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RESEARCH ARTICLE

STUDY OF THE FREQUENCY OF CONSUMPTION OF FOOD RECIPES AT THE COMMUNITY LEVEL IN FIVE REGIONS OF NIGER

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ABSTRACT

Malnutrition, particularly undernutrition and micronutrient deficiencies, persists and is a public health problem in Niger. The rates of these different forms exceed WHO standards. The objective of this study is to establish a reference situation in the regions of Niger most affected by malnutrition in order to develop a code dictionary of food recipes and foods, the starting point for the food consumption study. Thus, through focus groups, the different recipes and ingredients commonly consumed in 5 regions of Niger (Tillabéry, Dosso, Tahoua, Maradi, and Zinder) were collected. A wide variety of recipes were encountered. Pasta is the most common cereal-based dish consumed in the households we visited. It is often the family's evening meal, which can be reheated the next day for breakfast. The most commonly consumed pasta is made from millet, rice, or sorghum. Then come the drinks (boule) made from these cereals. However, some local foodstuffs are also found, but of low consumption, which could contribute to rebalancing the nutritional status of the populations. In this study, the recipients of the various food recipes identified are almost exclusively households (98.86%), with only one case cited for children under two years of age (cooked cowpeas) and one case for nursing mothers (milk). Overall, with the exception of the month of April (77.89%), at least 80% of the food recipes identified were consumed each month. However, additional studies must be conducted to better map them from a nutritional point of view.

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INTRODUCTION

The Republic of Niger is a large landlocked Sahelian country, nearly two-thirds of which is desert. Its population is very young and predominantly rural. A large majority of the labour force is engaged in agriculture, mainly on small, subsistence family farms and livestock. The agricultural sector, the basis of the country's economy, is highly dependent on harsh climatic conditions with recurrent periods of drought (FAO, 2009).

It is subject to severe environmental constraints, especially drought. Nigerien agriculture is highly dependent on rainfall, whose annual and seasonal fluctuations largely explain the low yields and strong variations in national agricultural production (FAO and WFP, 2004). Faced with high population growth and insufficient growth in agricultural production, national production is unable to cover the needs of the population on a regular basis, even taking into account irrigated cereal production (rice and wheat), the importance of which remains limited (WFP, 2005). In terms of covering food needs, over the last three decades (1970-2000), the cereal deficit represented a volume of more than 15% of annual consumption needs (RdN, 2006). A cereal deficit occurs one year out of three and the intervals between acute food crises are shrinking (WFP, 2005). Thus, traditional cereals, millet and sorghum, form the basis of the diet of Nigeriens and provide most of the energy (nearly three-quarters) and protein. Legumes and/or oilseeds are mainly used for the preparation of sauces. Fruits and vegetables are consumed exclusively seasonally. Meat consumption is mainly of interest to cities, and fish consumption is significant only around the Niger River, Lake Chad and rivers. Milk and sugar are consumed in varying ways depending on eating habits, availability and consumer income. Milk consumption, traditional among the agro-pastoral population, is decreasing due to the sharp reduction in livestock due to droughts and the deterioration in the terms of trade between livestock and cereals. Oil is consumed in significant quantities only in urban areas. However, food consumption patterns differ considerably by place of residence and ethnicity (INS, 2016). However, for a good dietary balance, a diversified diet is necessary to provide the body with most of the nutrients it needs for its functioning (Sita et al., (2018)). In terms of energy, cereals provide more than 70%, legumes and oilseeds 14%, vegetable oils 4% of the energy intake of the Nigerien food ration (Sabo et al., 2018). The regions most affected by food insecurity (severe and moderate) were Tahoua (38%), Tillabéri (34%) and Zinder (31%). The lowest rates of food insecurity were found in the departments of Diffa (12%) and in the urban community of Niamey (23%). In rural areas, 31% of households were food insecure, compared to 25% in urban areas. The household categories most affected by food insecurity were those headed by women or dependent on precarious sources of income such as selling wood or straw, day labour, or handicrafts (INS/SAP/RGAC, 2007). Another on the economic situation and the food vulnerability of households carried out in May 2006 included a qualitative assessment of household food consumption (INS/SAP/SIMA, 2006), with 15% of households having very poor food consumption, 26% having poor food consumption, 12% having a limit consumption (average) and 47% having acceptable consumption and geographically, the regions of Tahoua, Dosso and Tillabéri have the highest proportions of households with poor or very poor diets (INS/SAP/SIMA, 2006). Dietary diversity at the household level was studied in 2016 in the National Food Security Survey (NSI, 2016). Based on the Food Consumption Score (FCS) reflecting household access to different food groups, only 57% of rural households are classified as having an acceptable score (i.e. diversity). Then 18% of households have a poor dietary diversity, i.e. a monotonous diet composed mainly of cereals and very few foods rich in micronutrients of good bioavailability (such as foods of animal origin and fruits). According to the Household Scale Food Diversity Score (SDAM), diversity is acceptable for 43% of rural households and 20% of poor households. The risk of micronutrient deficiencies for the population of Niger is increased. Indeed, according to the SMART 2022 survey, the rates of different forms of malnutrition (chronic and acute, anaemia of children under five (5) years) exceed WHO thresholds. (INS, 2022). The living conditions of these populations are a major concern for the Nigerien government which, through the NSI, has set up the NIPN financed by the European Commission and monitored by the Delegation of the European Union (DUE) in Niger. In order to contribute to improving the nutritional status of the target groups, in particular to reducing micronutrient deficiencies in alignment with the strategies of the National Nutrition Security Policy (PNSN), Niger decided to conduct this study to understand the consumption habits of the populations. The main objective of this quantitative work is to study the frequency of consumption of basic dishes of the populations of the 5 of the eight regions, as well as the recipes that accompany them and the different constituent ingredients.

MATERIALS AND METHODS

Study site: After the first phase of literature search, the second phase of data collection, fielding foods, recipes and ingredients in 5 regions, was carried out. The regions concerned are the regions of Tillabéri, Dosso, Maradi, Zinder, Tahoua (see figure).

