

Peri-urban Agriculture: The Case of Market Gardening in Niamey, Niger

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Abstract

A study was carried out in Niamey (capital city of Niger) to explore the market gardening periurban system. This activity is an option to minimize the risk of urban food insecurity in the Republic of Niger. In Niamey, you have two traditional areas to practise the market gardening production: Gamkalle and Yantala. The investigations study the area of Gamkalle. This study revealed more than 600 market gardening producers in Gamkalle. 50 producers of Gamkalle have been interviewed. These producers predominantly belong to the ethnic group “Zarma” and market gardening is their main economic activity. The principal period of production is during the dry season, the producers cultivate lettuce, cabbage, tomato, sweet pepper, beetroot, celery, carrot, parsley. Despite the higher costs notably in particular for input, the incomes generated by this activity are very high (\$ 2805.23/year/acre). In conclusion, market gardening presents an opportunity for urban dwellers to increase and diversify their incomes and obtain food security. Nevertheless, there are many constraints to develop this production: land tenure security, pollution by industrial production and access to quality seeds, pesticides and fertilizers.

Key words: *Agriculture, Market gardening, food, land*

1. Introduction

In West Africa, the urban population has increased for the last twenty years. According to the World Bank, “the Sub-Saharan Africa’s population growth in both rural (1.9 per cent annual increase) and urban (4 per cent annual increase) areas is the highest in the world. Since 1990, its urban population has doubled to 290 million people in 2007” (World Bank, 2009. p 2). An estimation of the United Nations indicates that the rate of urbanization is estimated to be about 3.5 per cent per annum, confirming the World Bank assertion which shows the highest urbanization rate in the world (UN population division, 2004 in Drechsel, 2006; Temple and Moustier, 2004; Ag Bendeck, and *al.*, 1996). The principal cause of this urbanization is the rural-urban migration (Beauchemin and Bocquier, 2004. p 2045), although it has slowed down in

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recent years (Potts, 2009). The increase in the size and proportion of the urban population raises the demand for food and hence the need for urban agriculture (Moustier et Pages, 1997; Government of Niger, 2006).

The Sahel countries in Africa face a different kind of food insecurity problem because their rural populations are higher than their urban population but the supply to their cities is very difficult owing to their remoteness from a supply harbour. For example, the nearest harbour to Niamey is the harbour of Cotonou. It is at a distance of about 3,000 km. This import of food generates higher costs (CNUT, 2010). However, the market gardening producers intend to commercialize their production all the more so since the autoconsumption of the market gardening products is not generalised as the consumption of the inhabitants of Niger is strongly based on cereals (millet and sorghum). Besides, the vegetable consumption contributes to fight against hunger. It diversifies the diet and increases the nutritive quality of the food consumed. In Niamey, the periurban and urban market gardening production has increased along the Niger River. Indeed, in 2008, the market gardening production of Niamey was estimated at 18,848 tons. The area of market gardening is of 1,273 ha (Ministère du développement agricole, 2008). There are three market gardening areas in Niamey: Kori Ouallam (37 per cent); Gountou Yéna (12 per cent) and the riverside of the Niger River (51 per cent) (Serkin Arewa, 1989). The most important is the riverside of the Niger River namely the area of Gamkalle and Yantalla. Niamey presents different types of agricultural activities: rain agriculture, market gardening, flooded rice and fruit-tree cultivation.

In Younoussa and Haro, the market gardening cultures of Niamey produce fifteen vegetables: cabbage, lettuce, tomato, carrot, onion, zucchini, sweet pepper, hot pepper, eggplant, French beans, melon, cucumber, cassava root, maize, strawberry (Younoussa and Haro, 2004). The market gardening system is a traditional irrigating system with the introduction of power-driven pumps. In 2010, the area of Niamey was 320 km² large and its population amounted to 1.22 million inhabitants, that is 3,812 inhabitants/km² (INS-Niger, 2010). On average, the inhabitants of Niamey consume 17.9 kg of vegetables per person per year. This consumption is below the recommended standards for a balanced diet (Government of Niger, 1994). Niamey is the principal city of Niger where the habits of market gardening go back to several decades.

