

# Dried Locust a New Trend of Nutritious Food in the Sahel Region

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## ABSTRACT

There are Nutritional deficiencies in the Sahel, commercialization of locusts is frequent. This study aimed to assess nutritional interests through the locust vendors. Fifty-five vendors were questioned based on their activity linked with locust sales. A survey showed 84% of locust vendors have never received training in food hygiene, wear no clean clothes and 7% used disinfectants. 73% of vendors have sales locations on the streets and 7% on fixed locations. Five species have been identified namely *Ornithacristurhidacavroisi*, which represents the most-purchased and best-selling species in the markets, *Acanthacris rui cornis citrina*, *Kraussella angulifera*, *Acrideres strenuus* and *Diabolocatantops axillaris*. A 100kg cost 35-55\$ in November to December, then 70-90\$ January to February, then 110-130\$ in March. Locust sales value chain provides profit to the local people.

**KEYWORDS:** Locust, sales, income, nutritional value, Sahel

## INTRODUCTION

Over 12 thousand species of grasshoppers are identified of locust family of which about 500 are agricultural pests. The locust is a harmless animal that often goes unnoticed. But it can also be a plague, when it swarms and falls on crops, devastating everything in its path. The desert locust species covers Africa's north part of the equator, the Middle East, the Arabian Peninsulas, and the Indo-Pakistani region. In many countries, locusts are caught using large nets or other means. They are usually fried, roasted, or boiled and eaten immediately or well dried and eaten later. In some cases, locust has other medicinal uses although already can provide a rich source of additional nutritional food for animals and fish [1,2,3,4,5].

The locust is now a commercial product in Niger. Becoming more and more a product of high consumption in the dietary habits of Nigeriens, the locust also occupies an important place in informal trade in this country. Nowadays, there are hundreds of people involved in the locust sales business. It can be

seen all over in Niger in their different markets, here and there the points of locust sales product available. The locality of Maradi in Niger is the place where the business of locusts is booming as reported in the local media [6]. This activity, which takes place every month of the year, drains a numerous person along the chain of locust business, from capture to consumption, Maradi being one of the largest suppliers of these *Caelifera Acrididae* in the Sahel in general and Niger in particular. Selling locusts is a business like any other, the markets of Maradi are supplied from the various localities of the region. Indeed, these locusts are cooked and dried on site before selling them on the market reported Amadou [7]. The surveys carried out in 2019 by the National Institute of Statistics (INS) of Niger republic in collaboration with its technical and financial partners indicate that the rates prevalence of acute malnutrition is above the emergency threshold of 15%, particularly in Maradi (15.7%), Zinder (20.7%) and Tahoua (16.4%) [8]. The sale of locusts not only

