



The benefits of market gardening in a context of food insecurity in the commune of Djirataoua in Niger

Younoussou Rabo^{1*}, Inoussa Ali Garba¹ and Ali Mahamane²

¹University of Diffa, Faculty of Environmental Sciences, P.O.: 78, Diffa - Niger.

²Abdou Moumouni University of Niamey, Faculty of Science and Technology, Garba Mounkaila Laboratory, P.O.: 10662, Niamey-Niger

*Corresponding author: E-mail: raboyounoussou@gmail.com; Such : (00227) 96 38 89 53

<https://orcid.org/0009-0006-5858-6114>

Received: 04 Jan 2024; Received in revised form: 07 Feb 2024; Accepted: 15 Feb 2024; Available online: 27 Feb 2024

©2024 The Author(s). Published by Infogain Publication. This is an open access article under the CC BY license

(<https://creativecommons.org/licenses/by/4.0/>).

Abstract— Market gardening plays an important role in household food security and is an income-generating activity for market gardeners in the rural commune of Djirataoua. The objective of this study is to study the advantages of market gardening in the district of Djirataoua. To achieve this objective, the data collection method mainly involved individual surveys and focus groups on each of the six (6) sites, namely Djirataoua North, Djirataoua South, Kodrewa-Maradou, Radi-Adrewa, RPC (Rural Promotion Center) and Bakaoua. A total of 209 producers representing 5% of the producer workforce. Focus groups were held with the members of the cooperative. The data were processed by the Excel spreadsheet, IBM SPSS statistics 25 and Minitab 18 software for percentage calculations and subjected to the multivariate PCR and AFC statistical tests. The results show that thirteen (13) market gardening crops are grown in the district of Djirataoua. . The most widely grown crops are anise, red pepper, green pepper, onion and tomato. The least commonly grown crops are watermelon, sweet potato, carrot, potato and pepper. Thus, for phytosanitary treatment, chemicals are generally the most used. Thus, this activity has significant socio-economic impacts. The average annual income generated by this activity ranges from less than 200,000 CFA francs to more than 1,000,000 CFA francs. However, market gardeners encounter problems in the practice of this activity. To ensure the smooth running of this activity, solutions such as reducing the cost of the fee, support for agricultural inputs, technical support and the search for outlets for the products are proposed by market gardeners. There is no doubt that market gardening is an alternative to the chronic food insecurity problem experienced by the people of Djirataoua in particular and, in general, the problem of chronic food insecurity.

Keywords— Food insecurity, Practice, market gardening, Advantage and Djirataoua



I. INTRODUCTION

In Niger, the main activities of rural populations are agriculture and livestock, which employ more than 85% of rural households and contribute 40% to the country's Gross Domestic Product (GDP) (Yacouba et al., 2021). Despite its importance, the agricultural sector is struggling to modernize and remains largely dependent on climatic and edaphic hazards and unmodern techniques (Bouchetara, 2021; Yacouba, 2021). This sector does not cover the food needs of both rural and urban populations, plunging them into a situation of chronic food insecurity. According to a study conducted by Recca-Niger in 2011, food insecurity

affects 17.3% of the rural population globally and remains similar to that in urban areas in this country. Although the last century has seen enormous scientific and technological triumphs, overcoming food insecurity is still one of the major challenges for the countries of the South, including those that are relatively advantaged in terms of climatic conditions (Salissou, 2006). Due to the structural and cyclical nature of food insecurity in Niger, assistance options must meet the short-, medium- and long-term needs of vulnerable populations. Priority should be given to severely food insecure households, severely affected urban

poor households, children, and pregnant and lactating women (Reca-Niger, 2011).

Faced with this deterioration in agricultural production conditions, farmers have adopted several options, including rural exodus, emigration to more distant destinations and the adoption of market gardening practices in and around the villages, cities and the surrounding area, thus ensuring or increasing agricultural productivity. Thus, in order to cope with this situation of food insecurity, the populations have introduced the practice of market gardening, which, according to the WFO (World Food Organization) (2012), occupies an important place for human consumption and constitutes one of the most productive agricultural systems in Africa. Market gardening plays a key role in most nutrition and poverty alleviation programs and contributes significantly to family incomes (James et al., 2010 ; Yolou et al., 2015, Rabo, 2019 ; Rabo et al., 2022). As a result, vegetable crops represent an important and varied food source that completes the dietary needs of populations whose basic diet consists mainly of carbohydrates, the main energy elements (Yolou et al., 2015). Market gardening is marked by specific and varietal diversification and is an activity that can be found in almost all regions of the country, but its extent varies greatly between producers and between regions (Koc et al., 2006; Kanda et al., 2014). Also, by selling market garden products, market gardening provides income to the population (Rabo, 2019; Rabo et al., 2022; Rabo et al., 2024; Ndiaye et al., 2021). In addition, the development of both urban and peri-urban market gardening is encouraged by the growth of local demand.

Market gardening is practiced near water sources such as dams, rivers, lakes, wells, boreholes, but is only intensively exploited when the conditions for transport and preservation of the products are ensured. However, the Djirataoua site is characterized by boreholes, which are a real source of irrigation water. Indeed, apart from agriculture and livestock, the collection of market garden products is an important source of income and food for the community of Djirataoua. The contribution of market gardening products to food security is appreciable because they play an important role in food security and provide income to populations (Ndjeikornom, 2015; Rabo et al., 2022). According to Madjigoto et al. (2018), the introduction of market gardening aims to address cereal deficiencies, fight poverty, hunger and food insecurity. Market gardening therefore plays a major role in the lives of the population. It would therefore be imperative to study the practice of market gardening in the district of Djirataoua.

II. MATERIALS AND METHODS

Presentation and choice of study site

This study was conducted in the rural district of Djirataoua, located at 13 km from the city of Maradi (Figure 1). Large-scale market gardening was the main criterion for the choice of the study area. Thus, the perimeter is subdivided into six (6) sites, namely: Djirataoua North, Djirataoua South, Kodrewa-Maradou, Radi-Adrewa, RPC (Rural Promotion Center) and Bakaoua.

