Place of Groundnut in the Cropping System, Constraints, Local Taxonomy and Farmers’ Criteria for Characterizing Groundnut Cultivars in Niger

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Authors’ contributions

This work was carried out in collaboration among all authors. Author NMIG designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MLAI and AT managed the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

The groundnut is a leguminous, olea-proteaginous, cultivated in all the tropical zones throughout the world. In Niger, groundnut is used both as a cash and food crop and is highly valued for its nutritional and economic qualities. In order to show the local diversity of groundnut and its place in the cultivation system in Niger, a prospecting survey and seed collection was conducted in the regions of Zinder, Maradi, Tahoua and Dosso, which account for more than 90% of the national production. Two hundred and seventeen (217) producers were surveyed, using a quota-oriented technic. It emerged from this study that groundnut is generally grown pure or in association with cereals (millet, sorghum) or other legumes (cowpea, sorrel, sesame). Few producers know the varieties they use (55 437, RRB, JL 24, FLEUR 11); the rest only know the local names of the varieties (El Laray, El Haoussa, MargaMarga, El Dakar, Mai Silbi, Garangagia, Bahauussa, El Masar, Tsougouné, El Arba’in). This denomination depends on the origin of the variety, its

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1. INTRODUCTION

Groundnut is one of the main leguminous crops in the semi-arid tropical zones, cultivated in more than 120 countries in the world on more than 26 million hectares and the production of 43.9 million tons [1,2]. It is the 13th largest crop and the 6th largest oilseed in the world. It is cultivated as a food crop that provides seeds for human consumption and leaves as fodder for livestock [3,4]. The seeds contain about 45-50% lipids, 25-30% protein, 5-12% carbohydrates and 3% fiber [5]. Bi-weekly consumption of peanuts and/or peanut products would improve diets [6]. Groundnut is also a good fuel and additional source of income as cash crop. Groundnut has a particular interest in the concept of sustainable agriculture since its introduction into crop rotation that introduces crop rotation, diversification of production and environmental protection by saving on nitrogen fertilizers, thus reducing the use of chemical fertilizers which are not only costly but also, and above all, harmful to the environment [7]. Groundnuts were cultivated in Niger well before the end of the 19th century [8], some groundnut varieties as 55-437, 476, RRB were introduced into Niger in the early 1920s through the southern part of the country [9,10], and others selected by research institutes such as the National Institut for Agronomic Research (INRAN) and the International Crops Research Institutes of the Semi- Arid Tropics (ICRISAT). Groundnut was Niger's main export in the early years of independence with the creation of Nigerien society of groundnut trading (SONARA) in 1962, which was responsible for managing, organizing groundnut production and marketing in Niger [9]. Indeed, the largest groundnut production was obtained in 1966-1967 with 312,000 tons exported. Unfortunately, since the discovery of uranium, the 1974 drought and the 1970 famine [11] that have led to a reduction in cultivated areas, a decrease in soil fertility, and the emergence of other crops such as cowpeas for export. There is also competition from peanuts and other vegetable oils imported from Nigeria, the emergence of rosette in 1975 [12] and the liquidation of SONARA in 1989. All of these factors led to groundnuts ceasing to be Niger's important cash crop in the 1990s [9]. Despite its sharp decline in exports to Niger, groundnuts remain a highly valued product in the country and remain a major source of income for smallholder farmers. It accounts for sixty-six percent (66%) of household cash income in Niger [13]. The second most important legume in Niger after cowpea (1, 953,707 tons), groundnut, with 461,842 tons, is used as both a cash and food crop. It is widely cultivated in the southern part of the country, which accounts for more than 90% of national production [14,15,16]. Several groundnut varieties have been listed in the national catalog [17], selected varieties and those introduced by research institutions like INRAN and ICRISAT, few of which have adapted to Niger's climatic conditions.

In order to promote groundnut cultivation, we propose to make globally an inventory of this crop. Specifically to:(i) inventory the different groundnut cropping systems, (ii) identify the diversity and nomenclature of groundnut ecotypes according to the agrosystems in the surveyed areas of Niger, (iii) analyze the criteria of choice and sources of seed supply among producers, to identify the different constraints and difficulties related to its production, and (v) evaluate the influence of socio-environmental factors on groundnut seed and biomass production.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in January 2016 in four regions of Niger: Zinder (Miriiah and Magaria departments), Maradi (Madarounfa and Chadakoari departments), Tahoua (Konni and Madaoua departments), and Dosso (Tibiri, Doucchi and Gaya departments) (Fig. 1 and Table 1). All sites are located in the sedentary Sahelian zone with an annual rainfall between 400 and 600 mm and the Sudanian zone with an annual rainfall between 600 and 750 mm [18,19].

