

We present the description of the variables that are used in this research in Table 2.

Table 2: Description of the variables

Variables and description	**Unit**
The variable dependent	
The food security index combines an ensemble of food security indicators into a single indicator called the Food Security Index, which presents the overall status of the population's food security.	0= Food insecurity and 1= Food security
The treatment variable	
Women landowners: women who own their own plots of land in the household	0=No and 1=Yes
The explanatory or control variables	
Age: the age of the head of household	Years

Education level: the level of education of the woman in the household	0=Unschooled, 1=Primary and 2= At least Secondary
The place of residence	0=Urban and 1=Rural
Household size: the number of members in the household	Number of persons
Areas of land sown: the superficies / size of land cultivated	0= Less than 1 hectare 1= 1 hectare to less than 2 hectares and 2=2 hectares and more
Agricultural empowerment index: use of agricultural input and irrigation practice	Agricultural Empowerment Index value
Access to credit: Has your household borrowed (in cash or in-kind) in the last 12 months?	0=No and 1=Yes
Instrumental variables	
The occupancy status of the dwelling	0=No and 1=Yes

Source: Household survey, AGVSA (2017).

5. Results

We present the results of descriptive statistics and the effect of women's land ownership on household food security in Benin using different estimation approaches.

Descriptive statistics

The results of the descriptive statistics are presented in Table 3. The proportion of women who own their plots of land is on average 21%. More than half of households (88%) are food secure. However, there are disparities between households, as shown by the standard deviation of 0.33. Indeed, on average, 41.4% of households are food secure; 46.43% are marginally food secure; 11.18% in moderate food insecurity, and 1% in severe food insecurity. The women in the households were on average around 46 years old. The minimum age is 16 years, and the maximum age is 100 years. On average, most women in households had no level of formal education (71%); 18% have a primary level and 11% have at least a secondary level. The majority of women live in rural areas (74%). The average household size was approximately 8. On average, 18% of women have an area of sown land measuring less than one hectare and 21% of women have an area of sown land measuring one hectare to less than two hectares. More than half of women (61%) have an area of sown land measuring 2 hectares or more on average. The agricultural empowerment index shows that women in the household own on average two agricultural assets among five agricultural inputs and irrigation. Some have up to 6 agricultural assets (five agricultural inputs and irrigation). Other women, on the other hand, do not have any agricultural assets. The agricultural inputs used are organic fertilizers, chemical fertilizers, herbicides, improved seeds, and insecticides. The housing status of the women in the household shows that the majority of women (58%) on average live with their husbands where they own the property. On average, only 30% of women have access to credit.

Table 3: Descriptive statistics

Variables	Average/Proportion	Stat Dev	Minimum	Maximum
Landownership by women	0.21	0.41	0	1
Food Security Index	0.88	0.33	0	1
Age	46.47	14.12	16	100
Education level (Unschooled)	0.71	0.46	0	1
Education level (Primary)	0.18	0.39	0	1
Education level (At least Secondary)	0.11	0.31	0	1
Place of residence	0.74	0.44	0	1
Household size	8.22	5.14	0	86
Land size cultivated (Less than 1 hectare)	0.18	0.39	0	1
Land size cultivated (1 hectare to less than 2 hectares)	0.21	0.41	0	1
Land size cultivated (2 hectares and more)	0.61	0.49	0	1
Agricultural empowerment index	1.69	1.33	0	6
Status of the dwelling place	0.58	0.49	0	1
Access to credit	0.30	0.46	0	1

Source: Using data from AGVSA (2017).

Significant differences between land-owning women and non-land-owning women are revealed using the mean difference test and are presented in Table 4. On average, land-owning women are more food secure (63%) than women who do not own land (57.4%). Also, on average, women who own land are slightly more rural (74.7%), have a larger household size (8.668), and are older (47.915) than women who do not own land (74%), (8.095) and (46.080) respectively. The agricultural empowerment index for women who own land is higher (22.4%) on average than for women who do not own land (17%). There are more out-of-school women among landowners (22.2%) than non-landowners (18.2%). However, it should also be noted that women who do not own land have higher levels of "primary" (19%) and "at least secondary" (11.3%) education than women who own land (16.3%) and (9%) respectively. They have more access to credit (32.1%) and live in homes with owner status (22.3%) than women who do not own land (29.7%) and (18.9%) respectively. They hold more land areas measuring "2 hectares and more" (63.5%) than women who do not own land (60.1%). On the other hand, women who do not own land have more land areas measuring "Less than one hectare" (21.3%) and

"1 hectare to less than 2 hectares" (21.5%) than women who own land (19.8%) and (19.3%) respectively.

Table 4 : Descriptive statistics

Variables	All sample (6502)		Sample in which women own land (1366)		Sample in which women do not own of land (5136)		Mean-comparison test t-test
	Mean	SD	Mean	SD	Mean	SD	
Landownership by women	0.21	0.41	-	-	-	-	
Food Security Index	0.586	0.493	0.63	0.483	0.574	0.494	-0.055***
Age	46.466	14.119	47.915	13.760	46.080	14.189	-1.835***
Education level (Unschooled)	0.21	0.407	0.222	0.415	0.182	0.386	-0.040***
Education level (Primary)	0.185	0.388	0.163	0.37	0.190	0.393	0.027**
Education level (At least Secondary)	0.109	0.311	0.090	0.287	0.113	0.317	0.023***
Place of residence	0.741	0.438	0.747	0.435	0.740	0.439	-0.007
Household size	8.216	5.138	8.668	5.184	8.095	5.120	-0.572***
Land size cultivated (Less than 1 hectare)	0.210	0.407	0.198	0.399	0.213	0.409	0.015
Land size cultivated (1 hectare to less than 2 hectares)	0.210	0.407	0.193	0.395	0.215	0.411	0.021*
Land size cultivated (2 hectares (ha) and more)	0.608	0.488	0.635	0.481	0.601	0.490	-0.035***
Agricultural empowerment index	0.210	0.407	0.224	0.417	0.170	0.376	-0.053***
Status of the dwelling	0.210	0.407	0.223	0.416	0.189	0.391	0.034***
Access to credit	0.301	0.459	0.321	0.467	0.297	0.456	-0.025**

Source: Using data from AGVSA (2017).

