

COMPLIMENTARY SOURCES OF LIVELIHOOD FOR PERI-URBAN MARKET GARDENERS IN MARADI, NIGER REPUBLIC

¹Banani Maman, ²Bello Gambo and ³Amadou Oumani Abdoulaye

¹Ecological Monitoring Manager Supporting the Sustainable Management of Sahelo Saharan Protected Areas, Niger-Chad Projection / Noé Niger

² Geography Department, Bayero University, Kano (Nigeria) P.M.B. 3011

³Faculty of Agronomy and Environmental Sciences, University Dan Dickou Dankoulodo of Maradi (Niger Republic) B.P: 465 Maradi Rep.Niger

Corresponding Author's email: bgambo.geo@buk.edu.ng



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ABSTRACT

*This study examined the complimentary livelihood options adopted by market gardeners in Peri-urban Maradi, Niger Republic. Random sampling technique was used to select 47 market gardeners from 10 peri-urban market garden sites of the 3 communes of the city. The study found out that majority of the gardeners practiced breeding (76%). Out of this percentage, over 90% used organic manure in their activities. The garden site benefited from the livestock kept through organic manure, use of animal-drawn ploughs and transportation of inputs to the sites and products to city markets. On the other hand, the breeding of livestock enjoyed forage intake from the crops residues. Majority (78%) of the farmers combined forestry and gardening on a farmland. Those who were not combining forestry and gardening were on land rent. The most grown trees were moringa (*Moringa oleifera*) and mango (*Mangifera indica*) while the less cultivated were dates and mahogany. The different reasons for the economic activities in peri-urban Maradi were economy (for sale), family diet, inheritance, vocation and the future. The recommendations given included the extension of technical assistance and sensitization by non-governmental organization to the gardeners, and this study to be extended to other cities of Niger Republic and the Sahel zone in general.*

Keywords: Market gardening, Livelihood diversification, Breeding, Forestry

Introduction

Urban and peri-urban agriculture has become a coping strategy for the urban poor in developing countries. Its practice allows the creation, maintenance and ensures the management of green spaces in the city. It also leads to better management of household waste since the organic waste can be composted and used as fertilizer. In this

regard, this practice has an environmental benefit and improves soil quality through the use of composts made from residues and household waste which are clean for farmers. In addition, it is a source of employment and income for the poor and it constitute an economy for the transport sector (Roy, 2009).

In particular, peri-urban market gardening has been able to satisfy up to 20-50% of the total needs of urban consumers (Margiotta, 1997; Dominique, 2010). It allows developing a certain social cohesion. Its strategic location also promotes the development of agri-tourism and recreational activities that urban dwellers can enjoy without having to move on too long distances (Boily, 2012). In this sense, vegetables carried around cities play an important role in providing food, income and employment to small producers and poor urban families (Grain de sel, 2006). Thus, according to Yihdego and Kassa (2009), vegetable produce specifically from irrigation stabilizes the market demand. Given the importance of this activity, it is increasingly practiced by people in the peripheries of cities. Therefore, peri-urban market gardening deserves special attention.

Livelihoods are universal in nature. All people, poor and rich, both in developed and developing nations, pursue livelihoods to make a living (Olsson *et al.*, 2014). However, the concern for livelihood is more for Africa where about 25% of the food insecure people in the world lives. It is the only continent where agricultural production per capita has been decreasing for over 3 decades, partly due to wrong or inappropriate policies (Sasson, 2012). In particular, the people in sub-Saharan Africa experience more economic hardships, the decreasing purchasing power, increased cost of living, and urban and rural poverty (Owuor, 2006). To address these problems, the people need livelihood interventions (Satgé *et al.*, 2002).

Livelihood-focused interventions have been broadly classified into three different but overlapping categories: alternatives, compensation and incentives. Alternatives-based interventions are based on the assumption that pressure on natural resources is primarily the result of poverty and a lack of options. Thus, they partially or completely substitute for the monetary and nonmonetary benefits obtained from the exploitation of

particular natural resources. Compensation interventions are incentives that may promote very similar alternatives under the banner of in-kind payments, but with different conditions of implementation. Compensation schemes are aimed at adequately compensating for the losses incurred. Incentive-based interventions provide alternatives as in-kind payment if people change their behavior in accordance with agreements negotiated in advance (Wright *et al.*, 2015). There have been two main dimensions of study on livelihood strategies in Africa, especially in times of crisis. One dimension to the study focuses on how individuals and households deal with risk in unstable (physical) environments. On the other hand, some studies deal with livelihood diversification (Owuor, 2006).

In Niger Republic, the environment is characterized by variable annual rainfall both in its spatial and temporal distribution. The climate variability and change have made rainfall in the country uncertain, too early or too late, too little or too much (Mamouda, 2011). For example, the country experienced floods in 2005 and drought in 2009 (IFAD, 2013). For Maradi town in particular, the 2013 season was characterized by a series of floods with losses of crops and damages of infrastructure (DCA Maradi, 2013). In 2014, three short periods of rainfall deficiency were recorded which resulted in seed abortion (DCA Maradi, 2014). IPCC (2007) predicted that the Niger Sahel would experience a shortening of the length of the growing season of around 20% by 2050 and a 50% decrease in yields of rainfed agriculture by 2020. These adverse consequences due to climate change and particularly combined with the rate of population growth and the scarcity of land resources require new coping strategies for the people of Niger Republic in general and those of Maradi city in particular, to ensure their food safety and enhance their livelihoods.