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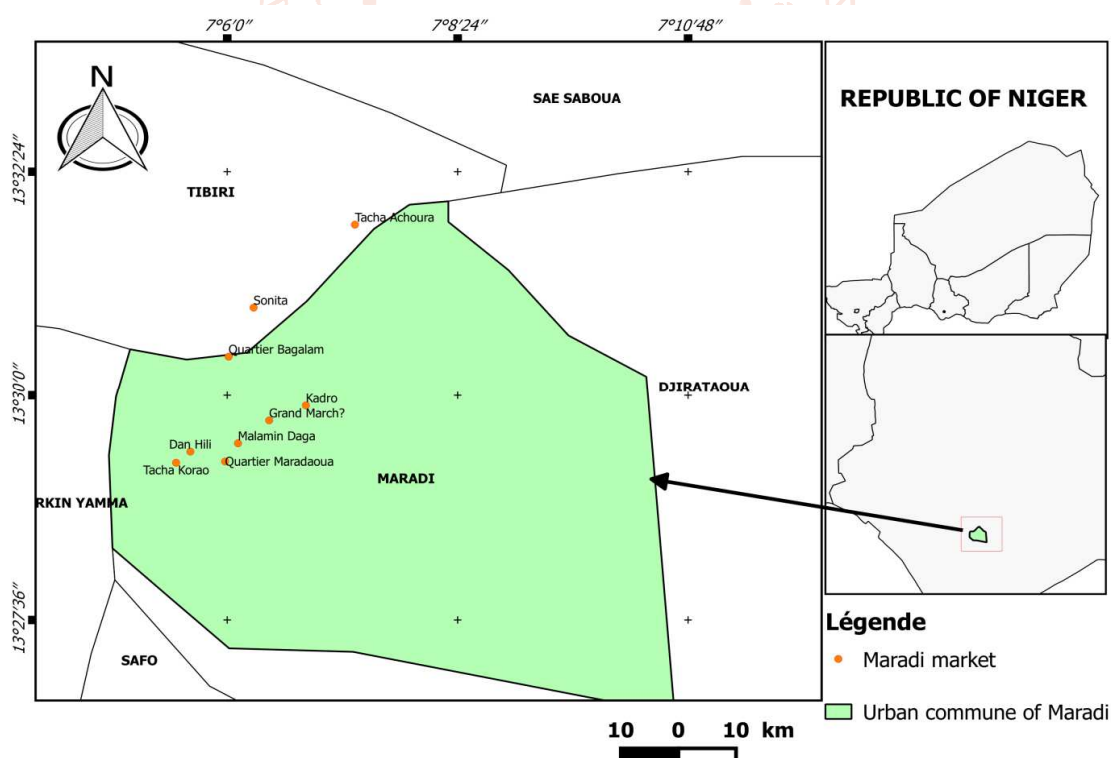
generates substantial income for the vulnerable population but also a significant supply of additional nutrients for women and children.

The consumption of insects constitutes an important dietary component in several communities, insects are attractive nutritious food for many people [9,10]. The protein content of insects is high and the use of insects in food can therefore improve the nutritional quality as a source of animal protein. The protein contents of insects also vary widely depending on the species [11]. Kulma et al. [12] reported the locust lipid content varying from 4 to 7 g/100 g wet basis and 29 to 31% of polyunsaturated fatty acids. can be considered a valuable source of vitamins. In the situation of food scarcity in the Sahel region places like Maradi are also in need of cheap and affordable sources of food nutrients such as locust. However, this study was carried out in the context of valuing natural resources to contribute in the fighting against malnutrition and food insecurity dans region. Therefore, the study aimed to characterized the locust sales circuit in the city of Maradi, Niger; and specifically, evaluate the nutrition knowledge and income generated through the markets.

## Materials and Methods

### Methodology

This study took place in Niger in Maradi region. The choice of Maradi township was linked to its status as an economic capital in the country where most of the ranges of locusts sold in the markets are easily found. The survey consisted of visiting through all the locust sellers who are in the markets and sites of the sale in Maradi; a GPS (Arrow Pro app.) were used for data collection. Thus, five (5) samples of the different species (Acrididae) were chosen in order to identify them. A questionnaire consisting of four main parts is submitted to locust vendors. The first part of this questionnaire deals to identify the seller. The second part on the general overview of the framework of the locust sale. The third part provides information on the overview of harvesting and the last part focuses on the overview of the conditions for transporting locusts. Fifty-five (55) people were questioned according to their activity on the locust sale market; therefore, 12 from *Sonita* site, 6 from *Kadro* site, 10 from central market site, 11 from *Tasha Korao* site, 5 from *Tasha Achoura* site, 1 from *MalaminDaga* site, 2 from *Dan Hili* site, 1 from *MaradaouaQuarters* site, 1 from *BagalamQuarters* site and 6 from *Sabon Machi* community market (Figure 1).