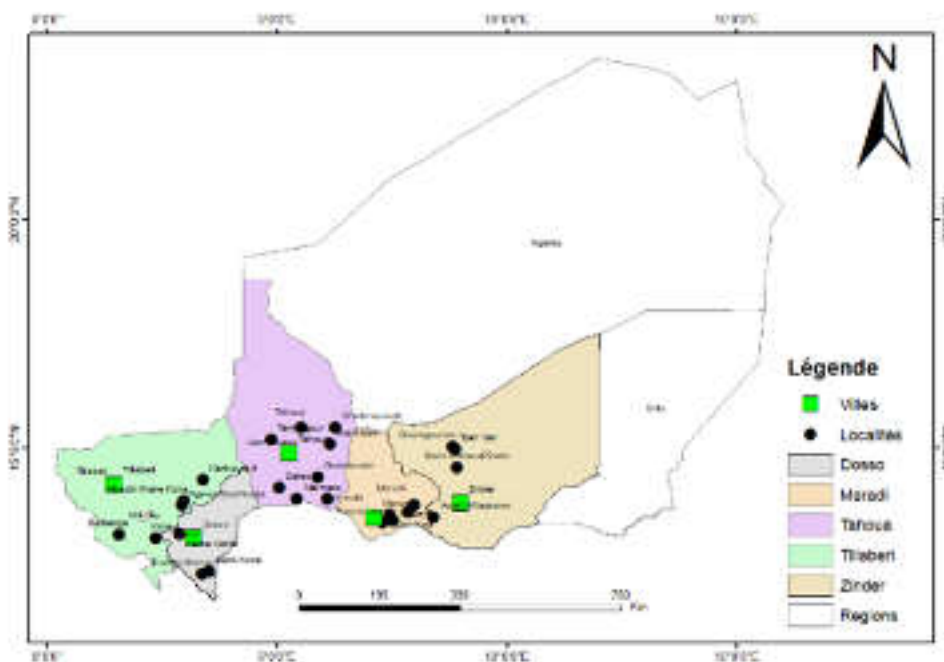


Figure 1. Map of Niger representing the study locations

Type of study: This study is a cross-sectional study (with one-time data collection without follow-up over time), observational and analytical. Study material. At the regional level, a maintenance guide was used during the Community Focus Groups to obtain information on the main activities of the different households, the name of the dish, the time at which the dish is prepared, the recipes that accompany this dish and its period of consumption.

- A GPS to take the geographical coordinates of the households surveyed for future implementation work.
- Tablets are used for the electronic collection of the data entered.

Methods

Field survey methodology: For this study, the collection of data on food recipes is done in the following steps:

Target population: Our population is made up of community key informants (women and men involved in home cooking and/or public catering).

Sampling: A sample of 30 villages per region was selected to conduct this survey (see map figure).

Sampling frame: For this collection, the sampling frame used is that from the fourth (4th) General Population and Housing Census carried out in 2012 (RGPH-2012); which classifies in ascending order of village code number (region, place of residence, department and commune).

Village draw: Two main bases were established according to the place of residence for each region (rural and urban) according to the weight of the population. For each category a simple random draw is applied to draw the sample villages.

Household choice: Six (6) households per village/neighborhood are identified by reasoned choice according to the type of meal preparation planned at the time of the interviewers' visit. Those who participated in the focus group discussions will help identify households to be surveyed on the basis of the most frequently consumed revenues.

Field data collection: The collection of data in the field, lasting eighteen (18) days, took place in the localities (neighborhoods and villages) drawn during the sampling phase. Heterogeneous groups with people of different social classes and different age categories are formed for focus groups. A grouping of revenues is carried out by a small team composed of identified resource persons.

Table 1. Distribution of the number of clusters by locality surveyed (focus group) by commune, department and region

Région	Département	Commune	Locality	Number of clusters
DOSSO	Boboye	Birni Ngaouré	Karba Karba	1
	Dioundiou	Karakara	Tounga Kourfaya	1
	Dosso	Dosso	Dosso	1
	Gaya	Yelou	Bano Koira	1
Yelou		Tounga Maman	1	
MARADI	Aguié	Aguié	Dankori	1
		Tchadoua	Magami	1
	Madarounfa	Dan Issa	Kassarawa	1
	Tessaoua	Tessaoua	Koura Angoua Koura	1
Tessaoua		Rougague Djimbidaoua	1	
TAHOUA	Abalak	Azeye	Arankidan	1
		Tabalak	Dan Toudou	1
	Birni Nkonni	Tsernaoua	Marmaro	1
	Bouza	Bouza	Gara doume	1
	Illéla	Illéla	Da fawa	1
	Madaoua	Bangui	Inwala	1
	Tahoua	Tahoua	Tahoua	1
		Takana mat	Tamangour	1
Tchintabaraden	Kao	Chintam ar walt	1	
	Tchintabaraden	Tchintabaraden	1	
TILLABERI	Belleyara	Tagazar	Aibachi Wane Koira	1
			Ngawa Boulhoua	1
	Filingué	Filingué	Kankoura ii	1
	Say	Say	Koba	1
Torodi	Makalondi	Bomonga	1	
ZINDER	Kantché	Daouché	Awaki Kilagawan	1
	Tanout	Ollélewa	Garin Ahmoud	1
		Tanout	Dan Yari	1
		Tanout	Goumgouma	1
Zinder	Zinder	Zinder	1	
Total				30

A first phase of group discussion was carried out in order to record all the information on the recipes (incoming foods in its composition, state of the food, cooking method, possible variant of the recipe ...). It is a semi-structured, moderated group discussion technique that aims to collect information on a limited number of questions defined in the guide. The size for the focus group is between 6 and 12 people. All discussions were audiotaped. Each focus is composed as follows: a representative of the women's association (KUNJIA), nutrition community relays, other women from the village and formal or informal restaurant owners. A profile code is assigned to each member of the focus group: 1. Customary Chief or his representative, 2. a representative of the women's association (KUNJIA), 3. a representative of the Nutrition Community Relay, 4. Other women/men of the village, 5. Formal or informal conservators and 6. a representative of a public service (health, education, etc.). Afterwards, a list of foods and dishes cooked and consumed by households is drawn up. A lexicon of foods, with the local name and the equivalent of the name in French for each food was used. And finally, a list of the most consumed recipes by region is established.

