J. Food. Stab (2023) 6 (3): 24-40 Journal homepage: www.foodstability.com

Received: 29/03/2023/ Revised: 26/05/2023/ Accepted: 10/06/2023 / Available online: 06/07/2023

DOI: 10.36400/J.Food.Stab.6.3.2023-021

Journal of Food Stability

https://www.ajol.info/index.php/jfs

ORIGINAL ARTICLE

Assessment of household food security and net income of young people in Northern Benin: Baseline study

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Funding source

The study, especially the baseline data collection was supported by SNV Netherlands Development Organization.

Abstract

Young people of northern Benin encounter difficulties in meeting their food and nutrition needs due to poverty and low agricultural productivity. The objective of this study was to assess the values of the five International Aid Transparency Initiative indicators (IATI) which are markers of progress and determine the variation of food security situation in the study population. The results showed that 1,380 young people out of the 3,400 targeted throughout the intervention area have increased access to food (40.6%). In the department of Alibori, the municipality of Banikoara had the highest number of young people with increased access to food (565 young people out of 1,056 targeted) (53.5%). In Atacora, the municipality of Natitingou had the highest food security prevalence rate (64.3%), 285 young people out of 443 targeted, while the lowest rate was observed in the municipality of Tanguiéta (12.3%), 39 young people out of the 317 targeted. Survey data also showed that the average income for all young people was XOF356,210. A comparative analysis of the income obtained by young people showed that the municipality of Kandi was in the lead (XOF721,295) followed by Natitingou (XOF357,180) and Banikoara (XOF331,490). The municipality of Boukoumbé recorded the lowest level of income (XOF213,250). The average income of women (XOF290,480) was lower than that of men (XOF423,975). The Empowerment Index found that very few women (2%) are empowered. Efforts therefore remain to be made to improve the income and food security of young people in North Benin.

Practical application

The food security situation of young people in northern Benin has been established. Training and technical support of young people, particularly in agriculture, will enable them to reduce the yield gap, to increase their level of income and improve their food security situation.

Keywords: Food Security; Food Availability; Increase of Production Yields; Net Income of young people; Women Empowerment

1. Introduction

Agricultural sector is of capital importance for the strengthening of Beninese economy because it represents 27.5% on average of Gross domestic Product (GDP) according to the Directorate of Agricultural Statistics (DSA, 2021), 75% of export earnings, 15 % of state revenue and provides around 70% of jobs (PSRSA, 2016).

Benin has an annual per capita income of 902 US dollars or XOF 496,100 and is one of the poorest countries in the world (World Bank, 2018). Despite sustained economic growth since 2012, monetary poverty is not declining. Salary rates for the population aged 15 to 64 are 8.3% in Atacora, and 5.2% in Alibori, for 20.8% in the whole of

Benin (34.3% for men and 9.7% for women) in 2018 (INSAE, 2018). Benin is considered the second country in West Africa where hunger is least present, and manages to cover 91.7% of its food needs. However, the food and nutritional situation remains worrying. In 2016, the country was at the 82nd position out of 118 in the world hunger index ranking (World Bank, 2018). In 2017, 9.6% of the population was food insecure, out of which 0.7% was severely insecure (AGVSA, 2017). In addition, the country has 4.9 million inhabitants (almost 43% of its population) who live in conditions closed to those of people in food security (AGVSA, 2017). Agriculture in Benin is generally recording growth in its production of cereals and tubers, as well as in its market garden crops. The total production in Atacora and Alibori, increased by 12.5% and 22% respectively in 2013 and 2019. However, this increase is largely attributable to the expansion of cultivated areas. Beninese agriculture is in fact characterized by the predominance of small and medium-sized farms, generally not very productive, but which alone, provide 95% of agricultural production in the departments of Alibori and Atacora. They are oriented towards mixed farming, often associated with small livestock. North Benin is recognized as the breadbasket of food products (Vodounou *et al.*, 2016). Despite this potential, the populations of the departments of Atacora and Alibori face several difficulties according to the preliminary diagnostic study carried out by SNV (2020). These difficulties are related to:

- Lack of mastery of innovative agricultural production techniques;
- Low capacity to meet their food and nutritional needs due to low productivity agriculture and widespread poverty;
- Limiting the prospects of young people, whose numbers are constantly increasing, leading to rural exodus and rising tensions;
- Worsening situation due to the impact of climate change and growing insecurity in the region.

In this context, Netherlands Development Organisation (SNV) started the project entitled "Youth Employment for Improving Food Security in North Benin (EJASA)". This project is being implemented in the municipality of Kandi and Banikoara (Department of Alibori) and in Natitingou, Tanguiéta, Materi and Boukoumbé (Department of Atacora). It aimed at increase the incomes of 3,400 young people (50% men and 50% women) working in agriculture with the consequence of improving their food and nutrition situation. The objective of this study is to assess the state of food security of the populations, their level of income as well as the employability of young people in order to determine actions for improvement.

2. Materials and Methods

2.1. Study area and sampling

The study was carried out among the young people targeted in the intervention zone of the EJASA project, in particular in six (06) municipalities including four (04) of the Department of Atacora (Natitingou, Tanguiéta, Materi and Boukoumbé) and two (02) of the Department of Alibori (Kandi and Banikoara). The EJASA project targeted a workforce of 3,400 young people, calculated from RGPH4 (2013) and EMICOV (2015) data and on the basis of certain specific characteristics of the population (Table 1). The sample that served as the basis for the survey consistent of 497 young actors drawn from the mother population of 3,400 young people identified by the EJASA project.