**Figure 1. Geographical localizations of different market sites in Maradi, Niger**

### Identification of collected specimens

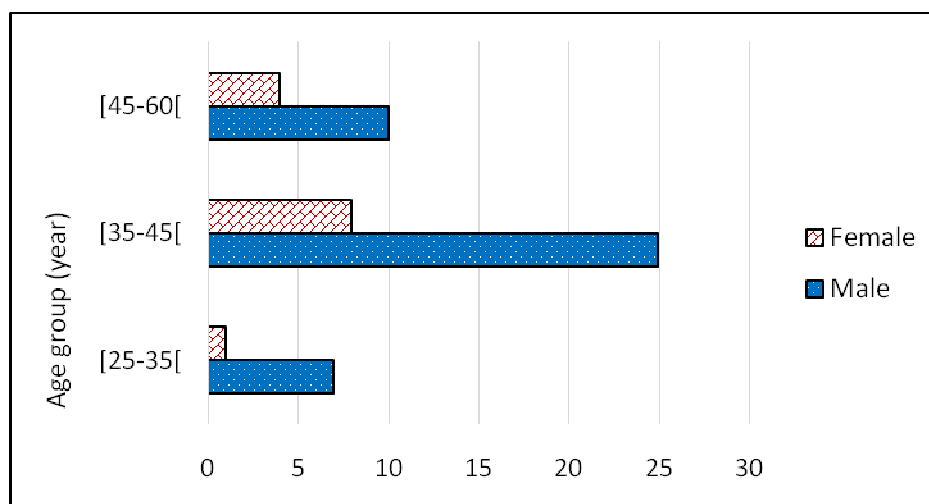
The locusts collected were identified at the entomology laboratory of CERRA, Maradi using identification keys from Lecoq [13]; Launois & Launois-Luong [14].

### Statistical analysis

Microsoft Excel version 2016 was used to process data and carried out comparison analysis were carried out using SPSS for IBM Statistical software version 20.

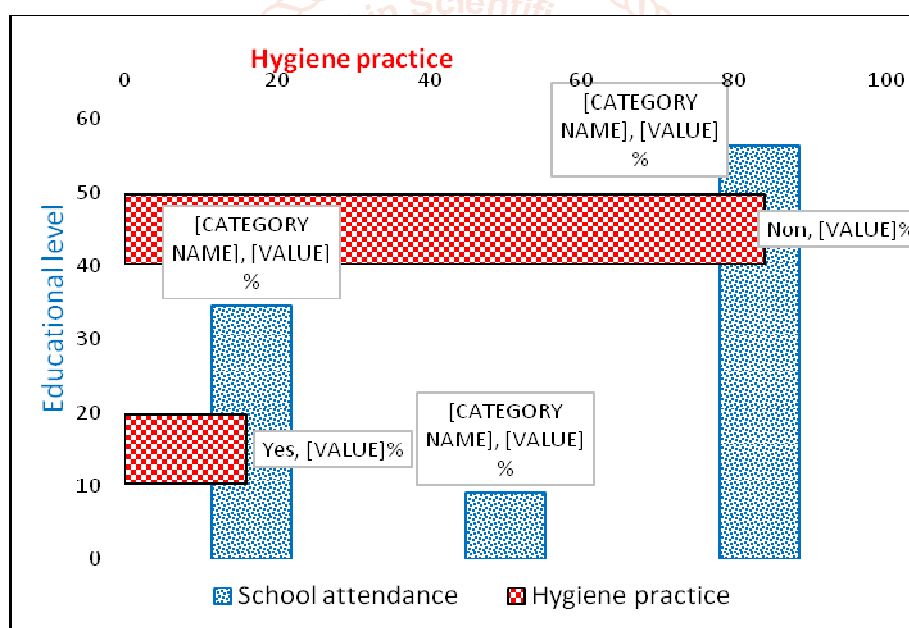
## Results

The marketing of dried locust in Maradi is an activity that is practiced more by men than women (Figure 2).