To cope with this situation, Niger Republic is engaged in the development of Market gardening through national policies and strategic orientations like Economic and Social Development Plan (PDES) and the initiative “Nigeriens nourish Nigeriens” on food security and building resilience. The peri-urban market gardening can be an alternative to mitigate the effects of climate change. It is one of the practices that can solve the majority of problems of cities in dry areas, directly or indirectly caused by climate change. It allows the ability to cope with urban growth and unemployment (Mathien *et al.*, 2007). However, in some areas, the market gardening is difficult because of scarcity of favorable conditions. This made the peri-urban market gardeners to diversify and adopt complimentary options of livelihood (Pagiola *et al.*, 2004).

Studies were conducted on adaptation of livelihood to climate change in Niger Republic and Maradi in particular. The scope of Dissirama (2010) and IFAD (2013) was the whole of Niger Republic. The work of Mamouda (2011) was limited to Maradi. However, these studies did not consider urban and peri-urban market gardening. Andres and Lebailly (2011) studied peri-urban agriculture using the case of market gardening in Niamey. However, they did not include complimentary sources of livelihood. That is why this study aims to examine the livelihood options by market gardeners in Peri-urban Maradi, Niger Republic. The achievement of the aim is through the following objectives: (i) to examine vegetables grown by the market gardeners as the main source of livelihood, (ii) to identify and describe the complimentary sources of livelihood to vegetables growth, and (iii) to explain the reasons for subscribing to the livelihood options.

Conceptual Background

Livelihood

Livelihood is the material means of living that includes sufficient availability and flow of food and money for the satisfaction of necessities of life (Niehof and Price, 2001). It is a primary means of living: all forms of sustenance that enable persons to have food, shelter and clothing (Desilva, 2013). The perspective of these definitions is narrow as they have failed to go beyond the material or economic objectives of life and do not incorporate aspects of non-material well-being (Friis, 2013). A broader definition considers livelihoods as the ensemble or opportunity set of capabilities, assets and activities that people require to earn a living (Olsson *et al.*, 2014; GS/OAS, 2015). In this direction, Chambers and Conway (1992), quoted by Petrik (2014), established that a livelihood “comprises the capabilities, assets (including both material and social resources) and activities required for a means of living”.

Livelihood diversification is the attempt by households to reduce their vulnerability by having more than one livelihood activity. Thus, in a diversified household, there are alternative sources of livelihood in case one productive activity does not provide enough or fails completely. A good livelihood strategy, which targets to achieve better outcomes, incorporates diversification so that households depend on various strategies for survival (Satgé *et al.*, 2002). Livelihood diversification can be in two dimensions, agricultural diversification through production of multiple crops or high-value crops or non-agricultural livelihood diversification through undertaking small enterprises and casual labour (Khatun and Roy, 2012).

Peri-urban Agriculture

Agriculture is the cultivation of animals, plants, fungi and other life forms of production for food, fiber, biofuels, drugs and other products used to maintain and improve human life (STANDS4 LLC, 2015). It includes all

jobs where the floor is subject to agricultural production. The peri-urban agriculture refers to farming practiced on the outskirts of an urban area. It also includes the production, processing and distribution of agricultural products (Roy, 2009). Again, it was described by Boily (2012) as an agricultural activity carried out in a space between the city and the countryside, which maintains trade ties with the urban area, in addition to be subjected to the proximity effects of the latter. It is the type of industry located on the fringe (peri-urban) of an urban area (town, city or metropolis) for the production, processing and distribution of different agricultural food and non-food products, using locally available resources, and for the benefit of the urban environment (Stewart *et al.*, 2013).

Market Gardening

Market gardening is the commercial production of vegetables, fruits, flowers and other plants on a larger scale than home garden, but small that most of the gardening principles can be applicable. It involves intense production of high value from a few acres cultures, and gives farmers the opportunity to increase their income. Vegetable gardening can refer to any form of recession or irrigated

crops conducted outside rainy season with an economic purpose or family diet (Bachmann, 2009). Market gardeners are people who grow their own vegetables for sale and market sellers are people who do not grow vegetables, but buy from growers to sale at Maradi town or elsewhere (Wong, 2005).

Conceptual Linkage between Peri-urban Agriculture and Livelihood

Peri-urban agriculture improves livelihood in two major ways: improved access to food and increased income (Figure 1). One, improved access to food increases household's food availability and eventually prevents hunger and malnutrition. Also, improved food access allows direct access by poor households to more nutritious and diverse diet. Two, income is increased by producers in two ways. The producers can save income through consumption of self produced foodstuffs that are cheaper to produce than to buy from the market. The producers can also generate income through selling or trading their products. Therefore, improvement of peri-urban livelihood requires a balance between food production and food sale (Stewart *et al.*, 2013).