Significant mean differences are indicated with *** p<0.01, ** p<0.05, * p<0.10.

Results estimated by the propensity score matching method

The results of the effect of women's land ownership on household food security by the propensity score matching method are presented in Tables 5 and 6.

The average treatment effect of female landowners on the household food security index is presented in Table 5. The result of this table shows that the coefficient of women landownership is significant and positive on the household food security index. Women's land ownership increases the household food security index by 5.8%.

Table 5 : Impact of women's land ownership on household food security using the propensity score matching method

Propensity-Score Matching		
Household food security index	Coefficient	Standard errors
Average treatment effect (Women landowners)	0.058***	0.02
Observations	6 502	

Source: Using data from AGVSA (2017).

Note: Significance level is indicated with *** p<0.01, ** p<0.05, * p<0.10.

The explanatory factors of women's land ownership are revealed in Table 6. The results reveal that variables such as "primary" and "at least secondary" education levels are significant and negative on women's land ownership. However, age, household size, agricultural empowerment index, and access to credit are significant and positive on women's land ownership.

Table 6 : Effect of landownership by women on household food security using the propensity score matching method.

Landownership by women	**Coefficient**	**Robust standard errors**
Age	0.0044***	0.0013
Education level (Unschooled) : Reference		
(Primary)	-0.095**	0.048
(At least Secondary)	-0.122**	0.061
Place of residence	0.0070	0.041
Household size	0.0073**	0.0035
Land size cultivated (Less than 1 hectare): Reference		
(1 hectare to less than 2 hectares)	-0.0390	0.0577

(2 hectares and more)	-0.0009	0.0500
Agricultural empowerment index	0.177***	0.0428
Access to credit	0.0714**	0.0383
Constant	-1.291***	0.0903
Observations: 6.502		
Log-likelihood = -3313.6915		
LR chi2(9) = 57.65		
Prob > chi2 = 0.0000		

Source: Using data from AGVSA (2017).

Note: Significance level is indicated with *** p<0.01, ** p<0.05, * p<0.10.

Robust standard errors are in parentheses.

Results estimated by endogenous switching regression (ESR)

The results of the endogenous switching regression (ESR) model assessing the effect of women's land ownership on household food security in Benin are presented in Tables 7 and 8.

Table 7 shows the results of the effect of women's land ownership on household food security and presents the results of the selection equation. The results of the selection equation reveal that the factors that significantly and positively influence women's land ownership are age, household size, agricultural empowerment index, and access to credit. On the other hand, the results also show that the factors that significantly and negatively influence women's land ownership are the level of "at least secondary" education and the household's housing status.

Table 7: Effect of landownership by women on household food security in Benin following the endogenous partition model (Selection equation)

Landownership by women (1/0)	Selection equation	
Age	0.0047***	(0.0013)
Education level (Unschooled) : Reference		
(Primary)	-0,078	(0.048)
(At least Secondary)	-0.108*	(0.061)
Place of residence	-0.013	(0.041)
Household size	0.0075**	(0.0034)
Land size cultivated (Less than 1 hectare) : Reference		
(1 hectare to less than 2 hectares)	-0.0363	(0.0583)
(2 hectares and more)	-0.0239	(0.0512)
Agricultural empowerment index	0.161***	(0.044)
Access to credit	0.082**	(0.0384)
Status of the dwelling place	-0.1037***	(0.0350)
Constant	-1.1443***	(0.0878)
Log likelihoold : -7579.0555 Wald chi2(15) = 75.38 Prob > chi2 = 0.0000 Observations : 6 502		

Source: Using data from AGVSA (2017).

Note: Significance level is indicated with *** p<0.01, ** p<0.05, * p<0.10.

Robust standard errors are in parentheses.

The results in Table 8 show that the Wald chi2 value is significant at 1%, indicating that the model is globally significant. Thus, the model presents a good fit with the explanatory variables. The non-significance of the test of the likelihood ratio of independence (0.1750) between the equations reveals that the errors of the treatment equation and those of the outcome are not correlated. Since the errors are not correlated then there is no sign of endogeneity. Moreover, Durbin (p = 0.3139) and Wu-Hausman (p = 0.3140) endogeneity tests confirm that the variables are exogenous.

The estimated parameters of the household food security index model for women landowners and non-landowners are reported in Table 8. This table also illustrates the factors that significantly influence the household food security index.

For women with land ownership, the levels of education “primary” and “at least secondary” and the area of land sown “2 hectares and more” are the factors that significantly negatively affect the security index. household food. On the other hand, the “Place of residence” area of residence significantly positively affects the household food security index.

As for women who do not have land ownership, the levels of “primary” and “at least secondary” education, the area of land sown “2 hectares and more” and the agricultural empowerment index are the factors that significantly negatively affect the household food security index. On the other hand, the “Place of residence” area of residence significantly positively affects the household food security index.

Table 8 : Effect of landownership by women on household food security in Benin according to the endogenous switching regression model (Outcome equation).

Dependant variable **Food Security Index**	**Outcomes models**			
	Women with land ownership		**Women without land ownership**	
Age	-0.0027	(0.0037)	-0.0018	(0.0012)
Education level (Unschooled) : Reference				
(Primary)	-0.4022*** (0.0960)		-0.1706***	(0.0433)
(At least Secondary)	-0.4232*** (0.1211)		-0.3189*** (0.0545)	
Place of residence	0.1631*** (0.0826)		0.1916***	(0.0374)
Household size	-0.0046 (0.0085)		-0.0035 (0.0032)	
Land size cultivated (Less than 1 hectare) : Reference				
(1 hectare to less than 2 hectares)	-0.0090 (0.1186)		-0.0855	(0.0527)
(2 hectares and more)	-0.4008*** (0.1146)		-0.2765***	(0.0480)
Agricultural empowerment index	-0.1898	(0.1438)	-0.2232	(0.0375)
Access to credit	0.0684	(0.0771)	-0.0567	(0.0345)
Constant	0.4602 (1.1511)		1.2890***	(0.0780)
rho_0 : -0.9369 (0,5930) ** rho_1 : 0.3003 (1,3049)				

Log likelihood: -7579.0555	Wald chi2(15) = 75.38	Prob > chi2 = 0.0000	Observations: 6 502	
Test des équations indépendantes de Wald (rho1=rho0=0) : chi2(2) = 3.49	Prob > chi2 = 0.1750			

Source: Using data from AGVSA (2017).

