

Full Length Research Paper

Socio-economic perception of snail meat consumption in Fako division, south-west region Cameroon

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Cameroon south-west region offers favorable climatic conditions for survival of land snails whose meat is known for their nutritional benefits. Besides, conventional livestock (beef, chicken, etc.) cannot satisfy the high demand in Cameroon. Hence, snail meat could be suitable alternative source of protein. Therefore, this article investigated the perception and identified the main determinants of land snail meat consumption in the Fako division (south-west region Cameroon). A multistage random sampling method was used to select a total of 211 respondents. Descriptive statistics has highlighted that snail meat is quite consumed in Fako with 76.30% of respondents. Majority of respondents were Christians (95.26%) and have their origin from south-west region (56.40%). Additionally, regression analysis has pointed out that snail meat consumption depends on marital status, household size, income, snail origin and religion. The amount of snail meat consumed was shown to be influenced by its price and price variation between seasons. At the end of this study, two recommendations were made: snail farming should be increased in order to reduce scarcity of snail during dry season as well as its price and educate the people coming from other region of Cameroon on the nutritional benefits of snail meat.

Key words: Snail consumption, African garden snails, Cameroon.

INTRODUCTION

The rate of under-nourishment in Cameroon has been about 16% household being underfed in the country as at 2017 (World Food Programme and Ministry of Agriculture and Rural Development, 2017). In fact, one of the problems of malnutrition in humans is the low consumption of animal protein (Schönfeldt and Hall, 2012). FAO Statistics of 2013 indicate that protein consumption in Cameroon is currently 61.96 g/capita/day, that is, below FAO norm, estimated at 81.23 g/capita/day

(FAO, 2013). Hence, the low consumption of protein could be due to the fact that breeding of conventional species in Cameroon (beef, chicken, etc.) is still in majority traditional and cannot satisfy the high demand of Cameroon population in terms of protein requirements per individual (Labonne et al., 2003). Besides, the prices of conventional species in the market are less affordable for the middle class of Cameroonian households (Labonne et al., 2003). Therefore, people have turned to

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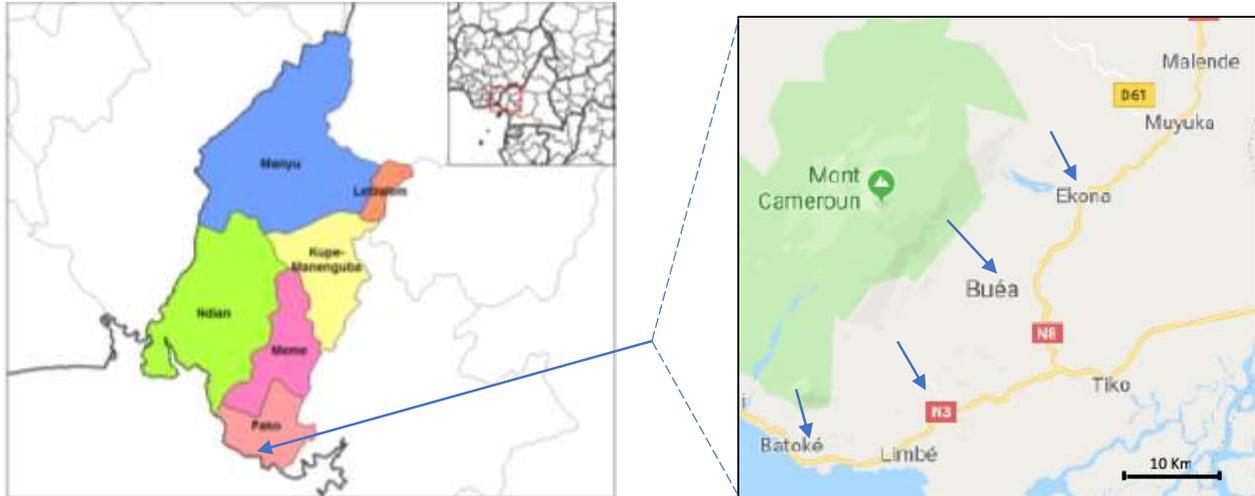


