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Households' Agribusiness Status and Food Security in Burkina Faso

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Food insecurity remains a major challenge worldwide. The political discourse calls for increasing agricultural productivity through agribusiness as a key driver of food and nutrition security. This is because the dominant agricultural system, that is, small farms, appears inefficient. However, the policy definition of agribusiness may exclude actors who fit into rural households in low-income countries. This study contributes to the literature by comparing the relationship between agribusiness and non-agribusiness households and by focusing on how this affects their respective food security. It develops an analytical framework that helps decision makers redirect agribusiness policies by clearly considering rural households as potential agribusinesses. Using a dataset covering the entire rural area of Burkina Faso, this study adopts an endogenous sample selection method to define the agribusiness status of these rural agricultural households. An instrumental variable (IV) probit regression was used to analyse the determining factors of agribusiness status, as it addresses the problem of selection bias or endogeneity. A simple linear regression was then used through which a multidimensional food security index was regressed over agribusiness and non-agribusiness household characteristics. The study finds that in rural areas, the level of agricultural technologies adopted, the input cost, and the quantity of family labour used in farming are among the determining factors of a household's agribusiness. Land size and the quantity of

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sales within a household are key determinants of the level of food security. As the level of food security in agribusiness households is (two times) high as in non-agribusiness households, this study recognises the relevance of targeting agribusiness as an enabler for achieving food security. This paper proposes that decision-makers extend their definition of agribusiness by including rural non-legally recognised agribusiness actors to increase fiscal income. This study is the first to address agribusiness and food security issues in Burkina Faso.

Keywords: Agribusiness; non-agribusiness; multidimensional index; (IV) probit; Burkina Faso.

JEL Classification: C26; D1 & Q12.

1. INTRODUCTION

Achieving food security and improving nutritional security remains a pressing challenge. Worldwide, 25.9% of the population has experienced moderate or severe food insecurity in 2019 [1]. This rate increased compared to that in 2014, when it was estimated at 22.4%. One explanation for this high rate of food insecurity is that small-scale farming does not enable food security, and calls for adopting agribusiness as a modernised agricultural practice.

Extensive knowledge exists in the ongoing debate comparing agribusiness to family (peasantry) farming. On the one hand, agribusiness based on cash crops can contribute to a substantial increase in yields and a significant reduction in poverty through exports [2,3,4]. Agribusiness is effective in improving the performance of the agricultural sector and reducing poverty in rural areas by strengthening its links with small producers [5]. Agribusiness is also efficient in postharvest management, thus influencing the price of food products [5,6]. On the other hand, small farming is labour-intensive (and low-cost labour), but better promotes equity and poverty reduction because it is conducted by poor households employing their families and other poor households [7]. Small farmers also tend to spend their income on local goods, boosting the local non-agricultural economy [7]. Lastly, small farms are less likely to adopt new technologies that require more capital, inputs, intensified mechanisation, and/or higher education levels that they do not have [7]. However, few studies have comprehensively examined the relative contributions of agribusiness and small farming to food security.

Hence, this study aims to1) formulate a framework for analysing the relationship between agribusiness and food security in line with the new challenges of sustainable development goals [8]; 2) conduct a comparative analysis of the contribution of agribusiness and small farming —that is, rural households' agricultural status —to food security; and 3) provide data to support a policy direction more inclusive of rural households as potential agribusiness actors, particularly in low-income countries. This answers the research question: does agribusiness contribute more significantly to food security than smallholder farming? The rationale for this research question lies in the fact that small farms, which are widespread in rural areas, are threatened by the rise of agribusiness or agricultural entrepreneurship [4].

To answer this question, this study frames the debate around three economic theoretical streams of thought: neoclassical, allocative efficiency, and peasantry theories (Cf. Table 11 in Appendix).

2. THEORETICAL PERSPECTIVE

2.1 Agribusiness versus Small-farming: Theoretical Foundation of their Difference

Neoclassical theory posits agribusiness as an agricultural enterprise (agri-enterprise) that evolves rationally by efficiently allocating resources in risky and uncertain environments [9]. The main goal of such an enterprise is to maximise its profit through the optimal use of resources such as land, capital (including technical progress), and labour [9]. To achieve this goal, an agri-enterprise needs to be competitive [6], meaning to better control its costs, such as rent for land, salary for employees, interest in capital, and all inputs and services involved in production activities. This is only possible if there is an "improved climate for investment, including a sound macro policy environment, public goods (infrastructure) provision, legal and regulatory frameworks that foster competition, business integrity, and fair practices; and access to private financial

services, risk-sharing institutions and business development services" [6]. However, a limitation of this view of an agricultural enterprise is that all rural farmers are or cannot be agripreneurs (agribusiness), as defined herein, mainly seeking to maximise their profit. Indeed, there is an imbalanced power relationship between large farmers (agribusiness) and poor smallholders, yielding unequal access to markets and inputs [10]. Other motivations may qualify producers as irrational economic agents. Some responses are found in the theory of the AL of traditional family farming [11] and the peasantry economy theory [12], which are referred to in this study.

The main argument supporting Schultz's theory is that traditional farmers have found the optimum pattern through a learning-by-doing process over centuries, and that only new factors and technologies can lead them to transform their traditional practices [13]. In other words, traditional farmers are well organized and operate at nearly a maximum or natural equilibrium in their traditional resource allocation [11]. Consequently, differences in the quantity and rate of increase in agricultural productivity are explained less by differences in land, but substantially by differences in the quality of material capital and in agricultural populations' capacities [11]. Customs, traditional know-how, tastes, and motivations are key factors that affect agricultural activity outcomes/outputs. Furthermore, the return rate of traditional factors is low and provides little economic motivation, whereas that of modern factors is high, thereby providing strong economic incentives for savings and investment. However, the return on investment required to induce savings is greater in traditional agriculture than in modern agriculture [14]. This is because people in traditional economies have greater marginal utility or preference for actual consumption than for future consumption, which is a consequence of their low incomes [14].

Chayanov's peasantry economic theory is another stream of thought in the debate [12]. This author contests the tenet of the (neo) classical analysis rooted in the place of land, labour, and capital in their comparison between traditional farming and capitalistic farming. Traditional farms are also rational (capable of margin reasoning), but from a different perspective than capitalistic farms when considering the close relationship between labour and consumption patterns pertaining to agricultural activity [12]. Indeed, there is no additional work (labour) if this is balanced with additional consumption through the traditional farming household; that is, the pursued goal of this type of farming is equilibrium [12]. Consequently, a traditional farm should use the market and natural conditions in a way that allows it to simultaneously achieve internal equilibrium for the family and the highest possible level of well-being at the same time [12]. Hence, the author concludes that traditional farming is more efficient than modern farming is.

This theoretical thinking was contested by peers. First, the poor performance (or results) of traditional farms can be explained by their failure to achieve this type of equilibrium, as the latter can intuitively imagine it [15]. This type of equilibrium, especially in peasant economies in the Global South, also qualifies as a 'poverty equilibrium' [16]. However, [15] recognises that these types of agriculture seek to better manage natural risks to maintain or improve their equilibrium at three levels: (i) the balance between resources and needs, (ii) the balance between people and nature, and (iii) the balance between humans themselves. In addition, while acknowledging the relevance of Chayanov's model, [17] highlighted its limitations by suggesting that it should be extended beyond nuclear households. Indeed, in real life, the model is not applicable to complex and dynamic household units [17].