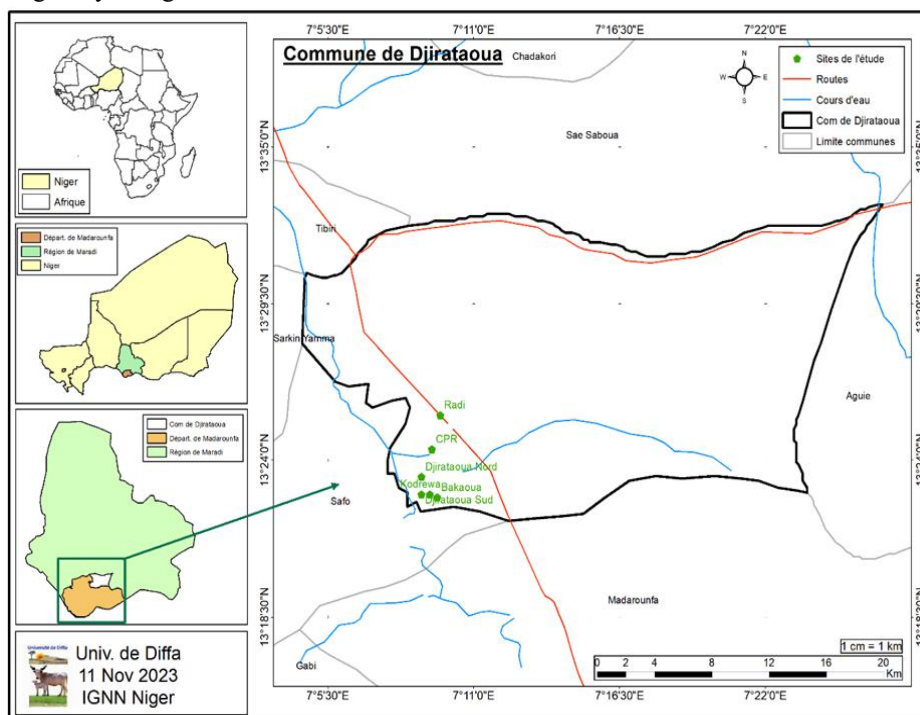


Fig.2: Location map of the rural district of Djirataoua

Sampling and data collection

This step was carried out as a result of two stages. First of all, it is about making contact with the technical services and the farmers' leaders. The help of these two experienced agricultural actors, who know the area well, made it possible to know the total number of sites and the number of producers per site who exploit the irrigated perimeter of Djirataoua.

Data on the productivity and socio-economic roles of vegetable crops were collected on the six (6) sites using a questionnaire as a basic tool. The objective is to survey at

least 5% of producers at the level of each site, the data collection concerned market gardeners aged about 18 years and over in order to obtain better information. A total of 209 producers have been selected on all sites. It consists of going to the level of market gardeners with the help of a pre-established survey sheet. Individual interviews and focus groups were conducted. A total of 209 cards were administered. The only criterion used for the choice of respondents is that they are market gardeners. Among these producers, the gender aspect has been respected. Thus, 29 questionnaires, or 14%, were administered to women vegetable producers.

Table 1: Number of Producers by Site

Sites	Number of producers	Sample (5%)
Djirataoua Nord	692	34
Djirataoua Sud	925	46
Kodrewa-Maradou	1016	50
Radi	756	37
CPR	680	34
Bakaoua	158	8
Total	4227	209

Data processing and analysis.

The collected data were captured, coded, processed and analyzed using the Excel spreadsheet and Minitab 18 and IBM SPSS V25 software. To relate the information collected on the crops cultivated, the incomes of market gardeners and the study sites, a Correspondence Factor Analysis (CFA) was carried out.

In addition, principal component analysis (PCA) was performed on quantitative data to identify the relationship between certain parameters and sites. Also, ANOVA tests were also carried out with the software after checking the normal distribution of the data as well as the equality of the variances.

III. RESULTS

Socio-professional characteristics of respondents

Socio-occupational characteristics relate to gender, ethnicity, age group, marital status, size of household and agricultural assets, level of education and main activity of the head of household, method of land acquisition and respondents' experience in market gardening. The results of the survey show that men are more represented in the practice of market gardening, as they represent 86% of respondents (Figure 2 A). In addition, the Hausa are in the majority in market gardening, with 97% of respondents representing them (Figure 2 B). Figure 2C gives us the age groups of the respondents on the site. According to this figure, young people (aged about 18 to 40 years) represent more than 50% of respondents, with market gardeners aged of 40 and over accounting for 42% of respondents. Figure 2D provides information on the marital status of the respondents. This figure shows that 80% of respondents are married.