Keywords: Groundnut; cultural practice; production; Niger.
These sites were selected on the basis of data collected at the Statistics Directorate of the Ministry of Agriculture and Livestock of Niger, the various departmental directorates of agriculture, and ICRISAT on groundnut production in Niger [20,21]. Thus, these regions in the southern part account for more than 90% of the production [16].

2.2 Survey and Peanut Collection Methods

The regions, communes and villages were chosen in concert with the departmental directors of agriculture or the heads of INRAN stations in the different departments on the basis of the most groundnut-producing areas. A quota-oriented survey was used to select respondents. In each village, 15 producers were randomly selected, corresponding to 30 per department and 60 per region, for a total of 240 respondents. The study focused on the social profile of the respondent, the cropping system, the fodder value of groundnut, its medicinal value, its commercial value, difficulties related to its production, storage of the haulms, diseases, and groundnut insects and pests.

In each village, samples of groundnut ecotypes were collected after each interview, and information was gathered on the origin of the seeds collected, the period of seed selection, the mode of acquisition, the different varieties of groundnut that the farmer is used to growing, and the area occupied by this crop. Each ecotype is labeled for identification with the name of the commune, the name of the village and the local or scientific name of the ecotype.

2.3 Statistical Analyses

As the questionnaire was codified in advance, all the information collected was entered into the CS Pro 6.2 software. The data were analyzed using IBM SPSS 2011 version 20 software, using simple descriptive analysis techniques (frequencies, percentages). Factor analysis was performed using XLSTAT 2014 software, which described the relationships between the ecotypes named by the producers and constraints related to groundnut production by region. The variation in the production of fodders and seeds was performed as a function of socio-environmental production parameters. The normality test was carried out for each of the two variables. Following the non-normal distribution of the variables, the Kruskal-Wallis test was carried out for this purpose with the software R version 3.6.0. The processing and presentation of certain tables and figures was done in Excel spreadsheet.

3. RESULTS AND DISCUSSION

A total of 217 producers were surveyed.

3.1 Social Situation of the Surveys

The prospecting survey carried out in 16 sixteen villages in Niger enabled the interviewing of 217 peanut producers and transformers, including 140 men and 77 women, with 64.5% and 35.5% respectively (Table 2). In Dosso, the percentage

| Regions | Departements | Villages               |
|---------|--------------|-----------------------|
| Zinder  | Mirriah      | Kanya Angoual kourna  |
|         |              | Rijiya                |
|         | Magaria      | Galla Rouga           |
|         |              | Kaqi Mougou           |
| Maradi  | Guidan Roumji| Chadakoari            |
|         |              | Inwala Sarkin Toudou  |
|         | Madarounfa   | Sarkin Bindiga        |
|         |              | Djirataoua            |
| Tahoua  | Madaoua      | Mallamawa             |
|         |              | Arzarori              |
|         | Konni        | Cerassa Mangou        |
|         |              | Cerassa Gouni         |
| Dosso   | Gaya         | Guwa                  |
|         |              | Guidan Gaaba          |
| Tibiri  |              | Guiecheme             |
|         |              | Wassangou             |
Fig. 1. Location of surveyed sites (Survey data, 2016)
of women interviewed was higher than that of men, 61.01% versus 38.98% (Table 2). The socio-economic characteristics of the respondents play an important role in the creation of awareness and knowledge about their exploitation model [22]. According to the results of the survey, men dominate groundnut production because it is a cash crop. Women also did not remain on the margins and are largely involved in production and especially in processing, as in the Dosso region. The work of [23] has shown that in Africa for cash or cash crops men generally take over from women, even though groundnut is considered as women's crop.

The results show that 54.84% of the respondents were between 40 and 60 years old, compared to 26.27% between 19 and 40 years old (Table 2). Concerning the training of producers, 26.21% are illiterate, 43.78 are literate and the remaining 30% have at least a primary level of education. The respondents are divided into three ethnic groups, 87.6% of those surveyed are of Haussa ethnicity, 7.8% are Tuareg, and 4.61% are Zarma (Table 2). The majority of producers are farmers (88.24%), traders (8.8%), and breeding (0.9%) as their main activities (Table 2).

