



Issue of Food Insecurity among Households in the Communities of Baoudetta and Koono in the Department of Tessaoua, Maradi Region in Niger

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Abstract

This study addresses the issue of food insecurity in the municipalities of Baoudetta and Koono. The objective is to analyze the foundation of food insecurity first through the living conditions of agricultural households. Furthermore, the analysis of the prevalence of food insecurity has allowed for an assessment of the availability of foodstuffs in the markets and their accessibility to the population. The methodology for this work is based on documentary research, data collection in fourteen villages using a household questionnaire via Kobocollect, semi-structured interview guides, and an observation grid. The surveys have allowed for the collection of quantitative and qualitative information. Finally, the treatment and analysis of the results were carried out using appropriate software and methods. The main results show that 9.3% of households are food secure, 41.8% are in mild food insecurity, while 13% suffer from severe food insecurity and 35.9% are in moderate food insecurity. The analysis revealed that households led by women are particularly vulnerable (51.5% of them are in severe food insecurity). The calculation of the Food Availability Index (FAI) shows that the majority of households have a high vulnerability, with a negative food self-sufficiency rate (FSSR) indicating a high dependence on imports. The interpretation of the composite food consumption score (SCA is 32.14) indicates insufficient food quality and quantity in households. As a result, these households face purchasing constraints related to rising prices, lack of money, exacerbated by the distance from markets.

Subject Areas

Agricultural Science

Keywords

Issues, Food Insecurity, Food Security, Municipality, Baoudetta, Koonaa, Niger

1. Introduction

The issue of food security is a major concern for third-world countries, where food insecurity affects 795 million people suffering from chronic hunger and nearly two billion suffering from hidden malnutrition [1]. In 2007, the FAO estimated 923 million people suffering from hunger worldwide [2]. Among these people, 95% are in developing countries, with Africa experiencing on average more than 16 food crises between 1982 and 2001 [3]. Furthermore, 24 of the 35 countries in severe food crisis recorded globally between 2003 and 2004 are in sub-Saharan Africa. The number of malnourished people in this region increased from 170 million in 1990 to 212 million in 2007, representing an annual increase of 1.37%. In 2023, according to the joint report by FAO, IFAD, WHO, WFP, and UNICEF on The State of Food Security and Nutrition in the World (SOFI), approximately 733 million people worldwide were suffering from hunger, or nearly one in eleven people [4]. Among them, about 90% to 95% live in developing countries, with Africa remaining the most affected region: it alone accounted for 282 million undernourished people in 2022, representing more than one-third of the global total [5]. Moreover, the prevalence of undernourishment in sub-Saharan Africa remains particularly high, affecting nearly one in five people [6]. Furthermore, FAO reports on food security already indicated that between 2003 and 2004, 24 of the 35 countries in a severe food situation were located in sub-Saharan Africa. The total number of undernourished people on the African continent rose from approximately 170 million in 1990 to 282 million in 2022, representing an average annual increase of nearly 1.5%. This reflects a continuous deterioration of the nutritional situation despite efforts made at both national and international levels [7].

In Niger, climate variability has led to a decline in rainfall and increasing competition over natural resources, exacerbating food insecurity for a population dependent on the exploitation of these resources [8]. Major food crises, such as those in 1973 and 2005, clearly illustrate the country's food imbalance [9]. In 2007, 12% of Nigerien households were affected by severe food insecurity and 22% moderately, according to the INS. Food security is based on four principles: food availability, supply stability, economic and physical accessibility, as well as food quality, safety, and sanitation. This means that every individual should have access to healthy and nutritious food, as well as health services and a healthy environment. On the other hand, food insecurity often results from the deprivation of one or more of these four dimensions. These issues are exacerbated by factors such as insufficient resources, limited access to non-agricultural employment, as well as inadequate road infrastructure. The manifestation of the food crisis in Niger can

be explained by the depletion of farmers' stocks, the rise in prices of essential food-stuffs, and the deterioration of children's nutritional status [10]. However, several researchers have highlighted the structural and situational causes of this crisis [9] [11]. These causes include the scarcity of resources, the technical level of farmers, and the poverty of the population. According to the IFAD 2019 report, about 34% of the Nigerien population lives in extreme poverty, and the country's human development index remains among the lowest in the world [12]. The central issue is feeding a young population, with more than 50% aged between 0 and 14, while avoiding the worsening of poverty. This study, conducted as part of a doctoral thesis, focuses on the issue of household food insecurity in the communes of Baoudetta and Koonaa in the Maradi region. It aims to analyze food insecurity in these communes through its foundations, the conditions related to food insecurity, and its prevalence of access in order to assess the food security of these farming households.

2. Geographical Characteristics of the Study Area

The communes of Baoudetta and Koonaa were established by Law No. 2002-14 of June 11, 2002, which sets the name of their administrative centers. They are part of the canton of Korgom in the department of Tessaoua. Located 22 and 30 km south of the departmental capital, between 8°4' and 8°10' East longitude and 13°30' and 13°45' North latitude, these communes are contiguous and cover approximately 249 km². They are bounded to the east by the rural communes of Maijirgui and Korgom, to the north and west by the rural commune of Maijirgui and the urban commune of Tessaoua, and to the south by the department of Aguié. Each of these localities comprises twenty-five (25) villages and tribes and/or hamlets, with a total population of 18,311 for Baoudetta and 22,972 for Koonaa in 2024 (see Figure 1).