The argument that traditional farming is more efficient than capitalistic farming in terms of higher output per unit of land [18] has also been contested. Some have said that productive efficiency is invariable for all types of farms (small, medium, and large, the latter being capitalistic). Others have found that Chayanov's model does not account for property rights (notably on land), which is crucial when considering highly populated and feudal countries. Specifically, sharecropping is more efficient than family farming, which in turn is more efficient than capitalist exploitation [19]. However, if there is a minimum contract between the sharecropper and the landowner in a feudal system, then the profit of the capitalistic farm would be higher than the rent of the sharecropper which is higher than the income of the traditional (family) farm [19]. This last argument makes sense in the case of Burkina Faso when considering the agricultural areas developed by the state. These lands are owned by the state and rented for agribusiness (under the exclusionary conditions of the poor), who in

turn employ local populations to work on them [20].

2.2 Determinants of the Agribusiness Status of Rural Households

The relevance of the theoretical debate above is that it has a direct empirical application that provides the socio-demographic, economic, and environmental characteristics of rural households practising family or small farming [17]. Indeed, the key concepts mentioned there, such as resource allocation, profit maximisation, equilibrium, organisation, learning, and performance, are all processes or decision-making behaviour and state depending on socio-demographic, economic, and environmental characteristics at the household and individual levels. Thus, this study focuses on some relevant characteristics as empirical variables to further investigate households' agribusiness and non-agribusiness statuses.

First, agricultural technology is a central determining factor (and characteristic) of rural households' agribusiness status, and extensive knowledge shows that when a household experiences technological change by moving towards more productive (intensive) technologies (such as animal traction or motorized traction) [21,22], it increases its productivity (yield) and, thus, its income/profit [22,23]. However, this argument does not include the climate impact of motorized traction, which uses fossil fuels and potentially pollutes the environment [24]. Recently, many authors have advocated for climate-smart innovations and technologies that have shown the ability to deliver increased yields while protecting the environment, conserving natural resources, and slowing climate change [25,26]. Therefore, this study assumes that adopted technology has a positive influence on a household's agribusiness status. The nature of this relationship is consistent with the national policy for the development of agricultural entrepreneurship in the sense that agriculture must be oriented towards extensive mechanisation while abandoning rudimentary practices in agricultural activity [27].

Second, sociodemographic characteristics such as sex, age, and education level of the household head were considered in this study with regard to existing evidence [28]. For example, education level (i.e., formal education) significantly affects agricultural production/ productivity through the decision-making process pertaining to the adoption of a given agricultural technology and other household decisions [22]. Thus, educational level was assumed to positively and significantly affect agribusiness.

Third, land size dedicated to agricultural activities is also a household characteristic that has been extensively studied. Land size is a key variable used to distinguish between agribusiness and traditional family farming in terms of agricultural entrepreneurship policies [23,27]. Land size has been contested in the literature because of its dynamic nature in the growth trajectories of agriculture-based economies [29]. Thus, one distinguishes between the land size for cereal production, mainly pertaining to traditional family farms, and that for cash crops, mostly related to commercial farms or agribusiness [7,30]. Both types of land sizes are assumed to significantly determine the agribusiness of rural agricultural households. In particular, land size for cash crops is supposed to positively influence whether the household is agribusiness [31,30].

Fourth, as labour plays a key role in farming, according to the above theories, the type and quantity of labour (family or hired) utilised by agricultural households were included. Hired labour is assumed to have a significant positive relationship with a household's agribusiness status, which is consistent with [7], who argued that agribusiness activities employ more hired (paid) labour than traditional farms. In contrast, family labour is assumed to negatively and significantly influence the agribusiness status of rural households, which is consistent with the argument that traditional agricultural farms mainly employ their (unpaid) family and other labour from their community [30,7].

Fifth, input costs, such as crop seeds, pesticides, fertilizers, and so on— particularly their total cost for households — are also a crucial factor determining agribusiness status with regard to all the above theories. Extensive empirical evidence supports the idea that these inputs increase agricultural yields [32,33]. However, the higher the input cost, the less poor farmers can afford it [22]. Thus, in this study, the input cost is assumed to have a positive influence on the agribusiness status of households with regard to work by [7], who argued that large farms (i.e., agribusinesses) spend a lot of money on these agricultural inputs.

Finally, the quantity of crops produced (or productivity) is strongly related to farm size [23].

Large farms (adopting more intensive techniques or agribusiness) tend to yield a more substantial quantity of crops than small farms that cannot adopt these techniques. In this study, the quantity of crops produced was assumed to have a significant positive relationship with the agribusiness of a household. For example, large farms tend to adopt cash crops that require the capacity to adopt improved seeds and fertilisers [31].

The following scheme summarises the conceptual framework that analyses the relationships between households' agribusiness status and its determining factors: These factors can be organised around labour, capital, and socio-demographic characteristics.

2.3 Determining Factors of Food Security at the Rural Household Level

Agriculture affects nutrition through access to food, care practices, and the health environment, whereas the underlying determinants affect nutritional status through food intake and health [34]. These two theoretical positions relate to agricultural production and household food security. The first is to increase cereal and livestock yields as the sole way to improve food and nutritional security [35]. Thus, agriculture contributes to food security via the production of food directly consumed by farmers or via income from crop selling, which serves to buy food from the market [36]. Moreover, agricultural patterns sensitive to women's conditions (i.e., respecting their work conditions, income balance, and better rights) guarantee food security [37]. Some authors have shown that specialized and trade-oriented production systems are more efficient in terms of food diversity [38]. In contrast, other authors have shown that production diversity at local farms [39] or individual farms [40] has better effects on food consumption diversity, which is a part of food security.

In particular, the performance (in terms of cereal production per capita) of more integrated farms (agriculture mixed with livestock), regardless of their size (large or small), is enduring and a good indicator of food security, as it increases food availability. In addition, as drawn from capital that allows access to modern inputs, the number of farmers increases production per unit land size and per capita, owing to the integration of agriculture and livestock [36].