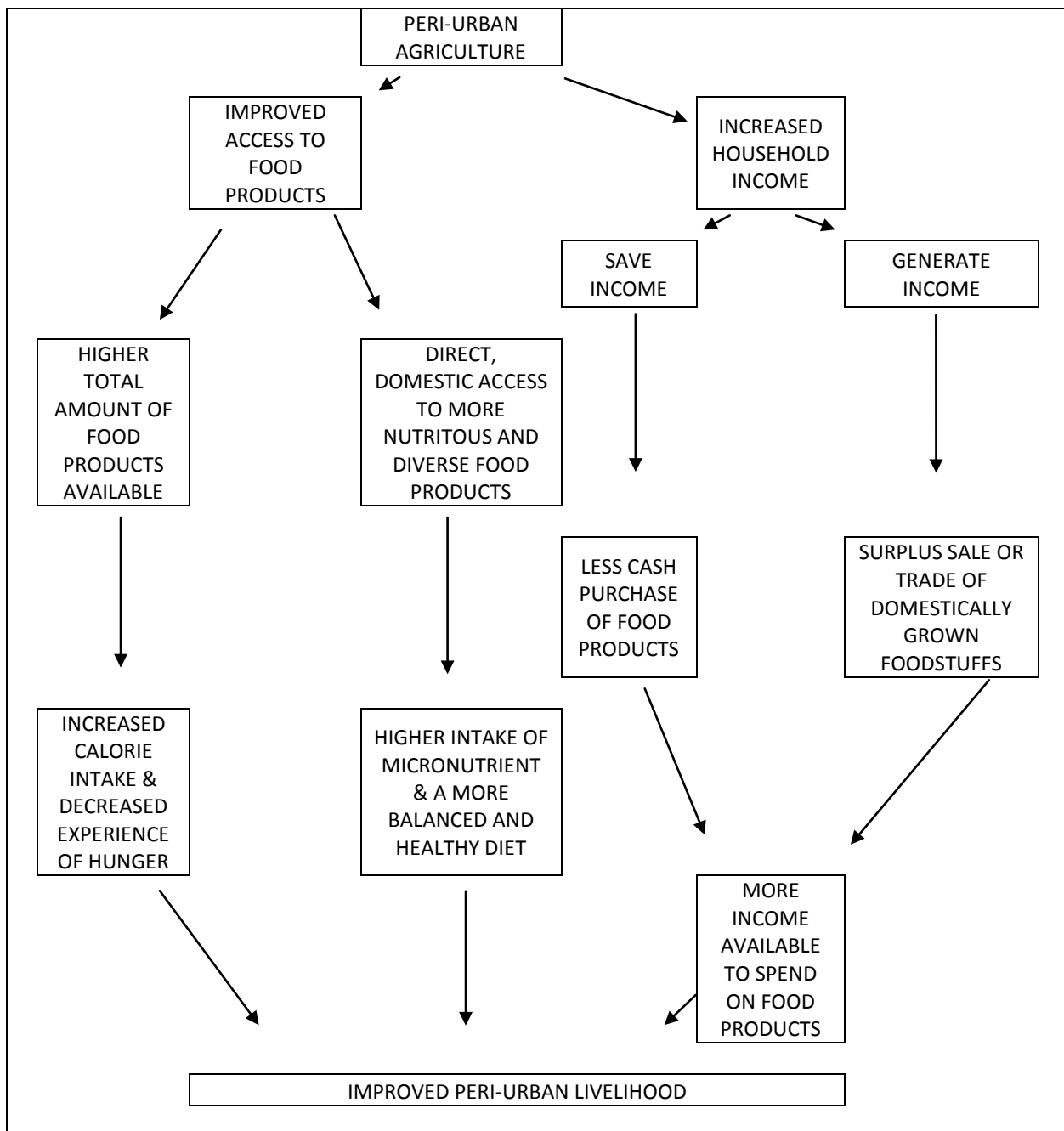


Figure 1: Two Key Pathways for Peri-urban Agriculture to Improved Livelihood

Source: Adapted from Stewart *et al.* (2013)

Materials and Methods

The Study Area

Maradi region is located in south-central part of the Niger Republic, between latitude 13° 0' and 15° 26' North and longitude 16° 6' and 8° 36' East, and covers an area of 41,796 km². It

is bordered to the North by Agadez region, to East by Zinder region, to west by Tahoua region and shares border of 150 km with the Federal Republic of Nigeria to the south. Maradi city is located in the southwest part of

the region approximately 750 km east of Niamey, halfway between Niger River and Lake Chad, and covers an area of 4,283 km² (Figure 2).

The population of Maradi region was estimated at 3,737,775 inhabitants and that of the city was estimated at 293,623 inhabitants in 2015 (DGS, 2015). The climate of the region is tropical dry with a long dry season and a short rainy season, and is Sahelian in the north where the average annual rainfall is between 200 and 300 mm and Sudano-Sahelian in

south with average annual rainfall between 500 and 600 mm. Farming is the main activity and it is practiced by more than 95% of the population. About 85% of the total population of the region depends on this activity. Livestock is the second activity after farming and is practiced by more than 90% of the population (DGS, 2015). Regional trade is highly developed especially with Nigeria, and this has contributed to the development of peri-urban market gardening in Maradi city (DRP, 2012).