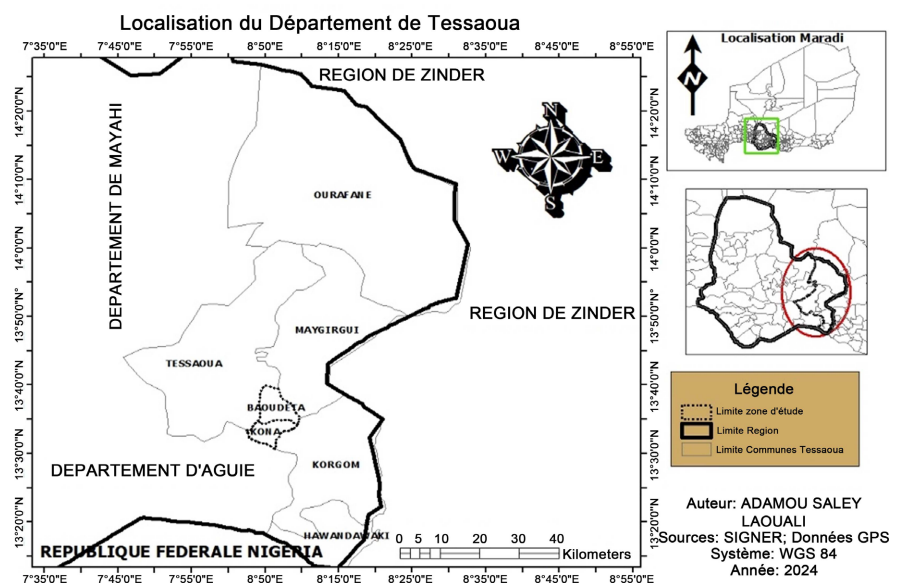


Figure 1. Location of the study area. Source: SIGNER data; Garmin GPS, 2024.

The climate of the study area is semi-arid Sahelian, with three seasons. Indeed, there is a long dry and cold season from November to February, a hot and dry season from March to May, and a rainy season from June to September, which can exceptionally extend to mid-October. Temperatures range between 40°C and 15°C, and the rainfall gradient goes from 400 to 600 mm per year from north to south. The terrain is flat, with a maximum elevation of 189 m, consisting of low plateaus, sand dunes, inter-dune depressions, and valleys. The hydrographic network is poor, with no permanent ponds; however, semi-permanent ponds exist and are used for watering animals and extracting construction materials.

3. Research Methodology

The collection of qualitative and quantitative data, as well as their processing, served as the methodology within the framework of this study.

3.1. Data Collection

Fieldwork was conducted through exploratory visits and surveys (both quantitative and qualitative). To do this, fourteen (14) villages were selected based on their sizes, household activities, and their geographical locations in relation to the administrative centers of the various municipalities. The villages primarily include Baoudetta Haoussa, Baoudetta Peul, Doubaoua, Gao Sofua Haoussa, Dan Baoussaoua, Gao Sofua Bougajé, and Mourey in the Baoudetta municipality, and Gochiro, Koonaa, Dagouajé, Rijiyal Sarki, Rijiyal Doudoua, Hardo Bamey, and Hardo Dotori in the Koonaa municipality (see [Figure 2](#)).

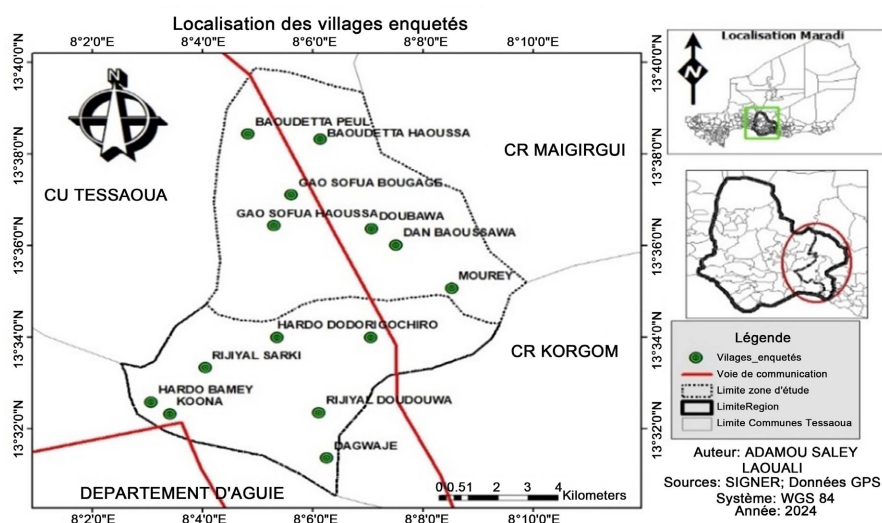


Figure 2. Distribution of surveyed localities. Source: SIGNER data; Garmin GPS, 2024.

According to the National Directory of Localities [13], these municipalities total 3009 agricultural households. The determination of the sample size at the level of the target villages was obtained according to the protocol of [14]. This method was inspired by the work of [15], which is written as: $\beta = Za2 \times pq/i2$ where:

- β = sample size;
- $Z\alpha = 1.96$: Standard score corresponding to a 5% risk α ;
- $p = n/N$ with p being the proportion of agricultural households in the study area;
- n = number of agricultural households in the study area;
- N = total number of households in the study area;
- $q = 1 - p$;
- i = desired precision or margin of error (traditionally set at 5%).

The quota method was used to determine the number of households surveyed per village. In total, 384 households were surveyed, representing 19.96% of the total number of farming households in the 14 villages (1924 farming households). The target population consisted of farmers aged at least 40 years, as they have sufficient hindsight to assess the evolution of food security over the past 20 years. Other individuals interviewed in the semi-structured interviews included State technical services, local officials, and other resource persons who are directly or indirectly connected to food issues through their relationships with the farmers. In total, 12 resource persons were surveyed at the two-commune level, 10 at the departmental level, and 3 at the level of each village. Additionally, focus groups were conducted to complement and enrich the collected data.