Table 1: Distribution of the target group

Municipality	Total population		Population	Underemployment	Actors
	2013	2020	15-35 years	34%	80%
Kandi	179 290	197 219	67 320	53 856	760
Banikoara	246 575	271 233	93 500	74 800	1 056
Natitingou	103 843	114 227	39 270	31 416	443
Tanguiéta	74 675	82 143	28 050	22 440	317
Matéri	113 958	125 354	43 010	34 408	486
Boukoumbé	82 450	90 695	29 920	23 936	338
TOTAL	802 804	882 890	301 070	240 856	3 400

Source : RGPH4 (2013) ; EMICOV (2015)

Sampling was done by clusters stratified by municipality and by selected sector with a calculated sampling interval K (K = 3400/493 = 6.896, or K = 7). Stratified sampling was used in order to ensure an appropriate representation of large groups of subpopulations without introducing distortions in the selection process. Thus, the number of young people surveyed varies from one municipality to another depending on the size of the mother population of each municipality (Table 2). At the level of each municipality, the selection of the units surveyed was made by systematic selection in each of the strata with the sampling interval K previously obtained.

Table 2: Initial population and sample size by gender

Municipalities	Initial population			Sample		
	Female	Male	Adjusted number	Female	Male	Adjusted number
Banikoara	187	479	666	81	77	158
Boukoumbé	331	225	556	33	25	58
Kandi	123	228	351	43	47	90
Matéri	400	404	804	49	41	90
Natitingou	138	308	446	19	24	43
Tanguiéta	404	173	577	30	28	58
Total	**1583**	**1817**	**3400**	**255**	**242**	**497**

2.2. Data collection

Data collection was carried out in two phases: the documentary review and structured / semi-structured interviews with key informants (young agripreneurs, market players, representatives decentralized and local government structures).

The documentary review consisted of collecting information from partners and structures such as the Programming and Foresight Department of MAEP; the Directorate of Agricultural Statistics (DSA); the National Institute of Statistics and Demography; the Departmental Directorates of Agriculture, Livestock and Fisheries (DDAEP) of Alibori and Atacora; the Territorial Agricultural Development Agencies (ATDA) poles 2 and 3 and their Communal Cells; Alibori and Atacora Departmental Directorates of Development; the National Employment Agency (ANPE); non-state actors in the agricultural sector (CNAB, PNOPPA, PASCiB, REB); the Town Halls of Natitingou, Boukoumbé, Materi, Tanguiéta, Kandi and Banikoara. As for the interviews, they were carried out by means of five (05) questionnaires developed to determine respectively the number of young people with increased access to food, the availability of food, the net income of the young people, the number of young people who are gradually reducing the achievement gap and the number of young women who gradually gain empowerment. These survey questionnaires were digitized in Akvo Flow and administered to key informants.

2.3. Methods and tools for determining indicators

2.3.1. Measuring the number of people with increased access to food

The first indicator related to the number of people with increased access to food was measured using the Food Insecurity Experience Scale (FIES) methodology as described by Cafiero *et al.* (2016). This methodology is based on sequences of experiences that characterize hunger and food insecurity. Data analysis was performed using Rstudio software (Version 1.1.463 – © 2009-2018 RStudio, Inc.) and using the FIES tool (FAO analysis grid). The analysis was done in four steps. The first was the estimation of the parameters used to calculate the level of severity of food insecurity associated with each FIES question and each respondent surveyed. Then, statistical validation was carried out to assess whether the measurement is valid depending on the quality of the data collected. The third and final step was related to the estimation of indicators and the calculation of food insecurity prevalence rates using the spreadsheet pre-designed by FAO. Two indicators of food insecurity were determined. The first indicator relates to the proportion of the population found between the limits of moderate food insecurity and severe food insecurity. This indicator is used to assess the achievement of the second development objective related to the fight against hunger (Sustainable Development Goal SDG 2.2.1). The second indicator related to the proportion of the population in severe food insecurity. It is distinguished from the first by the high level of severity of food insecurity. Knowledge of these two indicators made it possible to deduce the prevalence rate of food security, in other words, the number of people with increased access to food in the areas of intervention of the EJASA project.

2.3.2. Assessment of increased food availability

It corresponds to the quantity of food available, in good condition, at an affordable price and used to ensure food security and nutrition. The determination of food availability was made according to the food balance sheet, taking into account production, exports, imports and changes in stocks (FAO, 2017). The calculation is presented below:

Food availability = Production + Import - Export + Δ Stock

2.3.3. Determination of youth net incomes

For the indicator related to the net income (Rn) of young people, two levels of income were considered: i) the income generated by all household activities and ii) the income generated according to the different links of the supported activity.

i) The net income (Rn) generated by all household activities was determined as follow:

$$R_n = \sum_{i=1}^{n} (Income_i - Charge_i - tax_i)$$

i indicates the type of activity: Main activity (agricultural), Secondary activities (food crop & cash crop), Income from assets, Transfer from other households, Social benefits.

It is important to note that this net income is calculated for each young people (j) in the database. As these young people have been selected on the basis of a representative sample of the population, the average net income (Rnm) was obtained as follow:

$$R_{\text{nm}} = \frac{\sum_{j=1}^{m} R_{nj} * \alpha_j}{\sum_{j=1}^{m} \alpha_j}$$

Rnm determine the increase in the amount (in euros) of net income generated per year and per young person; $\alpha = \{\alpha_1, \alpha_2, \alpha_3, \ldots\ldots, \alpha_m\}$, the weights corresponding to each respondent in the sample.

ii) The net income (Rn) generated according to the links of the sustained activity was determined as follow:

$$R_n = \sum_{i=1}^{n} (Income_i - Charge_i)$$

i indicates the type of activity: Production, supply of inputs, provision of services, processing of food products.

$$R_{\text{nm}} = \frac{\sum_{j=1}^{m} R_{nj} * \alpha_j}{\sum_{j=1}^{m} \alpha_j}$$

Rnm determined Number, by gender, of young people supported who have gradually increased their net income through market sales, the provision of services or the processing of food products (D/H/ F) ; $\alpha = \{\alpha_1, \alpha_2, \alpha_3, \ldots\ldots, \alpha_m\}$, the weights corresponding to each respondent in the sample.