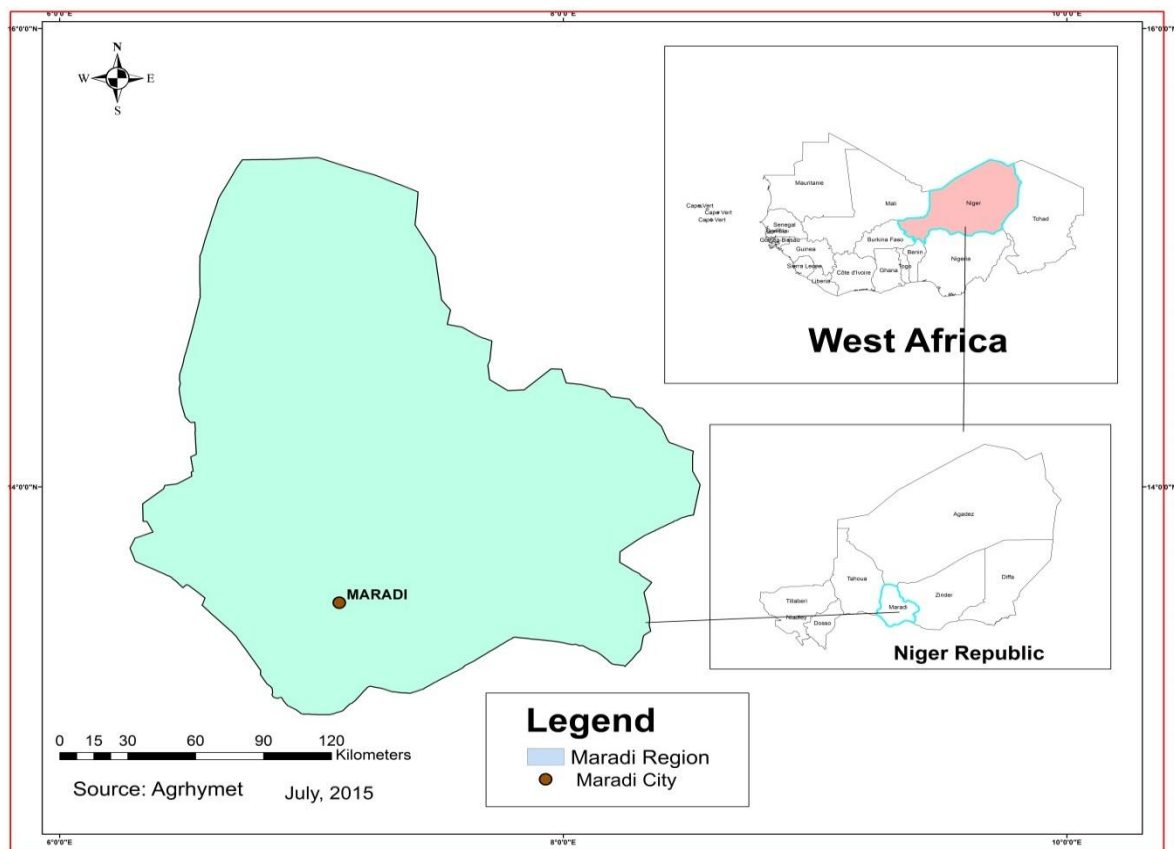


Figure 2: Maradi, Niger Republic

Sources of Data and Data Collection Techniques

Field observations including photography of some locations for illustrations were conducted. Then geographical coordinates of sites were collected for mapping the area (Figure 5) by visiting the sites one after another with guidance of one officer of the communal directory of agriculture of Maradi

and sometime with assistance of one of market gardeners, who is the group leader. Copies of questionnaire were administrated by author and research assistants because majority of the market gardeners could not fill them by themselves. The group leaders and some gardeners helped as research assistants

because they were educated, all attended tertiary institutions. Lastly focus group discussion was held with nine farmers. Three farmers were drawn from each of the 3 communes. Period of data collection was May 2015 and from August 2015 to February 2016.

Sampling Technique

This study considered all the three communes of Maradi city. Communes 1, 2 and 3 have 5, 6 and 8 market gardening sites respectively. 50% sample size was used to select 10 out of

the nineteen market garden sites. This is based on Neuman (2003) who observed that a researcher should use a large sampling ratio in order to achieve higher accuracy. Out of the total of 94 gardeners, 47 samples were drawn. Table 1 contains the number, sample and names of the sampled market garden sites. Stratified random sampling, using lottery method, was used to select the market garden sites and the gardeners. The communes formed the strata.

Table 1: Population and Sample

Communes	Number of Market Garden Sites	Number of Sampled Market Garden Sites	Name of Sampled Market Garden Sites	Total Number of Gardeners	Sample
1	5	3	i) Maguere1	14	7
			ii) Godia Noma	12	6
			iii) Soura Bakassa	8	4
2	6	3	i) Lambou entente,	12	6
			ii) Tabkin Daouda	10	5
			iii) Tatalin Noman-rani	6	3
3	8	4	i) Mafalia1	12	6
			ii) Kokari	6	3
			iii) Alheri	4	2
			iv) Matassa	10	5
Non Classified	2	0	-	-	-
Total	21	10		94	47

Source: Field Survey, 2016

Data Analysis and Presentation

Descriptive and inferential statistics were used to summarize and analyze the data collected. The completed questionnaire were accounted manually and classified. The different digital data and coded ones were synthesized, entered in Microsoft Excel 2007 software and transferred to SPSS Statistics Version 20 for treatment. This allowed analyzing the results in numbers and percentages, and presenting them in tables and charts. The geographical coordinates collected with GPS allowed mapping the study area by using ArcGIS 10.2

software. Field observation, pictures and questionnaire exploitation and synthesis of qualitative data from informal discussion with some gardeners allowed determination of the livelihood of the market gardeners.