The majority of respondents belong to the age groups of active producers. Groundnut is not only a food crop, but also a cash crop where young people are more involved in the sale of fodders, which is currently growing in Niger due to the nutritional quality of the fodders. Thus, groundnut is cultivated even on irrigated hydro-agricultural schemes in addition to rainfed cultivation, similar results are found by [24] in 2017 in the study of the Commercialization and nutritional value of fodder in urban centers in Niger: the case of the cities of Maradi and Niamey.

### 3.2 Peanuts in the Niger Cropping System

In order of crop frequency, groundnut occupies the fourth place (30.9%) after millet (62.20%), sorghum (39.60%), and cowpea (36.4%) (Fig. 2). It is therefore the second most important legume after cowpea. These results confirm the national statistics ones which that cowpea 1, 953,707 tons, and groundnut one was 461,842 tons [15].

The area devoted to groundnut cultivation is between 0.5 and 2 ha for 93% of the producers surveyed, with only 7% of respondents cultivating it on more than 3 ha, who are generally large producers (Fig. 3).

**Table 2. Social characteristics of respondents in the study areas**

| Variables         | Zinder | Maradi | Tahoua | Dosso | Total |
|-------------------|--------|--------|--------|-------|-------|
|                  | N   | %     | N   | %     | N  | %     | N  | %     | N  | %     |
| Sex               |     |       |     |       |     |       |     |       |     |       |
| Male              | 40  | 78.43 | 42  | 68.63 | 35  | 75     | 23  | 38.98 | 140 | 64.5  |
| Female            | 11  | 21.57 | 14  | 31.37 | 16  | 25     | 36  | 61.02 | 77  | 35.5  |
| Age               |     |       |     |       |     |       |     |       |     |       |
| [19 - 40 years]   | 14  | 27.45 | 14  | 25     | 14  | 27.45  | 15  | 25.42 | 57  | 26.27 |
| [40 - 60 years]   | 27  | 52.94 | 37  | 66.07 | 24  | 47.06  | 31  | 52.54 | 119 | 54.84 |
| ≥ 60years         | 10  | 19.61 | 5   | 8.93  | 13  | 25.49  | 13  | 22.03 | 41  | 18.89 |
| Ethnic Groups     |     |       |     |       |     |       |     |       |     |       |
| Haoussa           | 36  | 70.59 | 54  | 96.43 | 50  | 98.04  | 50  | 84.75 | 190 | 87.6  |
| Zarma             | 0   | 0     | 1   | 1.79  | 0   | 0      | 9   | 15.25 | 10  | 4.61  |
| Touareg           | 15  | 29.41 | 1   | 1.79  | 1   | 1.96   | 0   | 0     | 17  | 7.8   |
| Education level   |     |       |     |       |     |       |     |       |     |       |
| Illiterate        | 6   | 11.76 | 10  | 17.86 | 13  | 25.49  | 28  | 47.46 | 57  | 26.27 |
| Alphabetized      | 33  | 64.71 | 26  | 46.43 | 14  | 27.45  | 22  | 37.29 | 95  | 43.78 |
| Primary           | 9   | 17.65 | 11  | 19.64 | 20  | 39.22  | 8   | 13.56 | 48  | 22.12 |
| Secondary         | 3   | 5.88  | 9   | 16.07 | 3   | 5.88   | 1   | 1.69  | 16  | 7.37  |
| Superior          | 0   | 0     | 0   | 0     | 1   | 1.96   | 0   | 0     | 1   | 0.46  |
| Main activities   |     |       |     |       |     |       |     |       |     |       |
| Agriculture       | 45  | 88.24 | 49  | 87.5  | 42  | 82.35  | 57  | 96.61 | 193 | 88.9  |
| Breeding          | 2   | 3.92  | 0   | 0     | 0   | 0      | 0   | 0     | 2   | 0.9   |
| Trade             | 3   | 5.88  | 6   | 10.71 | 9   | 17.65  | 1   | 1.69  | 19  | 8.8   |
| Transport         | 1   | 1.96  | 0   | 0     | 0   | 0      | 0   | 0     | 1   | 0.5   |
| Other             | 0   | 0     | 1   | 1.79  | 0   | 0      | 1   | 1.69  | 2   | 0.9   |
The results showed that groundnut is grown as a pure crop in approximately 35% of farmers and the larger part (65%) in association with other crops. The main categories associations are: millet, cowpea, sorghum and groundnut (48%); millet, sorghum and groundnut (2%); millet, groundnut and cowpea (4%); groundnut and sesame (3%); groundnut and authors (8%) (Fig. 4). Pure groundnut cultivation is generally practiced by large producers, seed producers (seed companies), nongovernmental organizations, and projects working with research institutions for seed production.