Note : Significance level is indicated with *** p<0.01, ** p<0.05, * p<0.10.

Robust standard errors are in parentheses.

The household food security index under the real and counterfactual conditions is shown in Table 9, respectively. Cells (a) and (b) represent the expected household food security index results observed under the real conditions and (c) and (d) correspond to the counterfactuals. The household food security index of women landowners (a) is 0.634 and that of non-landowners (b) is 0.574. The difference between the two groups is 0.06. However, low production from the land could be the cause of this small difference. Some authors have found that the land to which women often have access is of lesser quality. In addition, research results have also shown that, although women can legally access land in some countries, the types of land they access are very often far away from their places of residence, their land is less fertile and less secure than land controlled by men, particularly in rural areas (Uchendu et al., 2022). As evidenced by the situation of women in times of inheritance, the plots of land that women obtain or inherit are often relatively more difficult to exploit compared to those of men. In sum, patriarchal land tenure, entrenched beliefs, and social and cultural norms prevent women from accessing secure land (Doghle et al., 2019).

The last column of Table 9 presents the effects of land ownership by women on the household food security index. In counterfactual (c), the household food security index of women landowners increases significantly by 0.63. The transient heterogeneity effect is positive (TH=0.77), implying that the effect of landownership on the food security index is significantly higher for women who participated in landownership than for those who did not attend. This involves implementing policies to encourage and continue women's participation in landownership. The last row of Table 9, which takes into account the potential effect of heterogeneity in the sample, reveals that women who participated in the land ownership program would have a higher food security index (0.432) than women who do not participate in land ownership (0.0026) in counterfactual cases (c) and (d). We conclude that there are significant heterogeneity factors showing advantages in favor of participants in women's land ownership over non-participants.

The results estimated by the endogenous switching regression (ESR) method and the propensity score matching (PSM) method reveal a positive and

significant effect of women's land ownership on household food security. There is therefore a convergence of the estimated results.

Table 9 : Impact of landownership by women on household food security: Conditional results, treatment and heterogeneity effects

Subgroups	Decision		Treatment effects
	Participants	Non-participants	
Participants	(a) 0.634 (0.0014)	(c) 0.0026 (0.00011)	TT = 0.63 (0.0027) ***
Non-participants	(d) 0.432 (0.0016)	(b) 0.574 (0.0012)	TU = -0.14 (0.00068) ***
Heterogeneity effects	BH1 0.203 (0.00017) ***	BH2 -0.57 (0.0025) ***	TH = 0.77 (0.0017) ***

Source: Using data from AGVSA (2017).

Note: Significance level is indicated with *** p<0.01, ** p<0.05, * p<0.10.

Standard errors are in parentheses.

6. Discussion

The estimation of the impact on the household food security index under the real and counterfactual conditions shows that participation in women's land ownership positively and significantly affects the household food security index for women landowners. The results estimated in the endogenous partition regression (ESR) than that of ordinary least squares reveal a positive and significant effect of women's land ownership on household food security. Our results converge with those of Quisumbing and Maluccio (2003) who show a positive relationship between the amount of property, including land, that a woman owns at the time of marriage and the share of household expenses spent on food. In addition, Asitik and Abu (2020) found that when women have access to arable land, their households are less likely to have severe or moderate hunger. Furthermore, empirical analysis of the research of Wei et al. (2021) indicates that women's access to their legal and family rights in households increases their bargaining power over resource use and food choices, which significantly and negatively reduces their food insecurity. On the other hand, when the women in the household own land, families spend more on food, reducing the household's vulnerability to food insecurity by increasing agricultural income and food availability (Katz and Chamorro, 2002; Baiphethi and Jacobs, 2009). This result is consistent with the research of Prosterman et al. (2009). Their research was based on a land purchase program in the Indian state of Andhra Pradesh, which provided beneficiaries with parcels of land up to one acre. The study found that recipient households had experienced significantly higher levels of food security: 76% of recipient households reported having spent two meals a day, compared to only 50 to 57 percent of non-recipient households. Thus, empowering women in agriculture more accurately with land ownership reduces the likelihood that their households are vulnerable to food insecurity and thus improves the state of food security of the household. Moreover, this result is also conformable with the research of Santos et al. (2014) which indicates that land rights are directly related to the increase in food production and household food security. OECD research in 2012 confirmed this result by showing that in countries where women have the opportunity to own land, their children are better fed, which improves and increases the household food security index. Allendorf's research in 2007 is also consistent with this result by demonstrating that the probability of a child suffering from severe food deficiency is halved if the child's mother owns the land. Moreover, Doss (2006) also showed that when women own a larger share of farmland in the household, families allocate a larger share of their family budget to food. Also, Tossou and Igue (2022) found

through the results of their estimations that the women's agricultural empowerment index including the land they own is positively correlated with the household food security index. Thus, the likelihood of a household being food secure increases when women's empowerment in agriculture increases. Women's agricultural empowerment increases the household food security index by 3.97 percentage points.