The decision was made by counting the number of young people whose difference between the income obtained in year n+1 and n is greater than 0.

2.3.4. Yield gap assessment

Improved productivity and resilience of agriculture were assessed through the yield gap of the targeted sectors. The indicator assessed the yield gaps for the main value chains supported.

It determined the gap between the actual yields achieved compared to the yields that can be achieved (potential) under good management conditions, taking into account the climate and sustainable water use. Yield gaps were assessed for crop production based on the areas and production declared by the young people in comparison with the potential yields obtained by laying yield squares and consolidated by the Directorate of Agricultural Statistics of Benin.

2.3.5. Determination of the Young Women Empowerment Index

The empowerment of young women was measured by the Women's Empowerment in Agriculture Index (WEAI) whose version adapted by SNV was piloted (WEA). Income generating

opportunities were appreciated by the number of secure jobs, self-employment and entrepreneurial initiatives in the population of direct actors called "agripreneurs". WEAI index including two sub-indices: (1) the index of the five (05) domains of empowerment (5DE) and (2) the index gender parity (GPI) as described by Alkire & Foster (2011). The 5DE assessed the degree of empowerment of women and men in five domains of empowerment (5DE) in agriculture: i) decision-making power over agricultural production; (ii) access to and decision-making power over productive resources; iii) monitoring the use of revenues; iv) leadership in the community; and v) use of time.

In this benchmark study, the 5 domains were represented by 10 groups of questions. To calculate the 5DE, a weight was assigned to each domain (Alkire *et al.*, 2013) as presented in Table 3. Each question asked had the following modalities: "1: Never; 2: Rarely; 3: Sometimes; 4: Often and 5: Always". Each coded question takes the value 1 if the respondent stated (Often or Always) and 0 if the respondent falls below.

The weighted sum of the 5 groups of questions was then used to determine whether an individual is autonomous or not. A person is considered autonomous if they have adequate achievement in 4 of the 5 domains or if they are autonomous in a combination of weighted indicators that reflect an adequacy of 80%.

Table 3: The five domains of empowerment in the WEAI and their weight

Domains	Group of questions	Weight
Production	Contribution in production decisions	1/10
	Autonomy in production	1/10
Ressources	Ownership of goods or productive resources	1/15
	Purchase, sale or transfer of property	1/15
	Access to productive resources	1/15
Incomes	Control of revenue use	1/5
Leadership	Group membership	1/10
	Member of a group office 1	1/10
Time	Workload	1/10
	Leisure	1/10

Source : Alkire *et al.* 2013

3. Results and discussion

3.1. Number of people with increased access to food

The food insecurity indicators provided the number of people with or without increased access to food in the target intervention areas of the EJASA project. Prevalence rates of food security (PSA), moderate or severe food insecurity (PIAmod+sev) and severe food insecurity (PIAsev) among the targeted youth population in the entire area of intervention, at the departmental and communal levels, are presented in Figure 1. Table 4 presents the number of young people in a situation of food security and those affected by food insecurity according to its severity. From the simultaneous analysis of Figure 1 and the table 4, it appears that 1,380 young people out of the 3,400 targeted in the entire intervention area have increased access to food. They are therefore in a food secure