3.2. Data Collection Tools and Equipment

For this study, a household questionnaire is used to collect quantitative data via KoboCollect. Additionally, a semi-structured interview guide, an observation grid, a GPS device, and a digital camera are also employed.

3.3. Types of Data Used

Documentary research, socioeconomic information of households, and cartographic materials were used in this study.

3.4. Processing of Collected Data and Analysis of Results

The collected data were processed using the Sphinx Plus2 V5 software. Some data were directly converted into tables or graphs, while others were modified and then transformed using the Excel spreadsheet. Qualitative data from semi-structured interviews were manually analyzed before being transcribed into Word. ArcMap 10.4 and QGIS 3.34 software were used to create the maps.

4. Results

This section presents the fundamentals of food insecurity in relation to the conditions of food insecurity in the study area. Furthermore, it examines the prevalence of access to food insecurity by municipality, as well as by sex and age of the respondents, in order to analyze the availability of food products in the markets and their accessibility to this population.

4.1. Foundation of Food Insecurity in the Communes of Baoudetta and Koonaa

The foundation of food insecurity here presents itself in various forms, including the conditions that hinder adequate access to food for this population. Understanding its factors will help highlight the foundation of food insecurity and its manifestations on the households studied.

4.1.1. Conditions Related to Food Insecurity of Agricultural Households

Conditions related to food insecurity provide information on the perception of vulnerability or lack of food among agricultural households in the research area.

Table 1. Agricultural households without food for at least 10 days.

	Staff					
	Baoudetta		Koonaa		Total	
<i>Numerous quotes</i>	Yes	No	Yes	No		
<i>Agricultural households without food for 10 days</i>	59	115	97	113	156	228

Source: field data, 2024.

Table 1 shows the number of household heads who reported experiencing a food shortage for at least ten days prior to the survey. The analysis indicates that the number of households answering “yes” (156) is very low compared to those answering “no” (228), both in the commune of Baoudetta (59 out of 115) and in Koonaa (97 out of 113). This situation can be explained by the fact that households who answered “yes” neither have food available nor the means to obtain it. The main causes could be low production, the selling off of crops at low prices, food price volatility, and the high number of people to feed. To better understand this situation, the frequencies of daily meals in these households will be calculated in the next analysis (**Table 2** and **Table 3**).

Table 2. Frequency of daily meals of farming households during the lean season.

	Municipalities						Total
	Baoudetta			Koonaa			
<i>Numerous quotes</i>	Once	2 times	3 times	Once	2 times	3 times	
Meal frequency during the weaning period	131	25	18	162	11	37	384
Percentage %	34.11	6.51	4.69	42.19	2.86	9.64	100

Source: field data, 2024.

Table 2 shows that very few households consume three meals a day (4.69% in Baoudetta and 9.64% in Koonaa), which often indicates a lack of food in the study area. In fact, 34.11% of the villages in the Baoudetta commune and 42.19% of those

in the Koonna commune eat only once a day during the lean season due to the depletion of food stocks or strict management of the granary before the harvest. It is therefore necessary to analyze this frequency after the harvest.

Table 3. Frequency of daily meals of farming households after the harvest.

	Municipalities						Total
	Baoudetta			Koonna			
Numerous quotes	Once	2 times	3 times	Once	2 times	3 times	
Meal frequency after harvest	20	103	51	32	112	66	384
Percentage %	5.21	26.82	13.28	8.33	29.17	17.19	100

Source: field data, 2024.

The analysis of **Table 3** reveals the proportion of respondents according to the frequency of meals in the communes after the harvest. A large proportion of households consume only two meals per day (26.82% in Baoudetta and 29.17% in Koonna). Some households manage to have three meals per day, with 13.28% in the villages of Baoudetta and 17.19% in the villages of Koonna. Other households consume only one meal, with rates of 5.21% and 8.33% in the communes of Baoudetta and Koonna, respectively. This variation does not favor households that have reached the standard daily meal frequency; nevertheless, conditions related to the question of “preferred food” may influence this situation. Households that have reached two and three meals per day will be analyzed in **Table 4** to explain this variation.

Table 4. Households having a preferred food for at least 1 month.

Answers	Staff					
	Baoudetta		Koonna		Total	
	Yes	No	Yes	No	Yes	No
Agricultural households that have eaten their preferred food for at least 1 month	17	137	23	155	40	292
Percentage %	5.12	41.27	6.93	46.69	12.05	87.95

Source: field data, 2024.

Nearly 88% (332 out of 384) of agricultural households had more than one meal per day. Only 12% had a preferred food during the four weeks preceding the survey. In any case, the surveyed households experienced shocks that affected their economic living conditions (**Figure 3**).