Figure 1. Map of the study area
Source: Wikipedia (2006); Google Map (2018).

the consumption of non-conventional species such as snails that were previously reserved for certain ethnic groups, particularly those from the south-west region (Ndah et al., 2017; Ngenwi et al., 2010). As in the south of Nigeria, the region nearby to Cameroon south west region, land snail meat consumption is common (Cobbinah and Vink, 2008). The major varieties of edible land snails found are *Achatina achatina* and *Achatina fulica* (Cobbinah and Vink, 2008). Besides, various studies have recommended snail meat to all ages (Malik et al., 2011; Adeyeye and Afolabi, 2004; Babalola and Akinsoyinu, 2009; Fagbuaro et al., 2006; Eneji et al., 2008). Since, snail meat was reported to be rich in proteins, low in fats and carbohydrates (Malik et al., 2011; Adeyeye and Afolabi, 2004; Babalola and Akinsoyinu, 2009; Fagbuaro et al., 2006; Eneji et al., 2008). Snail meat also contains several minerals such as calcium, phosphorus, potassium, iron and zinc (Engmann et al., 2013; Babalola and Akinsoyinu, 2009). In addition, it contains an additional source of essential amino acids such as Lysine and Arginine (Fagbuaro et al., 2006). Besides, its nutritional values, snail meat is more affordable than conventional livestock in Cameroon according to the prices in the market. Furthermore, the snail meat sector is a lucrative sector and source of income for several people in the south-west region that includes snail rearers, collectors, cleaners and vendors (Ndah et al., 2017; Ngenwi et al., 2010). With social crisis and increase of refugees ongoing in some region of the country, could snail meat be an alternative solution to food insecurity in Cameroon? There is a need to characterize the state of consumption of land snail consumption in Cameroon, particularly in the south-west region where it is very available. Therefore, objective of this study is firstly to identify the perception of snail meat consumption in the Fako division, south-west region of

Cameroon. Secondly, assess parameters that determine its consumption.

MATERIALS AND METHODS

Description of the study area

This study was conducted in the Fako Division, South West Region of Cameroon (Figure 1). The division is located at Latitude 4.1667° and Longitude 9.1667°. It covers an area of 2,093 km² and in 2014 had a total population of 1, 515, 888 inhabitants (Institut National de la Statistique, 2015). Of the six divisions in the South West region, Fako is a cosmopolitan area with numerous urban and semi-urban towns (Institut National de la Statistique, 2015). Besides, the division belongs to a humid forest with monomodal rainfall which offers favorable climatic conditions for the reproduction and development of land snails which is consumed as traditional meal.

Types and instrument of data collection and sample size process

Data used for the study were collected from 4 randomly selected areas in Fako division: Ekona, Buea, Limbe and Batoke as indicated in Figure 1, using a well-structured pre-tested questionnaire. Data were collected according to the socio-economic characteristics of the respondents (age, gender, household size, marital status, level of education, income, etc). Additional questions were related to snail consumption perception (quantity consumed, snail origin, determinants factors of consumption, eating form, and experience in snail consumption). A multistage random sampling method was used to select a total of 211 respondents that constituted the sample size. Descriptive statistics allowed the organization of the data (Table 1).

Data analysis

Data collected were statistically analyzed by using descriptive statistics and ordinary least squares multiple regression method of Stata 12.0 and Excel 2013. For regression calculation, snail meat

Table 1. Description of main socio economics characteristics.