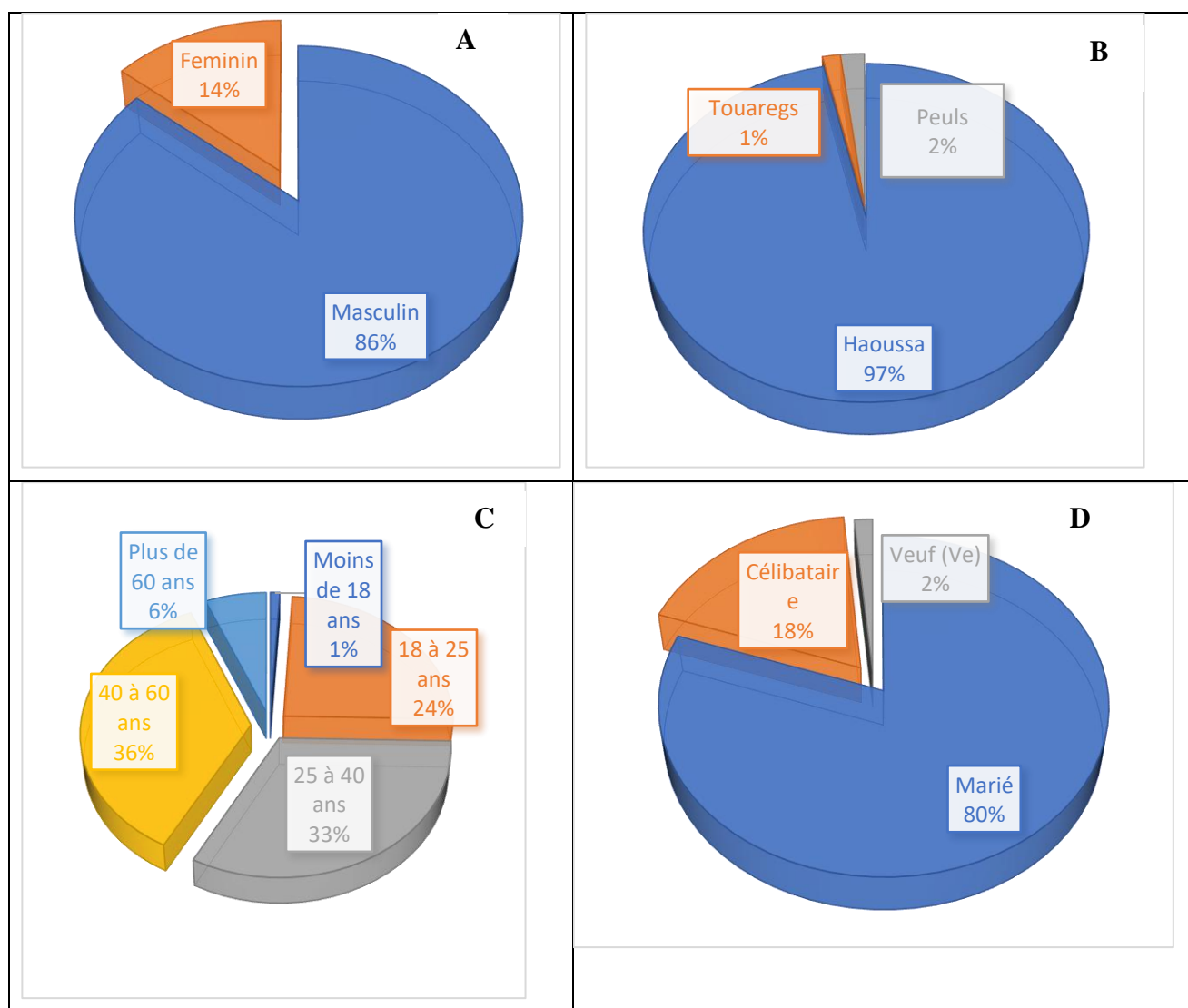


Fig.2: Proportion of respondents in (A) by sex, (B) by ethnicity, (C) by age group and (D) by marital status

Table 2 shows the average household size and the average number of agricultural workers. Analysis of this table shows that there is no significant difference between household sizes at the 5% threshold ($P = 0.287$). On the other hand, there is a statistically significant difference between the numbers of agricultural workers at the same 5% threshold ($p = 0.001$).

Table 2: Household Size and Number of Farm Workers

Parameters	Average Value	Probability
Household size	9,7±5,68	0,287
Farm assets	5,25±3,75	0,001

Figure 3A shows the level of education of the respondents at the site. The analysis of this figure shows that nearly 60% of the respondents attended Koranic school and more than

38% went to modern school, of which less than 1% have a university degree. Figure 3B shows the main activities by the respondents. The analysis of this figure shows that 95% of the respondents are engaged in agriculture as their main activity. On the other hand, land acquisition can be done through inheritance, purchase, lease, gift and loan (Figure 3C). This figure shows that more than 50% of respondents have acquired their land by inheritance and more than 40% farm their own acquired land in various ways. Also, the 3D figure illustrates the years of experience of market gardeners. The analysis of this figure shows that 30% of the respondents have 20 to 30 years' experience in market gardening, while 37% have 10 to 20 years of experience, while the youngest in practice, with less than 5 years of experience, representing 8%.

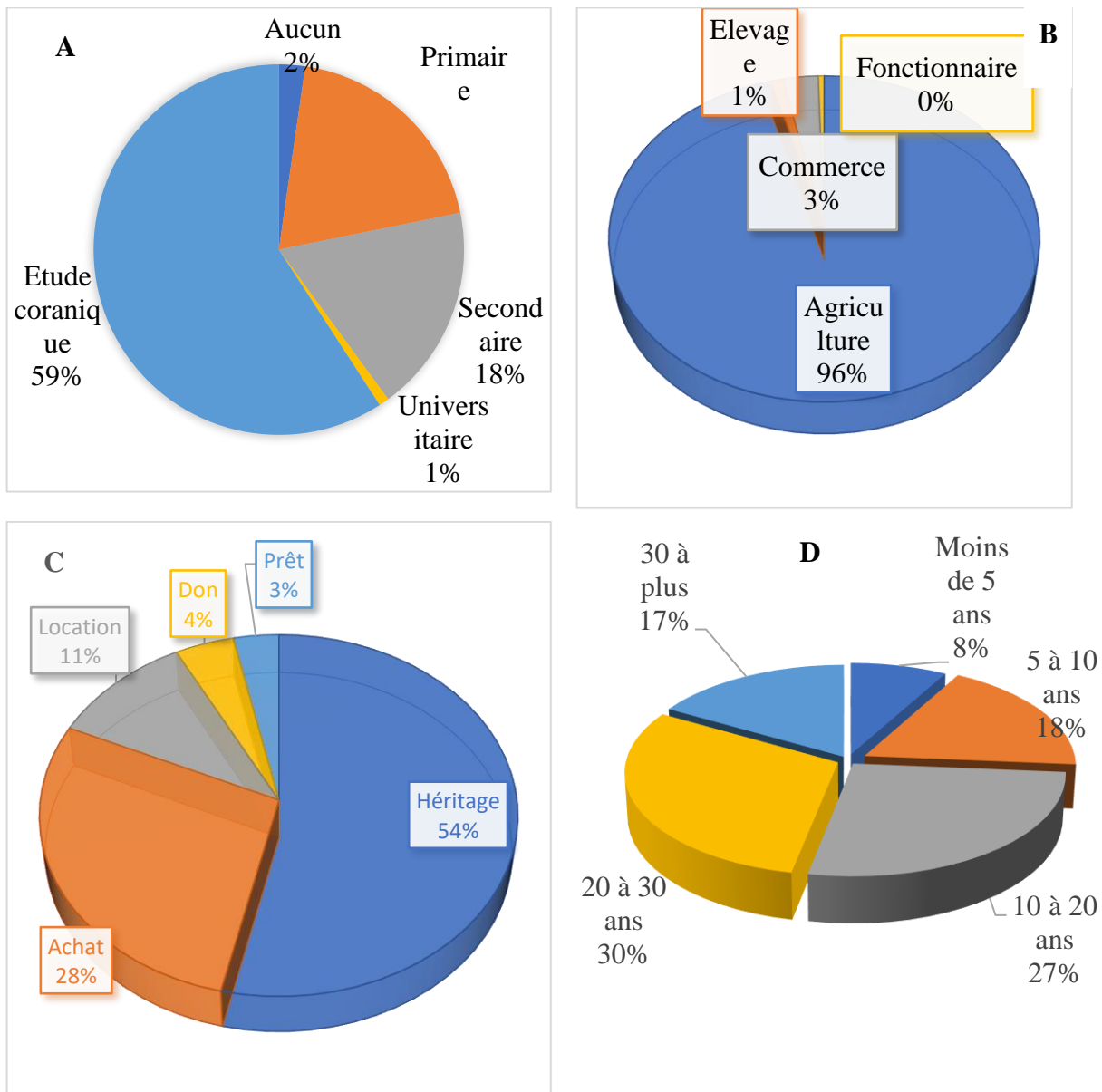


Fig.3: Frequency of respondents in (A) : Level of education (B) : Activities practiced in (C) : Land acquisition method and (D) : Number of years of experience

Market gardening grown on the site

Table 3 shows the different market gardening practices in the different districts of Djirataoua. An analysis of this table shows that a diversity of market gardening crops is practiced. In fact, thirteen (13) market gardening crops are grown on all the sites. The crops present on all sites are anise

and chili peppers and represent respectively 30.63% and 12.86% of the vegetable crops cultivated. On the other hand, the least cultivated crops are watermelon (0.32%), sweet potatoes (1%) and carrots (1%), potatoes (1%) and to a lesser extent peppers (2%). On the Bakaoua site, only two (2) crops, anise and chili, are grown.