The analysis of **Figure 3** reveals that agricultural households have experienced several shocks over the past 12 months. The main shocks include food shortages for 37.60% of households, a drop in household income for 14.76%, and a surge in food prices reported by 10.50%. In addition, 1.56% of households lost able-bodied

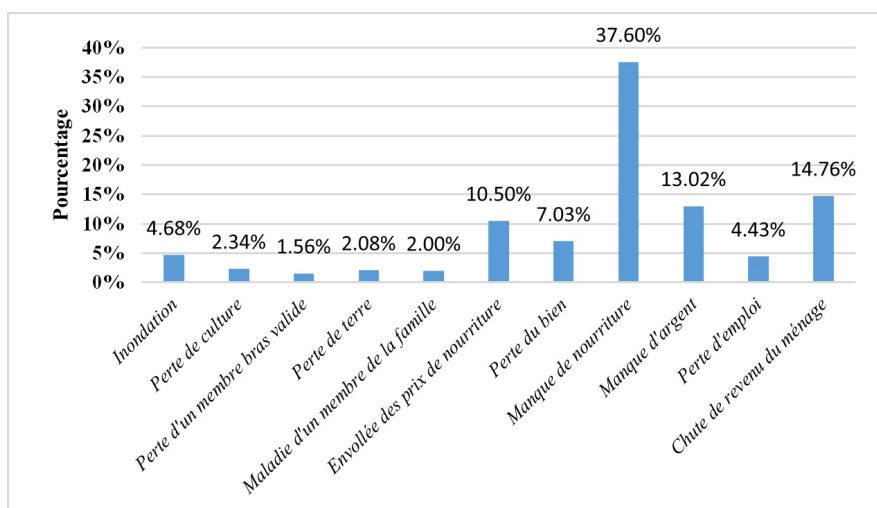


Figure 3. Shocks experienced by agricultural households during the year. Source: field data, 2024.

members, affecting fieldwork and income-generating activities (migration). Furthermore, 7.03% of households lost assets, notably animals and/or were victims of theft, and 2.08% suffered land losses due to land conflicts. Some household heads also mentioned floods as a major shock.



Photo 1. Effects of flooding on households and fields. Source: taken by Adamou, September 2024.

The analysis of the photos above confirms the responses of respondents who were victims of the floods. For some, the flooding affected households (4.68%) and for others, it manifested in their fields (2.34%). This led to crop loss for some households during the peak of the agricultural season (**Photo 1**).

4.1.2. Food Availability Index (FAI)

The food availability index of the households studied was assessed based on the average production and average food needs per survey site. **Table 5.** Food availability index of farming households

The analysis of the data in **Table 5** provides information on the food availability index of the evaluated households. From this, three (03) levels of vulnerability to food insecurity were defined. Indeed, food vulnerability is considered low for

Table 5. Food availability index of agricultural households.

Villages	Number of households surveyed	Average food availability in tons (corn)	Average food requirement in tons	FAI (FA/FN)	Vulnerability
Baoudetta Haoussa	45	18.32	13.8	1.33	Moyenne
Baoudetta Peul	15	7.05	6.8	1.04	Moyenne
Dagouajé	32	6.9	26.11	0.26	Forte
Dan Baoussaoua	11	3.3	7.86	0.42	Forte
Doubaoua	18	12.01	6.8	1.77	Faible
Gao Sofua Bougajé	15	1.22	10.25	0.12	Forte
Gao Sofua Haoussa	40	9.71	30.1	0.32	Forte
Gochiro	40	7.7	36.77	0.21	Forte
Hardo Bamey	13	6.39	3.25	1.97	Faible
Hardo Dodori	15	8.03	4.41	1.82	Faible
Koona	70	60.81	73.47	0.83	Forte
Mourey	30	11.92	6.53	1.8	Faible
Rijial Sarki	30	7.54	19.5	0.39	Forte
Rijiyal Doudoua	10	5.2	4.2	1.24	Moyenne

Source: field data, 2024.

households in villages with a high average production proportion, whose needs are less than the average amount of available food. These households are in the villages of Doubaoua, Hardo Bamey, and Hardo Dodori, where their FAI is above 1.5. For households in the villages of Baoudetta Haoussa, Baoudetta Peul, and Rijiyal Doudoua, their food availability is almost equal to food needs; however, their FAI is greater than 1 but less than 1.5, consequently, the vulnerability at this level is medium. In the other villages, households have high needs with very limited food availability. These households have a Food Consumption Score (FCS) below 1, so their vulnerability to food insecurity is high. This high vulnerability is more common in the villages of the Baoudetta commune than in those of Koona. Regarding low-vulnerability households, two villages per commune are identified, while for medium vulnerability, the Baoudetta commune also has two villages. To better understand this situation, it is necessary to calculate the food self-sufficiency rate (FSR) and the import dependency rate (IDR).

4.1.3. Food Self-Sufficiency Rate

The food self-sufficiency rate is assessed here based on different variables (production, importation, exportation), by village.

The analysis of the results in **Table 6** undoubtedly confirms that the households assessed have not achieved food self-sufficiency; moreover, the results reflect a strong dependence of this population. In order to assess this dependence and bet-

ter understand the share of available domestic supplies coming from imports and that from the households' own production, the next step calculates the import dependency rate.

Table 6. Food self-sufficiency rate of agricultural households. The rate of food self-sufficiency is assessed here based on the following formula: Food Self-Sufficiency Rate = $\frac{\text{Production}}{\text{Production}} + \text{Import-Export} * 100$.

Villages	Number of households surveyed	Average food production in tons (mil)	Average export in tons	Average import in tons (Mil)	Food Self-Sufficiency Rate (%)
Baoudetta Haoussa	45	36.51	18.32	19.56	-1811.44
Baoudetta Peul	15	9.3	2.25	8.13	-215.87
Dagouajé	32	11.45	4.55	13.45	-440.55
Dan Baoussaoua	11	6.66	3.36	6.20	-328.8
Doubaoua	18	16.08	4.07	6.12	-399.88
Gao Sofua Bougajé	15	4.4	3.18	5.21	-311.79
Gao Sofua Haoussa	40	12.29	2.58	6.89	-250.11
Gochiro	40	11.45	3.75	10.98	-363.02
Hardo Bamey	13	8.73	2.34	3.64	-229.36
Hardo Dodori	15	13.93	5.9	5.55	-583.45
Koona	70	89.76	28.95	36.41	-2857.59
Mourey	30	15.51	3.59	13.2	-344.77
Rijial Sarki	30	9.9	2.36	6.74	-228.26
Rijiyal Doudoua	10	8.78	3.58	3.98	-353.02

Source: field data, 2024.