Parameter	Description	Code
Sex	Gender of consumer	1=Male; 2=Female
Age	Age in year	1-<30; 2-30-40; 3-40-50; 3-50-60; 4->70
Marstat	Marital status	1=Single; 2=Married; 3=Separated; 4=Divorced, 5=Widow
Religion	Religion of the consumer	1=Christian; 2=Muslim; 3=Others
Housesize	Size of the household	Number of people in the house
Edulevel	Level of education	1-Primary; 2-Secondary; 3-Tertiary
Mainact	Main activity	1-Farming; 2-Trading; 3-Civil servant; 4-Artisan; 5-Other
Income	Salary per month (thousands of FCFA)	1=<30; 2=30-50; 3=50-75; 4=75-100; 5=>100
Snailcons	Consumption of snail's meat	1-Yes; 2-No
Consfrequency	Frequency of consumption	0-None; 1-Occasionally; 2-Each week; 3-Each month; 4- Other
Snailprice	Amount spent to buy snail meat	Amount in FCFA
Quantity (estimation of bowl used to sell snail meat in the market)	Quantity consumed	Quantity consumed (kg)
Snail origin	Snail meat origin	1-Farm; 2-Market; 3-Others
Eating form	Eating form preference	1-Grilled ; 2-Inside sauce; 3-Both; 4-None

Source: Data from the Field Survey (2018).

consumption model is tacitly specified as:

$$C = \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Housesize} + \beta_3 \text{Edulevel} + \beta_4 \text{Income} + \beta_5 \text{Eating form} + \beta_6 \text{Quantity} + \beta_7 \text{Frequency} + \beta_8 \text{Price} + \varepsilon$$

where C = Consumption of snail's meat (decision to consume snail's meat), β_i = econometrics coefficients of parameters with $i = 1, 2, 3, \dots, 8$, and ε = disturbance.

RESULTS

Socio-economic characteristics of respondents

Results showed that 52.13% of the studied sample were male while 47.87% were female (Table 2). Majority of respondents were between 0 and 30 years (49.76%) followed by the range of 30 to 40 (34.18%). The majority of respondents were married (50.24%) and single (45.50%). The majority had a study level which ranged between the secondary and tertiary level. Household size ranged from 3 to 4 persons as reported by 38.86% of

respondents. Concerning the main activity of the interviewed people, civil servants (31.75%) were more represented, followed by traders (25.59%), then students (19.91%). The level of income is ranged between 30.000 and 100.000 FCFA. Most of the respondents are Christian (95.26%) and their region of origin is mostly the south-west region (56.40%).

Snail meat consumption perception

Parameters of snail consumption are shown in Table 3. It was indicated that a large number of respondents 76.30% eat snail meat while 23.70% do not. Actually, 36.49% of the respondents presented good taste as main determinant of consuming snail meat. Other reasons of snail meat consumption as identified by the respondents include formation of blood cells, source of proteins and economic factor. Cultural taboo, not familiar to snail dislikes the taste, were the factors that prevent some of the respondents from snail consumption.

Table 2. Socio-economic characteristics of the studied sample.

Parameter		Frequency	Percentage	Mean
Gender	Male	110	52.13	1.478673
	Female	101	47.87	
	Total	211	100	
Age	>30	105	49.76	1.687204
	30-40	70	33.18	
	40-50	33	15.64	
	60-70	3	1.42	
	Total	211	100	
Marstat	Single	96	45.50	1.582938
	Married	106	50.24	
	Divorced	6	2.84	
	Widow	3	1.42	
House size	Total	211	100	4.71564
	1-2	37	17.53	
	3-4	82	38.86	
	5-6	47	22.27	
	7-8	26	12.32	
	9-11	19	9.00	
Edulevel	Primary	16	7.58	2.393365
	secondary	97	45.97	
	Tertiary	98	46.44	
	Total	211	100	
Mainact	Farming	39	18.48	/
	Trading	54	25.59	
	Civil servant	67	31.75	
	Artisan	9	4.27	
	students	42	19.91	
	Total	211	100	
Region of origin	South west	119	56.40	/
	North west	47	24.17	
	Littoral	17	8.06	
	West	23	10.90	
	North	5	2.37	
	Total	211	100	
Religion	Christian	201	95.26	1.047393
	Muslim	10	4.74	
	Total	211	100	

Source: Data from the Field Survey (2018).

Furthermore, 66.82% of respondents acquired their snail meat from the market, 9.48% from the farm, while

23.69% from both market and farm. Regarding the form of consumption, 36.49% of respondents eat snail meat

Table 3. Parameters of snail's consumption.