In Zinder region, more than 25% of the farmers cultivate groundnuts as pure crop in contrast to Maradi and Dosso, where more than 30% of the farmers cultivate groundnut in association with millet, cowpea and sorghum (Fig. 5). This association varies according to the crop and the area. It is more diversified in Maradi than in the other regions, due to the existence of the irrigated perimeter of Djirataoua (spices, voandzou, salad, cabbage, cucumber, papaya, banana).

In Niger, groundnut production varies according to study areas; it is cultivated in association, in rotation or pure. In general, crop rotation and association are intended to diversify and intensify production in order to avoid pest attacks. Groundnut is also highly valued for improving soil fertility [25,26]. This practice is explained by cultural, farming practice and nutritional needs of families. The results of the survey indicated that farmers grow groundnuts more in association than as a pure crop, and this predominance has implications for the type of groundnuts appropriate for the production system. For example, erect types would be more appropriate because most groundnut varieties released and propagated in Niger are of the erect type [14].

![Figure 2. Place of groundnut in Niger cropping system](image1)

![Figure 3. Area devoted to groundnut in Niger](image2)
3.3 Local nomenclature and diversity of peanut ecotypes grown in Niger

Several vernacular names of ecotypes (33), were inventoried in different peanut production areas. The Goujia and Tsougounne ecotypes are more prevalent in Tahoua and Dosso, Garangagia (Tahoua and Maradi), and Bahaoussa cited more in Maradi and Zinder (Table 3). The results also show that the same ecotype can have different vernacular names from one site to another and they are considered synonymous, or sometimes the same name can also designate different ecotypes such as the names Goujia and Koalanché. Thus local taxonomy is defined as a classification used by farmers to exploit and maintain the genetic diversity of their area [27,28], and these local names are at the origin of the good knowledge of biological diversity by producers [29]. Table 3, lists the ecotypes names.
(local name), the French translation of the local name and its main area of production. In Niger, according to the results of our survey, the number and quality of criteria used by producers to characterize an ecotype vary from one site to another. Several criteria are used to classify groundnut accessions, which are generally the origin of the variety, morphological characteristics, seed color, plant habit, pod shape, or earliness. Thus according to the popular nomenclature of groundnut of Niger some ecotypes are named according to their origin, for example El Dakar, El-Masar, El Paris, El Maradi mean respectively ecotypes coming from Dakar, Egypt, Paris or Maradi. It should be noted that according to the national catalog of 2012, El Dakar is a denomination of the 55 437 which is a Senegalese variety introduced in 1927 and which has been widely popularized in Niger [10].

In addition to the origin, producers also associate the origin to name the ecotypes so that the cultivar Bahaussa or el haussa represents the variety considered traditional by farmers. Morphological characteristics are also used by producers in naming ecotypes in Niger. The type of the port, Tsougoune and Takontche meaning respectively erect and creeping; the productivity, Garangagia and Koatsama; the color of the seed is not to be neglected in the determination of variety names, thus Djagoujia this name is given