Table 3: Representativeness of vegetable crops grown on the site

Frequency (%)

Crops	Scientific Names	Bakaou a	CPR	Djrt N	Djrt S	Kodrewa	Radi	Total
Anise	<i>Pimpinella anisum</i>	72,73	33,73	22,37	31,72	32,47	31,76	30,63
Eggplant	<i>Solanum melangena</i>	0,00	9,64	13,16	12,41	2,60	3,53	8,41
Cabbage	<i>Brassica oleracea</i>	0,00	0,00	5,26	4,14	9,09	3,53	4,92
Carrot	<i>Solanum melangena</i>	0,00	0,00	1,32	4,14	0,00	0,00	1,27
Lettuce	<i>Lactuca sativa</i>	0,00	8,43	3,95	8,28	2,60	0,00	4,60
Onion	<i>Allium cepa</i>	0,00	4,82	9,87	8,97	16,23	22,35	12,06
Chili pepper	<i>Capsicum frutescens</i>	27,27	16,87	9,87	6,21	18,18	14,12	12,86
Potato	<i>Solanum tuberosum</i>	0,00	0,00	0,00	1,38	0,00	2,35	0,63
Chili pepper	<i>Capsicum frutescens</i>	0,00	0,00	4,61	0,00	1,30	2,35	1,75
Watermelon	<i>Citrillus vulgaris</i>	0,00	0,00	1,32	0,00	0,00	0,00	0,32
Sweet potato	<i>Ipomoea batatas</i>	0,00	0,00	6,58	0,00	0,00	0,00	1,59
Green Chili Pepper	<i>Capsicum annum</i>	0,00	14,46	11,84	15,86	12,34	12,94	13,17
Tomato	<i>Lycopersicum esculentum</i>	0,00	12,05	9,87	6,90	5,19	7,06	7,78
Total		100,00	100,00	100,00	100,00	100,00	100,00	100,00

Legend: CPR: Centre for Rural Promotion; Djrt N: North Djirataoua; Djrt S: South Djirataoua

In addition, Figure 4 illustrates the results of correspondence factor analysis (CFA) whose axes account for 70% of the inertia. Thus, the results of the analysis revealed that crops such as green chili, eggplant, lettuce, pepper, watermelon, tomato are the most practiced in

Djirataoua North, Djirataoua South, and CPR. On the other hand, crops such as anise, onion, cabbage, sweet potato and chili pepper are more widely grown in Bakawa, Kodrewa and Radi.

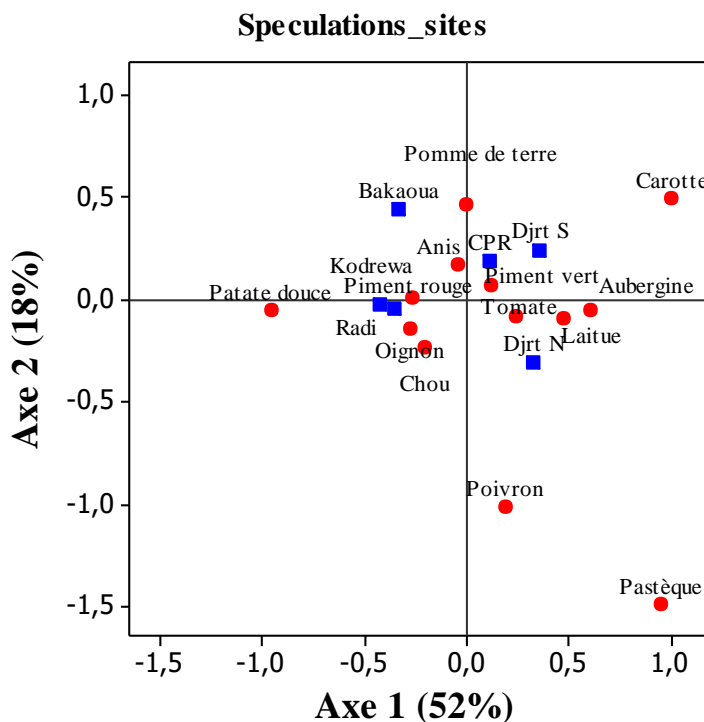


Fig.4: Relationship between sites and crops grown in the Factorial axis system after a Correspondence Factorial Analysis

Areas under cultivation

Figure 5 shows the areas occupied by vegetable crops. Indeed, the areas vary from less than 0.1 to 1 ha. Thus, areas between 0.25 and 0.5 ha are the most represented at the level of the CPR site (22.86%) and Djirataoua North (21.43%)

while areas of less than 0.1 ha are the most represented at the level of Djirataoua South (27.03%) and Radi (32.43%). Areas between 0.5 and 1 ha are the most represented in Kodrewa (52.94%) and for the Bakawa site, areas between 0.1 and 0.25 ha are the most represented.

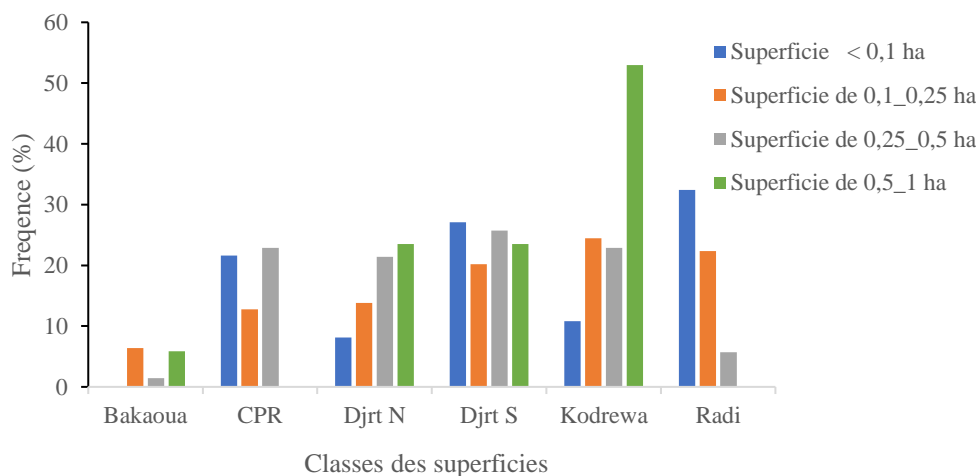


Table 4 shows the labour force employed at the different study sites with their respective costs. An analysis of this table shows that the number of men per day varies on average between 3.5±1.195 and 5.182±3.45 per head of household. Analysis of variance shows that there is no statistically significant difference at the 5% level. Also, market gardeners invest on average, in labour, 5406±2866

FCFA on the Bakaoua site, 7125±6781 FCFA, 7417±4500 FCFA, 7791±5409 FCFA, 7333±5355 FCFA and 4250±201 FCFA respectively on the CPR sites Djirataoua North, Djirataoua South, Kodrewa and Radi.