**Figure 2** Frequency of locust vendors in Maradi, Niger in terms of age groups and sex

Among the salespeople surveyed, there are 35% who have a primary education level, 9% have a secondary level and the 56% have never attended school (Figure 3). The result shows that 84% of locust vendors have never received training in food hygiene (Figure 3), 100% of vendors do not wear clean clothing and 7% use disinfection products. Seventy-three percent (73%) of vendors are located on street and 7% have fixed premises.



**Figure 3.**Hygiene knowledge and educational level of respondents

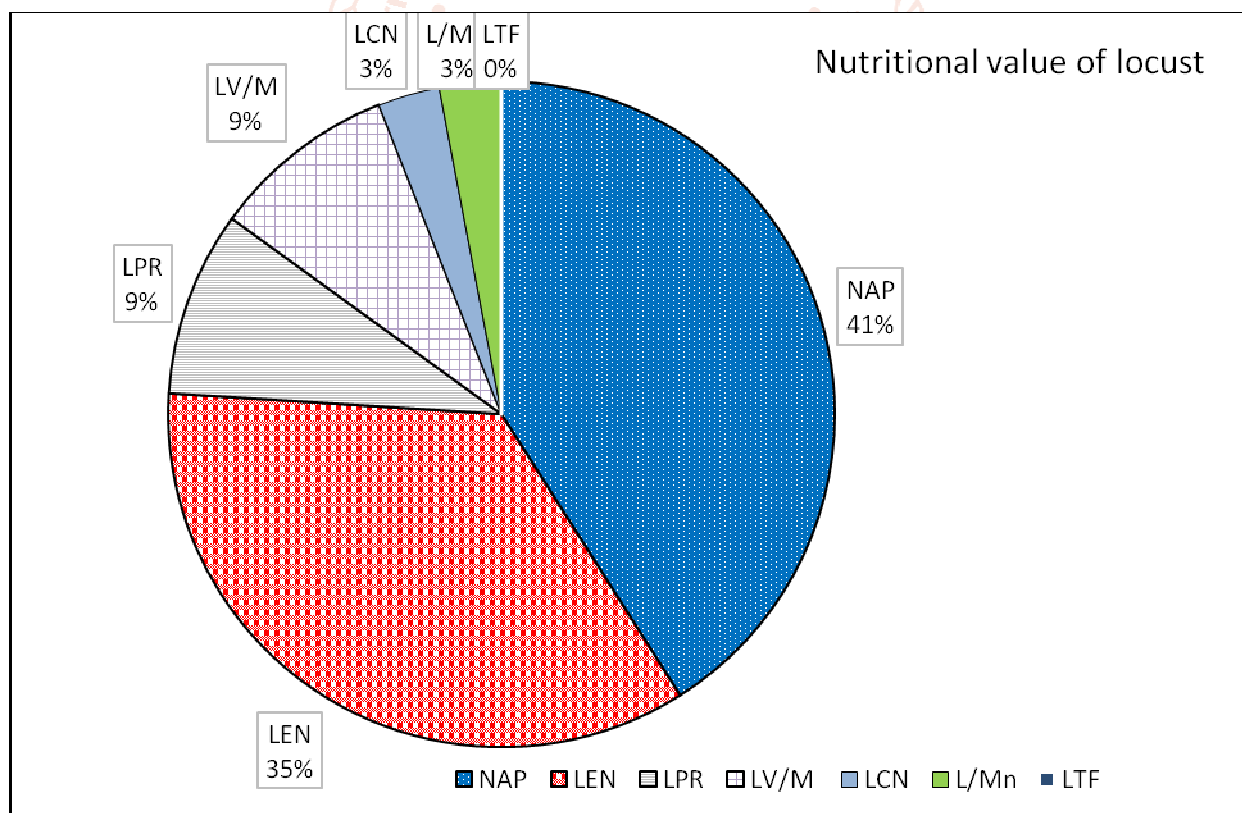
The whole questioned sellers do not cover the locusts and they use bags as storage materials and automobiles as means of transportation. Ninety-one percent 91% of salespeople do not clean their utensils. Among the locusts sold in Maradi, a large spectrum of species was found (Figure 4) such as *Accanthacrisruficorniscitrina*, *Kraussellaangulifera*, *Acridoderesstrenuus*, *Diabolocatantopsaxillaris*; all sourced from the neighboring villages around the region of Maradi. The locust hunting season varied from season to season, starting mainly toward the end of rainy season until the end of the cold season called harmattan in Sahel.