Age positively affects women's land ownership; this shows that age reflects the acquisition of experience and knowledge which are likely to push women to appropriate a portion of land. Household size positively influences women's land ownership. When the number of individuals living in the household is high, this could push women to own land to provide food for their household. “Primary” and “at least secondary” education levels negatively affect women’s land ownership and the household food security index. The more educated women are, the less land they own for agricultural production. Indeed, Adepoju et al. (2015) found that household size and education level significantly influence household food security. The agricultural empowerment index positively affects women’s land ownership. The possession of agricultural inputs and irrigation push the women of the household to own land to use it for agricultural purposes. Access to credit positively influences women’s land ownership. This result proves that land constitutes a guarantee which facilitates loans. Household housing status negatively influences women’s land ownership. The more women in the household live in a home where their husbands are owners, the less land they own.

The “Place of residence” area of residence has a positive and significant influence on the household food security index. This result confirms that it is in rural areas that we have greater agricultural production likely to reduce household food insecurity. The agricultural empowerment index significantly negatively affects the household food security index. The negative effect of the agricultural empowerment index on the household food security index could be explained by the poor quality of agricultural inputs or their low quantity compared to the quantity normally required for the area of land already sown. Indeed, the negative sign of the agricultural empowerment index could also result from the use of agricultural inputs and the practice of irrigation in a less intensive manner. The area of land sown “2 hectares and more” has a negative and significant influence on the household food security index. The most important thing is the quality of the area sown and not the quantity of the area sown. This negative effect could be explained by the low agricultural production from the sown area which could result from poorer quality land (Doghle et al., 2019; Uchendu et al., 2022). Low production would hurt the household food security index because of the loss that this could cause for the

women of the household. Indeed, Tossou and Igue (2022) found that the agricultural empowerment index of women and the area of land sown increase the household food security index.

7. Conclusion and policy implications

This research analyzed the effect of landownership by women on household food security in Benin. The results estimated using endogenous switching regression (ESR) and the propensity score matching (PSM) method reveal a positive and significant effect of women's land ownership on household food security. Women's land ownership increases the household food security index by 5.8% following the PSM method. Following the ESR and PSM method; The results reveal that the factors that significantly and positively influence women's land ownership are age, household size, agricultural empowerment index, and access to credit. However, the levels of “primary” and “at least secondary” education and the housing status of the household are the factors that significantly and negatively influence women’s land ownership.

For women landowners, the levels of education “primary” and “at least secondary” and the area of land sown “2 hectares and more” are the factors that significantly negatively affect the household food security index. On the other hand, the “Place of residence” area of residence significantly positively affects the household food security index. As for women who do not own land, the levels of education “primary” and “at least secondary”, the area of land sown “2 hectares and more” and the agricultural empowerment index are the factors that significantly negatively affect the household food security index. On the other hand, the “Place of residence” area of residence significantly positively affects the household food security index.

According to the estimated results of endogenous partition regression (ESR); the household food security index of women landowners is 0.634 and that of non-landowners is 0.574. In the counterfactual case, the household food security index of women landowners increases significantly by 0.63. The transient heterogeneity effect is positive (TH=0.77); implying that the effect of landownership on the food security index is significantly higher for women who participated in landownership than for those who did not. The potential effect of heterogeneity in the sample reveals that women who participated in the land ownership program would have a higher food security index (0.432) than women who did not participate in land ownership (0.0026).

Considering our results and to improve the level of household food security in Africa and more specifically in Benin, political decision-makers should favor

and encourage many women to acquire not only land but also large areas of land through applicable policies and reforms. Then, policymakers must also put in place communication systems to encourage more women's access to agricultural inputs and the practice of irrigation. Finally, policymakers must increase opportunities for women to access credit.

The limit of our research can be located on the quality of land owned by women. They own their own plots of land but the survey carried out is not in-depth to find out whether the land they own is of good quality or not. Another limitation of the paper is that there can be unequal access to food within the same household.

8. References

Action Aid International (2011). *What Women Farmers Need: A blueprint for action*. A l'adresse https://actionaid.org/publications/2011/what-women-farmers-need-blueprint-action

Abebaw, D., Fentie, Y., & Kassa, B. (2010). The impact of a food security program on household food consumption in Northwestern Ethiopia: A matching estimator approach. *Food Policy*, *35*(4), 286-293. https://doi.org/10.1016/j.foodpol.2010.01.002

Abrahamsson, S. (2013). *Agricultural Productivity, Land Access and Gender Equality: Based on a minor field study conducted in Zambia 2013*. http://urn.kb.se/resolve?urn=urn:nbn:se:lnu:diva-37044

Adepoju, A., Laudia, O., & D, A. (2015). The role of women in household food security in Osun State, Nigeria. *International Journal of Agricultural Policy and Research*, *3*, 104-113. https://doi.org/10.15739/IJAPR.032

Agada, M., & Igbokwe, E. (2016). Influence of Food Culture and Practices on Household Food Security in North Central Nigeria. *Journal of Food Security*, 6.

Agarwal, B. (1997). « "Bargaining" » and Gender Relations: Within and Beyond the Household. *Feminist Economics*, *3*(1), 1-51. https://doi.org/10.1080/135457097338799

AGVSA (2017). Analyse Globale de la Vulnérabilité et de la Sécurité Alimentaire (AGVSA), République du Bénin, INSAE ; Rapport_AGVSA_VF_2017.pdf (instad.bj)

Ahimbisibwe, B., Morton, J., Feleke, S., Alene, A., Abdoulaye, T., Wellard, K., Mungatana, E., Bua, A., Asfaw, S., & Manyong, V. (2020). Household welfare impacts of an agricultural innovation platform in Uganda. *Food and Energy Security*, *9*. https://doi.org/10.1002/fes3.225

Albert, jose ramon, Albert, G., Collado, P., & Monina, P. (2004). *Profile and Determinants of Poverty in the Philippines*.

Alchian, AA (1965). « Quelques aspects économiques des droits de propriété », dans Alchian , AA (éd.) (1977), Analyse économique des droits de propriété , Indianapolis : Liberty Press .

Alessandra Galie. (2013). Empowering Women Farmers: The Case of Participatory Plant Breeding in Ten Syrian Households. (2013). *Frontiers: A Journal of Women Studies*, *34*(1), 58-92.