Results and Discussions

To establish the sources of livelihood for peri-urban market gardeners in Maradi, the study presents the types of vegetables grown by the market gardeners, complimentary sources of

livelihood and reasons for subscribing the sources of livelihood.

Vegetables Grown By the Market Gardeners

The market gardens operators of peri-urban area of Maradi were growing around thirty (30) market garden crops of which the most cultivated were onion (bulb and seed), tomato, cabbage and lettuce and the less cultivated were potato, carrot and sorrel (Figure 3). Similar observation was made by the Regional Directorate of Agriculture (DRA, 2012 and 2014) and the Municipal Directorate of Agriculture (DCA, 2015), as well as Andres and Lebailly (2011) for the city of Niamey. However, some crops such as garlic, sugar cane, tobacco and many others which were often grown in association and of less value for operators were not at all mentioned by respondents but were identified during the field visits. All these market garden crops were grown in one cycle and at all the sites except cabbage (often 2 or even 3 cycles per year) at Mafalia1 and Matassa sites, lettuce (2 cycles at Matassa), corn (2 to 3 cycle also at Matassa and Soura Bakwassa), parsley, melon and watermelon (2 cycles at Matassa). According to the finding of the field and interviews with leaders of farmers' organizations, these three sites had the following particular features:

- (a) Massata was a site operated by market gardeners with high purchasing power who were able to properly irrigate their fields regardless of the drop in the water table and were up to combat pests and crop enemies.
- (b) Mafalia1 was a site that borders a permanent pool replenished by runoff of the city even if the water was not used at all in the market gardening activity.
- (c) Soura Bakwassa was a site bordering a pond replenished by Goulbi river flow.

Moreover all these sites were flooded with the arrival of Goulbi river flow.

Peri-urban market gardening was practiced in Maradi at a specific period of time. The period of high activity was from the months of October to February. This period was beneficial according to respondents because the soil had some moisture after the passage of the rainy season and that of Goulbi river flow, and also corresponded to a period of low temperature of the year due to the cold season. That promoted good seedling germination and greatly reduced the need of water for crops, and the cost of labor.

Based on the interview with some of the gardeners, it was revealed that there were many market gardening products in peri-urban area of Maradi and their availability period varies. Physically, the most disposed products were onion (bulb and seed) and cabbage. Corn and potato which largely entered into the family diet were not sold by some producers. Nevertheless some products such as "*yajin yawo*", beetroot, parsley, turnip, celery and chilli pepper were purely commercial.

The period of high availability is from the month of December to February. Some crops such as lettuce (grown in several cycles per year) and onion (whose producers have mastered its conservation) were often available throughout the year. However, the use of products from rural areas such as Djirataoua, Guidan roumji (melon and watermelon) and other regions such as Zinder (in squash), Tahoua (cabbage) and even other countries including Nigeria (in Tomato, Cabbage, onion and others) enable the availability of products on the market during all periods of the year even though prices vary from one period to another.