Data Management: Data is captured in real time in the field using tablets. ODK software for Android was used as the input interface. This minimized errors. The data from the recording were listened to, transcribed, codified and analyzed to complement the investigators' note-taking.

Data entry, analysis and processing: The data captured during the collection with the smartphone was entered in ODK (Open Data Kit). Thus, the actual processing of the data took place after the collection phase. From this server, the data were downloaded to computers for cleaning, anonymization using Excel software and were exported to STATA 14.0 for analysis.

RESULTS AND DISCUSSION

Results

The following paragraphs present the results of the respondents' profiles, receipts by place of residence and frequency of consumption in several ways.

-Identification of participants

Overall profile of Focus Group participants

Overall, during the focus groups organized to identify the different food recipes of this study, other unidentified men and women were the most represented with 59.93%. The least represented were the community relays with 4.28%.

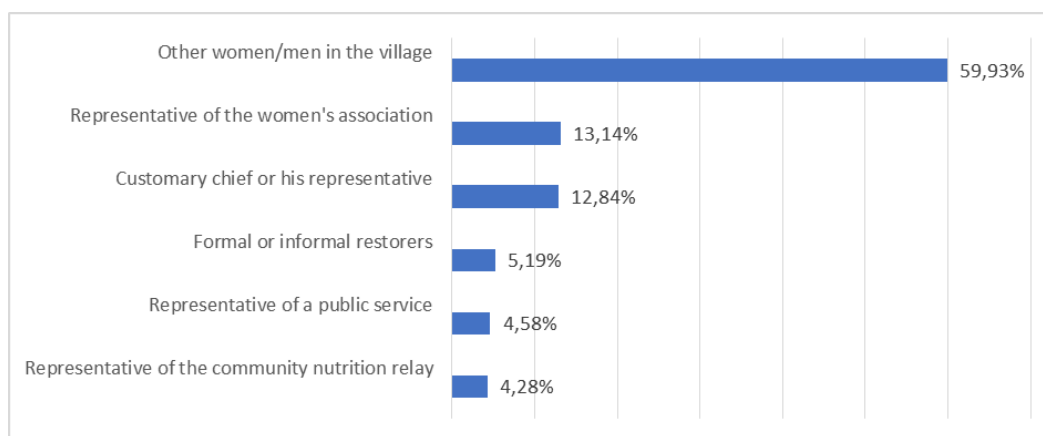


Figure 2. Distribution of participants in the focus groups of the survey on the frequency of consumption of receipts according to their profile

Overall profile of focus group participants by gender

The focus groups organized to identify the different food recipes of this study saw the participation of 170 men or 51.83% and 158 women or 48.17%. These results show that all the heads of household who participated in the focus groups identifying the most consumed food recipes are men. The representatives of the association are made up of 95.4% women. Of the representatives of the community relays who participated in the focus groups, 78.6% were women. Among other men and women in the village, men accounted for 54.6%. Among formal and informal restaurateurs, women were the most represented with 88.2%. 87.50% of the representatives of the public services were men.

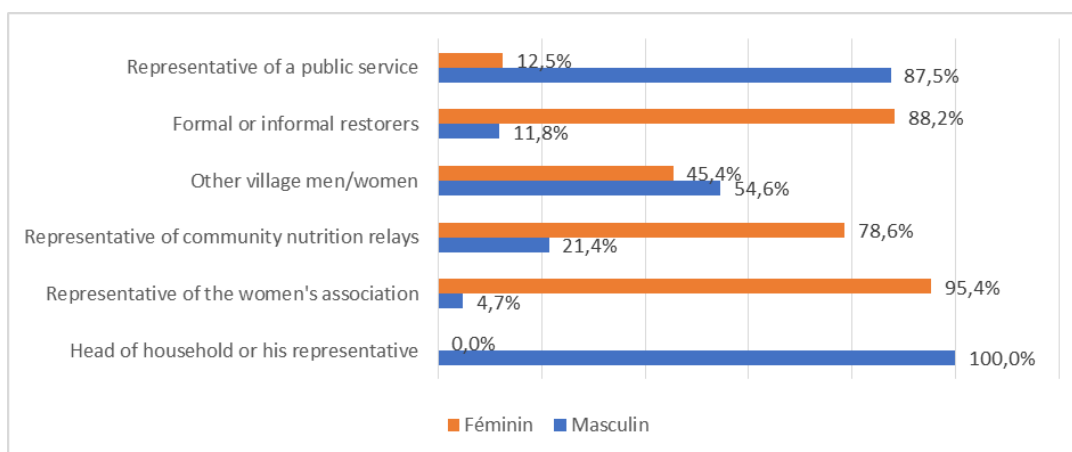


Figure 3. Profile of participants in the focus groups of the survey on the frequency of consumption of receipts by gender

Overall consumption of food recipes by place of residence

Table 2. Proportion of food receipts by respondents' place of residence

AREA OF RESIDENCE	Number	Percentage (%)
URBAN	335	27,39
RURAL	888	72,61
TOTAL	1223	100,00

Depending on the place of residence, the food recipes listed are found more in rural areas (72.61%) than in urban areas (27.39%).

Consumption of food recipes by place of residence and region

Table 3. Distribution of food receipts by respondents' place of residence and region

REGION	URBAN		RURAL		TOTAL	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENTAGE
DOSSO	44	16,99	215	83,01	259	100,00
MARADI	20	21,74	72	78,26	92	100,00
TAHOUA	44	33,85	86	66,15	130	100,00
TILLABERI	53	24,20	166	75,80	219	100,00
ZINDER	22	53,66	19	46,34	41	100,00

The frequency of consumption of food recipes is higher in rural areas than in urban areas in all regions except the Zinder region.