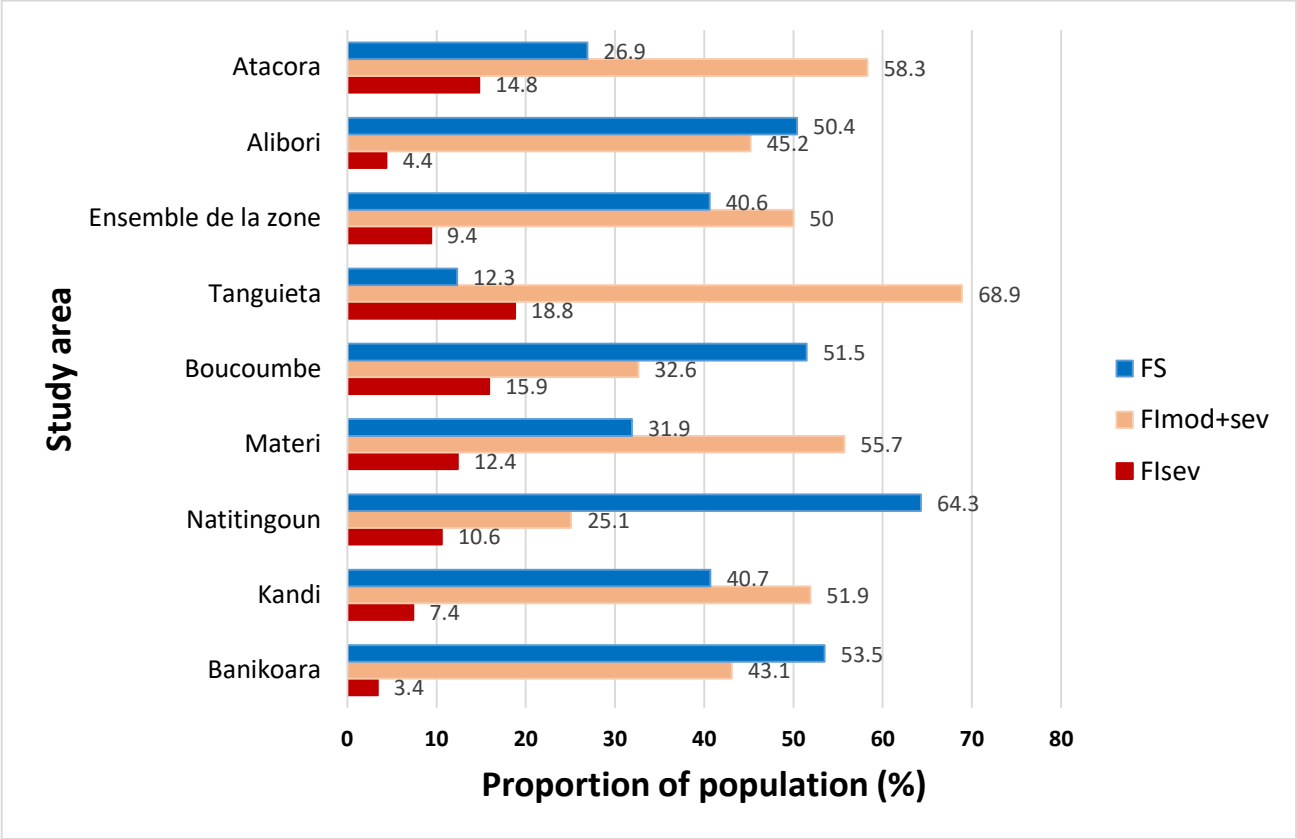

Figure 1: Prevalence of food security (FS), moderate or severe food insecurity (FImod+sev) and severe food insecurity (FIsev)

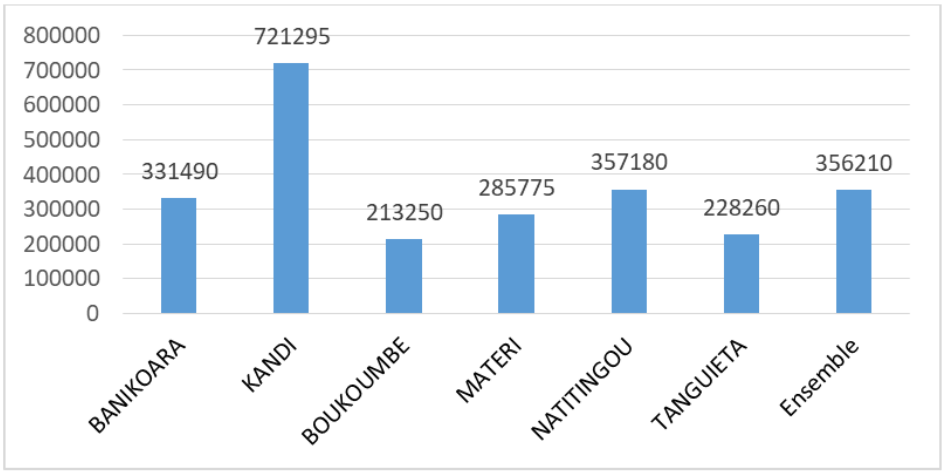

Figure 2: Net annual income by municipality

situation (40.6%). This prevalence rate of food security in the EJASA project intervention area was not too far from that of the Beninese population estimated at 47.5% in 2017 (AGVSA, 2017).

Table 4: Number of young people in security and food insecurity in the EJASA project area

Area		NY-FSS	NY-FImod+sev	NY-FIsev	NYT
Department	Municipality				
Atacora	Natitingou	285	111	47	443
	Boukombe	174	110	54	338
	Tanguiéta	39	218	60	317
	Matéri	155	271	60	486
	Ensemble	426	923	234	1,584
Alibori	Kandi	309	394	56	760
	Banikoara	565	455	36	1,056
	All	915	821	80	1,816
North Benin		1,380	1,700	320	3,400

NY-FSS: Number of Young people in food security situation; NY-FImod+sev: Number of young people affected by moderate or severe food insecurity; NY-FIsev: Number of young people affected by severe food insecurity; NYT: Number of young people targeted by area of intervention

The number of young people with increased access to food was higher in the Alibori department (915 young people out of 1,816 targeted), i.e. 50.4% of young people in food security in this department compared to 26.9% (426 young people out of 1,584 targeted) in Atacora. The results of the Global Analysis of Vulnerability and Food Security (AGVSA, 2017) based on the consolidated approach for the reporting of food security indicators (CARI) also showed that the populations of the department of Alibori were more food secure (47.9%) than those in the department of Atacora (36.4%). In the department of Alibori, the municipality of Banikoara was the one with the highest number of young people with increased access to food (565 young people out of 1,056 targeted), i.e. 53.5% of young people in food security in this department. Among the four municipalities of the department of Atacora, the municipality of Natitingou has the highest food security prevalence rate (64.3%), i.e. 285 young people out of 443 targeted, while the lowest rate was observed in the municipality of Tanguiéta (12.3%), i.e. 39 young people out of the 317 targeted.