Alinyo, F., & Leahy, T. (2012). Designing food security projects: Kapchorwa and Bukwo, Uganda. *Development in Practice*, *22*(3), 334-346.

Allendorf, K. (2007). Do Women's Land Rights Promote Empowerment and Child Health in Nepal? *World Development*, *35*(11), 1975-1988. https://doi.org/10.1016/j.worlddev.2006.12.005

Arsène, M. B., Patient, B. S., Albert, L. N., Didier, M. M., Fifi, I. K., & Jules, N. M. F. (2015). *Genre et exploitations agricoles familiales en milieu rural au Katanga : Étude de cas de Kipushi [Gender and family farms in rural area in Katanga: Case study of Kipushi]*. *11*(2), 9.

Asfaw, S., Shiferaw, B., Simtowe, F., & Lipper, L. (2012). Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. *Food Policy*, *37*(3), 283-295. https://doi.org/10.1016/j.foodpol.2012.02.013

Asitik, A. J., & Abu, B. M. (2020). Women empowerment in agriculture and food security in Savannah Accelerated Development Authority zone of Ghana. *African Journal of Economic and Management Studies*, *11*(2), 253-270.

AU and FAO (2018). *Leaving no one behind: Empowering Africa's rural women for Zero Hunger and shared prosperity - World | ReliefWeb*, à l'adresse https://reliefweb.int/report/world/leaving-no-one-behind-empowering-africas-rural-women-zero-hunger-and-shared-prosperity

Badiane, O., Collins, J., Dimaranan, B., Ulimwengu, J., & IFPRI. (2018). *An Assessment of the New Alliance for Food Security and Nutrition* [Technical Report]. NEPAD. https://akb.au.int//handle/AKB/2634)

Baiphethi, M. N., & Jacobs, P. T. (2009). The contribution of subsistence farming to food security in South Africa. *Agrekon*, *48*(4), 459-482. https://doi.org/10.1080/03031853.2009.9523836

Barzel, Y. (1997). Analyse économique des droits de propriété, (2e éd.), Cambridge : Cambridge

University Press.

Behrman, J. R. (1997). Chapter 4 Intrahousehold distribution and the family. In *Handbook of Population and Family Economics* (Vol. 1, p. 125-187). Elsevier. https://doi.org/10.1016/S1574-003X(97)80021-9

Bob, U. (2002). Rural African Women, Food (In) Security and Agricultural Production in the Ekuthuleni Land Redistribution Project, KwaZulu-Natal. *Agenda: Empowering Women for Gender Equity*, *51*, 16-32.

Bush, W. et Mayer, L. (1974). « Quelques implications de l'anarchie pour la répartition de la

propriété », Journal of Economic Theory , 8 : 401 – 412 .

Carmen Diana Deere and Magdalena León (2003). Empowering Women: Land and Property Rights in Latin America (Pittsburgh, PA: University of Pittsburgh Press, 2001), pp. xxv+486, $24.95, pb. *Journal of Latin American Studies*, *35*(2), 429-431. https://doi.org/10.1017/S0022216X03446816

Chapoto, A., Jayne, T. S., & Mason, N. M. (2011). Widows' land security in the era of HIV/AIDS: Panel survey evidence from Zambia. *Economic Development and Cultural Change*, *59*(3).

Coase Ronald (1960). « The Problem of Social Cost », *Journal of Law and Economics*, Vol. 3, Oct.,

1960, p. 1-44

Congost R (2003). Droits de propriété et analyse historique : quels droits ? Quelle Histoire. Passé Présent

81 : 35-72

Croppenstedt, A., Goldstein, M., & Rosas, N. (2013). Gender and Agriculture: Inefficiencies, Segregation, and Low Productivity Traps*. *World Bank Research Observer*, *28*(1), 79-109.

Daunton M (2010). Rationalité et institutions : réflexions sur Douglass North. Changement structurel

Econ Dyn 21 : 147-156

Demsetz, H. (1964). « L'échange et l'application des droits de propriété », Journal of Law and

Economics, 7 : 11 – 26 .

Demsetz Harold (1967). « Toward a Theory of Property Rights ». *The American Economic Review*, Vol.

57, No. 2, 1967, p. 347-359

Di Falco, S., Veronesi, M., & Yesuf, M. (2011). Does Adaptation to Climate Change Provide Food Security? A Micro-Perspective from Ethiopia. *American Journal of Agricultural Economics*, *93*(3), 829-846. https://doi.org/10.1093/ajae/aar006

Doghle, K., Owusu-Ansah, J., & Boniface Akaabre, P. (2019). *The Influences of Gendered Customary Land Tenure System On Food Security In Nandom District, Ghana*. *2*, 2657-2664.

Doss, C. (2006). The Effects of Intrahousehold Property Ownership on Expenditure Patterns in Ghana. *Journal of African Economies*, *15*, 149-180. https://doi.org/10.1093/jae/eji025

Doubogan, Y. O. (2017). Analyse du niveau d'autonomisation des femmes dans l'agriculture à partir de l'application du "Women's Empowerment In Agriculture Index (WEAI) : Étude de cas du Bénin. *Revue des Etudes Multidisciplinaires en Sciences Economiques et Sociales*, *2*(1), Article 1. https://doi.org/10.48375/IMIST.PRSM/remses-v2i1.7540

FAO (2002). *The State of Food Insecurity in the World.* Food and Agriculture. Rome, Italy. 31pp.

FAO (2011). The state of food and agriculture 2010-2011- Women in Agriculture: Closing the gender gap for development - World | ReliefWeb. (2011), à l'adresse https://reliefweb.int/report/world/state-food-and-agriculture-2010-2011-women-agriculture-closing-gender-gap-development

FAO. (2012a). « Investir dans l'agriculture pour un avenir meilleur » : la situation mondiale de

l'alimentation et de l'agriculture 2012, Rome : FAO, www.fao.org/publications/sofa/2012/en/

La situation mondiale de l'alimentation et de l'agriculture 2012 - Résumé (fao.org)

FAO (2012b). Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security. (2012). FAO. https://doi.org/10.4060/i2801e

FAO, I. (2021). *The State of Food Security and Nutrition in the World 2021: Transforming food systems for food security, improved nutrition and affordable healthy diets for all*. FAO. https://doi.org/10.4060/cb4474en

Furubot, E. et Pejovich , S. (1972). « Droits de propriété et théorie économique : une étude de la

Littérature récente », Journal of Economic Literature , 10 : 1137 – 1162 .