Basic dishes by region

Donut recipes consumed for all five regions

Table 4. Frequency and timing of consumption of donut recipes for the five regions

DONUTS RECIPES	FIVES REGION (%)	MORNING	NOON	EVENING	SNACK
WHEAT-BASED DONUT	2,27	80,00	80,00	40,00	20,00
COWBEA-BASED DONUT	3,34	83,33	83,33	33,33	33,33
SOYBEAN DONUT (AWARA)	3,41	0,00	20,00	40,00	60,00
TOTAL REGION/AVERAGE PERIOD	9,02	54,44	61,11	37,77	37,77

The donuts are made in proportions ranging from 2.27 to 3.41, made from wheat, cowpea and soybeans in the five regions. The period of consumption for the first two is in the morning and at noon. Soy fritters are mostly eaten in the evening as a snack.

The different biscuit recipes for all five regions

Table 5. Frequency and timing of cookie recipe consumption for the five regions

BISCUIT RECIPES	IN THE 5 REGIONS (%)	MORNING	NOON	EVENING	SNACK
WHEAT BISCUIT	1,51	0,00	100,00	100,00	0,00
MILLET BISCUIT	0,08	100,00	100,00	100,00	100,00
SESAME BISCUIT	0,43	100,00	0,00	0,00	0,00
SOYA BISCUIT (DAN KAKAN AWARA)	0,43	100,00	0,00	0,00	100,00
BISCUIT MADE OF NUTS	1,57	100,00	0,00	0,00	100,00
PEANUT BASED BISCUIT	0,43	0,00	0,00	0,00	100,00
Total Region/Average Period	4,45	66,66	33,33	33,33	66,66

The different cookie recipes commonly consumed in the regions are cookies made from sesame, soy, tigernut, wheat peanut and millet. However, wheat and tigernut biscuits are the most consumed. Depending on the period, millet, sesame, soy and tigernut cookies are consumed in the morning. Those of wheat and millet at noon and in the evening we find millet, soybeans, tigernuts and peanuts.

The different recipes of porridge for all five regions

Table 6. Frequency and period of consumption of porridge recipes for the five regions

PORRIDGE RECIPES	Five regions (%)	Morning	Noon	Soir	Collation
SORGHUM PORRIDGE (SIMPLE, ENRICHED, MIXED WITH WHEAT)	1,19	25,64	80,77	33,33	15,38
PEANUT-ENRICHED PORRIDGE	0,086	00,00	0,00	0,00	100,00
CEREAL PORRIDGE (MILLET, SORGHUM, MAIZE)	0,14	0,00	100,00	100,00	0,00
CORN PORRY	1,13	90,00	100,00	100,00	20,00
MILLET PORRIDGE (SIMPLE, AFLACFLAC, ENRICHED, MIXED WITH WHEAT, FERMENTED, UNSHELLED AND BRAN)	3,28	65,26	80,79	78,64	1,24
RICE PORRIDGE	0,20	100,00	100,00	100,00	0,00
TOTAL REGION/AVERAGE PERIOD	6,02	46,81	76,92	68,66	22,77

Porridges are the traditional hot drinks widely consumed by the Nigerien populations, The different porridges consumed are those based on cereals and mixture (simple, enriched, fermented, shelled or not), cereal bran and legumes Millet porridge is the most encountered. Porridges in general are eaten at any time and especially in the morning.

The different boules recipes for all five regions

Table 7. Frequency and period of consumption of Boule recipes for the five regions

Ball recipes	(%) Morning	Morning	Noon	Evening	Snack
CORN BALL	0,15	0,00	100,00	0,00	0,00
MILLET BALL (plain, enriched, unshelled, raw, boiled)	0,82	76,51	96,59	75,37	0,00
RICE BALL (plain, enriched)	0,82	50,00	100,00	50,00	0,00
SORGHUM BALL (plain, raw, boiled)	0,85	36,36	95,45	90,91	4,54
Total Region/Average Period	2,64	40,71	98,01	54,07	1,13

Well known to Nigeriens for a long time, the ball is still appreciated by Nigeriens in the cities and especially in the countryside. The ball is a drink very consumed by Nigeriens, We distinguish balls based on cereals (Mais, millet, rice and sorghum), shelled or not, raw or cooked, simple or enriched, The balls are mainly consumed at noon.

The different couscous recipes for all five regions

Table 8. Frequency and period of consumption of couscous recipes for the five regions

Couscous recipes	Five regions (%)	Morning	Noon	Evening	Snack
WHEAT COUSCOUS (simple, with fat)	0,61	0,00	100,00	100,00	0,00
CASSAVA FLOUR COUSCOUS (simple, GARI ROGO)	0,82	0,00	100,00	100,00	0,00
FONIO COUSCOUS	0,98	0,00	100,00	100,00	0,00
CORN COUSCOUS (simple, with cowpea leaves)	2,81	2,5	90,00	98,75	1,25
MILLET COUSCOUS, (single, DEGUE, MILLET BRABOUSCO)	0,95	54,63	65,74	39,81	0,00
COWS COUSCOUS (simple, with fat)	3,77	42,86	71,43	100,00	14,29
RICE COUSCOUS	4,91	6,67	86,67	100,00	0,00
SORGHUM COUSCOUS	2,38	62,86	97,14	97,14	2,86
Total Region/Average Period	17,23	21,15	88,87	91,96	2,30

Couscous is a dish frequently consumed by most households. It forms the basis of the family meal. Here we have cereal couscous (wheat, fonio, corn, millet, rice, sorghum, bran, corn), couscous made from legumes (cowpea), tubers (Cassava) often associated with vegetable leaves. The most consumed are rice couscous, cowpea, corn and sorghum. They are mainly eaten at noon and in the evening.