**Figure 4 Images of locusts (*Ornithacristurbidacavroisi*) in central market of Maradi, Niger**

The catching of locust is done manually at daybreak because locusts at that time are cold-bodied insects they cannot move; they are motionless and easy to catch. Figure 5 reveals the impression of respondents on the knowledge of nutritional value of locusts, revealed by the survey. The knowledge of nutritional value is key in the sales of locust in Maradi.



**Figure 5. Knowledge evaluation of locust nutritional value (NAP: Not applicable; LEN: Locust gives energy; LPR: Locust Contains protein; LV/M: Locust contains more vitamins than meat; LCN: Locust contains more nutrients; L/Mn: Locust combats malnutrition and LTF: Locust therapeutic food)**

It can be seen from this work that some of the locust species are more marketable than the others; probably due to the customers preferences. Thus, the selling price of locusts per 100kg bag change in market price varied from

35 to 55 USD in November to December, then the price moves up from 70 to 90USD around January to February and continue goes up from around 110 to 130 USD in March to May. Although, the vendors as from November to December the selling price of locusts (Table 1).

**Table 1 Selling price of locusts during the year in the Maradi markets**

Months	Price (USD)	November -December	January-February	March-May
Tia*		1 – 1.5	2 – 2.5	3 – 3.5
100Kg bag		35 – 55	70 – 90	110 – 130

**Tia** is a local measuring recipient as shown in Figure 4.

## Discussion

The grasshoppers are devastating insects, classified as major pests of crops, the losses differ depending on the species, due to their density, food requirements and the cultivated plant attacked. However, entomophagy is practiced in many countries around the world, but mainly in parts of Asia, Africa, Latin America and Oceania [15]. The Food and Agriculture Organization (FAO) considers locusts to be a nutritious food. Its consumption can be an alternative solution to fight against hunger in the world, it is a tasty dish which human should not deprive themselves of. The dry weight of a winged desert locust consists of about 62% protein, 17% fat and the rest minerals; even though, their nutritional contents vary greatly depending on the species [2,16]. In addition, locusts are known like other insects with high protein content. Insects have an important place in the food tradition of populations in tropical environments where the climate and environment favor their number and the diversity of species. They could therefore be a solution to nutritional deficiencies [17]. The use of this feeding behavior should be encouraged and should not constitute an insurmountable obstacle, especially as more than 2 billion people traditionally consume insects [18]. Locust marketing in Niger, particularly in Maradi, takes place throughout the year in the various markets concerned. Large traders buy bags of locusts for storage and resell at times when the product becomes more and more expensive. The locust is one of the elements in the creation of income and employment for the rural and urban communities who process and market them. Locusts contribute to the diet, and constitute a very important potential in the fight against hunger and under nutrition [2,6]. Likewise, in the Philippines, a few enterprising people discovered that pest locusts, which use to devastate large areas of plantation and natural vegetation, can now provide a rich source of additional nutritional food for animals and fish, including sales for the restaurants [19,20].

The results show that locust traders in their strategy in doing business manage well their activities in the supply chain. All the network in the value chain of

the products trade (cost, price, and transport...) are interconnected. Thus, the wholesalers go to seek the product in low-cost supply villages in large quantities in order to have it available to retailers at a suitable price. The sale of scalded locusts in Maradi, is an activity that is practiced more by men than by women as reported by Habou et al. [21] in their results that in the villages of the Dogondoutchi region, Niger, there are more women than the men in the locust collection link that supplies the locust market. The sale of locusts in Maradi generates substantial income, and the more far from the end of harvesting period that November the more expensive the locust it becomes; which is not negligible in terms of income for a resident of Maradi. People think of these locusts as delicious food and appetizer, there are hot cakes in sales and the traders are happy with the business where everyone finds their interest in the value chain, from retailers to wholesalers, including neighborhood vendors [22]. In fact, a real trade is developing around locusts, thus constitute an economic trade in Maradi.