FOWODE (2012). *Gender policy brief for Uganda's agriculture sector.* (2012). Forum for Women in Democracy (FOWODE).

Ghebru, H. (2019). *Women's land rights in Africa* (0 éd.). International Food Policy Research Institute. https://doi.org/10.2499/9780896293649_04

Ghislaine, S. T. (2007). *Integrer les questions de genre dans le secteur forestier en Afrique : Burkina Faso*. FAO. ftp://ftp.fao.org/docrep/fao/010/k0819f/k0819f00.pdf

Haddad, L., Hoddinott, J., & Alderman, H. (1998). Intrahousehold resource allocation in developing countries: Models, methods, and policies. *Food & Nutrition Bulletin*, *19*.

Harris-Fry, H., Azad, K., Kuddus, A., Shaha, S., Nahar, B., Hossen, M., Younes, L., Costello, A., & Fottrell, E. (2015). Socio-economic determinants of household food security and women's dietary diversity in rural Bangladesh: A cross-sectional study. *Journal of Health, Population, and Nutrition*, *33*, 2. https://doi.org/10.1186/s41043-015-0022-0

Harris-Fry, H., Nur, H., Shankar, B., Zanello, G., Srinivasan, C., & Kadiyala, S. (2020). The impact of gender equity in agriculture on nutritional status, diets, and household food security: A mixed-methods systematic review. *BMJ Global Health*, *5*(3), e002173. https://doi.org/10.1136/bmjgh-2019-002173

Hart Oliver et Moore John (1990). « Property Rights and the Nature of the Firm ».

The Journal of Political Economy, Vol. 98, No. 6 (Dec., 1990), pp. 1119-1158 "[1] [archive]"

Hill, R. V., & Vigneri, M. (2014). Mainstreaming Gender Sensitivity in Cash Crop Market Supply Chains. In A. R. Quisumbing, R. Meinzen-Dick, T. L. Raney, A. Croppenstedt, J. A. Behrman, & A. Peterman (Éds.), *Gender in Agriculture* (p. 315-341). Springer Netherlands. https://doi.org/10.1007/978-94-017-8616-4_13

Kabunga, N. S., Dubois, T., & Qaim, M. (2012). Yield Effects of Tissue Culture Bananas in Kenya: Accounting for Selection Bias and the Role of Complementary Inputs: Yield Effects of Tissue Culture Bananas in Kenya. *Journal of Agricultural Economics*, *63*(2), 444-464. https://doi.org/10.1111/j.1477-9552.2012.00337.x

Katz, E., & Chamorro, J. (2002). *Gender, land rights, and the household economy in rural Nicaragua and Honduras*. https://resourceequity.org/record/3091-gender-land-rights-and-the-household-economy-in-rural-nicaragua-and-honduras/

Kemeze, L. S., Mensah-Bonsu, A., Egyir, I. S., Amegashie, D. P. K., & Nlom, J. H. (Éds.). (2018). *Impact of Bioenergy Crop Adoption on Total Crop Incomes of Farmers in Northern Ghana: The Case of Jatropha Curcas*. https://doi.org/10.22004/ag.econ.302438

LaFave, D., & Thomas, D. (2014). Farms, Families, and Markets: New Evidence on Agricultural Labor

Markets. National Bureau of Economic Research Working Paper Series. https://doi.org/10.3386/w20699

Lokshin, M. and Sajaia, Z. (2004). Maximum likelihood estimation of endogenous switching regression

models. *Stata Journal,* 4 (3): 282–289.

Lokshin, M., & Sajaia, Z. (2011). Impact of Interventions on Discrete Outcomes: Maximum Likelihood Estimation of the Binary Choice Models with Binary Endogenous Regressors. *The Stata Journal*, *11*(3), 368-385. https://doi.org/10.1177/1536867X1101100303

Maddala, G. S. (1983). *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge University Press. https://doi.org/10.1017/CBO9780511810176

MAEP. (2011). Plan Stratégique de Relance du Secteur Agricole. République du Bénin. Ministère de

L'Agriculture de l'Elevage et de la Pêche. 9 p, 56p, à l'adresse https://leap.unep.org/sites/default/files/legislation/ben149176.pdf

MAEP. (2018). Plan Stratégique de Développement du Secteur Agricole. République du Bénin.

Ministère de l'Agriculture de l'Elevage et de la Pêche, à l'adresse Ben184002.pdf (fao.org)

Malhotra, A., & Schuler, S. R. (2002). Women's empowerment as a variable in international development. *PsycEXTRA Dataset*. https://www.academia.edu/17726621/Measuring_womens_empowerment_as_a_variable_in_international_development

McCloskey DN (2010). La dignité bourgeoise : pourquoi l'économie ne peut pas expliquer le monde

moderne. Presses de l'Université de Chicago, Chicago.

North , DC (1990). Institutions, Institutional Change, and Economic Performance. Cambridge:

Cambridge University Press, 1990.

OECD (2012). *Do discriminatory social institutions matter for food security?* https://data.landportal.info/node/52527

Onibon Doubogan, Y. (2015). Dynamique de l'entrepreneuriat féminin au Bénin. *JRSUL*, *Série B (17)2*, 20.

ORFAO (2022). Accès et contrôle des femmes et des jeunes au foncier. Bulletin d'information

Bimestriel de l'Observatoire Régional du Foncier Rural en Afrique de l'Ouest (ORFAO) Numéro 03 | Février 2022 www.uemoa.int/sites/default/files/bibliotheque/bulletin_dinfo_orfao_n03_fev_2022.pdf

Osabuohien, E. S. (2014). Large-scale agricultural land investments and local institutions in Africa: The Nigerian case. *Land Use Policy*, *39*, 155.