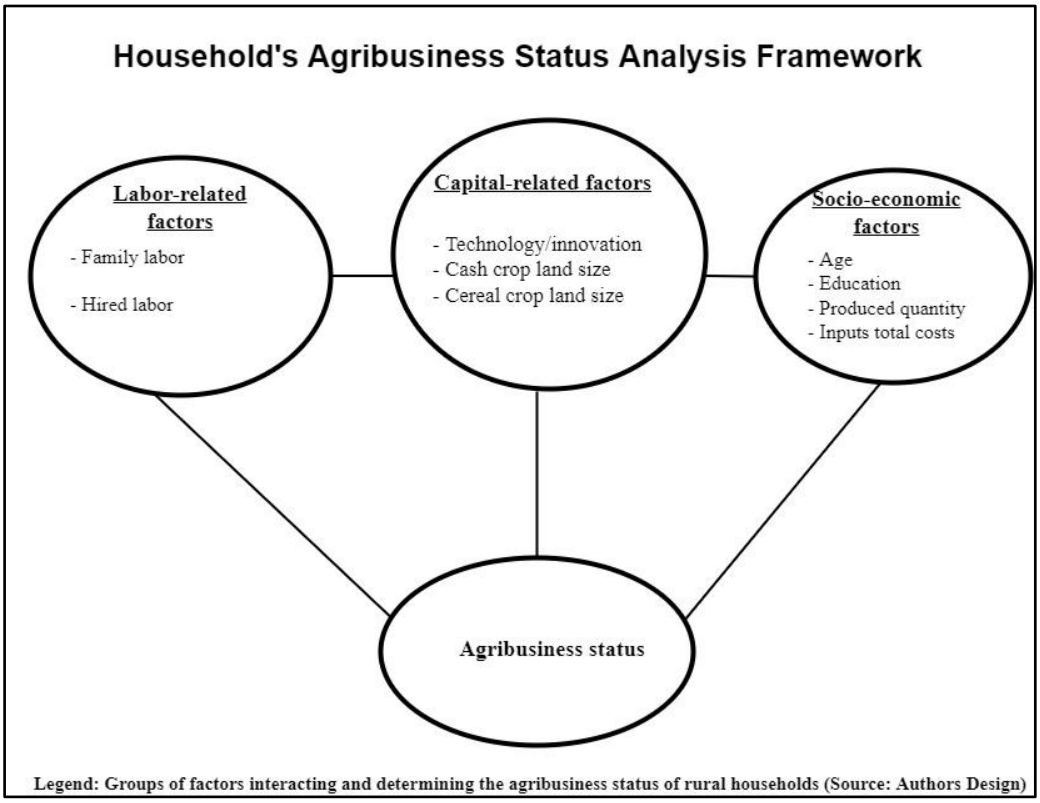

Fig. 1. Household's agribusiness status analysis framework

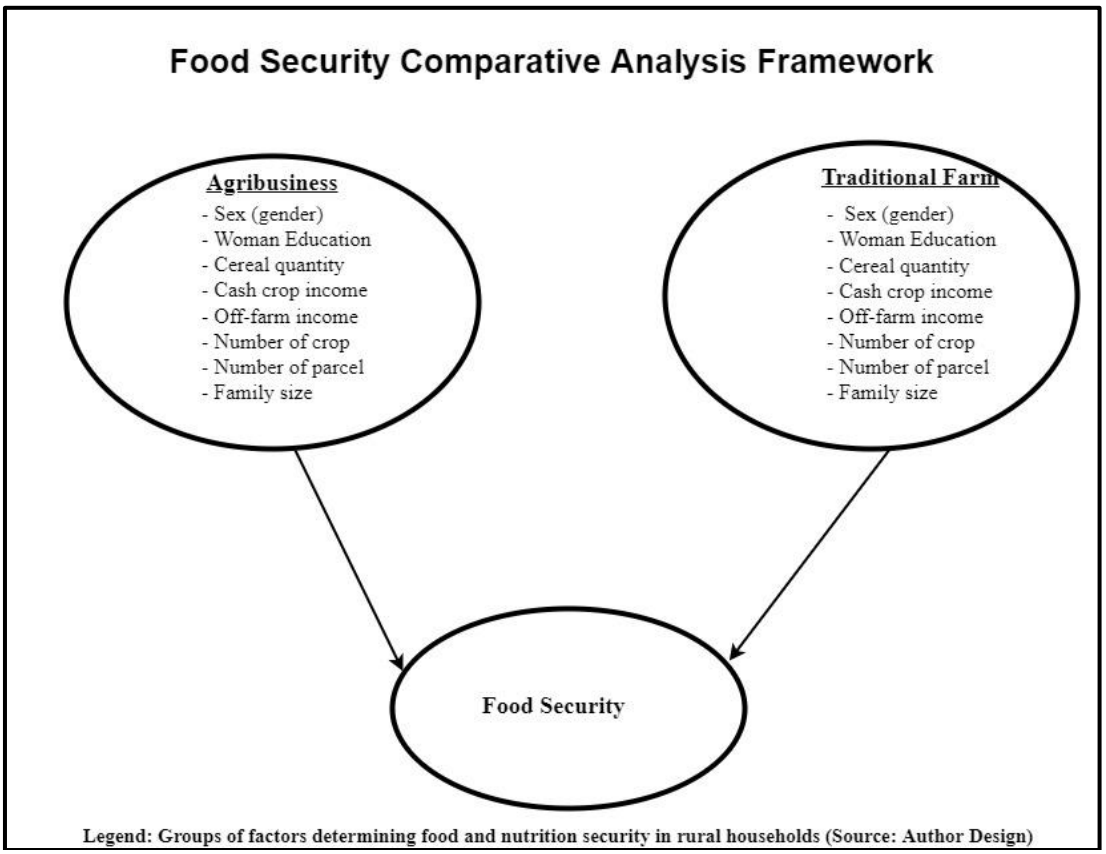

Fig. 2. Food security comparative analysis framework

The second position states that food security and reduction of malnutrition are not always linked to an increase in agricultural production [41,42]. For these authors, it was crucial to examine the trajectories linking agricultural production and food security on various scales. Macro/meso - and micro-determinants of food security exist [35]. At the macro or meso level, there is economic growth [43,44], agricultural growth [35], a non-agricultural rural economy [28,45], social protection [46,47], technological change or intensification [48,49], and agricultural trade [35]. The primary idea is that strong policies based on these factors could lead to a higher level of food security. Despite the relevance of these macro determinants, this study focuses on the micro determinants of food security.

The literature shows the benefits (in terms of food security) of agribusiness compared with traditional farming. On the demand side, agribusiness, through its effectiveness in post-harvest management, can significantly influence the price of food products for consumption and they guarantee household food security [5]. Agribusiness, through the agro-industry, can contribute to improving poor health and food security by increasing the availability, diversity, and nutritional value of food products [5]. In the case of food shortages, staple food availability and consumption of essential nutrients may be guaranteed throughout the year.

On the supply side, the agro-industry directly influences poor people's livelihoods as it increases employment in this industry and consumption of primary food staples. Agribusiness also contributes strongly to women's empowerment and food security [5]. For example, most new jobs in agro-industrial activities are held by women, notably in small food-processing settings and restaurants [50]. Furthermore, agro-industrial firms provide essential services and resources to those without access, notably among producers, leading to improved productivity (quantity) and quality of food products and stimulating innovations in the market [51].

Extensive knowledge exists on the micro determinants of food security, including households' sociodemographic and economic

characteristics. These include the education of the household head, women's (mother's) education level, cash crop income, off-farm income, total income, access to credit [52], extension courses, nutrition information, production systems, family size, distance between residence location and the city [53], cereal grains and other crops locally grown and processed [54], gender of the household head, age, received money remittances, and inflation assets such as crops and land [55].

First, food insecurity can result from lack of education [56]. Specifically, educated women are more likely to be aware of nutrition, hygiene, and healthcare, all of which enable food security [57]. Second, households with a large family size are more likely to have malnourished children [57], and large family size negatively affects household food security by reducing food intake [58]. Third, cereal production (quantity/yield) significantly contributes to food security by decreasing the prevalence of undernourishment [59], and increasing food availability and access [60]. Fourth, non-food expenditures drive increases in aggregate consumption expenditures, and thus food diversity and intake [61]. Fifth, non-agricultural or off-farm income improves food security [62]. Off-farm income affects food expenditure, especially on non-cereal items, thus enabling greater dietary diversity [63]. Sixth, cash crop income improves or is associated with improved food security through increased purchasing power, which allows households to diversify their food consumption [62,64]. Land fragmentation, which involves several parcels and crops, is associated with improved food security [65]. Land fragmentation allows farmers to create diverse crop portfolios that help mitigate weather risks and increase the diversity of available food, thus reducing food insecurity [66].