Furthermore, the poverty rate of this city (27.8%) is below the national average that is 59.5% which allows to develop and to distribute the market gardening production more easily (Government of Niger, 2008b). Currently, the market gardening production improvement is not integrated in the rural development policy of Niger. Nevertheless, this rural development policy attempts to develop the irrigation along the Niger River. The development of irrigation should be able to encourage the market gardening production (Government of Niger, 2003). But, market gardening is not introduced in this rural development policy specifically and a specific context should be created by the State of Niger. In the future, the issue of the supply of market gardening products in Niamey will be an essential priority for the national authorities and this production will allow to develop the periurban agriculture and to raise food self-sufficiency of the urban population of Niamey. The case of Niamey is very different compared with the other cities of West Africa (Abidjan, Accra, Cotonou and Dakar). Indeed, Niamey is located next the Sahara but this city is particularly interesting because it is along the Niger River (Ba Diao, 2004; Floquet, 1999; Gough and Yankson, 2000).

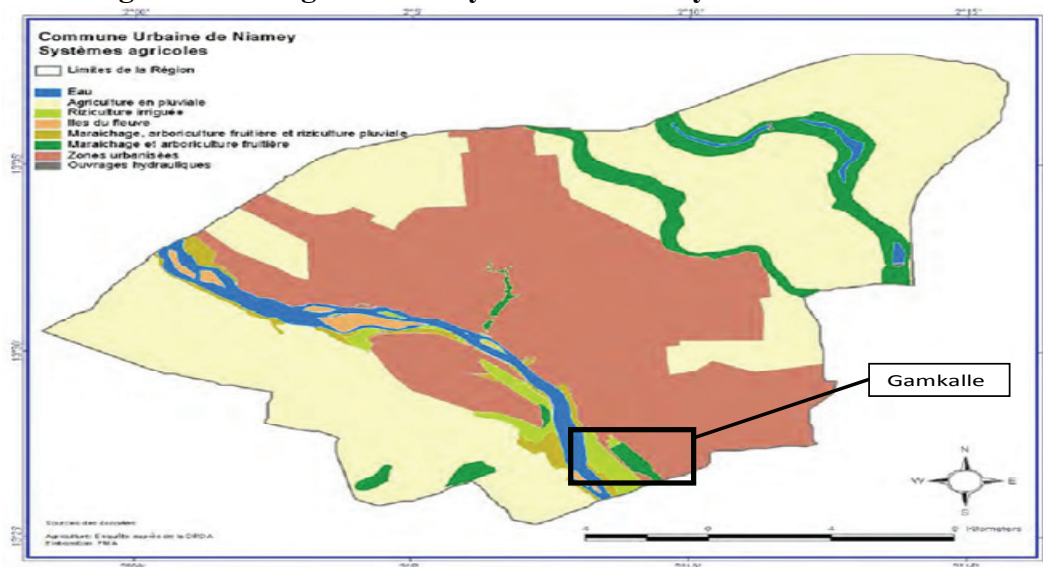
In this paper, we analyse market gardening in the Gamkallé area and the objective of this paper is to prove the importance, the potentials and the constraints of the periurban market gardening in Gamkalle, a settlement which is located on the left side of the Niger River in Niamey. It is a particularly interesting case study because it is one of the biggest market garden areas in the country, stretching over an area of 230 ha cultivated by an estimated 600 producers (Motcho Kokou, 2004; Ali Hamidou, 2011).

The rest of the paper is divided into three sections. The next section explains the methodology used for this study. Following that, the paper presents the result and the discussion about the investigations and other studies. This part is further divided into six sub-sections: the estimate of vegetable demand of Niamey; the price of some product into five market of Niamey; the case of Gamkalle; the socio-economic and agronomic characteristics of market gardening producer; the gross margin of market gardening producers, and the description of marketing system. The final section of this paper is the conclusion which highlights the main findings of the study and analyses the opportunities and the constraints of the market gardening production in Niamey.

2. Case Study Area and Method of Data Collection

Figure 1 shows the location of Gamkalle in Niamey where market gardening is characterized by two food production systems, namely irrigated rice-growing and market gardening. These systems are associated and their surfaces vary each year. For example, in 2008, the irrigated rice surface (2962 ha) was higher than the market gardening surface (1,273 ha) (Ministère du développement agricole, 2008). Market gardening in Niamey is characterized by commercialization of vegetable and fruit production. Market gardening is generally characterized by a local food system. In Comps and *al.*, the local food system is defined as “system mobilizing not more than one intermediate person (Chaffotte and Chiffolleaux. in Comps and *al.*, 2011. p 2). The distance between the production area and the market does not exceed ten kilometers.