Oxfam International (2022). *Empowering women farmers to end hunger and poverty*. https://www.oxfam.org/en/empowering-women-farmers-end-hunger-and-poverty

PAM (2018). Examen Stratégique National Faim Zéro au Bénin, Rapport Final, Version provisoire,

Juillet 2018. https://docs.wfp.org/api/documents/WFP-0000103371/download/

Peterman, A., Quisumbing, A., Behrman, J., & Nkonya, E. (2011). Understanding the Complexities Surrounding Gender Differences in Agricultural Productivity in Nigeria and Uganda. *Journal of Development Studies*, *47*(10), 1482-1509. https://doi.org/10.1080/00220388.2010.536222

Pinto AS et Rolo JC (2015). "Sécurité alimentaire : orientation de la politique publique portugaise et

défis à l'élaboration d'indicateurs" in Feeding Expo Milano with Mediterranean Perspectives. Paris : CIHEAM, April 2015 - Watch Letter n°32.http://www.ciheam.org/. ISSN 2114-3129.

Prosterman, R. L., Mitchell, R. G., & Hanstad, T. M. (Éds.). (2009). *One billion rising: Law, land and the alleviation of global poverty*. Leiden University Press.

Quisumbing, A., R, A., ed, Meinzen-Dick, R., & Suseela, R. (2001). *Empowering women to achieve food security:*

Quisumbing, A. R., & Maluccio, J. A. (2003). Resources at Marriage and

Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa*. *Oxford Bulletin of Economics and Statistics*, *65*(3), 283-327. https://doi.org/10.1111/1468-0084.t01-1-00052

Quisumbing, A.R., J. P. Estudillo and K. Otsuka. (2003). *Land and Schooling: Transferring Wealth across Generations (International Food Policy Research Institute)*. (2003), à l'adresse https://www.allbookstores.com/Land-Schooling-Transferring-Wealth-across/9780801878428

Santos, F., Fletschner, D., Savath, V., & Peterman, A. (2014). Can Government-Allocated Land Contribute to Food Security? Intrahousehold Analysis of West Bengal's Microplot Allocation Program. *World Development*, *64*(C), 860-872.

Savath, V., Fletschner, D., Peterman, A., & Santos, F. (2014). *Land, Assets, and Livelihoods: Gendered Analysis of Evidence from Odisha State in India* (SSRN Scholarly Paper N° 2405717). https://doi.org/10.2139/ssrn.2405717

Scherr, S. J. (2000). A downward spiral? Research evidence on the relationship between poverty and natural resource degradation. *Food Policy*, *25*(4), 479-498. https://doi.org/10.1016/S0306-9192(00)00022-1

Seymour, G. (2017). Women's empowerment in agriculture: Implications for technical efficiency in rural Bangladesh. *Agricultural Economics*, *48*(4), 513-522.

Sharaunga, S., Mudhara, M., & Bogale, A. (2015). The Impact of « Women's Empowerment in Agriculture » on Household Vulnerability to Food Insecurity in the KwaZulu-Natal Province. *Forum for Development Studies*, *42*(2). https://doi.org/10.1080/08039410.2014.997792

Sraboni, E., Malapit, H. J., Quisumbing, A. R., & Ahmed, A. U. (2014). Women's Empowerment in Agriculture: What Role for Food Security in Bangladesh? *World Development*, *61*, 11-52. https://doi.org/10.1016/j.worlddev.2014.03.025

Tossou, J. U., & Igue, C. B. (2022). *Assessing the effects of women empowerment: Women employment and entrepreneurship in poverty alleviation in Bénin*. LAP LAMBERT Academic Publishing.

Uchendu Eugene Chigbu, Ruishan Chen, & Chao Ye. (2022). Land Perspectives: People, Tenure, Planning, Tools, Space, and Health. *Land*, *11*(2). https://doi.org/10.3390/land11020296

Umbeck , J. (1981), « Le pouvoir fait les droits : une théorie de la formation et de la répartition initiale

des droits de propriété », Economic Inquiry , 19 : 38 – 59 .

Uphoff, N. (2003). *Some Analytical Issues in Measuring Empowerment for the Poor, with Concern for Community and Local Governance*.

Wei, W., Sarker, T., Roy, R., Sarkar, A., & Ghulam Rabbany, M. (2021). Women's empowerment and their experience to food security in rural Bangladesh. *Sociology of Health & Illness*, *43*(4), 971-994. https://doi.org/10.1111/1467-9566.13273

World Bank, Food and Agriculture Organization, & International Fund for Agricultural Development. (2008). *Gender in Agriculture Sourcebook*. The World Bank. https://doi.org/10.1596/978-0-8213-7587-7

World Development Report (2012): *Gender Equality and Development: Main report*. (s. d.). [Text/HTML]. World Bank, à l'adresse https://documents.worldbank.org/en/publication/documents-reports/documentdetail/492221468136792185/Main-report

9. Annex

Classification criteria

The food consumption score (FCS) indicator:

Food security: Acceptable food consumption: an SCA > 35

Marginal food security: Acceptable food consumption: an SCA > 35

Moderate food insecurity: Limit food consumption: 21 < SCA < 35

Severe food insecurity: Poor food consumption: SCA < 21

The indicator measuring economic vulnerability:

Food security: Share of food expenditure < 50%.

Marginal food security: 50% < Share of food expenditure < 65%

Moderate food insecurity: 65% < Share of food expenditure < 75%.

Severe food insecurity: Share of food expenditure > 75%.

The livelihoods-based survival strategies indicator:

Food security: Livelihood-based coping strategies: None.

Marginal food security: Livelihood-based coping strategies: Stress.

Moderate food insecurity: Livelihood-based coping strategies: Crisis.