Hence, this study assumes that farmers who grow more crop types are more food-secure. As agribusiness is more intensive on cash crops, this hypothesis suggests that family farmers should be more food-secure than agribusiness. Overall, the hypotheses tested in this study are that the effect of each of the eight variables will be greater for agribusiness than for (traditional) family farms.

The following conceptual scheme maps the relationships between the level of food security and explanatory variables regarding household agribusiness status:

3. METHODOLOGY

3.1 Case Study of Burkina Faso

Data show that in Burkina Faso, 47.69% of the population faced moderate-to-severe food insecurity in 2018. This number has increased since 2015, with an estimated 42.37% [1].

Small-scale farmers are accused of sustaining food insecurity in Burkina Faso because of their low productivity and inefficiency, despite the substantial budget allocated by the government to the agricultural sector [66,67]. Recent data show that the productivity of small-scale food producers, measured in terms of agricultural output per labour per day, is estimated at US$ 3.64, while large-scale food producers are close to US$ 6.00 [1], that is, a gap of US$ 2.36. In addition, the share of the government budget supporting the agriculture and food sector increased from US$ 342.053.000 (19.16% of the total budget) in 2006 to US$ 589.526.960 (16.94% of the total budget) in 2013, an increase of 64.3% in absolute value, but a decrease in relative value (19.16 to 16.94) [68]. An important reason why these family farms are not included in the growth process is that their farming practices continue to be extensive rather than intensive [66,69] identifies them by their lack (low level) of equipment and absence (low use) of inputs in their production process. This situation is exacerbated by natural resource degradation (land and forest products), which serves as the basis for farmers' livelihoods [30].

To overcome food insecurity through increased agricultural productivity, the Burkina Faso government directed its agricultural policy towards modernised agriculture in the early 1990s. As such, policies support and facilitate access to extended land (acreage) through Land Law 034, subsidised inputs such as fertilisers, pesticides, and improved seeds for agribusinesses. In addition, agricultural machines (such as tractors) are provided to agribusiness actors under soft conditions by the government as a pathway towards agricultural modernisation.

The main objective of this policy was to promote agribusiness at the bottom. Agribusiness, as an approach, is an interesting alternative to traditional/smallholding farming, notably by overcoming issues pertaining to low productivity [66]. Through agribusiness, the government aimed to direct agricultural production towards the market (more access to the market) and a

better intensification and diversification of agricultural, forestry, and animal production based on a sustained increase in crop productivity [27]. A strong assumption is that the promotion of private investment in the agricultural sector can boost agricultural production by focusing on intensification rather than extensive cultivation, which contributes to natural resource degradation [20,6]. In addition, such a policy seeks to implement a legal framework for enlarging the tax base, as agribusiness, identified as agricultural enterprises or large agricultural farms, are taxpayers in the same way as conventional enterprises [70].

However, agribusiness is characterised by the grabbing of agricultural land to the detriment of small-scale farming systems [30], as small farms represent 99% of the country's agricultural stakeholders [71]. These actors derive their income and means of subsistence from the production of primary agricultural products; thus, their disappearance creates a high unemployment rate in rural areas [72].

Finally, in Burkina Faso, agribusiness refers to a commercial producer selling at least 60% of its production in the market because the goal is to maximise his/her activity surplus [27]. This contextual definition of agribusiness is limited because it does not clearly mention the processing and service nodes in the agricultural value chains. The most recent data show that agribusiness comprises livestock (49%), horticulture (43%), forestry (4%), hunting (3%), and 1% agro-sylvo-pastoral raw products [27]. Policymakers also understand agribusiness as technological innovation in the agricultural sector [27, 66].

Hence, this study uses the case of Burkina Faso to fill the gap in knowledge on the comparative analysis of agribusiness, small farming, and the state of food security.

3.2 Data Collection

This study used survey data collected under the Second National Land Management Program (PNGT2) impact evaluation by the Quantitative Analysis Applied to Sahel Development (LAQAD-S) group at the University of Thomas Sankara in Burkina Faso. The survey was conducted in 2011 and covered 45 provinces, 270 villages, and 2,160 rural households. A randomised controlled trial was conducted to select villages and household beneficiaries of the program (Phase 2 of PNGT2). A structured questionnaire was designed based on household living conditions, such as demography, education (formal and informal), health and nutrition (including anthropometry), income (agriculture, livestock, and other income sources), living setting, expenditure, finance, food security, market price, and information on the villages and municipalities to which they belonged.

The set of variables discussed in the theoretical framework were drawn from this questionnaire. Table 1 presents the variables and their measurements.

Table 1. Variables and their measurement

Variables	Measurement
sex	Sex of the head of household is a binary variable (1=male; 0=female)
age	Age (number of years) of the head of the household
Educ1	Level of education of the head of household (0= not educated to 6= university degree)
Educ2	Level of education of the spouse of the head of household or female head of household (0= not educated to 6= university degree)
qcer	Quantity of cereal produced by the household in kilogrammes
qcash	Quantity of cash crops produced by the household in kilogrammes
Off_inc	Off-farm income: revenue earned by household members from non-agricultural activities in XOF
Crop	Number of crops: number of grown crops by the household
Parcel	Number of parcels exploited by the household
Size	Number of people in the household
Labourf	Family labour: total amount of labour (in people per day) by the family members working at the household's farm
Labourh	Hired labour: total amount of labour (in people per day) of hired people by the household to work on its family farm

Variables	Measurement
Tech	Technology/innovation: type of agricultural technology adopted by the household, which ranges from 0 (manual) to 3 (motorized) traction
Land_cash	Cash crop land: land-size (in ha) dedicated to the production of cash crops
Land_cereal	Cereal crop land: land-size (in ha) dedicated to the production of cereal in the household
Prod_total	Quantity produced: total quantity in kilogrammes of all food stuffs produced by the household over year
Cost_inp	Inputs cost: total cost of inputs (in XOF) used by the household in its production process
Nfood_sp	Non-food spending in the household (in XOF);
Sales	Total sales (in kilogrammes) of agricultural products by the household
AGB	Agribusiness status: the household is an agribusiness if its sales are more than 60% and non-agribusiness if its sales are less than 60%

Source: The author

Table 2. Proportion of households according to the education level of the man and spouse

Education level	Man (n=1835)		Woman (n=1835)	
	Freq.	Percent		
1 (None)	1.709	93.13	1.816	98.96
2 (Literacy training)	8	0.44	1	0.05
3 (koranic school)	80	4.36	12	0.65
4 (primary school)	29	1.58	6	0.33
5 (secondary school)	8	0.44		
6 (university degree)	1	0.05		
Total	1.835	100.00	1.835	100.00

Source: Data PNGT2, 2011

Table 3. Proportion of households according to the sex of their head (gender)

Sex (N=1835)	Freq.	Percent
Male	1.769	96.40
Female	66	3.60
Total	1.835	100.00

Source: Data PNGT2, 2011

This study also used the multidimensional food security index (MFSI) developed by [2] as a dependent variable. This composite index helps distinguish between household food security (if the index value is higher than 0.4) and food insecurity (if the MFSI value is lower than 0.4). Note that variables such as qcer, off_inc, Prod_total, Cost_inp, Nfoo_sp, qcash, and sales are later transformed using the Neperian logarithm. Tables 2, 3, 4, and 5 present descriptive statistics for these variables. All computations and regressions in this paper were used Stata 13 (StataCorp LLC, Texas, United States of America).