Analysis of variance shows that there is a statistically significant difference between average labour costs. Thus,

market gardeners in South Djirataoua are the ones who have invested the most in labour, unlike those in Radi.

Table 4: Average cost of labour employed at the different sites

Sites	Man/day	Labor Cost (FCFA)
Bakaoua	3,5±1,195a	5406±2866ab
CPR	3,813±1,401a	7125±6781ab
Djrt N	5,182±3,45a	7417±4500ab
Djrt S	4,907±2,486a	7791±5409a
Kodrewa	4,359±3,208a	7333±5355ab
Radi	3,824±1,834a	4250±2012b
Probability	0,149	0,036

Means followed by the same letter on the column do not have a statistical difference

Legend: CPR: Centre for Rural Promotion; Djrt N: North Djirataoua; Djrt S: South Djirataoua

Yield of main crops

Table 5 shows the yield of four (4) main crops: anise, green pepper, red pepper and onion. Thus, it appears from the analysis of this table that the production of anise and green pepper varies from 7,658 kg/ha and 7,875 kg/ha (Djirataoua north) to 456.75 kg/ha and 247.5 kg/ha (Djirataoua south)

respectively. For red pepper and onion, the best yields were recorded at the Djirataoua site with 8,507.25 kg/ha and 14,950 kg/ha respectively. On the other hand, the lowest yield of red pepper is observed at Kodrewa with 1,247.625 kg/ha. Analysis of variance shows that there is no statistically significant difference between crop yields at the 5% level.

Table 5: Main Crops Yields

Sites	Yield of main crops(Kg/ha)			
	Anise	Green Chili Pepper	Chili Pepper	Onion
Bakaoua	2 625a	2 587,5a	3 411,9a	–
CPR	3 886,4a	1 162,12a	3 712,5a	10 114a
Djrt N	7 658a	7 875a	1 462,5a	11 267,1a
Djrt S	456,75a	247,5a	8 507,25a	14 950a
Kodrewa	7 140a	4 279,5a	1 247,625a	10 240a
Radi	1 467,2a	3 882,37a	4 455a	10 075a
p-value	0,285	0,256	0,4506	0,850

Legend: CPR: Centre for Rural Promotion; Djrt N: North Djirataoua; Djrt S: South Djirataoua

Means followed by the same letters in the same column are not statistically different

Income from market gardening

In this study, the income of vegetable producers was estimated (Figure 6). Thus, four (4) income classes have been defined. The results show that 24.71%, 4.71% and 35.29% of respondents have an income of less than 200,000 CFA francs respectively at the sites of Radi, Bakaoua and

Kodrewa. Income between 500,000 FCFA and 1,000,000 FCFA is better represented at the level of the RPC site (21.43%). For the Djirataoua North site, the income between 200,000 and 500,000 CFA francs is more represented. And finally, the income of 1,000,000 FCFA at more is better represented at the level of South Djirataoua (50%).

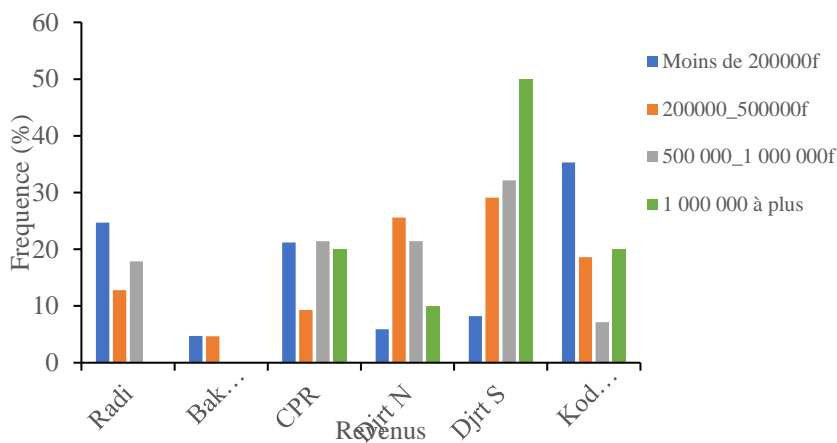


Fig.6: Income from market gardening

The results of the principal component analysis (Figure 7) show that the first two axes concentrate 66% of the inertia, which seems sufficient for the interpretation of the data. The analysis of this figure shows that all crops are more widely grown in Djirataoua North, Djirataoua South and Kodrewa and the highest incomes (500,000 to more than 1,000,000

CFA francs) are more likely to be found at these sites. The vegetable crops grown are red pepper, sweet potato, cabbage and onion. However, low incomes, of less than 200,000 CFA francs, are more common in Bakawa, Radi and CPR.

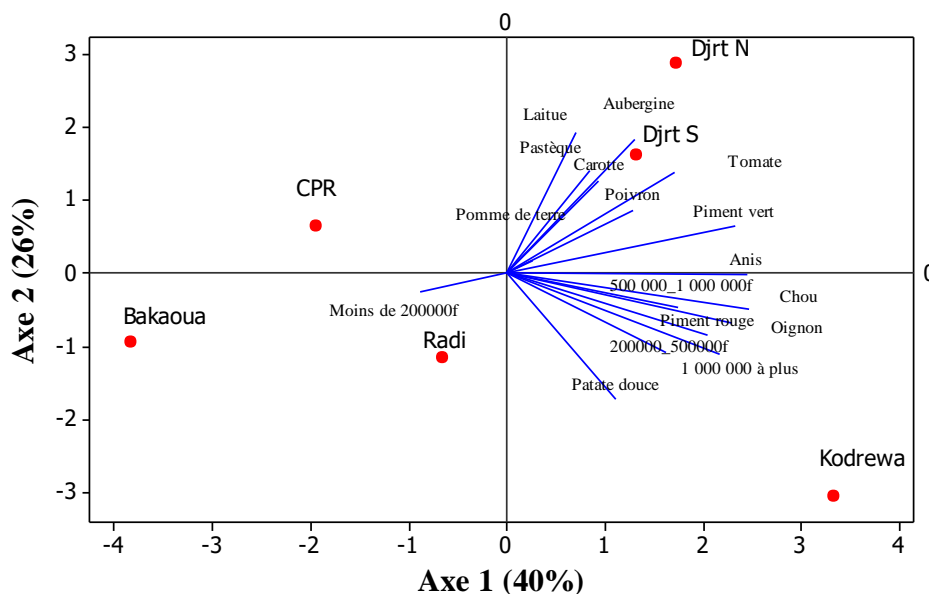


Fig.7: PCA linking crops, income by site

Legend: CPR: Centre for Rural Promotion; Djirt N: North Djirataoua; Djirt S: South Djirataoua

Use of income from market gardening

The income from market gardening contributes to the satisfaction of family needs. Thus, Figure 8 shows the proportions of the different uses of market gardening income. It appears from this figure that 22% of households

allocate their income from market gardening to marriage/naming ceremony, 18% to health and children's schooling; Only 11% of respondents use their income from market gardening to buy food. Some respondents invest in small businesses (14% of respondents) and others in livestock fattening (15% of respondents).