Parameter		Frequency	Percentage
Snailscons	Yes	161	76.30
	No	50	23.70
	Total	211	100
Determinants factors of consumption	Blood formation	47	22.27
	Tasty	77	36.49
	Proteins	25	11.85
	Economical	12	5.69
	Don't like it	24	11.37
	Not use too	6	2.84
	Cultural taboo	20	9.48
	Total	211	100
Snail meat origin	Market	141	66.82
	Farm	20	9.48
	Others	50	23.69
	Total	211	100
Eating frequency	None	50	23.70
	(Occasionally)	47	22.27
	Weekly	64	30.33
	Monthly	50	23.70
	Total	211	100
Form of snail meat eaten	Fried (Soya)	52	24.64
	Inside Soup	77	36.49
	Fried, inside soup	32	15.17
	None	50	23.70
	Total	211	100
Snail price appreciation	Yes	154	72.99
	No	57	27.01
	Total	211	100

Source: Data from the Field Survey (2018).

inside soup, while 24.64% eat it grilled. About the frequency of consumption, 30.33% of respondents consume snail meat weekly, 23.7% monthly, while 22.70% daily and 23.70% occasionally. When interrogated about snail meat price in the market, 72.99% of respondent said that it is expensive while 27.01% do not.

Results from Table 4 showed that the average of snail consumed by respondents is 3.08 kg. In addition, it was also shown that the amount in average disbursed by respondents to buy snail in the market is around to 3000 FCFA.

Statistical regression model

Table 5 shows the result of regression of decision to consume snail meat between all the parameters of the

study. These results showed that there is a significant correlation at 1% between the decision to consume snail meat and the following parameters: marital status, income, snail origin, quantity of snail and religion. Similarly, a significative correlation of 5% between snail consumption and household size.

Table 6 shows the regression results of snail meat quantity consumption between 4 parameters: house size, snail price, price changing period and eating form. The results showed that there is a significant correlation at 1% between the quantity of snail consumption and the price of snails, and at 5% with the price changing period.

DISCUSSION

The objective of this study was to identify the perception and determinants of snail consumption in the Fako

Table 4. Distribution of some socio-economic parameters of snail consumption.

Parameter	Obs.	Mean	Std. Dev.	Min.	Max.
Consexp	211	11.52607	9.258357	0	35
Income	211	2.758294	1.422059	1	5
Quantity	211	3.081754	3.201675	0	20
Snailprice	211	2937.915	2717.086	0	15000
Price appreciation	211	1.270142	0.4450891	1	2
Price changing period	211	1.014218	0.1186701	1	2

Source: Data from the Field Survey (2018).

Table 5. Regression result of decision of snail meat consumption.

Linear regression

Number of obs.=211
 F(16, 194)=79.54
 Prob>F=0.0000
 R-squared=0.8677
 Adj R-squared=0.8568
 Root MSE=0.16129

Snailscons	Coeff.	Standard Error	P> t
Gender	0.027407	0.0180659	0.142
Age	0.0266096	0.0189007	0.337
Marstat***	0.181954	0.0046077	0.010
Housesize**	0.011927	0.020926	0.032
Edulevel	0.0453304	0.0094646	0.118
Mainact***	0.0124174	0.0015845	0.000
Consexp	0.0092369	0.0086055	0.284
Income***	0.0444666	0.0114828	0.000
Consfrequency	0.0036247	0.0047221	0.444
Quantity***	0.0979535	0.0244912	0.000
Snailorigins***	0.0000239	5.72e-06	0.000
Snailprice***	0.0818777	0.0266815	0.002
Priceappreciatio	0.1633416	0.0974191	0.095
Pricechangingperiod***	0.1789202	0.0153234	0.000
Eatingform	0.1069955	0.0567397	0.061
Religion**_cons	0.718624	0.1547055	0.000

***Value significant at 1%; **Value significant at 5%.

Source: Data from Survey (2018).

Department.

Percentage of women and men interviewed were similar. In addition, the studied sample is composed of young people (0-40 years old). This result showed that the studied sample is representative of the Cameroonian population that comprised a young population and a similar percentage between women and men (Institut National de la Statistique, 2015). Most of the respondents are educated beyond primary school and have a job. This implies that the answers given during this questionnaire

could be considered and it is a guarantee of validity of this study.