The different dough recipes for all five regions

Table 9. Frequency and timing of pasta recipes for the five regions

Pasta recipes	Five regions (%)	Morning	Noon	Evening	Snack
WHEAT PASTE (PLAIN, BRAN)	0,17	50,00	50,00	0,00	50,00
CASSAVA FLOUR PASTE (FAT, TEBA)	1,17	30,00	60,00	35,00	50,00
COWBEA FLOUR PASTE (SIMPLE, ALALA)	1,15	0,00	100,00	100,00	0,00
FONIO PASTE	0,92	8,70	33,70	98,91	0,00
CORN PASTE	6,9	49,17	50,83	97,50	0,00
MILLET PASTE (SIMPLE, WITH MEAT (MOUKFE, WITH SORREL LEAVES (ROUMATCHE), BRAN)	2,87	43,75	39,58	93,75	0,81
RICE PASTE	7,4	3,61	71,08	90,36	0,00
SORGHUM PASTE (PLAIN, FAT)	8,47	70,1	71,57	100,00	0,00
VOANDZOU PASTE	0,30	0,00	20,00	80,00	0,00
YAM PASTE	0,23	0,00	100,00	100,00	0,00
Total region/average period	29,58	25,33	59,67	79,55	10,08

Dough is the most common cereal-based dish, consumed in the households encountered. It is often the evening dish of families that can be reheated the next day for breakfast, The most consumed pasta are pasta made from millet, rice, sorghum.

The different salad recipes consumed for all five regions

Table 10. Frequency and timing of salad recipes for the five regions

Salad recipes	Five regions (%)	Morning	Noon	Evening	Snack
EUPHORBIA BALSAMIFERA SALAD (AGOUA)	0,17	50,00	0,00	0,00	0,00
BOSCIA SALICIFOLIA SALAD (ZOURE)	0,08	100,00	0,00	0,00	0,00
CALABASHIER SALAD (DUMA)	0,17	0,00	0,00	0,00	0,00
COMMIPHORA AFRICAN SALAD (DACHI)	0,08	0,00	0,00	0,00	0,00
RAW SALAD	0,062	0,00	100,00	100,00	0,00
CASSAVA FLOUR SALAD	1,14	22,22	55,56	44,44	100,00
SALAD OF COOKED GYNANDROPSIS GYNANDRA LEAVES, COOKED CASSIA TORA, COOKED CABBAGE, CRATEVA ADANSONII (INGUIDIDI, LELE), COOKED DESERT DATE PALM, FIG, LEPTADANIA HASTATA, COOKED MORINGA, COWBEA, SCLEROCARYA BIRREA (DANYA), TAPINANATHUS GLOBIFERUS (EPIPHYTES), SPINACH, SORREL SIMPLE AND WITH SOUMBALA)	0,43	9,50	51,14	41,37	55,71
FICUS SALAD DEKDEKENA(CHIRIYA)	0,08	50,00	50,00	50,00	33,33
PANICUMPANSUM(GHANSSI) GRAIN SALAD	0,18	0,00	100,00	0,00	41,67
GREEN BEAN SALAD	0,08	25,00	75,00	50,00	0,00
LETTUCE SALAD	0,42	0,00	50,00	50,00	66,67
LEPTADENIA HASTATA SALAD	0,17	0,00	0,00	0,00	100,00
MAERUA CRASSIFOLIA SALAD	0,34	0,00	100,00	100,00	75,00
COWBEA SALAD	0,19	33,33	100,00	100,00	100,00
COOKED SWEET POTATO SALAD	0,17	0,00	50,00	50,00	0,00
POTATO SALAD	0,14	0,00	100,00	100,00	0,00
CASSAVA FLOUR SALAD	0,14	0,00	85,71	85,71	25,00
Total region/average period	4,02	17,06	53,96	45,38	35,14

In this table, we have a whole multitude of vegetable salads, green leaves mentioned in the different localities surveyed during the Focus group discussion. These are the leaves available all year round or the seasonal leaves. Depending on the region, cassava flour salad is the most consumed, salad made from cooked Gynandropsis gynandra leaves, salad made from sorrel leaves, salad based on cooked Cassia tora leaves, cooked Moringa leaves, cowpea leaves, Sclerocarya birrea, Tapinanthus globiferus, Maerua crassifolia. The periods of consumption are mainly noon and evening.

The different stew recipes for all five regions

Table 11. Stew recipes consumed by Frequency and period of consumption of donut recipes for the five regions

Stew Recipes	Five Region (%)	Morning	Noon	Evening	Snack
YAM STEW	0,71	0,00	85,71	57,14	0,00
CASSAVA STEW	0,71	11,11	88,89	77,78	0,00
COWBEA STEW	1,13	0,00	60,00	80,00	0,00
SWEET POTATO STEW	1,32	6,25	81,25	75,00	0,00
POTATO STEW	0,59	0,00	83,33	83,33	14,29
VOANDZOU STEW	0,39	0,00	100,00	50,00	0,00
TARO STEW	0,00	0,00	50,00	0,00	0,00
Total Region/Average Period	4,85	12,00	78,45	60,46	2,04

Soupouts are also the staple dishes of the diet of Nigeriens. The stew recipes encountered here are tuber-based stews and legumes-based stews. The stew, cowpea and sweet potato are the most consumed.

Other basic food recipes for all five regions

During this study, community-specific dishes are encountered. There are recipes for grains of cereals or legumes with fat. Tuber purees or fried are also encountered. Grilled tubers or proteins of animal origin were cited.