Table 7. Import Dependency Rate (IDR).

Villages	Number of households surveyed	Average food production in tons (mil)	Average export in tons	Average import in tons (Mil)	IDR (%)
Baoudetta Haoussa	45	36.51	18.32	19.56	51.82
Baoudetta Peul	15	9.3	2.25	8.13	53.56
Dagouajé	32	11.45	4.55	13.45	66.09
Dan Baoussaoua	11	6.66	3.36	6.20	65.26
Doubaoua	18	16.08	4.07	6.12	33.76
Gao Sofua Bougajé	15	4.4	3.18	5.21	81.03
Gao Sofua Haoussa	40	12.29	2.58	6.89	41.51
Gochiro	40	11.45	3.75	10.98	58.78

Continued

Hardo Bamey	13	8.73	2.34	3.64	36.3
Hardo Dodori	15	13.93	5.9	5.55	40.87
Koona	70	89.76	28.95	36.41	37.46
Mourey	30	15.51	3.59	13.2	52.55
Rijjal Sarki	30	9.9	2.36	6.74	47.2
Rijiyal Doudoua	10	8.78	3.58	3.98	43.36

Source: field data, 2024.

Table 7 shows that more than half of households in villages such as Baoudetta Haoussa, Baoudetta Peul, and Dagouajé rely on imports rather than local production, with a rate exceeding 50%. In contrast, the villages of Doubaoua, Hardo Bamey, Rijiyal Sarki, and Hardo Dodori show a rate below 50%, related to the low import of quality products. To better understand food consumption, calculating the food consumption score is necessary.

4.1.4. Food Consumption Score (FCS)

The Food Consumption Score is a proximity indicator that reflects the quantity (kcal) and quality of the diet. It is based on a recall of the past 7 days regarding types/groups of foods (diversity) and frequency of consumption.

Table 8. Food consumption score of agricultural households over the past 7 days.

Food	Food group	Weighting A	Number of days of use over the past 7 days B	Note A × B
Corn, Millet, Sorghum, Rice, and other cereals	Cereals and tubers	2	5.87	11.74
Tubers	Dried vegetables	3	0.9	2.7
Bean, peanut	Vegetables	1	4.29	4.29
Vegetables, condiments, leaves	Meat	4	0.56	2.24
Meat, Egg, Fish	Milk	4	1.66	6.64
Dairy products	Sugar	0.5	4.5	2.25
Sugar	Oil	0.5	3.32	1.66
Oil, fat	Fruit	1	0.62	0.62
Fruits			Composite score	32.14

Source: field data, 2024.

The analysis of **Table 8** shows the average household consumption assessed over the 7 days preceding the survey, based on the number of consumptions and

the diversity of foods. This led to the interpretation of the composite score, which is 32.14, hence, according to the method recommended by the World Food Programme (WFP) in 2014, «Borderline»: >21.0 à 35.0 points, these households have limited food consumption of inadequate quality and insufficient quantity.

4.1.5. Empowerment of Subsistence Farming

Agriculture in the study area has always faced low yields. This activity is practiced by more than 92% of the surveyed households. This is explained by the lack of investment in the agricultural sector. In addition, there are rudimentary farming tools and poor soil fertility. This always results in low yields in a context where there is a gap between the growing food demand and limited availability.

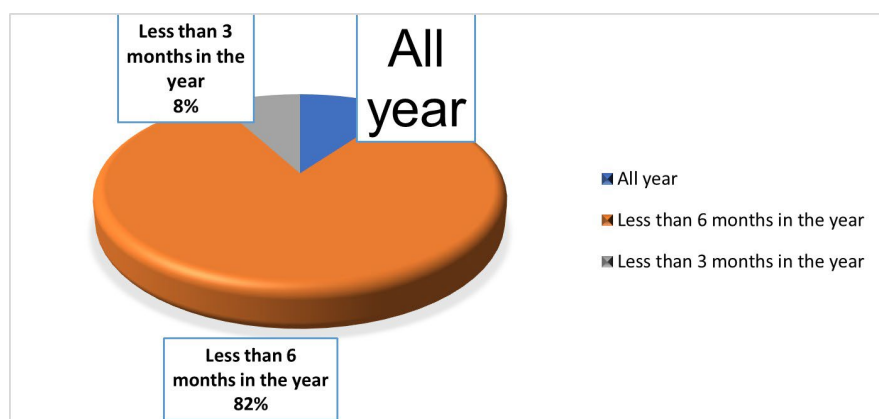


Figure 4. Perception of the population on food availability. Source: Field data, 2024.

An examination of **Figure 4** shows that 82% of households have a food supply lasting less than 6 months, 8% of households have less than 3 months, while only 10% have an annual food availability. This is due to inaccessibility and a lack of resources to procure food. Households with annual food availability engage in various income-generating activities and maintain small savings that allow them to stock up in preparation for the lean period. In addition, these households are often supported by remittances from their migrant members in other locations.

4.2. Analysis of the Prevalence of Food Insecurity among Agricultural Households

The prevalence of food insecurity in the population assessed refers to households experiencing limited food consumption. It is evaluated here for all villages, and then by the sex and age of the respondents.