| Names of ecotypes | Translation | Regions |
|-------------------|-------------|---------|
|                   |             | Zinder | Maradi | Tahoua | Dosso | Total |
| Bahaoussa         | From Hausa  | 13     | 20     | 0      | 2     | 35    |
| Tsouguounne       | Erect Bearing variety | 4 | 1 | 10 | 15 | 30 |
| Bazanfara         | From Zanfara | 0 | 0 | 5 | 0 | 5 |
| El Arbin          | From 40 days | 0 | 10 | 0 | 0 | 10 |
| El Dakar          | From Dakar   | 4 | 0 | 0 | 0 | 4 |
| El Paris           | From Paris   | 1 | 0 | 1 | 5 | 7 |
| El Laray           | From laray   | 0 | 1 | 0 | 0 | 1 |
| El Koukouma       |             | 0 | 0 | 7 | 0 | 7 |
| El Madaoua        | From Madaoua | 0 | 0 | 3 | 0 | 3 |
| El Maradi         | From Maradi  | 1 | 0 | 3 | 2 | 6 |
| El Massar         | From Egypte  | 0 | 3 | 0 | 0 | 3 |
| El Zahi           | Early        | 0 | 0 | 1 | 0 | 1 |
| Garangagia        | Which produces lot | 0 | 20 | 15 | 0 | 35 |
| Fara              | White        | 2 | 0 | 0 | 6 | 8 |
| Goujia            | Name of peanut in Haussa | 1 | 3 | 28 | 18 | 50 |
| Goujia fara       | White peanut | 0 | 0 | 0 | 1 | 1 |
| Goujia Ja         | Red peanut   | 4 | 0 | 2 | 8 | 14 |
| Koatsama          | Which produc lot | 0 | 0 | 3 | 0 | 3 |
| Takontche         | Crawling variety | 0 | 5 | 0 | 7 | 12 |
| Margamarga        | Red and pink blend | 0 | 0 | 0 | 5 | 5 |
| Mota              | car          | 0 | 0 | 0 | 8 | 8 |
| Bbba mota         | Large car    | 0 | 0 | 0 | 5 | 5 |
| Rrb               | RRB          | 0 | 0 | 0 | 4 | 4 |
| Tatsaye           | Peanut with erect port | 0 | 0 | 0 | 2 | 2 |
| 55 437            | 55 437       | 0 | 2 | 0 | 2 | 4 |
| Fleur 11          | FLEUR 11     | 0 | 0 | 0 | 2 | 2 |
| EL Nigeria        | From Nigeria | 0 | 2 | 0 | 0 | 2 |
| JL 24             | JL 24        | 0 | 2 | 0 | 0 | 2 |
| Mai Yado          | Crawling variety | 1 | 0 | 0 | 0 | 1 |
| Mai tisnin baki   | Peanut with pronounced beak | 0 | 0 | 0 | 2 | 2 |
| Mai rakoumi       | Peanut with long pods | 0 | 0 | 1 | 0 | 1 |
| Ta zaman          | Improved peanut variety | 0 | 1 | 0 | 0 | 1 |
| Bagobira          | From Gobir   | 0 | 0 | 2 | 0 | 2 |
| Koalanche         | Name of peanut in Haussa | 0 | 0 | 0 | 6 | 6 |
that includes ecotypes correlated to the Dosso region, while the third group which is on the negative part of the two axes, that includes ecotypes specific to the Tahoua region. Thus, a spatial distribution of the peanut ecotypes named by the respondents can be observed. The regions of Maradi and Zinder are not only the main but also the oldest groundnut production areas in Niger. These regions include ecotypes from Egypt (El Masr) and Senegal (El Dakar), where groundnuts are widely grown. According to [42] both regions lie on the axis where groundnuts were reported in the mid-18th and early 19th centuries. In Tahoua there are ecotypes mainly from Maradi, where producers orient their production towards irrigated cultivation, especially for the production of haulm.

### 3.4 Seed Selection Criteria

The criteria for choosing the seeds used vary according to production objectives of the producers. Indeed, some, prefer varieties that are early and have good seed yield (example of seed sellers), others prefer varieties that produce a lot of haulm even if they do not get enough seed (case of haulm sellers), and processors who prefer varieties that have a good oil performance. The choice can also be based on the variety for seed color (mostly red), or seed size. Farmers' seed management methods, which are the exchange of varieties between farmers, are cause of diversity between crop species [43,44]. Using seeds of lower quality over years, plant material declines its quality and productivity.

### 3.5 Seed Supply Sources and Transactions

The results of the study (Table 4), show that 75.1% of the groundnut producers use traditional seeds, 19.9% use improved seeds and 5% of the producers use both types of seeds. Among those who use traditional seeds, 74.3% use their own production, 25% buy the seeds at the market and 0.7 get them from donation; For those who use improved seeds, 47.7% buy the seeds in research institutions like INRAN and ICRISAT, with seed farms, others received them in support by NGOs or programs (54.3%). In Niger the informal sector remains the main supplier of seeds, so when they run out of seeds, producers usually got to other sources such as family, friends or nearby markets [10].
Fig. 6. Graphical representation of ecotypes according to regions
3.6 Peanut Production Products

All producers surveyed (100%) grow groundnuts for seeds and fodders. The produced seeds are generally sold to meet family needs or used for transformation. Similarly, the fodders are also kept for livestock and/or sold depending on the produced quantity. In relation to use, the haulms are mainly used to supplement animals, especially during the dry season to fatten them (sheep, dairy cows) or to prepare them for field work during the rainy season. The price of a bag of haulms is higher during this same period, which can reach 3,000 CFA francs per bag in Zinder, while in Dosso the price of haulms is about 1,500 CFA francs. Sale prices vary according to zone and period (Fig. 7).