Figure 1: The agricultural systems of Niamey



Source: Younoussa and Haro, 2004

For the purpose of this paper, market gardening is defined as “the growing of vegetables for markets and is commonly associated with the cultivation of fruit and flowers” (Wong, 2005, p 6; Bachmann, 2009, p. 1). Gross margins are calculated on the basis of the cost price and the selling price of different products. The evaluation of the total value of the vegetables price is estimated by the multiplication of the total produced quantity and the unit price of the product. The cost price is the addition of the fixed (e.g., agricultural equipment) and variable (e.g., input and work force) costs. The difference between the selling price and the cost price is called the gross margin (Ferraton and Touzard, 2009). The figures are expressed in terms of the US dollar (\$). These calculations were done using SPSS statistical software and the results presented with the help of MS Excel.

We interviewed officials of the market gardening producers’ organization in Gamkalle as well as 50 market gardening producers. The investigations were conducted in June and July 2011 within the framework of collaboration between the University of Abdou Moumouni of Niamey and the University of Gembloux Agro Bio Tech. These investigations were complemented by a large review of existing studies on population, vegetable consumption, land tenure, production of vegetables, and prices of some produce.

3. Results and Discussion

3.1. *The vegetable demand of Niamey*

The Republic of Niger has had three censuses of the population in 1977, 1988, and 2001. The vegetable demand calculation in Niamey is based on those censuses. Between 1977 and 2010, the evolution of the population of Niamey was multiplied by 5.4 and the average annual rate of increase (1977-2001) is 3.3 per cent (%). This rate is the highest in the sub-Saharan Africa countries (Table 1) (Bureau Central du Recensement, 1977; Bureau Central du Recensement, 1988; Bureau Central du Recensement, 2001; INS-Niger, 2010). This noteworthy increase is explained by the significant national and regional immigration. During the past three decades, this immigration was mainly due to rural depopulation resulting from the growing economic attraction of Niamey.

Table 1 : Evolution of the population (inhabitants) of Niamey

Year	1977	1988	2001	2010 [‡]
Niamey	225,000	391,876	708,851	1,222,066

Sources : Bureau Central du Recensement, 1977; Bureau Central du Recensement, 1988; Bureau Central du Recensement, 2001; INS-Niger, 2010

The only study that characterized the vegetable consumption in the urban areas of Niger dates back to 1994. This study showed that the vegetable consumption in the city of Niamey was estimated at 17.9 kg per inhabitant per year (Government of Niger, 1994). This standard has been used to calculate the total demand of vegetable in Niamey in 2010 that was estimated at 21,875 tons. However, according to the Ministry of Agricultural Development and Livestock, the market gardening production was estimated at 18,848 tons (Ministère du développement agricole, 2010). In 2010, the balanced diet with vegetables showed a deficit of 3,027 tons of vegetables in Niamey. Furthermore, the majority of vegetables consumed in Niamey

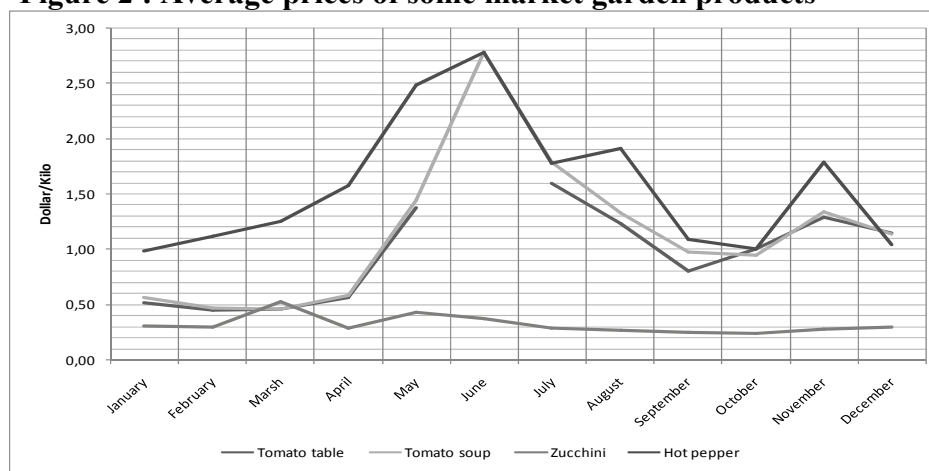
[‡] The data introduced in 2010 are an estimation calculated from the demographic increase rate of 3.3% per year of the three censuses

are tomatoes and zucchini (Government of Niger, 1994). This estimation confirms the potentialities of the development of market gardening production in the periurban area of Niamey. The market gardening production increase will reduce significantly the vegetable importations from Ghana, Nigeria, Madoua City (Niger), Burkina Faso, and the Republic of Benin (Rodrigo et al., 2011).