Severe food insecurity: Livelihood-based coping strategies: Emergency.

The different questions that households answered during the survey :

3.	Racines, tubercules : pomme de terre, igname, manioc, Banane plantain, autres tubercules	|__|	|__|	|__|
4.	Céréales : sorgho, mil, maïs	|__|	|__|	|__|
5.	Légumineuse/noix : haricots, niébé, arachides, lentille, souchet et/ou autre noix	|__|	|__|	|__|
6.	Légumes de couleur orange (légumes riches en Vitamine A) : carotte, piment rouge	|__|	|__|	|__|
7.	**Légumes à feuilles vertes**: d'autres feuilles vert foncé etc. ???	|__|	|__|	|__|
8.	Autres légumes : oignon, tomates, concombre, radis, haricot vert, petit pois etc.	|__|	|__|	|__|
9.	Fruit de couleur orange (Fruits riches en Vitamine A) : mangue, papaye, abricot, pêche	|__|	|__|	|__|
10.	Autres Fruits : banane, pomme, citron, mandarine	|__|	|__|	|__|
11.	Viande : chèvres, bœuf, poulets, porc (viande en grande quantité et non comme condiment)	|__|	|__|	|__|

12.	Foie, rognon, cœur et/ou autres abats rouges	|__|	|__|	|__|
13.	Poisson : escargot, thon en boite, autre fruits de mer,	|__|	|__|	|__|
14.	Œufs	|__|	|__|	|__|
15.	Lait et Autres produits laitiers : Lait frais/ aigri, yaourt, fromage, autre produits laitiers SAUF [redacted] margarine / beurre ou de petites quantités de lait pour le thé / café	|__|	|__|	|__|
16.	Huile/gras/beurre : huile végétale, palme, beurre de karité, margarine, autres gras/huile	|__|	|__|	|__|
17.	Sucre ou produits sucré : miel, confiture, beignets, bonbons, biscuits, pâtisseries, gâteaux et autre produits sucré	|__|	|__|	|__|
18.	Epices/Condiments : thé, café/cacao, sel, ail, épices, levure/poudre à pâte, lanwin, tomate/sauce piquante, viande ou poisson comme condiments, autre condiments y compris petite quantité de lait pour le thé/café.	|__|	|__|	|__|

SECTION 4 : CONSOMMATION ALIMENTAIRE ET SOURCES DES ALIMENTS

4.01 - Combien de jours durant la semaine dernière les membres de votre ménage ont-ils consommé les produits alimentaires suivants et comment ces aliments ont-ils été acquis ? *(utiliser les codes à droite, écrire 0 pour les produits non consommés les 7 derniers jours et si nécessaire noter sources des aliments)*				
	Produits alimentaires	Hier, votre ménage a-t-il mangé les aliments suivants ? 0 = Non 1= Oui	Nombre de jours de consommation durant les 7 derniers jours *Si 0 jours, ne pas préciser le mode d'acquisition*	Source principale des aliments consommés
1.	Riz	__|	__|	__|
2.	Pâtes alimentaire,et pain/galette, beignets	__|	__|	__|

Code des so

1 = Propre production (végétale, animale)
2 = Pêche, Chasse
3 = Collecte/Cueillette
4 = Emprunt
5 = Achat
6 = Travail contre nourriture
7 = Troc
8 = Don aliments (famille/amis/voisins/communauté)
9 = Aide alimentaire (ONG etc.)
10 = Transfert des migrant

SECTION 6 - DEPENSES

Code	**6.08 -**Avez-vous dépensé pour acquérir les biens services suivants au cours des **30 derniers jours** ? 0 = Non 1 = Oui	**6.09 -**Dépense estimée en cash au cours des **30** **derniers jours ?** Pour la stricte consommation du ménage	membres du ménage ont consommé des aliments provenant de leur production ou qu'ils ont reçu sous forme de dons d'amis/aide alimentaire? Si c'est les deux, quelle est la source principale? *1 = propre production* *2 = dons/aide alimentaire*	**6.11 -** Estimer la valeur de chaque aliment consumé de la source mentionnée dans **6.10** au cours de **30 derniers jours**? *(Francs CFA)*

			? *(Francs CFA)*	*3 = Non; Si Non Aller à la prochaine ligne*	
1.	Sorgho	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
2.	Mil	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
3.	Maïs	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
4.	Pâtes alimentaires	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
5.	pain/beignets	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
6.	Viande	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
7.	Poisson	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
8.	Volaille	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
9.	Igname	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
10.	Manioc	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
11.	Gari	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|

12.	Taro	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
13.	Pomme de terre	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
14.	Banane plantain	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|

15.	Autre tubercule/racine (à préciser)	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
16.	arachide	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
17.	Niébé/haricot	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
18.		|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
19.	Petit pois	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
20.	voandzou	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
21.	soja	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
22.	Lentilles	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
23.	Légumes/feuilles	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
24.	fruits/jus de fruits	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
25.	Lait/Produits laitiers	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
26.	Œuf	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
27.	Huiles/Graisses /Beurre de karité pour la cuisson	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|

28.	Sucre/Miel/Sucreries	|___|	|___|___|___|___|___|	|___|	|___|___|___|___|___|
29.	Thé et café	|___|	|___|___|___|___|___|		
30.	Savon	|___|	|___|___|___|___|___|		
31.	Transport (essence incluse)	|___|	|___|___|___|___|___|		
32.	Combustible de cuisine / éclairage	|___|	|___|___|___|___|___|		
33.	Loyer	|___|	|___|___|___|___|___|		
34.	Alcool et tabac	|___|	|___|___|___|___|___|		
35.	Crédit téléphone (fixe et mobile/Internet)	|___|	|___|___|___|___|___|		
36.	Paiement de la main d'œuvre	|___|	|___|___|___|___|___|		
	Alimentation hors ménage (collation,				
37.	restaurant, boissons, etc…)	|___|	|___|___|___|___|___|		
38.	Autre (à préciser)	|___|	|___|___|___|___|___|		

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