3.3 The Theoretical Model

A simple Tobit model appears to be the correct functional form of the relationship between food security and overall characteristics of (non) non-agribusiness households. This model assesses the probability and intensity of a food-secure household. However, based on the (above) definition of agribusiness, a selection problem may exist at two levels. On the one hand, there is a sample of agribusiness households in food security. This non-random aspect of the sample is commonly misinterpreted as a "selection bias" problem [73]. However, there was a sample of non-agribusiness households in terms of food security. Having both sets of households in the sample means that other characteristics differ from those of agribusiness households. Thus, an endogeneity problem occurs regarding households' agribusiness status. The endogenous partitioning of samples is required [74]. Therefore, the dichotomy between agribusiness and non-agribusiness households is called households' agribusiness status.

Considering these problems (selection bias and endogeneity), a simple Tobit model is no longer the correct functional form. To identify a convenient model, this study considers that a household's agribusiness status (AGB) generates benefits in terms of well-being, particularly in terms of expected food security AGB^* . It is then possible to determine the probability that a given household in the sample is nonagricultural. As such, household agribusiness status is a binary variable defined as follows:

$$AGB = \begin{cases} 1 & if\ AGB^* \prec 0 \\ 0 & if\ AGB^* \geq 0 \end{cases} \quad (1)$$

where denotes the observed food status. The latent variable was defined as the state of food security derived from the agribusiness status of the household. Regarding equation (1), agribusiness status takes a value of 0 when the related household is agribusiness and 1 when the household is non-agribusiness. This is because agribusiness households are safer than non-agribusiness households are.

By hypothesis, $AGB^* = f(C_i) + e_i$ with C_i represents the socioeconomic, technological, and demographic characteristics of household *i.*

The binary choice equation can then be rewritten as follows:

$$AGB^* = C\omega + e \quad (2)$$

with ω , the vector of parameters to be estimated, and e , the error term, assumed to be normally distributed and of unit variance.

On this basis, the relationship between food security and agribusiness status can be rewritten in vector form, as follows:

$$MFSI = X\beta + \varepsilon \quad (3)$$

with $MFSI$ the multidimensional food security index in its vector form, assimilated to *AGB** as the expected food status of the household is captured by the composite food security index ; the vector of household's characteristics different from the explanatory variables included

Table 4. Proportion of households according to the agricultural technology adopted

Tech (N= 1300)	Freq.	Percent
Manual	51	3.92
Animal traction	1229	94.54
Motorised traction	20	1.54
Total	1300	100.00

Source: Data PNGT2, 2011

Table 5. Summary statistics of households' characteristics

	Obs	Mean	Std. Dev.	Min	Max
Size	1,835	9.72	5.35	1	57
Land_cereal	1,833	3.79	2.71	0	25
Land_cash	1,833	0.97	4.61	0	181
qcer	1,835	1,991.13	1,934.69	0	18,800
qcash	1,835	1,910.93	4,530.89	0	180,000
Prod_total	1,835	2,700.81	5,206.86	0	181,300
Sales	1,835	836.69	4,526.06	0	180,300
Labourh	1,809	53.52	261.57	0	9,527
Labourf	1,808	370.67	368.41	10	6,140
Off_inc (XOF[1])	1,835	127,036	358,934.6	-	6,765,000
Cost_inp (XOF)	1,835	155,637	2,380,310	-	9,680,000
Nfoo_sp	1,835	187,762.0	221,625.6	1,000	3,056,000
MFSI (agribusiness)	222	0.1077	0.2217	0.2147	0.4041
MFSI (non-agribusiness)	1606	0.1058	0.4778	0.2474	0.2405

Source: Data PNGT2, 2011

[1] *In 2011, 1USD was equal to 505.18 XOF*

in model (2) with regard to the presence of endogeneity in the binary choice model; is the vector of parameters to be estimated, and the error term following the normal distribution.

Because a household's agribusiness status affects the model's parameters, the structural model is:

$$\begin{cases} MFSI = X\beta_1 + \varepsilon_1 & if\ AGB=1 \\ MFSI = X\beta_0 + \varepsilon_0 & if\ AGB=0 \end{cases} \quad (4)$$

[74] argued that given the null hypothesis of mathematical expectation (ε_i) as the tenet of ordinary least squares (OLS), the latter cannot be used to estimate the model. The following equations show this argument:

$$E(\varepsilon_1 \mid AGB = 1) = -\sigma_1 \frac{\phi(X\beta)}{\Phi(X\beta)}$$

$$E(\varepsilon_0 \mid AGB = 0) = -\sigma_0 \frac{\phi(X\beta)}{1-\Phi(X\beta)}$$

with ϕ and Φ , respectively, and the density and cumulative density functions of the normal distribution, respectively. The fact that the error terms follow a normal distribution ensures that their respective variances, σ_0 and σ_1 , are non-zero. Therefore, both elements of conditional expectation are not zero.

By posing $IRM_1 = -\frac{\phi(\cdot)}{\Phi(\cdot)}$ and $IRM_0 = -\frac{\phi(\cdot)}{1-\Phi(\cdot)}$, the model in (4) becomes:

$$\begin{cases} MFSI = X\beta_1 + \sigma_1 IRM_1 + \mu_1 & if\ AGB=1 \\ MFSI = X\beta_0 + \sigma_0 IRM_0 + \mu_0 & if\ AGB=0 \end{cases} \quad (5)$$

where $u_1 = \varepsilon_1 + \sigma_1 IRM_1$ and $u_0 = \varepsilon_0 + \sigma_0 IRM_0$; IRM_1 and IRM_0 are the inverse ratios of Mills, respectively. Therefore, if the model is estimated in its original form (4), there will be an error in variable omission (i.e., IRM_1 and IRM_0).

Based on equation (5), $E(u_1) = E(u_0) = 0$ as errors u_0 and u_1 follow the reduced-centred normal distribution of zero expectation. It is then possible to apply the least squares method. However, the details of ϕ and Φ remain unclear. This requires obtaining their respective estimators before estimating equation (5).

The two-step method (Heckman, 1979), is a potential method for estimating the system (5). The basic principle of this method is to evaluate $E(\varepsilon_i)$ and replace the values obtained in Model (4). Next, the resulting system (5) is estimated using the least least-squares (OLS) method. Because ϕ and Φ are unknown, Heckman (1979) proposed estimating equation (1) using a probit regression technique to derive the estimators of ϕ and Φ . These estimators are then used to compute the inverse ratios of Mills, which are finally integrated in the second step as regressors in Model (5).

By applying the maximum likelihood method to the binary choice model, ω estimates were obtained, permitting to draw the inverse ratios for Mills (IRM_1 and IRM_0).

3.4 Estimation Techniques of Agribusiness Status Model

Empirically, Equation (2) can be rewritten using its explanatory variables as follows:

$$AGB^* = f(qcer, educ1, land\_cereal, land\_cash, laborf, laborh, tech, Cost\_inp) + e$$

As highlighted above, the estimation of this model follows the method in [75]. This estimation may be difficult if there are measurement errors in the explanatory variables, that is, the so-called right errors [76]. This generally causes a bias in the parameter estimates. In other words, when correct errors occur, the endogeneity problem prevents convergence of the estimated parameters. Bias in the model estimates may also arise from simultaneity between the dependent variable and at least one explanatory variable. In the case where these biases appear or are suspected, several estimation methods can be used to obtain consistent estimates, namely the instrumental variable probit (IVProbit), the method of [77], and the triple least squares method (3SLS).