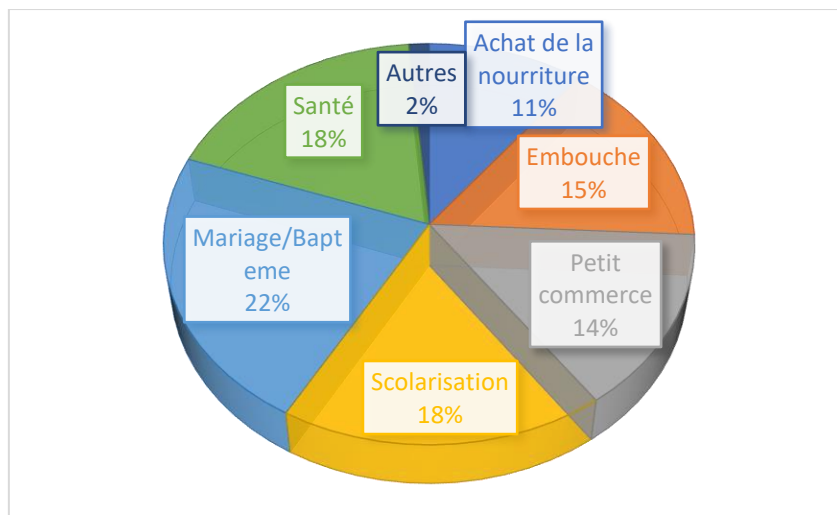


Figure 8: Use of income from market gardening

Constraints related to the practice of market gardening

Market gardeners face difficulties in this activity, both technically and financially. Table 6 summarizes the problems faced by producers. The analysis of variance shows that there is a statistically significant difference between the mean proportions of the stresses, at the 5% level. Thus, it appears from the analysis of this table that the

constraints such as pest attack and cost of the fee are much greater at the sites of Djirataoua South and Kodrewa. On the other hand, theft, the problem of flow and flow are more encountered in Kodrewa. As for the cost of fertilizers, it is much more cited by respondents at the Djirataoua South site. The Bakaoua site is the one where respondents encounter fewer constraints.

Table 6: Representativeness of constraints related to vegetable crops

Constraints	Bakaoua	CPR	Djrt N	Djrt S	Kodrewa	Radi	P-value
Pest Attack	4,68b	15,79ab	16,96ab	20,47a	25,73a	16,37ab	0,001
Water Fee Cost	4,76b	18,10ab	13,33ab	25,71a	25,71a	12,38ab	0,03
High Fertilizer Cost	3,45b	10,34ab	18,97ab	36,21a	20,69ab	10,34ab	0,0137
Theft	5,26b	21,05ab	20,00a	10,53b	36,84a	26,32ab	0,04
Flow problem	3,23b	12,90ab	16,13ab	35,48a	22,58a	9,68ab	0,001
Water Problem	6,82b	18,18ab	18,18ab	9,09b	20,45a	27,27a	0,02

Legend: CPR: Centre for Rural Promotion; Djrt N: North Djirataoua; Djrt S: South Djirataoua

Means followed by the same letters on the same line are not statistically different. CPR: Central

Possible solutions to problems

To overcome the various constraints faced by market gardeners in the rural commune of Djirataoua, solutions were proposed by the respondents (Figure 9). The analysis in Figure 9 shows that among the solutions envisaged by the

respondents, are the reduction of the cost of the fee, support for agricultural inputs, technical support and the search for outlets for the products. Thus, nearly 35% of respondents are asking for support in terms of agricultural inputs and a reduction in the cost of the fee at the same time, and 25% are asking for technical support.

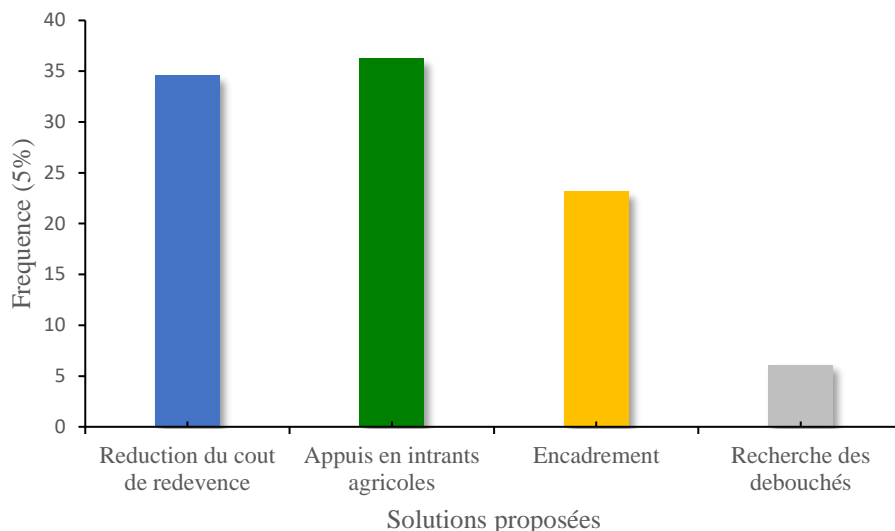


Fig.9: Representativeness of Proposed Solutions

IV. DISCUSSION

Market gardening is a practice that takes an important place for both men and women, as this study shows. In the selected sites, 209 market gardeners were interviewed on the basis of their availability, of which 86% are men and only 14% are women. This high proportion of men can be explained by the fact that field work in general, and market gardening in particular, requires a great deal of physical effort, which men are most capable of exercising. Similar results were reported by Rabo et al. (2022) where men account for 93% and 77% of market gardeners respectively at the sites of Tibiri Gobir and Madarounfa. These results corroborate those of Rabo et al. (2024). Indeed, by studying the socio-economic effects of insecurity on pepper producers and adaptation strategies in Diffa region of Niger, these authors reported that men represent 88.3% of the respondents and thus dominate pepper production. Similar results have been reported by Saley et al. (2022), who state that pepper cultivation is a predominantly male activity with a low percentage of women (12%) involved in pepper production activities. According to these authors, the low involvement of women in pepper production could be explained by land tenure status, which traditionally gives primacy to men.