3.7 Difficulties and Constraints of Groundnut Production

The survey results (Fig. 8) show that the major concerns of groundnut surveyed producers are mainly: insufficient fertilizer 26.47%, diseases and insects 18.95%, followed by insufficient rainfall 17.32%, and inaccessibility to quality seeds 10.78%, financial problems and working tools (11.44%). These constraints influence qualitatively and quantitatively production groundnut. It should be noted that, in general, the problems related to groundnut production can be summarized in all these constraints only according to zones; the order of these problems can vary. Several studies have shown that disease and insect pests, financial problems and lack of quality seeds are the main constraints of production, in Nigeria by [45,46,47,48] and [22], in Togo by [49] and in Ethiopia by [50].

In order to structure the problems related to groundnut production specific to each region, we conducted a Factorial Correspondence Analysis, the first two axes that take into account 83.19% of the total information (Fig. 9). Axis 1 opposes on the one hand the germination problem, insufficient fertilizer and seed, and on the other hand the soil degradation, marketing problem, working tools and weeding problem, it is positively correlated to the Maradi region. Axis 2 opposes constraints such as insufficient space, insufficient fertilizer, seed and hard work to the problem of poor harvests, while at the same time it opposes the region of Zinder and Dosso. The analysis of the Fig. 9, shows that the constraints are cited in more or less the same regions with some specificities: Maradi: germination; Dosso: marketing, weeding, insufficient working tools; Zinder: hard work; Tahoua: insufficient working tools.

![Fig. 7. Average selling price of peanut tops](image-url)
Fig. 8. Constraints to groundnut production in Niger. Source: 2016 survey

Table 4. Source of supply of groundnut seed

| Seed types            | Percentage (%) | Sources  | Percentage (%) |
|-----------------------|----------------|----------|----------------|
| Traditional seeds     | 75.1           | Own      | 74.3           |
|                       |                | Purchase | 25.0           |
|                       |                | Donation | 0.7            |
| Selected variety seeds| 19.9           | Purchase | 45.7           |
|                       |                | Support  | 54.3           |
| Deux                  | 5              | -----    | -----          |

3.8 Influence of Socio-Environmental Factors on Seed and Biomass Production

The results (Table 5), showed that among the socio-environmental factors, age (p-value=0.523 and p-value = 0.227), ethnic group (p-value=0.416, and p-value = 0.484), main activity (p-value=0.471 and p-value = 0.476), and level of education (p-value=0.604 and p-value = 0.596), do not influence both groundnut seed and leaf production (p-value giving for biomass and seed production respectively). The non-significant results imply that producers learn the activity by working whether they are young or adult; Haussa, Zarma or Tuareg; farmers, breeders or traders, with or without education. These results confirm those [51] who have also found that the level of education does not influence groundnut production (p-value= 0.700). Gender has an influence on biomass production (p-value=0.030) because men are in the majority in groundnut production with large areas, and especially producers are placing more and more importance on the marketing of the tops. Climatic zones influence seed production. The factor of regions (p-value=0.000, p-value=0.004), has a very significant effect on the production of both fodders and seeds respectively. These results can be explained by the climatic conditions that vary from a zone to another and a region to another. But also by the difference in types of varieties available, cultivation techniques and soil types, which can vary over regions.
Fig. 9. Groundnut production constraints by region
Table 5. Socio-environmental factors influencing production of groundnut tops and seeds

| Factors            | Biomass Production (P-value) | Seed Production (P-value) |
|--------------------|------------------------------|---------------------------|
| Gender             | 0.030 *                      | 0.051 ns                  |
| Age                | 0.523 ns                     | 0.227 ns                  |
| Ethnic group       | 0.416 ns                     | 0.484 ns                  |
| Main Activity      | 0.471 ns                     | 0.476 ns                  |
| Grade level        | 0.604 ns                     | 0.596 ns                  |
| Regions            | 0.000 ***                    | 0.004 **                  |
| Climatic zones     | 0.307 ns                     | 0.001 **                  |

4. CONCLUSION

At the end of this study, the results of the survey show that, the place of groundnuts in the agro-ecosystem of the different villages surveyed and the different criteria used by producers to name the groundnut ecotype in Niger. The used criteria are often, the origin, morphology, type of port. This study shows the existence of a strong diversity within the groundnut crop in Niger. In reality, however, all the used criteria are not sufficient to really distinguish the varieties of groundnut. So, that should be later confirmed by agro-morphological and genetic evaluation, in order to ensure its long-term conservation and avoid genetic erosion of the species.

CONSENT

As per international standard or university standard, respondents’ written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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