The analysis of **Figure 5** shows four categories of food insecurity among the evaluated population. Indeed, 9.3% of households are food secure. These households are able to meet their daily food needs, but not the “essential food requirement”, without resorting to coping strategies. 41.8% are mildly food insecure. These households have adequate consumption but cannot afford certain essential non-food expenditures. 35.9% experience moderate food insecurity. Their

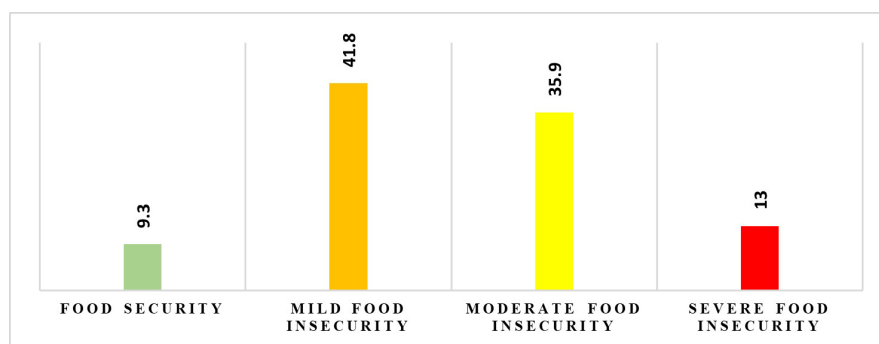


Figure 5. Prevalence of food insecurity among farming households. Source: field data, 2024.

consumption is insufficient, and they cannot meet minimal food needs without coping strategies. Finally, 13% are severely food insecure. These households have major difficulties in meeting their immediate food needs and, moreover, require assistance. These prevalences reveal disparities that highlight the need for a thorough analysis by the sex and age of household heads.

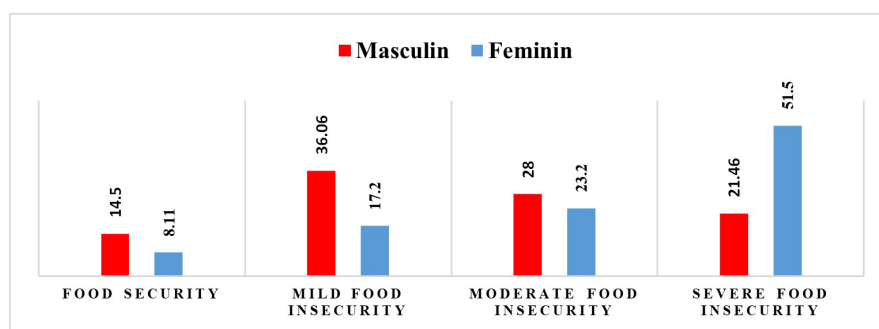


Figure 6. Prevalence of access to food insecurity according to the gender of household heads. Source: field data, 2024.

The examination of **Figure 6** indicates that the proportions of households that are in food security are largely headed by men. Indeed, among the male household heads surveyed, 14.5% are food secure, 36.06% are in mild insecurity, and 21.46% are in severe food insecurity. In contrast, half of the women surveyed are in a situation of severe food insecurity (51.5%) compared to only 8.11% of women who ensure food security in their households. However, food insecurity poses a greater threat to female-headed households than to male-headed ones. **Figure 8** presents the prevalence of access to food insecurity according to the age of household heads.

Figure 7 shows that food insecurity varies according to age groups. Indeed, 6.2% of people aged 40 to 60 and 3.8% of those aged 60 to 80 are in severe food insecurity, while the oldest (18.6%) are the most threatened. Their vulnerability is linked to their reduced production capacity and dependence on aid. Thus, more than 40% of elderly people are food secure, compared to 35.52% for the age group between 40 and 60, and more than 39% suffer from mild food insecurity.

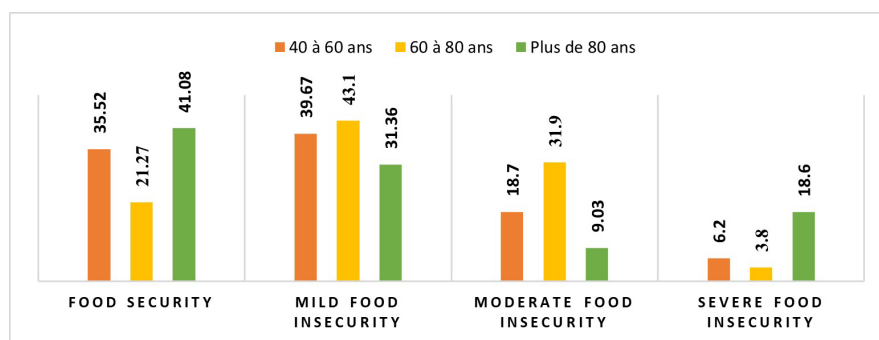


Figure 7. Prevalence of access to food insecurity according to the age of household heads. Source: field data, 2024.

5. Analysis of Food Availability in Markets and Population Access to Products

To study the food security of a population, it is essential to examine both the physical availability of food and access to products. These conditions, which are indispensable for the food security of populations, are influenced by the origin of products, certain risk factors, and market constraints.

5.1. Analysis of Infrastructure, Accessibility, and Food Stability

Physical inaccessibility and the price instability of staple foods threaten food availability in the communes of Baoudetta and Koonaa. The only lateritic road connecting the two communes is impassable in some areas, especially during the rainy season. This complicates food supply, particularly for remote villages. Transport is mainly carried out by cart, except for goods transported by motorcycles. Moreover, the area suffers from a lack of storage, preservation, and processing infrastructure.