Apart from young people with increased access to food, and therefore food secure, some young people are mostly affected by moderate or severe food insecurity and a few were exposed to severe food insecurity. Indeed, 50% of the population of young people targeted in the area of intervention, i.e. 1,700 young people out of the 3,400 targeted, were in moderate or severe food insecurity. The prevalence rate of severe food insecurity within the entire population of targeted young people was estimated at 9.4%, or 320 young people out of the 3,400 targeted. More than 45% of the populations of young people targeted in each of the two departments covered by the study were affected by moderate or severe food insecurity, i.e. 821 young people out of 1,816 targeted in Alibori (45.2%) and 923 young people in 1584 targeted in Atacora (58.3%). Atacora was the department where the prevalence of food insecurity is higher (58.3%) with severe food insecurity assessed at 14.8% (234 young people

out of 1584 young people targeted) against 3% in 2017 (AGVSA, 2017) for the whole population. AGVSA (2017) also reported that in August 2017, the department of Atacora was the most affected by food insecurity (24%). The situation was the same for the department of Alibori, in which severe food insecurity increased from 0% in 2017 (AGVSA, 2017) to 4.4% (80 young people out of 1,816 young people targeted) in 2021. It emerges that the situation of food insecurity of the populations of young people targeted in the two departments has increased over the past four years. But by analyzing the situation closely in relation to the target group of the EJASA project (young people aged 15 to 35), the high prevalence rates of food insecurity could be explained by the fact that young people who have no an adequate employability situation, and therefore deprived of income and means of subsistence, face serious food accessibility difficulties, which makes them more vulnerable (Ballard *et al.*, 2013). The municipalities most affected by moderate or severe food insecurity were Tanguieta (68.9%, or 218 young people out of 317 targeted) and Materi (55.7%, or 271 young people out of 486 targeted) in the department of Atacora. The food insecurity situation was not as good in the department of Alibori where more than 40% of the populations of the two municipalities concerned (Kandi and Banikoara) were in moderate or severe food insecurity with the municipality of Kandi in the lead (51.9%), i.e. 394 young people out of 760 targeted. Like moderate or severe food insecurity, severe food insecurity was higher in the four municipalities of the Atacora department (10.6-18.8%) than in the two municipalities of the Alibori department (3.4-7.4%).

3.2. Food availability level

Food availability is very useful for improving household food security. The National Report on Human Development: Agriculture, Food Security and Human Development (UNDP, 2015) showed that Benin in general was self-sufficiency or quasi-self-sufficiency about several crops (soya, maize, cassava, pepper, yam, groundnut, cowpea and related products, sweet potato, millet and sorghum). On the other hand, for other products such as potatoes, rice, fish products, milk and meat in general, there was a strong dependence on imports.

Based on the data received from the DSA and the DDAEPs on production, export, import as well as the variation in stock, we noted that the availability of tomatoes in the 6 municipalities of the project varies between 9 and 3,026 tons. The municipality of Kandi came out with the highest value while the lowest was recorded in the municipality of Tanguiéta. Tomato availability for the entire project intervention area was estimated at 11,101 tons.

As for pepper, the overall availability was estimated at 5,983 tons. The municipality of Banikoara obtained the highest value (2,192 tons) while the lowest value (3 tons) was obtained in Tanguiéta.

The overall availability of horsehair in the entire project intervention area was 502 tons with the highest value of 312 tons (Kandi) against the lowest value of 11 tons (Banikoara).

Overall, 13,107 tons of okra was available throughout the project intervention area. The municipality of Matéri came first with 5,126 tonnes of okra available against 315 tonnes in Tanguiéta.

The analysis of the availability of soybeans in the project intervention area was estimated at 22,712 tons. The municipality of Banikoara displayed the highest value (6,793 tons) while Tanguiéta obtained the lowest value (1,380 tons).

3.3. Youth Net Incomes

Analysis of the data collected (Figure 2) indicated an average net annual income of XOF356,210 for all the young agripreneurs surveyed in EJASA project intervention area. This level of net annual income was slightly higher (18.74%) than the average salary of determined agricultural enterprises, which stood at XOF300,000 (INSAE, 2010). It was however twice, three times and eighteen times lower than the average annual per capita incomes of Benin, Africa and the world respectively estimated at XOF697,254 ($1,250), XOF1,028,031,30 ($1,843) and XOF6,498,965,08 ($11,651) by the World Bank (2019). The municipality of Kandi had the highest level of income, i.e. XOF721,295 against an average of XOF213,250 for young people in the municipality of Boukoumbé whose income was the lowest. The high average income obtained in the municipality of Kandi was explained by the fact that the young people of this municipality have more freedom in decision-making to undertake their own production activity, unlike the young people of Banikoara who work more on family farms and still do not directly benefit from the income from these productions. In addition, the transfers of resources between young people and their parents are often not estimated by these young people. For most of the time, the transfers would generally be in kind, materialized by the purchase of a motorcycle, the financing of expenses for the customary marriage, etc.

The main activity (agricultural), secondary activities (food crop & cash crop), income from assets, transfers from other households and social benefits were the sources of income. The main source (agricultural activity) brought in an average income of XOF180,325 while the secondary activities (food crop & cash crop) provided an average of XOF162,580. The three other income sources brought lower amount of money to the young people surveyed. These incomes were estimated to XOF7,610 (income from assets), XOF4,285 (transfers from other households) and XOF1,405 (social benefits). The high average income level of young people in Kandi (Figure 2) might be surprising due to the high production of cotton which brings in an average of XOF89,300/ha (Westerberg *et al.*, 2017). The difficulties of access to land for young people in an increasingly pressing demographic context and the fact that data collection appealed to the memory of producers. These types of income could be hidden. Also, as the project targets vulnerable young people, some respondents who were part of the cotton-producing population, could not derive enough income from their activities. According to gender, men had a higher income than women. Indeed, it was XOF423,915 for all young people against XOF290,475 for all women, i.e. an income gap estimated at XOF133,440. Income inequality between men and women was more noticeable in the municipalities of Banikoara, Boukoumbé and Tanguiéta (data not shown).

The production and processing of soybeans and the breeding of small ruminants were the activities that bring more income to the young people surveyed in the project area (Figure 3). However, soy appears to be the most profitable compared to the other three sectors of the project. This overall trend varied depending on the municipality. In the municipalities of Banikoara, Kandi and Matéri, soy provided more income to young people, while in municipalities such as Boukoumbé and Tanguiéta, the breeding of small ruminants and market gardening provided more income. In Natitingou, market gardening generates more income than the other sectors. The high income level of young people in the soybean sector in all municipalities could be

explained by the growth observed in the sector in recent years. This level of income was higher in the municipalities of Kandi, Tanguiéta and Natitingou compared to the other municipalities. This could be explained by the type of value chain but also the geographical position of the said municipalities which are major marketing centers.