Majority of people interviewed have for region of origin the south-west. Indeed, this result justifies the consumption of snails being important in the study population since south-west region where Fako division belongs is a humid forest with monomodal rainfall which offers favorable climatic conditions for the reproduction and development of land snails (Cobbinah and Vink, 2008; Chukwuka et al., 2014). In addition, tribes of the

Table 6. Regression result of quantity of snail meat consumption.

Linear regression			
Number of obs.=211			
F (16, 194)=10.32			
Prob>F=0.0000			
R-squared=0.8197			
Adj R-squared=0.7851			
Root MSE=2.4485			
Quantity	Coeff	Standard Error	P> t
House size	0.1162846	0.0706552	0.101
Snail price***	0.0005123	0.0000829	0.000
Price changing period**	3.654077	1.466317	0.014
Eating form	0.5112772	0.3013252	0.091
_cons	2.728105	2.467996	0.270

***Value significant at 1%; **Value significant at 5%.
Source: Data from Survey (2018).

area have integrated land snails consumption as their cultural meal (Ngenwi et al., 2010; Ndah et al., 2017).

Most of respondents of the study are Christians. It could be explained by the fact that south-west region is part of the “greater” south of Cameroon, that is, Christian (Institut National de la Statistique, 2015). Furthermore, correlation analyses have shown that religion influences the consumption of snails. However, there is no law that forbid christians to consume snails except those who are from ethnic groups that consider snails as a taboo and do not consume it. As of Muslim who said not to eat snail meat, there is also no religious law that prohibits them to eat snail. Besides, the majority of Muslims in Cameroon are from the Sudano-Sahelian area (Institut National de la Statistique, 2015) and the climatic conditions are not favorable to the reproduction and the survival of the terrestrial snails (Cobbinah and Vink, 2008; Chukwuka et al., 2014). As a result, they do not consume snails because they have not been in contact with it culturally as people origin from the South.

The present results showed that snail meat is consumed in a regular basis and the majority of respondents gets it from the market. Indeed, correlation analysis confirms this result that the origin of snails is a determining factor of its consumption. Besides, many of them think that the price is high. This result could explain the fact marital status, household size and income were revealed as factors determining the consumption of snails. Indeed, when married, more important will be the size of the household, the quantity of snail meat to consume will be important and the price of snail meat will consequently influence its consumption. Furthermore, this study has revealed that there is a correlation between the main activity and the decision to consume snails. Indeed, if somebody has an income he could

easily afford snail meat.

Moreover, it showed that there is a correlation between quantity of snails consumed and the price variation according to the season. Indeed, there are still very few snail farms and snails are still supplied by harvesting in the fields and around houses (Ngenwi et al., 2010; Ndah et al., 2017). In addition, snails hibernate during the dry season and become rare (Chukwuka et al., 2014). Consequently, snail meat price's increases during dry season and less important will be their consumption because of the price increase.

Definitively, this study has highlighted that snail meat is very consumed in the Fako division. It has also been shown that consumption is dependent on marital status, household size, income, snail origins and religion. In addition, it has been pointed out that snail meat consumption quantity is influenced by its price and price variation according to season. Even though, the sample has some characteristics of Cameroon population, this result is specific to the study area. To have general recommendations, it will be interesting to extend the study to the other regions of Cameroon. According to results pointed out from this study, two recommendations can be made. Firstly, snail farming should be increased in order to reduce scarcity of snail during dry season as well as its price. Secondly, people coming from other regions of Cameroon than south-west should be educated on the nutritional benefits of snail meat. One of the limitations of the study was not to be able to apply the questionnaire in some town of Fako division because of social crisis in the south-west region. Next step of this study will be firstly, to extend the survey in other division of the region as well as other regions of Cameroon with the same climatic conditions. Secondly, interview land snail collectors in order to evaluate the methods of supplying land snails.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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REFERENCES