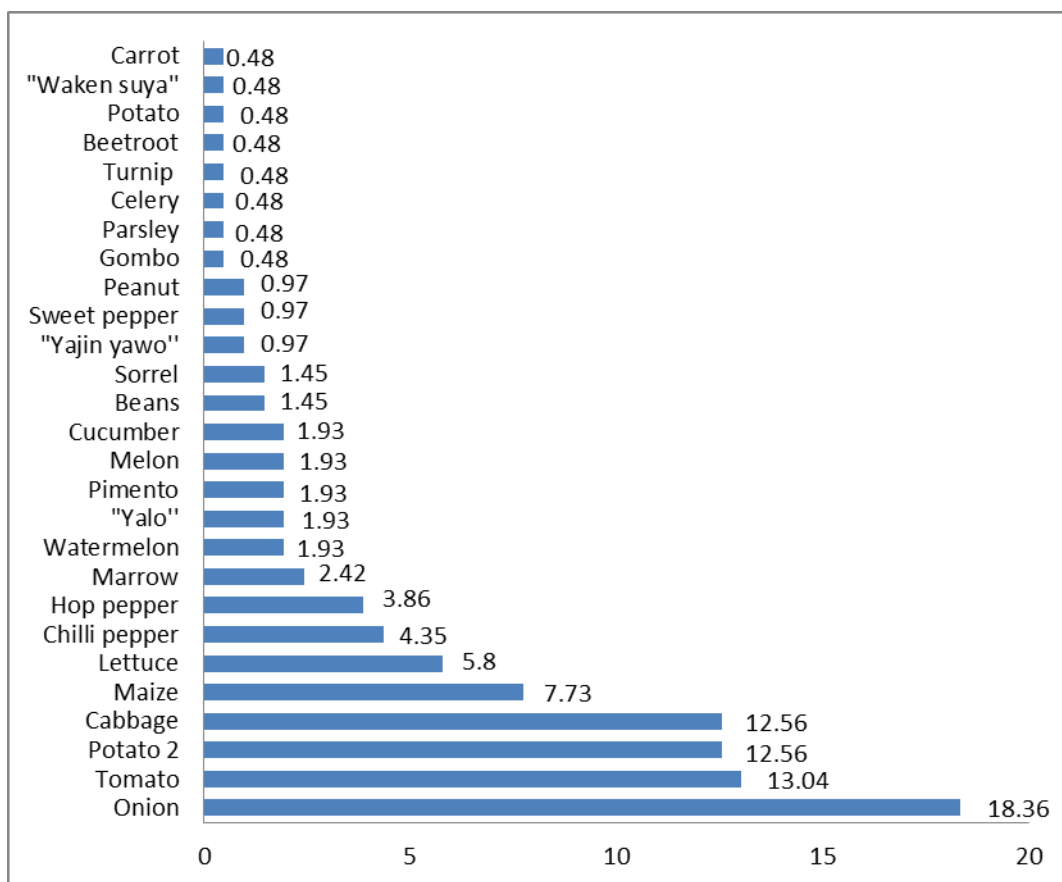


Figure 3: Various Vegetables Grown by Market Gardeners
Source: Field Survey, 2016

Complimentary Sources of Livelihood

Breeding of Livestock

Breeding was also an activity largely practiced by peri-urban market gardeners in Maradi. Being one of the main contributing sources to the economy of Niger Republic and the second activity of the Maradi region's population, the practice of breeding is not a new thing both in urban and peri-urban areas (DRP, 2012). The manure produced was widely used by market gardeners (Plate 1). This study found that majority of the Maradi peri-urban market gardening gardeners practiced breeding (76%), out of which over 90% used organic manure in their activities (Table 2). The same

observation was made by Ali *et al.* (2003) who reported that 60.9% of urban households and 81.1% of peri-urban households in the city of Maradi kept livestock and manure produced by animals, 68.6% for urban households and 96.7% for peri-urban households, used primarily for agricultural purposes to amend poor soils. However, in Niamey little proportion (2%) was practicing breeding (Andres and Lebailly, 2011). In Maradi, the gardeners do not worry about the management of soil fertility (fertilizers) and its pollution in peri-urban garden sites.



Plate 1: Manure Used by Market Gardeners in Godiya Noma Site (Commune 1)

Source: Field Survey, 2016

Table 2: Breeding Practice and Use of Organic Manure

Options	Breeding Livestock		Options	Use of Organic Manure	
	Number of Gardeners	%		Number of Gardeners	%
Practice	34	76	Practice	41	93
Not Practice	11	24	Not Practice	3	7
Total	45	100	Total	44	100

Source: Field Survey, 2016

From this study, one can clearly see a strong qualitative interrelationship between Maradi market gardening and urban and peri-urban stock farming. The gardening site benefited from livestock through organic manure, the use of animal-drawn ploughs for ploughing and use of animals in the transportation of inputs to the sites as well as products for refueling city markets. On the other hand, breeding enjoyed a forage intake from the

crops residues and herbs that accompany crops especially during the lean season. In addition, some market gardeners were able to buy more livestock with income they generated from sale of surplus garden products following a good harvest. Thus, they practice livestock fattening with the savings made from the sale of products. This interrelationship is of great importance and it might come in response to what was revealed

from the study of Ali *et al.* (2003) that "The high cost of fodder and their scarcity were the main constraints, particularly during the lean period" which slowed or even stopped the practice of livestock in some households. Thus, this practice also reduced the problem highlighted by Andres and Lebailly (2011) for which the "most costly input for market gardening is the fertilizer".

Forestry

The combination of forestry and gardening on a farmland is a practice widely used in the peri-urban market garden sites of Maradi (Plates 2 & 3) and majority, about 78% of farmers practiced that (Table 3). Those who were not combining forestry and gardening in this area had their reason, which was because the lands did not belong to them. Majority of the market gardeners that practice forestry

were growing moringa (*Moringa oleifera*) (19.69%) and mango (*Mangifera indica*) (18.90%). The least proportion of the gardeners were growing dates and mahogany, with 0.79% each (Figure 4). It was found out by this study that all the market gardening farmers holding the land on rent were not practicing forestry. Therefore, renting site constitutes an obstacle to the development of the forestry practice. This shows that majority of the oldest sites (Soura Bakassa, Kokari, Godiya Noma, Lanbou Entente and Tabkin Daouda) were dominated by forestry than vegetable cultivation. The result also shows that in terms of the quality of trees cultivated some market gardeners (0.79%) practice tree nursery and supply the neighboring settlements - Tchadoua, Serkin Yamma, Tagaza among others.