5.1.1. Analysis of Food Prices

The price of agricultural products fluctuates throughout the year. **Figure 8** shows the evolution of the average price of the main agricultural products (measured in “Tiya”), which are the most consumed by the population.

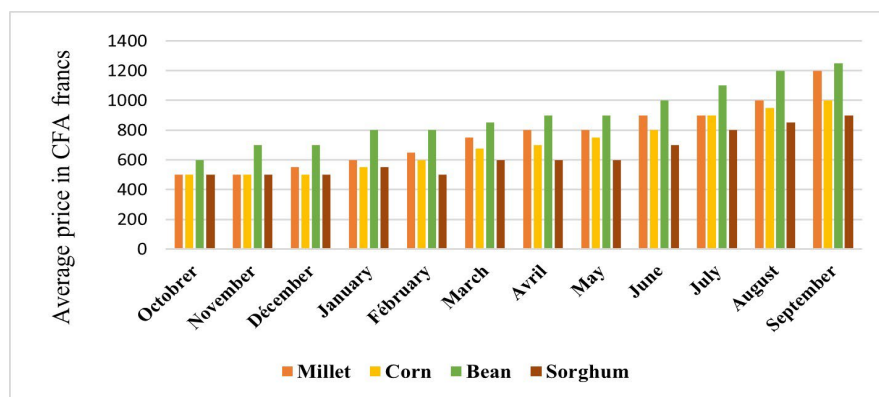


Figure 8. Evolution of the average price of agricultural products. Source: Field Data, 2024.

The examination of **Figure 8** reveals periods of sharp increases in the average prices of the most commonly used agricultural products over the course of a reference year. Indeed, these prices can double or even triple. This variation is influenced by demand and the time of year. For example, a measure of beans sold at 600 FCFA in October 2023 costs more than 1200 FCFA in July-August-September 2024. Millet follows the same trend, as does sorghum. During this period, the price surge coincides with the lean season, when reserves are depleted among producers awaiting new harvests. The time when the prices of these products are affordable is observed immediately after the harvest (October-November and January), although even during this period prices rise from day to day.

5.1.2. Origin of the Products Consumed

Households in the research area consume food from various sources (**Figure 9**).

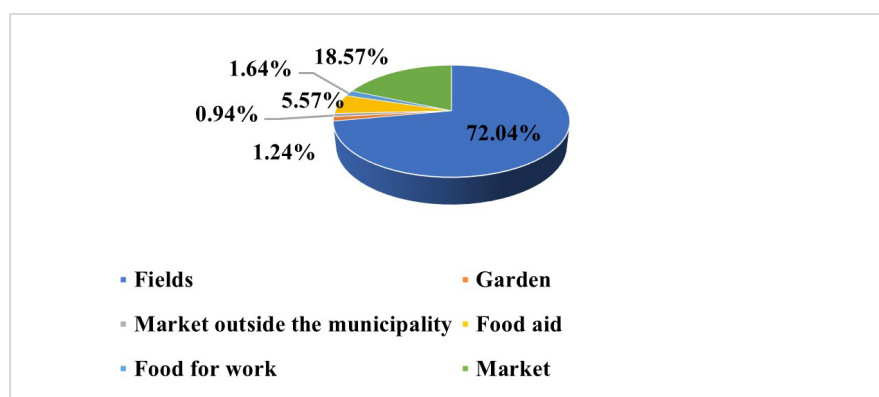


Figure 9. Origin of consumed products. Source: Field data, 2024.

The examination of **Figure 9** reveals that household food production is insufficient to meet their needs. Indeed, 72.04% of households consume their own production, while 18.57% rely on local markets. However, 5.57% of households depend on food aid (from family, NGOs, or development projects). These households lack sufficient production, making them dependent on markets and assistance. Moreover, the limited supply in markets outside the commune is due to transportation costs and difficult access. This raises the issue of food accessibility and forces the population to cope with market constraints.

5.1.3. Purchase Constraints in the Markets

Households with a smaller amount of goods available from their own production are the most dependent on markets and food aid. Thus, a variety of market constraints is observed (**Figure 10**).

Figure 10 presents the constraints related to purchasing products within the surveyed community. The main obstacles identified are high prices (57.01%), lack of money (28.60%), and product unavailability (6.3%). Some attribute these difficulties to poor product quality due to pesticides, the distance of villages from markets (3.12%), and the poor condition of roads (0.9%). In addition to these factors,

the rhythm of household income also has an impact. All of these variables highlight the low income levels of households. The frequency of these constraints will help better understand their weight in the difficulties faced by populations in adequately ensuring their food security.

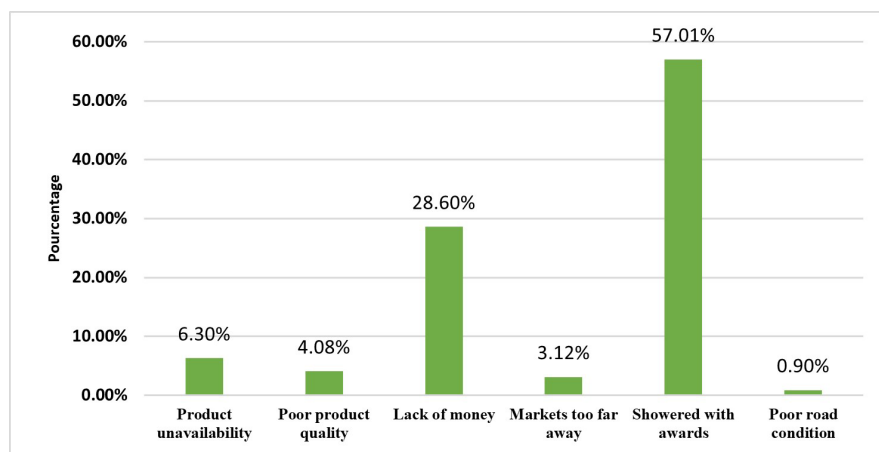


Figure 10. Market-Related constraints. Source: field data, 2024.