Table 12. Other recipes consumed by Frequency and period in the five regions

Other Recipes	Five region (%)	Morning	Noon	Evening	Snack
MILLET BALLS (simple, SOUMBALA, BRAN)	0,14	49,99	52,77	30,55	16,66
COWBEA PELLET (DAN WAKE)	3,99	0,00	100,00	0,00	8,33
SORGHUM PELLET	0,25	0,00	66,67	66,67	0,00
CASSAVA FLOUR IN WATER	0,06	0,00	100,00	100,00	0,00
FISH ROASTED MILLET FLOUR	0,06	100,00	100,00	0,00	0,00
SORREL LEAVES COOKED WITH FISH	0,06	0,00	100,00	0,00	0,00
GRILLED (MEAT, POULTRY)	0,49	66,67	66,67	66,67	0,00
PILE GREEN BEAN	1,14	100,00	100,00	100,00	0,00
FRIED YAM	0,71	0,00	66,67	33,33	33,33
CASSAVA (BOILED, GRILLED)	0,06	100,00	50,00	50,00	0,00
COOKED MILLET (FAT, SOUMBALA, FATTY COWBEA, SORREL (ROUMATCHE), COOKED SORGHUM (CHAKKOU))	0,37	33,33	91,66	79,16	8,33
COOKED COWS (SIMPLE, IN FAT)	0,44	10,00	60,00	100,00	0,00
EGG OMELETS	0,96	100,00	33,33	33,33	66,67
SWEET POTATO (BOILED, FRIED, GRILLED)	0,21	41,66	100,00	41,66	0,00
PASTA (SIMPLE, WITH COWS IN FATTY, COOKED)	3,42	5,56	88,89	83,33	5,88
FRIED POTATO	0,14	0,00	100,00	100,00	0,00
PURÉE OF (PUMPKIN, FONIO, COWBES, MILLET, MILLET SORREL LEAVES, GREEN BEANS, COWBES, ENRICHED MILLET, MILLET WITH SORREL LEAVES, VEGETABLES MADE FROM GREEN BEANS)	0,78	0,00	100,00	100,00	22,22
RICE (FAT, COWBEA, COOKED, PASTE, COWBEA, FAT PASTE, COOKED)	6,53	6,25	87,50	81,25	6,25
MEAT SOUP	0,27	100,00	100,00	100,00	100,00
SORGHUM IN FATTY (SINGLE FATTY (CHAKKOU), COWS FATTY)	0,21	50,00	83,33	100,00	16,66
Wheat semolina Tagoula	0,18	100,00	66,67	66,67	0,00
TARO (BOILED, FRIED)	0,28	0,00	75,00	100,00	0,00
Total Region/Average Period	20,75	39,24	88,90	65,11	12,92

The accompaniments of the basic dishes for all five regions

Dosso Region

Table 13. Accompaniments to basic dishes in the Dosso region

Accompaniments/Dosso Region	Percentage (%)
PEANUT	3,09
COOKED LEAVES OF (AMARANTH, SPINACH, SORREL, CASSIA TORA, CASSIA TORA AND CRATEVA ADANSONII (LELE) LEAVES, COOKED CABBAGE, DESERT DATE PALM, MISTLETOE, LELE, MANIOC MORINGA, NIEBE, GREEN)	3,00
OIL	0,77
MILK	0,39
LETTUCE	0,39
COOKED COWS	2,32
SARDINES	0,39
SAUCE OF (ONIONS, PUMPKIN, LEAVES (OF AMARANTH, SPINACH, SORREL, BAOBAB, CERATHOTHECA SESAMOIDES, CORCHORUS TRIDENS, GOMBO, PUMPKIN SEEDS (AGUSSI), VEGETABLES, COWS, PEANUT PASTE, FISH, SOUMBALA, TOMATO, MEAT, MOUTON MALKOU)	2,66
SUGAR	0,39
Overall	13,4

We have a great list of accompaniments in the Dosso area. Among these accompaniments, peanut legume (3.09%), cooked green leaves (3.00%), different sauces (2.66%), cooked cowpea (2.32%) are the most cited during the organized focus groups.

Mara di Region

Table 14. Accompaniments to basic dishes in the Mara di region

Accompaniments/MaradiRegion	Percentage (%)
PEANUT SAUCE	3,26
ONION SAUCE	1,09
LEAF SAUCE (SORREL, BAOBAB, CASSIA TORA, CERATHOTHECA SESAMOIDES)	33,41
GOMBO SAUCE	10,87
SESAME SAUCE	3,26
SOUMBALA SAUCE	4,35
TOMATO SAUCE	9,78
Total	66,02

In the Maradi region, the food recipes that accompany the basic dishes are green leaf sauces (33.41%), okra sauces (10.87%), tomato sauces (9.78%), soumbala sauces (4.35%), peanut and sesame respectively 3.26% and onions (1.09%).

Tahoua Region

Table 15. Accompaniments of basic dishes in the Tahoua region

Support/Region Tahoua	Percentage (%)
PEANUT	1,54
SQUASH	0,77
COOKED MORINGA LEAVES	0,77
MILK	0,77
SAUCE OF (PEANUT, SQUASH, LEAVES (OF SORREL, BAOBAB, CASSIA TORA, CERATHOTHECA SASAMPOISES, CORCHORUS TRIDENS), GOMBO, VEGETABLES, COWS, FISH, TOMATO, DRIED TOMATO, TRIPES, MEAT, POULTRY, VEGETABLES BASED ON 'ONIONS, MOUTON MALKOU)	95,41
MEAT	0,77
Total	100,03

In the Tahoua region, the most consumed accompaniments are vegetable, meat, and legume sauces (95.41%) then peanut (1.54%) and squash, cooked Moringa leaves, milk and meat respectively at 0.77%.

Region of Tillabéri

Table 16. Accompaniments to basic dishes in the Tillabéri region

Accompaniments/Tillabéri Region	Percentage (%)
COOKED LEAVES OF (CASAVA AND MORINGA, CASSAVA, CASSAVA AND MIXED SPICES AND OIL, MORINGA, MORINGA AND WHITE HOSE PETALS)	0,98
OIL AND PEPPERS	1,83
MILK (Plain, quail, sugar)	3,04
COOKED CASSAVA	0,46
MIXED SPICES (ALONE, AND OIL, SALT AND PEANUT CAKES AND CHILI PEPPER)	1,98
COOKED COWS (SINGLE, WHITE SORREL PETALS, WHITE SORREL PETALS AND MORINGA LEAVES)	0,46
COOKED SWEET POTATO	0,46
COOKED WHITE SORREL PETALS	0,46
SAUCE OF PEANUTS, PEANUTS AND LEAVES OF CASSIA TORA, EGGPLANT, ONIONS, SQUASH, ZUCCHINI, SORREL LEAVES, BAOBAB, BAOBAB AND FISH, CERATHOTHECA SESAMOIDES, CERATHOTHECA SESAMOIDES AND FISH, CORCHORUS TRIDENS, CORCHORUS TRIDENS WITH FISH, GOMBO WITH FISH, GOMBO, VEGETABLES, COWS, WILD WATERMELON, FISH, TOMATO)	3,24
SUGAR (SIMPLE, SPICES)	0,46
Total	13,37

The region of Tillabéri has stood out for a larger list of recipes accompanying these dishes. Thus, the different sauces represent 3.24%; simple, curdled or sweet milk (3.04%), oil and peppers (1.83%); the spice blend, 1.98%; cooked leaves 0.98%; and recipes for cassava, cowpea, sweet potato, sorrel petals and cooked cowpeas, sugar each accounting for 0.46%.