In addition, the sites are characterized by a diversity of cultivated species. Indeed, thirteen (13) species have been recorded on the irrigated perimeter of Djirataoua. This diversity is lower than that reported by Rabo et al. (2022) who identified eighteen (18) and seventeen (17) in Tibiri gobir and Madarounfa, respectively. It is also higher than that reported by Rabo et al. (2019). These authors have identified a total of nine (9) species of vegetable crops

associated with *M. oleifera* in the Niger River valley and seven (7) in the Goulbi of Maradi with a specialization of the sites in certain crops.

The most widely grown crops are anise, green pepper, red pepper and onion. Speculations such as peppers, sweet potatoes, carrots, potatoes and watermelons are the least practiced. These results are similar to those of Rabo et al. (2022). According to these authors, the crops most commonly grown by growers are onions, tomatoes and cabbage, regardless of the site. In addition, the soils are fertilized with organic manure and/or mineral fertilizers. The combination of the two (2) types of fertilizer is dominant in our study area with a rate of 85 to 100%. These results corroborate those of Ouikoun et al. (2019) in Southern Benin, who stipulate that the application of organic and mineral fertilizer is observed by 90% to 98% of respondents. The results on phytosanitary treatment show that 99.52% of producers use only chemical pesticides for crop treatment compared to only 0.48% who combine two types of products (pesticides and natural products). This could be explained by the fact that producers do not master the manufacturing process of natural bio-pesticides. These results are high, compared to those obtained by Sani (2018) who reports that 70% of the people surveyed are not familiar with natural pesticides in the irrigated perimeter of Djirataoua.

This study also examined the yields of vegetable crops, including anise, green pepper, red pepper and onion. Indeed, anise yields vary from 7,658 to 7,875 kg/ha. These results are out of step with those of Manzo (2018) who reported an anise yield of 2519.33 kg/ha in the rural district of Djirataoua. This could be explained by the fact that this

author has limited himself to a single site. Similarly, the results of this onion yield study (10,075 to 14,950 kg/ha) are not consistent with those reported by Rabo et al. (2020) who obtained a yield of 157886 ± 26706 kg/ha on the one hand, but with those reported by Abdoul Habou et al. (2015), on the other hand. By studying the effect of nitrogen on the shelf life of onion bulbs, the authors found yields ranging from 17 to 34 t/ha.

From an economic point of view, the sale of market garden products is an income-generating activity. Thus, on the different production sites, the average annual income of producers varies from less than 200,000 CFA francs to more than 1,000,000 CFA francs. These results are similar to those obtained by Zeinadou (2019) who reports that the average annual income of producers is 434328.75 FCFA or 36194.7 FCFA per month, which testifies to the profitability of market gardening and that onions, tomatoes and cabbage are the most popular crops in the commune of Malbaza. Market gardening is an important source of product supply for the population. In the rural district of Djirataoua, market gardening contributes not only to social cohesion but also to their economic development. From a social point of view, market gardening creates jobs. The cultivation of market garden products occupies a large number of the population and makes it possible to meet their basic needs. The results of this study showed that 20.02% of households allocated the income from market gardening to marriage/baptism, 19.40% bought food, 16.31% to health and schooling of children, 12.90% to livestock fattening, 1.24% to small businesses. These results are also close to those of Zeinadou (2019) who states that "100% of producers say they buy food with income generated by market gardening, 42.5% of producers provide health care for their families and 28% ensure their children's schooling. These results corroborate those of Ndiaye et al. (2021) who state that given the multiple benefits of market gardening, this activity constitutes a supplementary activity. The largest incomes were obtained from crops such as red pepper, sweet potato, cabbage and onion. Similar results were reported by Rabo et al. (2022). According to these authors, the most profitable vegetable crops are eggplant and, to a lesser extent, melon, pumpkin, watermelon, cassava, onion and pepper can and can provide up to 500,000 CFA francs/ha/cycle. By studying the structures functioning and prospects for improvement of Moringa oleifera-based agroforestry systems in the Niger River and Maradi Goulbi valleys in Niger, similar results have been reported by Rabo (2019) who states that average financial productivity of crops is 304,688 to 10565167 FCFA in year 1 and 912670 to 2433571 FCFA in year 2, but that the systems of the Maradi goulbi are individually more cost-effective. This can be explained by the fact that farmers in Goulbi spend less than those in the river valley on the one

hand, and that vegetable crops have been combined with moringa on the other. Indeed, according to this author, the most profitable river valley systems are, only, those including sorrel, eggplant, squash and cucumber while all the Maradi goulbi systems have proven to be profitable.

This study also revealed several forms of constraints faced by market gardeners in the rural district of Djirataoua. The constraints most noted by the respondents were pest attacks, the cost of water fees, theft, the cost of fertilizers and the problem of drainage. The results of this study are in line with those of Plea (2016). According to this author, water insufficiency is cited by 85.75% of respondents, he also states that the lack of means to access equipment and inputs was reported by 60% and 62% of respondents. The problem of equipment and input was also reported by NDAO (2009) in the rural community of Ndiob. According to Plea (2016), 51.43% of respondents mentioned difficulties related to marketing. Doing a prospecting, surveying, and collecting study of pepper (*Capsicum Annuum*) accessions grown in the Diffa region, Saley et al. (2022) reported that pepper cultivation faces a number of biotic and abiotic constraints. According to the surveys carried out by these authors, insecurity and flooding are the major constraints faced by producers. They add that constraints such as lack of financial means, crop diseases and insects, lack of inputs, and weeds have been highlighted by producers with varying proportions from one department to another.

V. CONCLUSION

This study focused on the benefits of market gardening in the rural district of Djirataoua. The results of the producer survey identified thirteen (13) crops grown in the study area. The role of this activity is no longer to be demonstrated today given to its socio-economic impact through its contribution to the dietary diversification of populations and to the income of the population. However, the market gardening and marketing sector faces many problems that jeopardize its development and limit its participation in the local economy.

However, the promotion of local consumption, the construction of infrastructure, and the provision of technical and financial support to producers could make the production and the marketing of market garden products profitable and less arduous. This situation requires effective solutions in order to make market gardening profitable and less arduous.

ACKNOWLEDGMENTS

At the end of this study, we would like to thank CORAF through its TARSPRO Project whose financial support made it possible to carry out the said study.