3.2. The price of some market gardening products

Average prices in five markets of Niamey (Harobanda, Katakoto, Petit Marché, Bonkaney and Wadata) in 2010 are showed in Figure 2. The data come from the Information System of Agricultural Market and they date back to 2010 (SIMA, 2011). The products analysed were table tomato, the tomato for sauce, zucchini and hot pepper because, according to the study of the Government of Niger (1994), tomatoes and zucchini are the most consumed vegetables in Niamey. Figure 2 shows the variation in the prices of these products. Yet, the prices of zucchini remain stable all the year round.

Figure 2 : Average prices of some market garden products



Source: SIMA, 2011

These price variations are influenced by the agricultural cycle of each product. This cycle varies between one (lettuce) and three (carrot) months. During the hot season (March-May), the market gardeners of Gamkalle grow hot pepper, zucchini and cucumber. During the rainy season (June-September), they cultivate gumbo, melon and beans. During the dry season (October-February), they grow lettuce, cabbage, tomato, sweet pepper, beetroot, celery, carrot, and parsley. Between March and September, the price of some products is very high because a lot of producers do not cultivate these market gardening products (tomato or hot pepper). The price of table tomatoes is not available during the months of May, April, June and July because the market gardening producers do not produce those products (Figure 2). This part shows that a continuous production all the year round can raise significantly the gross margin of market gardening producers and interest for the market gardening production in periurban areas (SIMA, 2011).

4. The case of Gamkalle

Gamkalle is located on the left riverside of the Niger River. It is a big village at the outskirts of Niamey. Currently, this village is incorporated into the four “communes” of the Urban Community of Niamey (UCN). Gamkalle is composed of residential areas, industrial areas, agricultural areas (market gardening and rice production). The

proximity of industrial areas leads to a soil pollution of agricultural areas. This pollution comes from the dumping of toxic waste of some industries into the Niger River. For example, there is a textile industry next to the market gardening area and the waste is usually deposited into the Niger River. It is one of the principal problems of the market gardening area of Gamkalle (Motcho Kokou, 2004; Ali Hamidou, 2011; Diaz Olvera *et al.*, 2002).

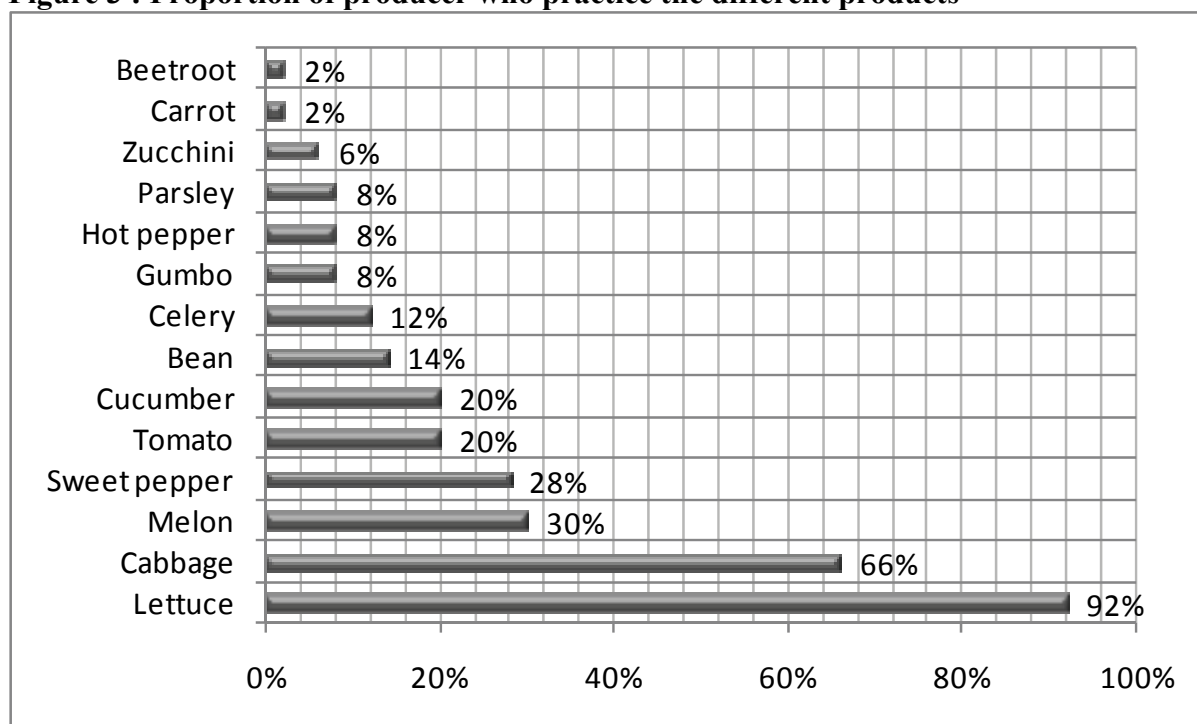
4.1. Socio-economic and agronomic characteristics of the market gardening producers of Gamkalle