Zinder Region

Table 17. Accompaniments in the Zinder region

Zinder region	Percent (%)
SAUCE OF LEAVES (SORREL, BAOBAB, CASSIA TORA, CORCHORUS TRIDENS, TCHINTANGOU)	58,54
GOMBO SAUCE	26,83
GREEN BEAN SAUCE	2,44
TOMATO SAUCE	7,32
MEAT SAUCE	2,44
SHEEP MALKOU SAUCE	2,44
Total	100,00

We notice a large consumption of sauce recipes in the Zinder region. Thus, green leafy sauces are consumed at 58.54%; okra sauces 26.83%; Tomato sauces at 7.32% and gougouri, meat and mutton malkou sauces each at 2.44%.

Recipients of food recipes

Recipients of food recipes in the five regions : In this study overall, the recipients of the various food recipes identified are almost exclusively intended for households (98.86%), Only one case was cited for children under two years of age (cooked cowpea) and one case for breastfeeding women (milk).

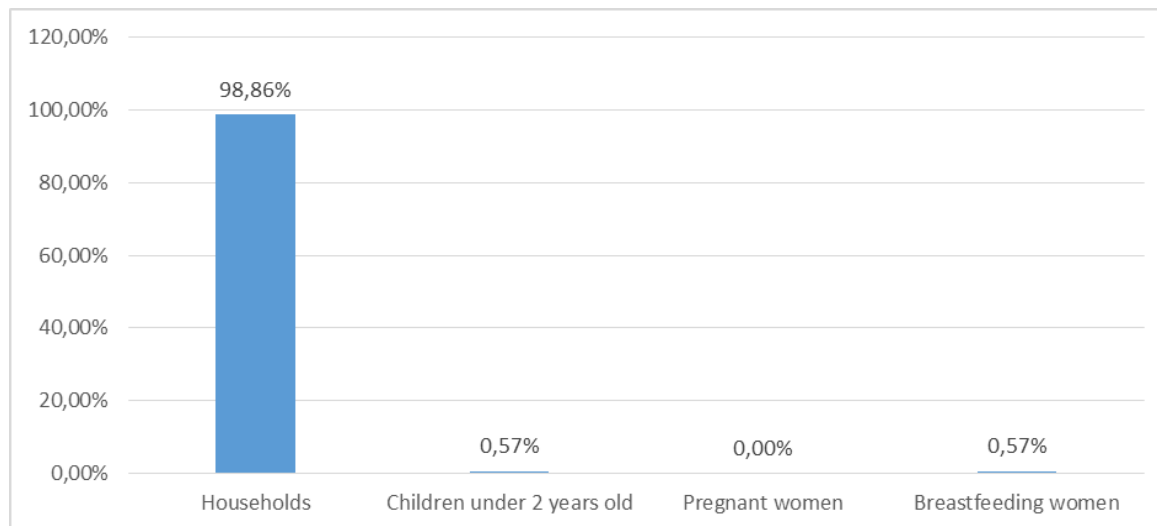


Figure 4. Recipients of food recipes in the 5 regions of Niger

Overall consumption of food receipts by time of year in the five regions

- Overall consumption of food receipts in the regions
- Overall, with the exception of April (77.89%), at least 80% of identified food receipts are consumed each month,

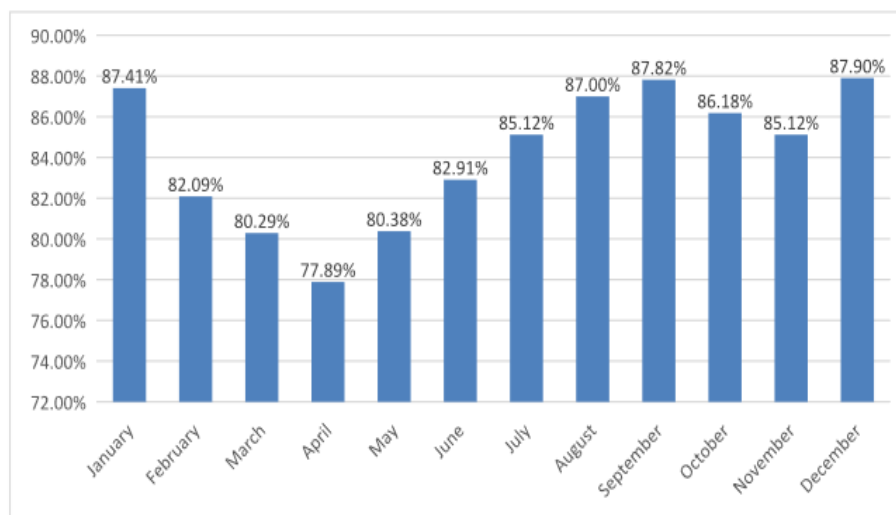


Figure 5. Overall proportion of food receipts consumed by time of year in the five regions

DISCUSSION

In Niger, Nigerien cuisine is a reflection of many traditional African cuisines, It uses a significant amount of spices in dishes, grilled meat, seasonal vegetables, salads and various sauces are some of the foods consumed. These are local dishes that characterize the Nigerien culinary identity, These traditional elements from a wide range of Nigerian culinary art prove sufficiently how rich is Niger's intangible cultural heritage, Despite modernization and socio-cultural changes, Nigeriens use knowledge and practices, know-how related to tradition to feed themselves daily with a 100% Nigerien diet. Thus, it is important to safeguard and enhance the culinary arts that constitute an integral part of the Nigerien identity and in a patriotic spirit (Ibrahim, 2022). In this study, it emerged a high consumption of cereals. This was reported by the FAO in 1990, in Niger the diet is exclusively carbohydrate-based on cereals, especially in rural areas. The study by Bidisha et al., in Bangladesh in 2017 reported the predominance of cereals in the diets of rural households such as those in our study. In another study conducted in 2008, on the diversity and preferences in plant food forest resources of the Otammari peoples of the Boukoumbé region in northwestern Benin, maize, sorghum, fonio and rice are the basis of the diet of the Bètammaribè. These staples most often accompany a vegetable sauce enriched with fish or bushmeat.