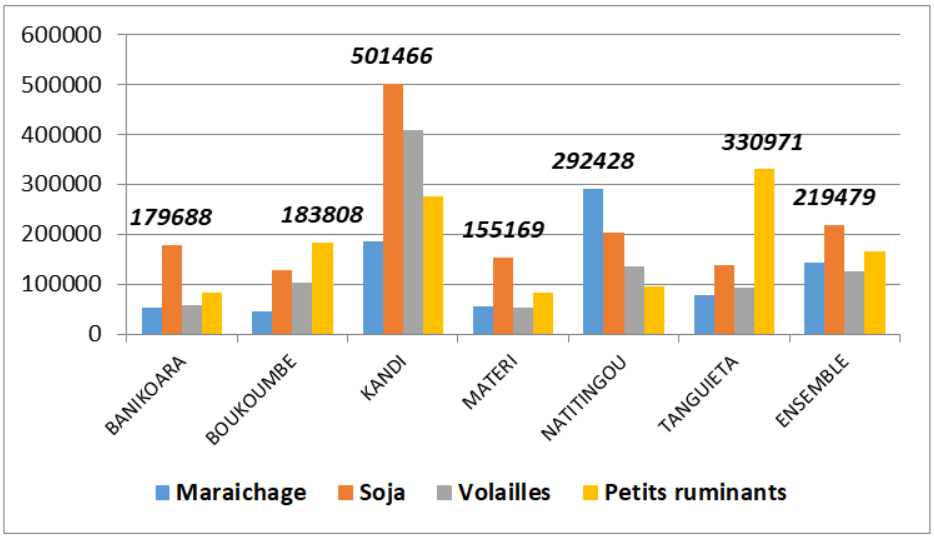

Figure 3: Breakdown of income by sector and by municipality

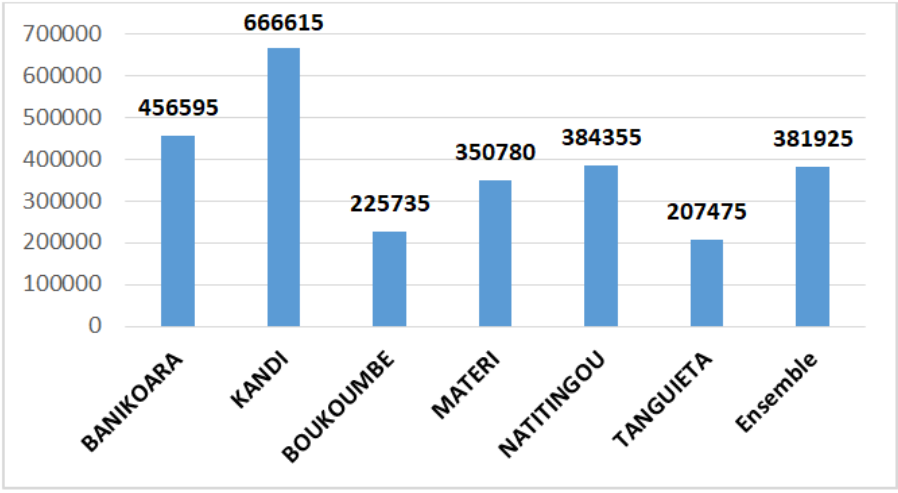

Figure 4: Net annual income by municipalities

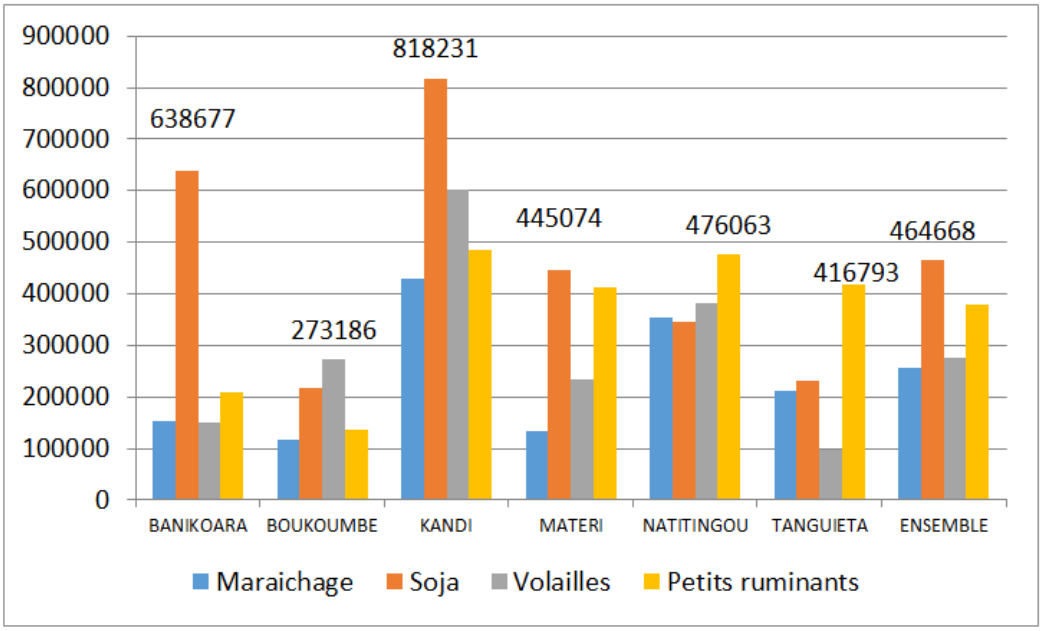

Figure 5: Breakdown of net annual income by sector and by municipality

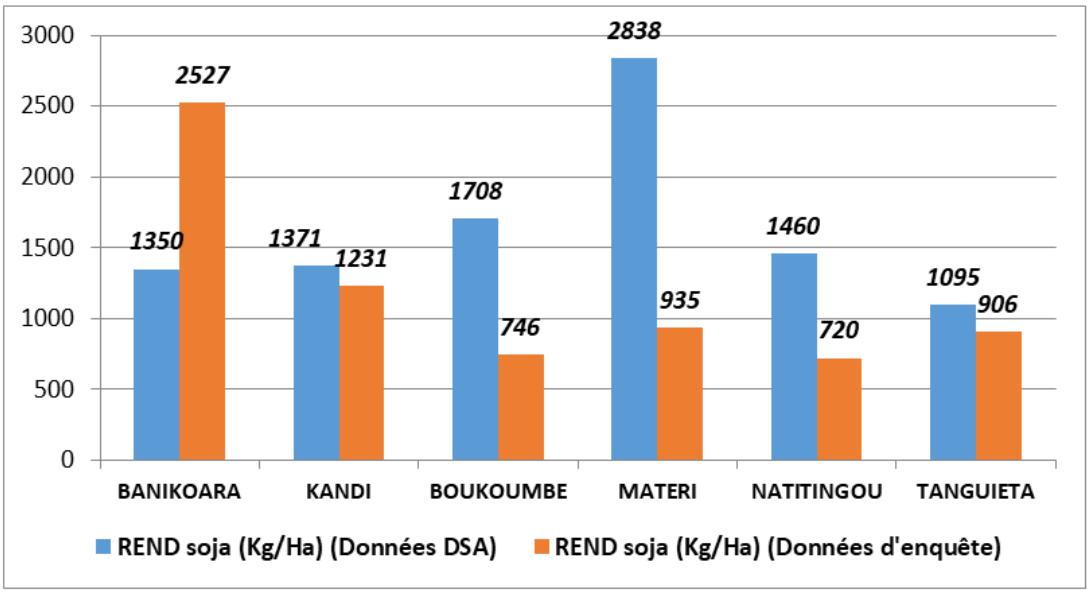

Figure 6: Average yield (kg/ha) of soybeans in 2020
Source : Direction de la Statistique Agricole et enquête baseline Mai, 2021

Depending on the type of job, income improved by 45% when moving from employee status to entrepreneurial initiative (Table 5). There was a great disparity in the income of employees. This disparity was explained by the fact that there were two main categories of employees, namely i) young people who received vocational training in agriculture in technical schools/training centers and whose salaries are high and ii) those who did not received a diploma course but had experience in agricultural production and whose salary was generally very low. In general, employers consider the second category of young employees as unskilled and are often sub-contracted.

The net annual income in the reference situation was evaluated at an amount of XOF381,925 for all respondents (Figure 4). This amount was high in the municipality of Kandi (XOF666,615) and low in the municipality of Tanguiéta (XOF207,215). In all the municipalities, young people whose main activity was soy have the highest average income (XOF464,668) (Figure 5). The same trend was observed in the municipalities of Banikoara (XOF638,677), Kandi (XOF818,231) and Matéri (XOF445,074). Nevertheless, young people whose main activity was small ruminants had the highest average incomes in the municipalities of Natitingou (XOF476,063) and Tanguiéta (XOF416,793).

Table 5: Amount of net annual income by type of employment