Table 6. Estimates of robustness

	Rivers &Vuong	IV Probit	3SLS	Probit
qcer	0.7298***	1.5827***	0.16442***	0.8555***
	(0.01338)	(0.21750)	(0.01408)	(0.09598)
Educ1	0.0084	0.0201	0.00799	0.06990
	(0.0807)	(0.06212)	(0.00970)	(0.06641)
Land_cereal	-0.0304	-0.1036***	-0.00516	-0.02378
	(0.0258)	(0.03546)	(0.00368)	(0.02166)
Land_cash	-0.01045	-0.0192*	-0.00370**	-0.01397
	(0.00705)	(0.01136)	(0.00166)	(0.00945)
Labourh	-0.000034	0.00002	0.000001	0.00002*
	(0.00006)	(0.00001)	(0.00002)	(0.00001)
Labourf	-0.00043***	-0.0006***	-0.00009***	-0.00045***
	(0.00013)	(0.00011)	(0.00002)	(0.00012)
Tech	-0.28408***	-0.3317***	-0.04263***	-0.22649***
	(0.06222)	(0.06746)	(0.00853)	(0.06733)
Cost_inp	0.00618	-0.0672**	-0.00916	-0.0357
	(0.04393)	(0.03185)	(0.00590)	(0.03457)
cons	-3.2156	-8.6602***	-0.11848	-4.0144***
	(1.0005)	(1.5217)	(0.10497)	(0.65921)

Source: Data PNGT2, 2011

However, as suggested by [78], not all these methods are robust. [79] performed a comparative analysis of three methods (IVProbit, MLE-simple probit, and Rivers and Vuong's method). He found that IVProbit, Rivers, and Vuong's methods are less powerful than the simple probit method, and that none of these three methods allows us to determine the origin of endogeneity. [79] used the 3SLS estimation method to identify the origin of this endogeneity. Hence, this study used the Rivers and Vuong method, IVProbit, 3SLS, and simple probit as the most robust tests. Table 6 summarises these estimates.

3.5 Choice of the Estimation Method

Table 6 presents the estimates of IVProbit, 3SLS, Rivers and Vuong's method, and the simple probit method and sheds light on the robustness of each estimation method. This indicates that the 3SLS and simple probit models have substantially the same results, notably four significant parameters each (the parameter estimates are almost identical in their sign and value, but their standard deviations differ from those of the 3SLS estimates are lower than those of the simple probit estimates). The results of both methods differ from those obtained using Rivers and Vuong's method, because only three estimated parameters are significant for the latter method. By contrast, the parameters estimated using the Rivers and Vuong methods and their standard deviations were greater than those estimated using the 3SLS and simple probit methods. Regarding the IVProbit method, six of the eight estimated parameters were significant, and most had standard deviations greater than those obtained using the other three methods.

Based on this analysis, IVProbit appears to be more efficient than the other three methods (Rivers and Vuong, 3SLS, and simple probit). In other words, the estimates show that the PIVProbit method is more powerful than other methods; therefore, the quantity of cereals (qcer) is endogenous. Thus, IVProbit is a better estimation method for addressing this problem, as recommended in [75]. Consequently, the inverse ratios of Mills were drawn from the IVProbit estimates to correct for endogeneity bias in the model estimating the determinants of food security.

A link test was conducted to show whether the model was well specified and did not suffer from omission of important explanatory variables. The data in Table 7 confirm that the model is well-specified and that no omission has occurred, as the coefficient of the variable _hat is significant. In addition, a Wald test was conducted to detect whether the endogeneity problem was solved in the IVProbit estimate (see Table 8). As a result, the variable 'athrho' is significant at the 5% level. This result confirms that the quantity of cereals (qcer) in the agribusiness status model was no longer endogenous. In other words, the significance of the coefficient of this variable

shows that, without this control, the estimate would be skewed. That is, instrumental variable estimation corrects the effect of endogeneity of this related variable.

Table 7. Results of the 'link test'

Agri-status	Coef.	Std. Err.
_hat	1.02837***	0.188947
_hatsq	-0.014329	0.0778921
_cons	-0.0111897	0.1384351

LR chi2(2)= 109.87

The non-significance of the link test allows for the interpretation of the results of the IVProbit regression of equation (6). Additionally, the Wald test statistic (Table 8) was significant, indicating that all explanatory variables were significant, justifying the model's overall fit and allowing for the interpretation of the coefficients.

3.6 Estimation Techniques of the Food Security Model

Households' food security status was regressed on their own characteristics. Thus, ordinary least squares (OLS) techniques were used to estimate the relationship between the multidimensional food security index and explanatory variables (X) introduced in the empirical model of System (5).

Table 8. Results of IVProbit estimates

Agribusiness status	Coef.	Std. Err.	dy/dx
qcer	1.5827***	0.21750	0.15182***
Educ1	0.0201	0.06212	0.01240
Land_cereal	-0.1036***	0.03546	-0.00422
Land_cash	-0.0192*	0.01136	-0.00248
Labourh	0.00002	0.00001	0.000002
Labourf	-0.0006***	0.00011	-0.00008***
Tech	-0.3317***	0.06746	-0.04019***
Cost_inp	-0.0672**	0.03185	-0.00634*
_cons	-8.6602***	1.5217	-
/athrho	-0.64216**	-	-
/lnsigma	-0.45847***	-	-

*** significant at 1%, ** significant at 5%, *Significant at 10%*

Wald test of exogeneity (/athrho = 0): chi2(1) = 4.32, Prob = 0.0377, Wald chi2(8)= 101.03 with Prob = 0.000

% Correct predictions: 86.93, Source: Data PNGT2, 2011

Table 9. Food security determinants

MFSI	Non-agribusiness	Agribusiness
Sex	-0.00608	0.03309
	(0.01633)	(0.03943)
Size	-0.00329***	-0.00402***
	(0.00035)	(0.00084)
Qcash	0.01185***	-0.00655
	(0.00183)	(0.00589)
Nfoo_sp	-0.00060	-0.00177
	(0.00243)	(0.00520)
Off_inc	0.00449***	0.00480
	(0.00145)	(0.00306)
Sales	0.00571***	0.03198***
	(0.001109)	(0.00830)
invmills1	-0.11853***	-0.05455**
	(0.01356)	(0.02327)
_cons	0.18697***	0.04417
	(0.03936)	(0.08982)
	F= 46.95	F= 12.664
	(Prob= 0.000)	(Prob= 0.000)
	R^2= 0.4766	R^2= 0.5884

Source: Data PNGT2, 2011

$$\begin{cases} MFSI = X\beta_1 + \sigma_1 IRM_1 + \mu_1 & if\ AGB=1 \\ MFSI = X\beta_0 + \sigma_0 IRM_0 + \mu_0 & if\ AGB=0 \end{cases}$$

with,

$$X = (sex, size, qcash, nfood\_sp, Off\_inc, invmills)$$

Based on two-step principles, this model was regressed by incorporating the inverse ratio of Mills drawn from agribusiness status regression. Furthermore, the study applied a multiple equation estimation technique to estimate the system (5). Table 9 presents the results of the regression.