REFERENCES

- [1] **Abdoul Habou, Z., Chaibou, I. M. & Adam T., (2015).** Effet de l'azote sur l'aptitude à la conservation des bulbes d'oignon (*Allium cepa* L.) *Int. J. Biol. Chem. Sci.* 9(6): 2889-2896.
- [2] **Bouchetara, M., Wotto, M. & Eyih, S. (2021).** Les effets de la modernisation du secteur agricole sur la croissance économique : l'analyse comparative des stratégies nationales de l'Algérie, du Maroc et de la Tunisie. 12. 735-752. 10.34118/djei.v12i1.1123.
- [3] **FAO, (2012).** Growing greener cities in Africa. First status report on urban and peri-urban horticulture in Africa. Roma: FAO. 111p
- [4] **Finger, F. L., Rêgo, E. R., Segatto, F. B. & Nascimento, N. F. F. (2012).** Produção e potencial de mercado para pimenta ornamental. *Informe Agropecuário.* 33: 14-20.
- [5] **James, B., Atcha-Ahowé, C., Godonou, I., Baimey, H., Goergen, G., Sikirou, R. & Toko, M. (2010).** Gestion intégrée des nuisibles en production maraîchère : guide pour les agents de vulgarisation en Afrique de l'Ouest. Ibadan, Nigéria: IITA. 112p
- [6] **Kanda, M., Akpavi, S., Wala, K., Boundjou, G. D. & Akpagana, K. (2014).** Diversité des espèces cultivées et contraintes à la production en agriculture maraîchère au Togo, *Int. J. Biol. Chem. Sci.* 8(1): 115-127
- [7] **Koc, M., Macrae, R., Mougeot, J. A. L. & Welsh, J. (2000).** Armer les Villes contre la Faim: Systèmes Alimentaires Urbains Durables. CRDI ; 243.
- [8] **Madjigoto, R., Ndjekornom, O. & Kiari, F. H. (2018).** *La diffusion des cultures maraîchères dans le lac Fitri. : l'étude des îles et villages Moudou, Doumourou, Maafé et Yao au Tchad.* Rapport de recherche du Laboratoire des langues-Cultures, d'Analyse du Discours et des Pratiques Enseignantes (LACDIPE) de l'Université Abdou Moumouni de Niamey, 322p.
- [9] **Ndao, A. (2009).** Cultures maraîchères et dynamique socio-économiques et spatiales dans la communauté rurale de Ndiob (Département de Fatick. Mémoire de Master II. Université Gaston Berger de Saint-Louis, UGB, Section de géographie. Consulté en ligne le 08/01/24
- [10] **Ndiaye, O., Diatta, U., Abeudje, A., Dramé, M., Ndiaye, S. & Tidiane B. C. (2021).** Caractérisation des périmètres maraîchers institués par les groupements des femmes comme stratégie de résilience en zone post conflit (Casamance, Sénégal). *European Scientific Journal, ESJ*, 17(13) : 118-135. <https://doi.org/10.19044/esj.2021.v17n13p11>
- [11] **Ndjekornom, O. (2015).** *La diffusion des cultures maraîchères dans le lac Fitri. : l'étude des îles et villages Moudou, Doumourou, Maafé et Yao.* Mémoire de Master 2 en gestion des territoires et développement, géographie, Université de N'Djamena, 166p.
- [12] **Ouikoun, G. C., Bouka, C. E., Lawson-Evi, P., Dossou, J. & Eklu-Gadégbeku, K. (2019).** Caractérisation des Systèmes de Cultures des Sites Maraîchers de Houéyihou, de Sèmè-Kpodji et de Grand-Popo au Sud-Bénin. *European Scientific Journal*, 15(18): 113-130. DOI: <http://dx.doi.org/10.19044/esj.2019.v15n18p113>.
- [13] **Plea, A. (2016).** Stratégie d'adaptation des groupes sociaux face aux changements climatiques : Cas du maraîchage dans le village de koumbri (Commune rurale de yognogo, cercle de kutiala). Mémoire de fin cycle Master à l'Université des Sciences Sociales et de Gestion de Bamako, Mali, 73 pages.
- [14] **Rabo, Y. (2019).** *Structures, fonctionnement et perspectives d'amélioration des Systèmes Agroforestiers à base de Moringa oleifera Lam. dans les vallées du Fleuve Niger et du Goulbi de Maradi au Niger.* Thèse de doctorat. Université Dan Dicko Dankoulodo de Maradi, Niger, 152 p.
- [15] **Rabo, Y., Morou, B., Lawali, S. & Mahamane, A. (2020).** Combined effect of Moringa oleifera Moringa oleifera Lam. plant layout and cutting level on onion bulb yield (*Allium cepa* L, Galmi purple variety) *International Journal of Current Research*, 12, (05):11543-11548.
- [16] **Rabo, Y., Matchi, I. I., Assane, M. M. & Mahamane, A. (2022).** Productivité Et Rôles SocioÉconomiques Des Cultures Maraîchères Dans Les Communes De Tibiri Gobir Et De Madarounfa (Niger). *ESJ*, 18 (8) : 189-207 <https://doi.org/10.19044/esj.2022.v18n8p188>;
- [17] **Rabo Y., Katchalla E. I. M., Aboubacar M. M. R., and Mahamane A., 2024.** Socioeconomic effects of insecurity on pepper producers and coping strategies in the Diffa region of Niger. *International Journal of Scientific Research*, 12(1) :1-4. DOI : 10.36106/ijsr
- [18] **RECA, (2011).** Enquête sur la sécurité alimentaire des ménages au Niger. 10p
- [19] **Rêgo, E. R., Rêgo, M. M. & Finger, F. L. (2015).** Methodological basis and advances for ornamental pepper
- [20] **Saley, M. D., Amadou, H. I., Kéllou, K. K. B., Boubacar, M. M., Moustapha, G. & Ali, M. (2022).** Prospection, Enquête et Collectes des Accessions de Poivron (*Capsicum annum* L.) Cultivés dans la Région de Diffa, Niger. *ESI Preprints*. <https://doi.org/10.19044/esipreprint.11.2022.p513>
- [21] **Salissou, M. S. (2006).** Intégration des marchés céréaliers dans l'UEMOA : une analyse par les prix, ENSEA, Abidjan, Côte d'Ivoire. Consulté le 09 janvier 2024
- [22] **Ulhoa, A. B., Pereira, T. N., Silva, R. N. & Ragassi, C. F. (2014).** Caracterização molecular de linhagens de pimenta do tipo Jalapeño amarelo. *Horticultura.* 32 : 35-40.
- [23] **Yacouba, A. R., Soumana, B. & Idrissa, S. M. (2021).** Typologie des exploitations agricoles productrices du mil et niébé pluvial dans la commune rurale de Karma. *Int. J. Biol. Chem. Sci.* 15(4): 1385-1397
- [24] **Yolou, I., Yabi, I., Kombieni, F., Tovihoudji, P. G., Yabi, J. A., Paraïso, A. A. and Afouda F. (2015).** Maraîchage en milieu urbain à Parakou au Nord-Bénin et sa rentabilité économique. *Int. J. Innovation Sci. Res.*, 19(2), 290-302. <http://www.ijisr-issr-journals.org/>
- [25] **Zanaïdou, S. A. (2019).** Contribution des cultures maraîchères dans le renforcement de la résilience sociale : Cas de commune de Malbaza dans la Région de Tahoua. Mémoire de licence en cultures irriguées maîtrise de l'eau, Université de Tahoua, Niger, 30 pages.