Type of employment	Main activity (agricultural)	Secondary activities (food crop & cash crop)	Income from heritage	Transfer from other households	Social Security benefits	Total
	Mean (Standard deviation)	Mean (Standard deviation)	Mean (Standard deviation)	Mean (Standard deviation)	Mean (Standard deviation)	Mean (Standard deviation)
Employees	181375 (148055)	41970 (20585)	0 (0)	0 (0)	0 (0)	223350 (137605)
Auto jobs	176785 (15700)	163275 (20830)	4495 (2835)	6655 (1865)	1550 (1090)	352765 (32775)
Entrepreneurial initiatives	217475 (47670)	165870 (48420)	2450 (4780)	18355 (7025)	0 (0)	404160 (67500)
Total	180325 (14870)	162580 (19340)	4285 (2600)	7610 (1805)	1405 (990)	356210 (30300)

3.4. Reducing the yield gap

Figures 6 and 7 below present the yields by sector according to the municipalities after the analysis of the data collected in the field and from the Directorate of Agricultural Statistics (DSA). The estimated yields obtained from the youngsters in the field were compared with the yields provided by the DSA. Data collected in the field, the average soybean yield was higher in the municipality of Banikoara (2,527 kg/ha) and lower in Tanguiéta (906 kg/ha).

On the other hand, the analysis of historical data provided by the DSA relating to the 2020-2021 agricultural campaign showed that the best soybean yield (2,838 Kg/ha) was obtained in the municipality of Matéri while the other municipalities obtained between 1,095kg/ha and 1708 kg/ha. Access to land, particularly to less

degraded soils in the municipality of Matéri and the after-effect of chemical fertilizers, could explain this trend. The Atacora region is a mountainous area with low availability of agricultural land compared to Alibori. Cotton cultivation, particularly in Banikoara and Kandi, requires chemical fertilizers. Based on the data collected, women got better yields compared to men.