Plate 2: Combination of Forestry and Market Gardening in Godia Noma Site (Commune 1)
Source: Field Survey, 2016



Plate 3: Combination of Forestry and Market Gardening in Soura Bakassa Site (Commune 1)
Source: Field Survey, 2016

Table 3: Whether Respondents Combine Forestry with Market Gardening

Responses	Number of Gardeners	%
Yes	35	78
No	10	22
Total	45	100

Source: Field Survey, 2016

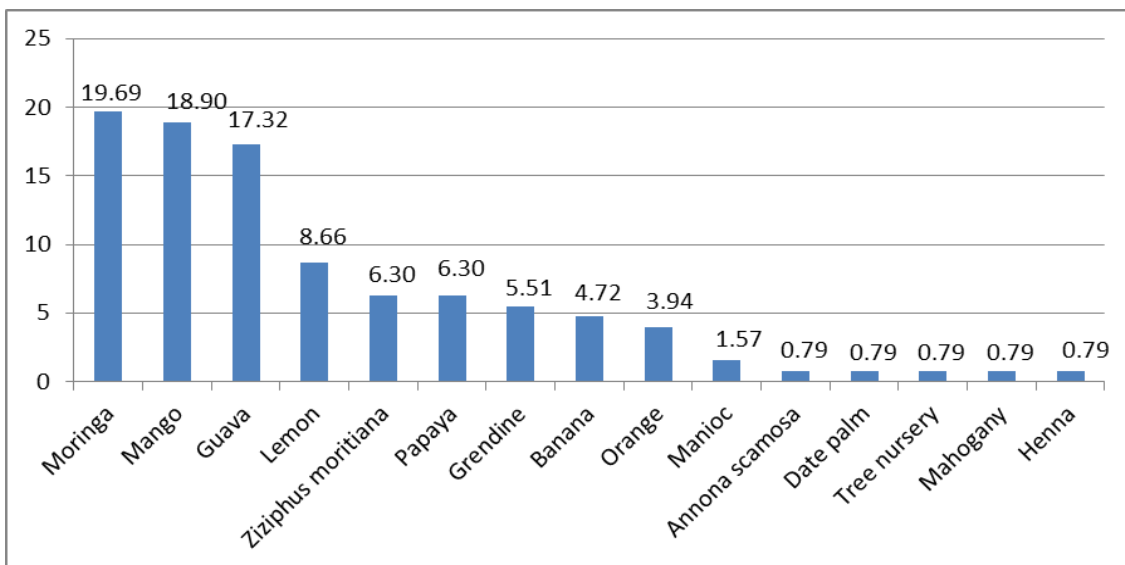


Figure 4: The Forest Products Grown by the Market Gardeners

Source: Field Survey, 2016

Reasons for the Sources of Livelihood

The different reasons of peri-urban market gardening practice, together with breeding and forestry, in Maradi were economy (for sale), family diet, inheritance (to maintain parental occupation), vocation (because of interest and skills in the work) and the future (for sustenance of livelihood). The dominant ones were economic reasons (47%) and family diet (27%), and the least were vocation (6%) and future (3%) (Figure 5). The gardeners who

practiced gardening for the future had as their reason that the activity was not beneficial at the beginning, but with age and mastery in practice, it is going to be of great importance economically in the future. Focus group discussion revealed that despite the threats facing this activity ranging from temperature rise to parasitic threats, production was increasing rather than decreasing.

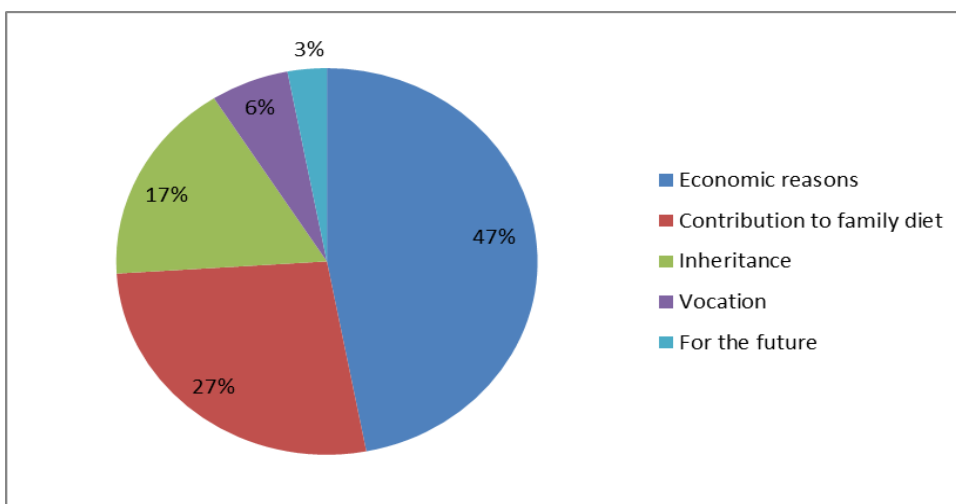


Figure 5: Reasons for the Practice of Peri-urban Gardening

Source: Field Survey, 2016

Sale of products is one of the driving factors of good practice of market gardening. Figure 6 shows the market garden sites and markets for the produce. For the produce price, its quantification was not easy considering not only its strong variability but also the

measurement units (*Tiya*, Bag, Basket, floor division) and condition of products for sale (fresh or dry). It was in this condition that some product' prices were collected during the period of data collection (Table 4).