4. RESULTS AND DISCUSSION

4.1 Determinants of Agribusiness Status among Rural Households

The data in Table 8 indicate that the coefficients of the six explanatory variables (coefficients) are statistically significant, including the quantity of cereals (qcer), land size for cereals (Land_cereal), land size for cash crops (Land_cash), hired labour force (Labourh), family labour force (Labourf), technology used (tech), and input cost (Cost_inp). However, among these coefficients, only four have significant marginal effects. These marginal effects concern the quantity of cereal, the family labour force, the technology used, and the input cost. Therefore, this study considers only the interpretation and discussion of these marginal effects.

The quantity of cereals produced by a household has a significant positive marginal effect on agribusiness status. This means that there is a high probability that households specialising in cereal production are not agribusiness. This result may express the ease for non-agribusiness households to produce cereals compared with cash crops, as the latter often requires certain investments in agricultural equipment or specific inputs with certain financial capacity. The results also reinforce the idea that non-agribusiness households are merely traditional farms struggling for subsistence, in accordance with the theory of the peasant economy, but barely affect agricultural profit through market participation. This is contrary to the findings of [80] in Ethiopia, for which the produced quantity of maize positively influences rural households' decision to participate in the market. This means that, depending on the type of cereal, rural households are more likely to experience agribusiness.

The household family labour force is negatively and significantly linked to agribusiness. This means that an increase in family labour by one man/day decreases the probability of this household being non-agribusiness. This result may be contradictory to the research expectation, insofar as non-agribusiness households should be characterised by a positive influence of their family labour. The reason may be that such households barely rent/hire community labour. In other words, agribusiness should be a great source of hired labour from the community. However, field experience shows that many households with a high family labour force are often large producers of both cash and cereal crops [30]. In addition, in regard to the definition of 'agribusiness', most agribusiness households might have greater family labour than hired labour if their size is large (especially in terms of agricultural assets). This result is consistent with the work of [81], who found that family labour generates less farm income than hired labour at the household level in Nigeria.

Agricultural technology used in household farming negatively and significantly influences the agribusiness of these households. That is, the use of more performing technology by a household in farming has a negative and significant effect on the probability of this household being non-agribusiness. For example, if a household changes its technology from manual to animal traction, the probability that the household is agribusiness is high. This result supports the argument that agribusiness is closely related to the farm equipment. For example, the equipment level significantly influences agricultural productivity [22]. In particular, the adoption of animal or motorised traction generates higher productivity than manual traction (ibid).

The cost of the inputs used in household farming has a negative effect on agribusiness. In other words, if the input cost is high, there is a high probability that the related household is non-agribusiness or agribusiness. This result supports the idea that agribusiness households (as businesses) spend large amounts of money on agricultural inputs, including seeds, manure, pesticides, herbicides, and chemical fertilisers. Thus, these results meet the research expectation that households that spend more money on agricultural input are agribusinesses. This finding is consistent with that reported previously [82]. These authors found that input costs positively affected farmers' market

participation, a typical case of agribusiness actors.

Overall, a household's agribusiness status is influenced by several factors that characterise them. Indeed, non-agribusiness households are characterised by their level of specialisation in cereal production, probably justifying their designation of 'traditional farms'. According to Chayanov, these farms manage natural risks and maintain a balance at three levels:1) between resources and needs, 2) between humans and nature, and 3) between humans and humans. As such, they use few or no chemicals and (chemical) fertilisers to increase their yields. That is, they are not intensification-oriented, given the negative relationship between non-agribusiness and the input level. This may also explain their low level of equipment, as agribusiness is negatively linked to the level of technology adopted. In contrast, agribusinesses have intensification-oriented behaviour as they resort to the increased use of inputs (chemicals and fertilisers). While this may guarantee better productivity and higher profit, such farms pay little attention to the triple-level balance characterising non-agribusinesses.

Finally, the family labour force significantly determines a household's agribusiness status. That is, an increasing family labour in a household implies a high chance for this household to be an agribusiness. This is contrary to hired labour, which is not a significant determinant of a household's agribusiness status. Otherwise, the results would have established that agribusinesses use more local labour insofar as national data indicate that these actors can contribute to job creation for local populations [27].

4.2 State of Food Security in Regard to the Agribusiness Status

The estimates of the food security model for non-agribusiness households show that overall, the explanatory variables are significant, as the F-statistic is 46.95 (cf. Table 8). In addition, the model's coefficient of determination was estimated to be 47.66, indicating that 47.66% of MFSI's variation in the MFSI is explained by these explanatory variables. For agribusiness households, estimates show that, overall, explanatory variables are significant, as the F-statistic is 12.66 (Prob=0.000). In addition, the coefficient of determination was estimated at 58.84, indicating that 58.84% of the MFSI's variation in the MFSI was explained by these explanatory variables. Thus, both the models fit the data well.

Table 10 indicate that a proportion of agribusiness and non-agribusiness households were food insecure. Descriptive statistics related to the food security index indicated that 99.25% of non-agribusiness households were food insecure (0.75%). The minimum and maximum MFSI scores were 0.1058 and 0.02405, respectively. On average, these households had a food security index of 0.2474, with a median of 0.02405. The latter means that 50% of non-agribusiness households have food security of less than 0.2405.

For agribusiness households, Tables 10 also show that the minimum value of MFSI is 0.1077. This is slightly higher (by 1.79%) than the minimum value of the index for non-agribusiness households (0.1058). In addition, the average value of MFSI was estimated to be 0.2217 (2.15 times lower than that for non-agribusinesses). The median is estimated to be 0.2147, indicating that 50% of agribusiness households reach a food security level above 0.2147. This is 15.23% lower than that of households without agribusiness. Finally, the maximum value of MSFI is 0.4041, a value higher (by 1.68 time) than that of non-agribusiness households.

The findings described in Tables 10 show that most agribusiness households have a higher level of food security than non-agribusiness households. However, this difference is small when considering the importance of agricultural sector reforms in agribusiness. This is consistent with the defenders of traditional (small) family farming, to whom it is necessary to preserve and protect this type of farming, as this constitutes the future and agricultural sustainability in developing countries such as Burkina Faso [83].

Overall, the results show that two main factors affect agribusiness in households' food security levels: size and agricultural sales. Four determining factors affect the level of food security in non-agribusiness households: family size, quantity of cash crops, non-farm income, and agricultural sales.

Independent of agribusiness, household size had a negative influence on food security. For non-agribusiness households in particular, this result can be understood insofar as they are 'small' farms with few resources [7,8,83].

Table 10. Proportion of non-agribusiness households in food security

MFSI	Agribusiness		Non-agribusiness	
	Number	%	Number	%
< 0.40	221	99.55	1594	99.25
> 0.40	1	0.45	12	0.75
Total	222	100	1606	100

Source: Data PNGT2, 2011

As such, a newborn in such a household would reduce food availability per capita and per day, and expose the household to food insecurity. This may explain why off-farm income positively influences food security in non-agribusiness households. Given their low production levels, most households participate in non-agricultural activities to earn additional income to buy food to supplement their consumption. This finding is consistent with those obtained by [28] and [84] regarding the central role of off-farm income in rural household wellbeing. By contrast, in agribusiness households, the fact that their size has a negative influence on their level of food security seems contradictory. Indeed, in accordance with the arguments in favour of agribusiness, agribusiness households should be able to reach a production level that is sold on the market, which can guarantee a higher level of food security to its members. In addition, given that agribusiness status is positively linked to the quantity of family labour, agribusiness production level is expected to increase with household size (providing family labour) and, therefore, positively influences the food security of these members. However, the findings show that agribusiness households probably do not produce (or sell) enough food to guarantee security for their members.