- Adeyeye EI, Afolabi EO (2004). Amino Acid Composition of Three Different Types of Land Snails Consumed in Nigeria. *Food Chemistry* 85(4):535-539.
- Babalola OO, Akinsoyinu AO (2009). Proximate Composition and Mineral Profile of Snail Meat from Different Breeds of Land Snail in Nigeria. *Pakistan Journal of Nutrition* 8(12):1842-44.
- Chukwuka CO, Ejere VC, Asogwa CN, Nnamonu EI, Okeke OC, Odii EI, Ugwu GC, Okanya LC, Levi CA (2014). Eco-Physiological Adaptation of the Land Snail *Achatina Achatina* (Gastropoda: Pulmonata) in Tropical Agro-Ecosystem. *The Journal of Basic and Applied Zoology* 67(2):48-57.
- Cobbinah JR, Vink A (2008). *Snail Farming. Production, Processing and Marketing*. Agromisa Foundation, Wageningen.
- Eneji CA, Ogogo AU, Emmanuel-Ikpeme CA, Okon OE (2008). Nutritional Assessment of Some Nigerian Land and Water Snail Species. *Ethiopian Journal of Environmental Studies and Management* 1(2):56-60.
- Engmann FN, Afoakwah NA, Darko PO, Sefah W (2013). Proximate and Mineral Composition of Snail (*Achatina Achatina*) Meat; Any Nutritional Justification for Acclaimed Health Benefits?. *Journal of Basic and Applied Science Research* 3(4):8-15.
- Fagbuaoro O, Oso JA, Edward JB, Ogunleye RF (2006) Nutritional Status of Four Species of Giant Land Snails in Nigeria. *Journal of Zhejiang University Science B* 7(9):686-689.
- Food and agriculture organisation of united nation (FAO) (2013). *Food Balance Sheets*.
- Google map (2018). Map of Fako Division. <https://www.google.com/maps/place/Fako/@4.1782002,8.9623954,10z/data=!3m1!4m5!3m4!1s0x10612e4f932b5443:0x13884415293f1148!8m2!3d4.0972466!4d9.2785583>
- Institut national de la statistique (2015). *Caractéristiques de la population. Annuaire statistique du cameroun*. http://www.stat.cm/downloads/2016/annuaire2016/CHAPITRE4_CARACTERISTIQUES_POPULATION.pdf
- Labonne M, Magrion P, Oustalet Y (2003). *Le Secteur de l'élevage Au Cameroun et Dans Les Provinces Du Grand Nord: Situation Actuelle, Contraintes, Enjeux et Défis*. Cirad, Prasac. Inc, 12 p.
- Malik AA, Aremu A, Bayode GB, Ibrahim BA (2011). A Nutritional and Organoleptic Assessment of the Meat of the Giant African Land Snail (*Archachatina Marginata Swaison*) Compared to the Meat of Other Livestock. *Livestock Research for Rural Development* 23(3):60.
- Ndah NR, Celestine Fonyikeh-Bomboh CL, Chia EL, Enow EA, Yengo T, Ngwa AD (2017). Assessment of Snail Farming from Selected Villages in the Mount Cameroon Range, South West Region of Cameroon. *Asian Research Journal of Agriculture* 6(4):1-11.
- Ngenwi AA, Mafeni JM, Etchu KA, Oben FT (2010). Characteristics of Snail Farmers and Constraints to Increased Production in West and Central Africa. *African Journal of Environmental Science and Technology* 4(5):274-278.
- Schönfeldt HC, Hall NG (2012). Dietary Protein Quality and Malnutrition in Africa. *British Journal of Nutrition* 108(S2):S69-76.
- Wikipedia (2006). Southwest Cameroon Divisions. [https://en.wikipedia.org/wiki/Southwest_Region_\(Cameroon\)#/media/File:Southwest_Cameroon_divisions.png](https://en.wikipedia.org/wiki/Southwest_Region_(Cameroon)#/media/File:Southwest_Cameroon_divisions.png)
- World food programme (WFP), and Ministry of Agriculture and Rural Development (MINADER) (2017). *Comprehensive Food Security and Vulnerability Analysis (CFSVA)*.