As shown in Figure 7, the yields of market gardening value-added chains differ from one municipality to another. The highest tomato yields were observed in Kandi (13,500 kg/ha) and Banikoara (11,000 kg/ha). Thus, tomato was more productive in Kandi and Banikoara. Regarding pepper, the highest average yields were recorded in Banikoara (2,000 kg/ha) and Kandi (2,000 kg/ha) while the lowest was recorded in Matéri (1,065 kg/ha). Okra and crincrin recorded their highest average yields respectively in Tanguiéta (7,004 kg/ha) and Natitingou (16,122 kg/ha).

Table 6: Breakdown of autonomous women by municipality

Municipalities	*Empowerment*		*Total*
	No	*Yes*	
BANIKOARA	78	3	81
BOUKOUMBE	33	0	33
KANDI	42	1	43
MATERI	49	0	49
NATITINGOU	19	0	19
TANGUIETA	28	1	29
Total	249	5	254

3.5. Empowerment of young women in the agricultural sector

A person was considered autonomous if he has adequate achievement in 4 of the 5 empowerment domains defined in the WEAI or if he has autonomous in a combination of weighted indicators that reflect an adequacy of 80%. The distribution by municipality of women who met these conditions is presented in Table 6. From all the 254 young women interviewed, only five (05) obtained adequate achievements. These women who met the empowerment criteria were found in the municipalities of Banikoara (03), Kandi (01) and Tanguiéta (01). These represented 25 women out of the 1,583 in the target population, ie 15 women in Banikoara, 05 in Kandi and 05 in Tanguiéta. The low level of empowerment of women throughout the study area could explain the low level of income obtained by women compared to young people. The distribution of the level of empowerment by sex (Table 7) made it possible to better see in which municipality and which sex had the highest weighted values. The level of empowerment of all women in all municipalities (27.1%) was lower compared to that of men (36.3%). The highest levels of empowerment recorded among women and men were all obtained in the municipality of Natitingoun, respectively 35.6% for women against 46.0% for men. The level of youth empowerment (M/F) in the entire area was very low (31.6%). It is urgent that interventions be made in this direction to help young people to better take charge of them.

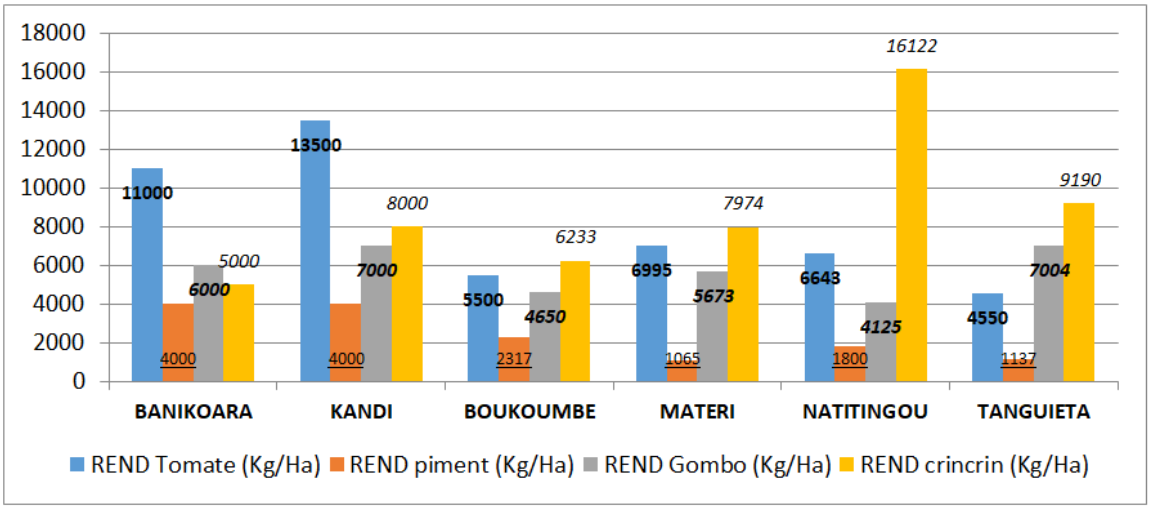

Figure 7: Average historical yield (kg/ha) of market gardening CVAs from 2018 to 2020 by municipality
Source : Direction des Statistiques Agricoles (2021)

Table 7: Level of empowerment by sex and by municipality

Municipalities	*Level of empowerment*		Total
	Female	Male	
BANIKOARA	22.6%	33.7%	28.0%
BOUKOUMBE	21.6%	26.9%	23.9%
KANDI	26.8%	37.9%	32.6%
MATERI	32.4%	35.9%	34.0%
NATITINGOU	35.6%	46.0%	41.4%
TANGUIETA	32.2%	41.0%	36.6%
Total	**27.1%**	**36.3%**	**31.6%**

4. Conclusion

This study has made it possible to reveal the food security situation of young people in North Benin and to evaluate the reference levels of some IATI (International Aid Transparency Initiative) indicators which are markers of progress and which determine the variation in food security or food insecurity. The results obtained clearly showed that the average annual per capita income of all young people in the study area and more specifically of young people in each of the municipalities concerned, with the exception of the municipality of Kandi, are not sufficient to enable young people to live in better conditions and ensure their food and nutritional security. In other words, many interventions are necessary in the targeted municipalities to promote the employability of young people in agriculture and consequently an improvement in their income in order to increase the prevalence rate of food security and therefore fight hunger in this region from Benin.

Acknowledgments

None

Conflict of interest

The authors declare that there are not conflicts of interest.

Ethics

This Study does not involve Human or Animal Testing.

Funding source

The study, especially the baseline data collection was supported by SNV Netherlands Development Organization.

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Cite this paper as: Assogba, M.F., Laourou, A.L., Vroeg, P. (2023). Assessment of household food security and net income of young people in Northern Benin: Baseline study. *Journal of Food Stability*, 6 (3), 24-40.
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