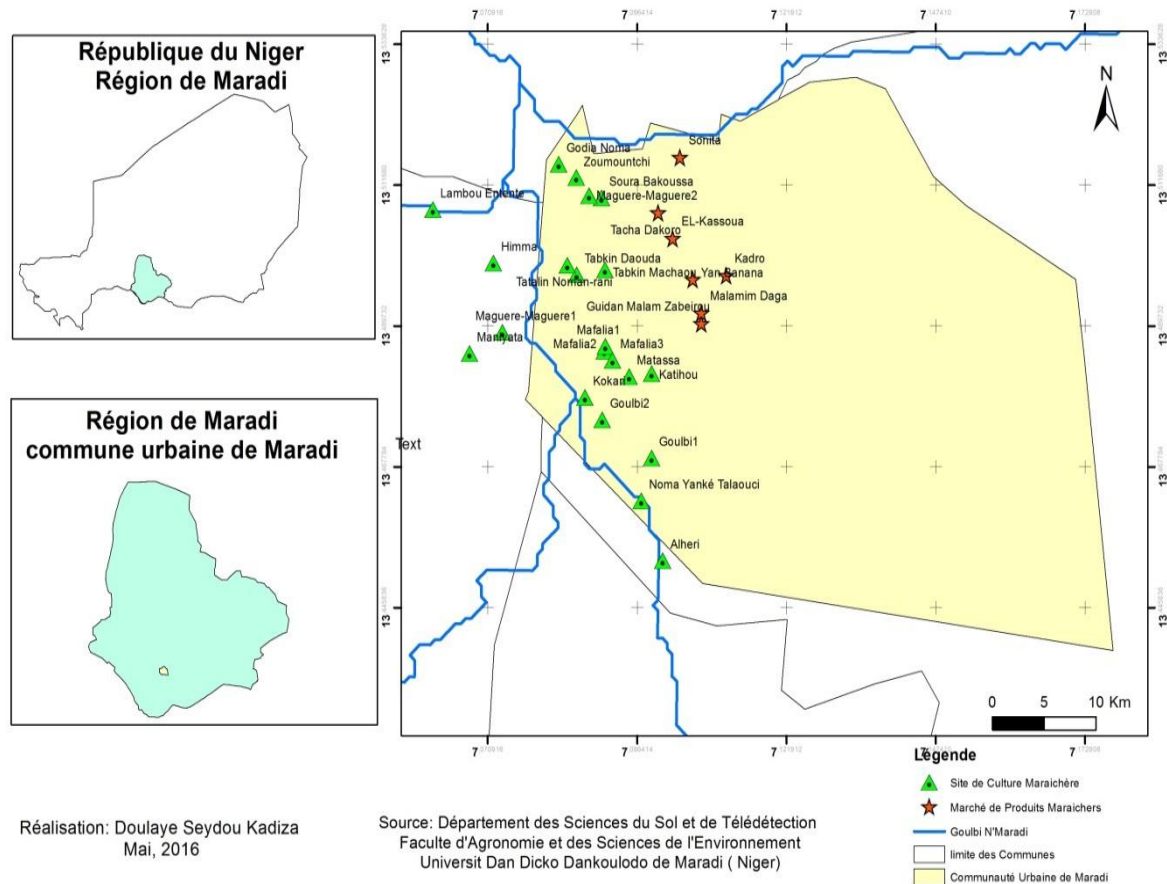


Figure 6: Garden Sites and Markets for Garden Produce of Maradi City

Table 4: Price of Products

Products	Minimum (in FCFA)	Maximum (in FCFA)	Unit
Onion	10000	15000	Bag
Cabbage	5000	10000	Bag
Tomato (fresh)	1500	5000	Basket
Chilli pepper	10000	13000	Bag
Lettuce	1500	2000	Basket

Source: Field Survey, 2016

Conclusion

First, peri-urban market gardening complimented by breeding of livestock and forestry in Maradi has contributed greatly to food security, livelihood and the lessening of more other adverse impacts caused directly or indirectly by climate change. This activity allows some gardeners to be independent from rainfed agriculture and shows that drought may not lead to famine in this area. Second, the ownership of sites has effect on the diversification of livelihood as rented lands constituted obstacle to engagement in forestry. However, those who personally owned the lands particularly in the old sites could compliment market gardening with forestry. Third, the response by some of the gardeners that they inherited the work is a clear indication that it is an old practice in the area. Fourth, the complimentary livelihood options require patience for the benefits to be enjoyed. This is evident from the reason given by some of the gardeners that they engaged in the activity for future benefit because it was not beneficial at the beginning.

Recommendations

Based on the conclusions, the following recommendations are made.

- i. The state and Non Governmental Organization should assist the peri-urban market gardeners with technical training and sensitization. This will help improve the activity so that it can offer more contributions to adaptation to and mitigation of climate variability and change.
- ii. More and better inputs should be made available and affordable to the farmers so as to boost their activities. Instead of relying on manure derived from animal dung, fertilizer should be made accessible by government and other organizations. Other inputs to be made available to the farmers should include pesticides, implements and improved seeds among others.
- iii. The market gardeners should be trained on the various waste processing techniques into fertilizer to ensure urban safety, reduce financial input and to avoid excess use of chemical fertilizer.
- iv. This study should be extended to other cities of Niger Republic and the Sahel zone in general in order to find out more on advantages and sustainability of peri-urban market gardening.

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