5.2. Frequency of Purchasing Constraints in the Markets

The different constraints that households face in the research sector change over time.

- **Surge in product prices**

Among the farmers who cited high prices as the main constraint, 26.8% considered it a recurring constraint, 65% as a constraint specific to the lean season, and only 8.2% of household heads regarded it as an occasional constraint. Therefore, it is more a problem of accessibility, especially during the lean season, than of availability.

- **Distant markets**

The remoteness of the market was reported by 58.9% of household heads as a constraint specifically linked to the lean season. This remoteness is experienced as a constant constraint by 9.7% and occasionally by 31.4% of respondents. The difficulties in obtaining food products in markets outside the communes (Tessaoua, Korgom, Aguié Gazaoua markets, and the May Adoua market in Nigeria) demonstrate that a «*market too far away*» is indeed a constraint for food security in the research communes.

- **Lack of money**

Among the household heads who cited lack of money as a constraint, 42.21% considered it a recurring constraint, 36.43% considered it a constraint linked to the lean season, and 21.4% perceived this situation occasionally. It is therefore easy to understand that households also sell part of their production, but the income they derive from it is too low to meet their needs for a variety of goods. The issue of accessibility then arises in the study area.

- **Unavailability of products**

The unavailability of products is a recurring constraint for only 12.5% of respondents, a constraint specifically related to the lean period for 36.45%, and an occasional constraint for 51.05% of respondents. It should be noted that the availability problem is not only linked to the lean period; other constraints can also increase it.

- **Poor road conditions**

More than half of the respondents (72.9%) perceive it as constant. This situation will have effects on imported and exported products. The proportion of household heads who consider this situation occasional is 17.70%, while 9.4% affirm it occurs during the lean period.

- **Poor quality of products**

30% of respondents consider this constraint to be permanent, while 61.08% associate it specifically with the lean season, and 8.92% see it as occasional. The quality of food products in the municipalities of Baoudetta and Koonaa deteriorates during the lean season because merchants take advantage of the increased customer demand. Consequently, households in these municipalities are increasingly faced with purchasing constraints. This reveals the vulnerability of farmers to price fluctuations and shortages, which threatens their food security.

6. Discussion of Results

The results of this study highlight the basis of food insecurity and its manifestations in the communes of Baoudetta and Koonaa. This issue is both structural and cyclical, related to socio-economic and environmental dynamics [2] [3]. The high dependence of the households studied on agriculture, with more than 92% of activities primarily agricultural, reflects their vulnerability to climatic hazards, soil degradation, and low productivity. These findings are in line with the work of [8] [9] [16]. The low availability of resources, overexploitation of land, and poor soil fertility contribute to declining agricultural yields, which threatens the food security of the evaluated households.

The data also reveal that the majority of households have food self-sufficiency of less than six (06) months. This once again reflects their vulnerability to climatic and economic shocks. The dependence on food imports of these households, with a rate exceeding 50% in most of the evaluated villages, confirms the fragility of their food system. This aligns perfectly with the findings of [17]. Thus, households in the study area have varied food consumption frequency over time, often with only one meal per day. This situation is often characterized by the complete depletion of farmers' stocks (lean season) and the sharp rise in cereal prices, which corresponds to the observations of [10]. Price fluctuations, distance from markets, lack of money, and poor quality of products exacerbate this vulnerability, especially during the lean season. These results highlight the idea of [15] where the majority of households cannot ensure a diverse and sufficient diet. Furthermore, the prevalence of household food insecurity indicates that these households face difficulties in meeting their immediate food needs. The analysis shows that food

insecurity threatens female-headed households more than male-headed ones. Additionally, elderly people are more exposed to shocks. Their vulnerability is not only related to their limited capacity to engage in productive activities, especially agricultural ones. Most of these households depend partially on assistance in kind and cash from their members present locally or living in other areas for their consumption.

7. Conclusions

The study on food insecurity in the communes of Baoudetta and Koonaa highlights major challenges faced by agricultural households in these areas. The results reveal a concerning situation. Thus, the vulnerability of households in the study area is mainly related to their heavy reliance on agriculture, the degradation of natural resources, insufficient infrastructure, and low household incomes. However, the issue of food insecurity is influenced by economic, social, and environmental factors. Indeed, more than 50% of the households assessed suffer from moderate to severe food insecurity, with direct impacts on their well-being. The causes of this food insecurity are multiple and include the reasons for the vulnerability of these households. Additionally, female-headed households and the elderly are particularly exposed to this insecurity.

Faced with this situation, it is the responsibility of the State and its development partners to explore resilience strategies adapted to this population. These strategies could include strengthening agricultural capacities through the improvement of farming techniques, access to quality seeds, and the establishment of effective storage systems. Moreover, the development of transport and market infrastructures will facilitate access to foodstuffs and reduce their costs for the population. Finally, promoting social support programs and nutritional education will help improve food security and the quality of life of households in the communes of Baoudetta and Koonaa. Thus, an in-depth analysis of structural and conjunctural factors paves the way for thorough reflection on the resilience strategies of this population and their effectiveness.

Conflicts of Interest

The authors declare no conflicts of interest.

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