The diversity of wild vegetables is low but they are the most used of all vegetables in the locality because of the attachment of the Otammari to their environment with a consumption of fruits also. Food consumption patterns in Niger vary enormously between rural and urban areas. An identical result was found by a CILSS study in 2004. According to this study, variability is also observed between sedentary and nomadic rural populations. Overall, the number of meals is two or three per 24 hours, The basis of these meals is traditional cereals and rice that are consumed all year round, With regard to the consumption of the other main products, it can be seen that meat is consumed very much. Rarely in sedentary rural areas, while milk is frequently consumed by Fulani and Tuareg herders especially during wintering and the beginning of the dry season, The seasonal nature of vegetables limits their use to only a few months of the year (CILSS, 2004). The accompanying recipes, most of which are sauces of vegetables and green leafy vegetables, sauces of meat products, cooked green leaves, cooked vegetables then legumes and cooked tubers, certain foods including (milk, sugar, oil, peanut and derivatives, spices and mixture) etc. The frequency of consumption of these different recipes depends on the regions surveyed, These same recipes were encountered in the study conducted by Saadou et al, in 1993 on cultivated and spontaneous plants and culinary recipes of Niger where we find the name of food recipes in national languages of Niger, the organ used and the different associated ingredients and the methods of preparation, In a study conducted in Niger in 2018 by FOPAT on the market for processed products in Niger in five localities (Niamey, Zinder, Dosso, Maradi and Tahoua), different recipes or preparations are mobilized to prepare cereals, Overall, the opinions expressed during the focus groups on the most common dishes or preparations or the most frequently discussed in the groups concern the dough, couscous, dégués, ... etc These results are similar to those found in our study in which we also listed recipes for dough, couscous and dégué.

Dough is the cereal-based dish most frequently consumed in the households encountered. It is often the evening dish of families that can be reheated the next day for breakfast. It is most often prepared from corn; This result corroborates that of FOPAT, 2018, which also showed that this dish is variously appreciated by household members in the different respondents and vice versa in Niamey where few heads of household consume it. In a study done in Burkina Faso by Nikléma et al.; in 2010 on household feeding practices in Burkina Faso, sources of total daily energy intake, macronutrients and micronutrients, the most consumed dishes are dough or tô accompanied most often by vegetable sauces, leafy vegetables etc., beans, rice, cereal porridges regardless of the region surveyed and the season. These types of recipes are also encountered in our study. However, we see a monotony in the diet of households and with a high consumption of cereals and small amounts of ingredients and not varied in food recipes especially sauces.

This may be due on the one hand to the inability of households to better diversify their food consumption, due to their low socio-economic level and on the other hand to the availability of food in households generally consuming what they produce, while the level of production remains low. We note in our results a low consumption compared to cereals of animal products, fruits, vegetables. These same findings have been made in studies conducted in other rural communities in Sudan (Workicho et al., 2016) and Ethiopia (Khalid et al., 2017). In Niger in the consumption budget surveys (PNAN, 2006), despite the low consumption of vegetables, they noted a diversity of leafy vegetables that constitute a supplementary food of great nutritional value for rural populations. This same constant of the riches of wild resources was reported by Sanou et al.; in 2018 in four communes in the Nord region, Burkina Faso. And yet the latter are complementary foods that guarantee the diversity of the diet providing the body with a little of everything (carbohydrates, fats, proteins, vitamins, minerals). Indeed, according to Becker (1986), these foods are mainly used to compensate for vitamin deficiencies occurring at the beginning of the wet season and for Dupriez & De Leener (1987) they allow the body to build its health

CONCLUSION

At the end of this study, we had to identify revenues in the five regions surveyed in Niger, namely Tillabéri, Dosso, Tahoua, Maradi and Zinder. Thus, among the basic dishes we have recipes for donuts, biscuits, porridges, balls, couscous, pasta, salads and stews. These dishes are consumed in very different ways at noon and in the evening. However, many other specificities are encountered and are taken in the morning or as a snack. The accompaniments and especially the sauces are made with seasonal vegetables and often specific in the terroir. It also emerged that about 99% of these dishes are prepared in households. This mapping will serve as a basis for reconstructions, standardizations, and various measures in order to assess the nutritional status of target groups in order to fill gaps through the promotion of micro nutrient-rich foods.

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Conflicts of interest

The authors state that there is no conflict of interest.

Authors' contributions : All authors contributed to the conduct of this work. The authors of this article have read and approved its contents.

Glossary of abbreviations

AMU: Abdou Moumouni University (UAM)
 DUE: Delegation of the European Union
 FAO: Food and Agriculture Organisation
 FCS: Food Consumption Score
 GPHC: General Population and Housing Census
 GPS: Global Positioning System
 HC3N: High Commission for the 3 N initiative
 ICDCS: Permanent Inter-State Committee for Drought Control in the Sahel (CILSS)
 KUNJIA: Representative of the women's association
 NAPN: NATIONAL ACTION PLAN FOR NUTRITION (PNAN)
 NFNP: National Food and Nutrition Policy (RdN)
 NIS: National Institute of statistic

NIS/EWS/GCAL: National Institute of Statistic/Early Warning System/General Census of Agriculture and Livestock
 NIS/EWS/AMIS: National Institute of Statistic/Early Warning System/Agricultural Market Information System
 NIPN: National Platform for Information and Nutrition
 NSI: National Food Security Survey
 NN SP: National Nutrition Security Policy
 ODK: Open Data Kit
 PFPFP: Project for the fortification of processed food products (FOPAT)
 PhD: Doctor of Philosophy
 3N: Nigeriens fed Nigeriens
 SDAM: Household Scale Food Diversity Score
 SMART: Standardized Monitoring and Assessment of Relief and Transitions
 WFP: World Food Program
 WHO: World Health Organisation
 Monitoring and Assessment of Relief and Transitions
 WFP: World Food Program
 WHO: World Health Organisation

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