## Conclusion

This study focused on Characterization of the locust sales circuit in the Maradi, Niger. Different species were sold and identified. Indeed, the locust represents a considerable interest in providing nutrients to the population of Maradi; in addition, it is an economical interest reported. Respondents are aware of the importance of the locust in food and that is why many people consume it and often export it to neighboring countries. Which could be explained by the interests it represents. The price of locust in the market change depending on the period of the year. The survey suggested that this food increases the household income of the sellers. There is need to restructure the locust market in Maradi with modern marking and packaging so as to conquer well the world international market; or to move further in processing locust as ingredient to use to improve some local food poor in nutrient such as protein.

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## Conflict of interest

Author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## References

- [1] H.J. Pflüger, P. Bräunig, One hundred years of phase polymorphism research in locusts. *J. Comp. Physiol. A.* (2021) 1-6. <https://doi.org/10.1007/s00359-021-01485-3>
- [2] A.A. Mariod, Nutrient composition of desert locust (*Schistocerca gregaria*). In *African Edible Insects As Alternative Source of Food, Oil, Protein and Bioactive Components* (2020) (pp. 257-263). Springer, Cham. <https://doi.org/10.1007/978-3-030-32952-5>
- [3] W. Peng, N.L. Ma, D. Zhang, Q. Zhou, X. Yue, S.C. Khoo,... C. Sonne, A review of historical and recent locust outbreaks: Links to global warming, food security and mitigation strategies. *Env. Res.* 191 (2020) 110046. <https://doi.org/10.1016/j.envres.2020.110046>
- [4] W. Anderson, C. Taylor, S.P. McDermid, E. Ilboudo-Nébié, R. Seager, W. Schlenker,...F. Cottier, A. de Sherbinin, D. Mendeloff, K. Markey, Characterizing the effect of drought, conflict, and locusts on food security in Africa. *Res. Square*, (2020) 31p. DOI:10.21203/rs.3.rs-104065/v1
- [5] J.L. Tamesse, S. Kekeunou, L.J. Tchatchouang, O.L.M. Ndegue, L.M. Aissatou, D. Tombouck, B. Youssa, Insects as food, traditional medicine and cultural rites in the west and south regions of Cameroon. *J. Insects Food Feed* 2 (3) (2016) 153-160. <https://doi.org/10.3920/JIFF2015.0088>
- [6] Studio kalangou (2017). Forum 09/11/2017: La consommation des criquets dans la société nigérienne: retombées économiques, apports nutritifs et conséquences sur la santé par l'usage des pesticides. Consulted 10/12/2019; Available online <https://www.studiokalangou.org/index.php/dialogues/9491>
- [7] Amadou, T. Capture, préparation, exportation du criquet : Maradi, la plaque tournante. Écrit le 21 mars 2019 ANP/ ONEP Maradi. Publié dans *Société/NigerDiaspora*. (2019) Consulted 21/01/2020; Available online <https://nigerdiaspora.net/index.php/societe/6078>
- [8] INS, Institut national de la statistique, Nigeronline (2019). Available on [www.stat-niger.org](http://www.stat-niger.org)
- [9] J. Van Itterbeeck, I. N. RakotomalalaAndrianavalona, F. I. Rajemison, J. F. Rakotondrasoa, V.R. Ralantoarinaivo, S. Hugel, B.L. Fisher, Diversity and use of edible grasshoppers, locusts, crickets, and katydids (Orthoptera) in Madagascar. *Foods*, 8(12) (2019) 666. <https://doi.org/10.3390/foods8120666>
- [10] B.A. Rumpold, O.K. Schlüter, Nutritional composition and safety aspects of edible insects. *Mol. Nut. Food Res.* 57 (2013) 802-823. doi: 10.1002/mnfr.201200735.
- [11] K.O. Ademolu, A.B. Idowu, G.O. Olatunde, Nutritional value assessment of variegated grasshopper, *Zonocerus variegatus* (L.) (Acridoidea: Pygomorphidae), during post-embryonic development. *African Entomol.* 18(2) (2010) 360-364. <https://doi.org/10.4001/003.018.0201>
- [12] M. Kulma, L. Kourimská, V. Plachý, M. Božik, A. Adámková, V. Vrabec, Effect of sex on the nutritional value of house cricket, *Acheta domestica* L. *Food Chem.* 272(2019) 267-272. doi: 10.1016/j.foodchem.2018.08.049.
- [13] M. Lecoq, Les Criquets du sahel, Collection Acridologie Opérationnelle (I) CIRAD/PRIFAS, (1988) 125 p. <http://portails.cilss.bf:8500/documents/3050.pdf>
- [14] M. Launois, M.H. Launois-Luong, *Oedaleus senegalensis* (krauss 1877) sauteriau ravageur du sahel, Collection Acridologie Opérationnelle (IV), CIRAD/PRIFAS, (1989) 36 p. [http://locust.cirad.fr/ouvrages\\_pratiques/pdf/DFPV4.pdf](http://locust.cirad.fr/ouvrages_pratiques/pdf/DFPV4.pdf)
- [15] X. Fernandez-Cassi, A. Supeanu, M. Vaga, A. Jansson, S. Boqvist, I. Vagsholm, The house cricket (*Achetadomesticus*) as a novel food: a risk profile. *J. Insects Food Feed* 5(2) (2019) 137-157. DOI: 10.3920/JIFF2018.0021
- [16] FAO, World Health Organization, & WHO, Expert Committee on Food Additives. (2017). Evaluation of certain contaminants in food: eighty-third report of the Joint FAO/WHO Expert Committee on Food Additives. World Health Organization.