The findings also show that agricultural sales affect food security in both the agribusiness and non-agribusiness scenarios. This effect is 4.6 times greater for agribusiness households than for non-agribusiness households. In other words, when sales increase, the level of food security increases for both agribusiness and non-agribusiness but more substantively for agribusiness. This implies that agricultural income drawn by these actors positively influences their level of food security. Therefore, resorting to the market by vending agricultural products contributes to reducing food insecurity, as shown in [31,83], and [85] in the case of East Africa.

Last but not the least, cash crop quantity positively influences non-agribusiness households' food security level. This result confirms [31]. This finding also supports the work of [86], in which cash crop production increased households' food security through the income they could generate. Indeed, cash crops are merely oriented towards the market (e.g., cotton). Thus, as this quantity increases, sales also increase, offering households other opportunities to diversify their diet. Large producers of cash crops, such as cotton, usually produce certain cereals, such as maize, because of the common input needs. Thus, with the input credits granted by companies operating in the cotton sector, maize and cotton production may simultaneously increase and influence the level of food security of the households involved.

5. CONCLUSION

Rural agricultural households have been excluded from the agribusiness policy until now, as they were not considered agribusiness. This paper has designed an agribusiness status of these rural households and determined the socio-economic factors explaining the probability of a household being agribusiness. The study concludes that, in the current state of knowledge, agribusiness in Burkina Faso is determined by the level of technology used, the quantity of family labour, the quantity of cereal produced on the farm, and the cost of inputs used on the farm. The study also concludes that agribusiness contributes to household food security four times more than traditional farming in Burkina Faso does.

In addition, the level of food security for both agribusiness and non-agribusiness households is characterised by the size of their farms (land) and the amount of their sales. This is understandable, as rural households with a large farm size are those with a large family size (and family labour). They produce cash crops for the market and cereal crops for both the market and consumption. In contrast, non-agribusiness households sell less in the market, probably because they produce less (and have a small farm size), so their production is merely directed

for their own consumption. As the agricultural policy did not clearly target rural households as key actors in the agribusiness sector, the state loses the potential for taxpayers in the country annually. Indeed, by focusing only on legally installed agricultural enterprises such as agribusiness, most large farms in rural areas do not pay taxes. However, many large rural farms do not profit from subsidies or facilities (e.g., access to credit and improved seeds) offered by the state to agribusiness. A tentative policy that included small farm holders and large rural farms began in 2020, through a general census of all farmers in the country. The idea is to grant them an ID code that will help them access inputs. But, on the ground, this policy suffers from inefficiency in regard to a significant number of farmers in the country and the fact the definition of agribusiness is kept unchanged.

Specifically, the findings that the adoption of more mechanised agricultural technologies (e.g., tractors) and the cost of inputs (e.g., improved seen, fertilisers, and chemicals) are key characteristics of agribusiness support the neoclassical theory, which asserts that agribusiness seeks to maximise its profit. Indeed, investing in modernised technologies and inputs with high productivity is a typical behaviour that leads to more profit as the output increases. This is also shown by the finding that agricultural sales increase the level of food security (through profit or income earned) more significantly than traditional farming does. The latter finding may show the taste of agribusiness actors for income/profit from market participation compared with traditional farming, which participates less, as they mostly produce non-cash products. Thus, agribusiness tends to continuously optimise profits under the constraint of limited resources. By specialising in non-cash agricultural production (that is, their equilibrium), traditional farmers may certainly have other considerations beyond the profit that guides their behaviour, such as protecting their small land from degradation by not using chemical or conventional fertilisers. However, if they decide over time to shift from these considerations through the adoption of modernised technologies, they are more likely to move away from this equilibrium. This finding supports the traditional farming system proposed by Schultz and Chayanov, in which traditional farmers are not necessarily irrational.

Therefore, the policy implication is that rural households should be included in decision-making in line with agribusiness. Thus, to address both fiscal and food security issues, policymakers should focus not only on formal enterprises, which usually come from outside communities and buy cheap land to implement agribusiness activities. In addition, agricultural policies offering access to subsidised inputs (including fertilisers, improved seeds, and pesticides) for agribusiness should be extended to rural households that sellmore than 60% of their agricultural products. This has the potential to reduce production costs, which are mainly constitutive of input costs. Furthermore, access to technological equipment supplied by the state to agribusiness in the framework of agricultural modernisation should also benefit such households. In doing so, policies can efficiently boost agricultural production and ensure food security.

Furthermore, agribusiness policies focusing on rural households have been neglected, probably because it may be easier to efficiently support (through subsidies) a reduced number (less than 1%) of households than the mass (more than 80% of the population) given that the government's budget is low and cannot afford it. In addition, for a long time, there was no clear policy distinction between agribusiness and non-agribusiness apart from their legal status, which was an exclusionary of the existing potential. However, since this definition is known and easily applicable on the ground, the main limitation of this policy recommendation is the limited amount of money the government can allocate as subsidies to reach out to all identified agripreneurs from rural communities. In other words, there is still an important proportion of rural households with agribusiness status.

The first major limitation of this study is that it relied on dated data. It was difficult to collect data covering the entire country because of the large number of topics that were addressed. Second, it was unable to use real data on legally existing agribusiness actors. This limits the policy lessons drawn from this study.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

DISCLAIMER

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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APPENDIX

Table 11. Summary of the theoretical debate on agribusiness and traditional farming

Theoretical debate around agribusiness and traditional farming	Strengths		Weaknesses /limitations	
	Agribusiness	**Traditional farming**	**Agribusiness**	**Traditional farming**
Neoclassical theory	-Adapted to modern agriculture; -High competition between actors, i.e., better control its costs; -Call for an "improved climate for investment" such as a sound macro policy environment, public goods provision, legal and regulatory frameworks	-Imbalanced power relations between actors leads to unequal access to markets and inputs	-Non-adapted to traditional or rural farming;	-
Allocative efficiency theory	-Efficient resources allocation in risky and uncertain environments; -Maximising its profit through the optimal use of resources such as land, capital, technical progress, and labour	-Traditional farming is more efficient than modern farming	-All rural farmers are or cannot be agripreneurs so, do not seek for maximising their profit	-Productive efficiency is invariable for all types of farms
Peasantry theory	-	-This type of agriculture seeks to manage natural risks better to maintain or improve their equilibrium at three levels: (i) the balance between resources and needs, (ii) the balance between people and nature, and (iii) the balance between humans themselves	-Careless of the environmental sustainability	-Not extended beyond nuclear households so that in real life, the model is not applicable to complex and dynamic household units;

Theoretical debate around agribusiness and traditional farming	Strengths		Weaknesses /limitations	
	Agribusiness	**Traditional farming**	**Agribusiness**	**Traditional farming**
		-Traditional farms are also rational (capable of margin reasoning), but from a different perspective than capitalistic farms when considering the close relationship between labour and consumption patterns pertaining to agricultural activity; - Pursued goal of this type of farming is equilibrium		-The model does not account for property rights (notably on land)

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