- [17] Y. Hanboonsong, Edible insects and associated food habits in Thailand. In Forest insects as food: humans bite back, Proceedings of a workshop on Asia-Pacific resources and their potential for developmen. Bangkok, Thailandm: FAO Regional Office for Asia and the Pacific (2010) (pp. 173-182).ISBN: 9789251064887.
- [18] J. Bruinsma, (Ed.). (2003). World agriculture: towards 2015/2030: an FAO perspective. Earthscan.  
<http://www.fao.org/docrep/pdf/005/y4252e/y4252e00.pdf>
- [19] S. Imathiu, Benefits and food safety concerns associated with consumption of edible insects. *NFS J.* 18 (2020) 1-11.  
<https://doi.org/10.1016/j.nfs.2019.11.002>
- [20] S. Patel, H.A.R. Suleria, A. Rauf, Edible insects as innovative foods: Nutritional and functional assessments. *Trends Food Sci. Technol.* 86 (2019) 352-359.  
<https://doi.org/10.1016/j.tifs.2019.02.033>
- [21] Z.A. Habou, A. Tougiani, R. Seydou, A. Toudou, Une évaluation de Criquets comestibles au Niger: *Ornithacristurbidacavroisi* (Finot, 1907), *Anacridiummelanorhodon* (Walker, 1870) et *Accanthacrisruficorniscitrina* (Serville, 1838). *J. Applied Bio.* 90 (2015) 8348-8354.DOI: 10.4314/jab.v90i1.6
- [22] I. Amadou H.O. Diadie, O.S. Samna A. Balla, Status of some food quality prevalent in Niger: a review. *Modern Applied Sci.* 13 (6) (2019) 135-143.doi:10.5539/mas.v13n6p135