The market gardening production of Gamkalle stretches on an area of 230 ha. There are 600 producers in this area but we have investigated and analysed the work of 50 producers of this area. The village of Gamkalle is predominantly composed of the ethnic group "Zarma" whose principal activity is fishing and irrigated agriculture (market gardening and rice-growing). Hundred per cent of the sample have market gardening as their principal activity and 96 per cent are Zarma. A majority of the producers are residents in the Gamkalle district. On average, the producers have been practising market gardening production for 16 years. Nevertheless, some producers (20 per cent) realize a secondary activity: trade (12 per cent); livestock farming (2 per cent); cereal agriculture for subsistence (2 per cent) and taxi driving (4 per cent). The rest of interviewed does not have secondary activities. The average age of our sample is 43 years with a maximum of 67 years and a minimum of 22 years. Market gardening is essentially practised by men. Indeed, 98 per cent of the producers are male. It is interesting to observe that only one woman practices market gardening. The investigations have showed that the wife of the head of the household has other profit-making activities, including cook selling dishes. Seventy six per cent of the producers are the heads of the household. On average, the households of the producers are composed of 12 members. The highest number of members per household is 27 and the minimum is 5 members.

These market gardens are irrigated by power-driven pumps but the other activities of the production are characterized by traditional techniques (the model of modern and traditional hoes). The total area cultivated by all producers is 10.5 ha and the average area per producer is 0.21 ha but there is a high variation, the standard deviation is 0.31 ha. The minimum area is 0.02 ha and the maximum area is 1.44 ha. The farming lease tenure of this area has been obtained by different ways: inheritance (54 per cent); buying (10 per cent); renting (28 per cent); lending (8 per cent). Many properties are traditionally-owned (inheritance) and few estates are bought or rented.

In Niamey, communal leaders and the traditional chiefs have the power to manage land, although Government of Niger has created a structure under the Rural Code to more formally regulate land tenure (Lund, 1998). Also, The Rural Code Secretariat manages the relationship between producers and communal authorities. The area of each producer is subdivided into "planks". These "planks" have an average dimension of 5.3 square metres. They vary between 1.6 and 10.0 square metres. Each market gardening producer has on average 334 boards and there is one product per "plank". On average, there are three products per market gardener and the average period of market gardening production is 4 months but there is a big variation per producer. In total, the producers of our sample produce the following products: lettuce, cabbage, Melon, Sweet pepper, Tomato, Cucumber, Bean, Celery, Gumbo, Hot pepper, Parsley, Zucchini, carrot, beetroot. The most frequent cultures are lettuce and cabbage. Indeed, lettuce is cultivated by 92 per cent of the market gardeners and cabbage is cultivated by 66 per cent of the market gardening producers (Figure 3).

Figure 3 : Proportion of producer who practice the different products



Source: Ali Hamidou, 2011

The technical procedure is the same for each product: soil preparation of the "planks"; irrigation with a power driven pump, input spreading and hoeing. The producers make the mounding of some products (carrot, Melon, Celery). The spreading is made from the beginning of the agricultural cycle; it is realized with organic enrichment (manure). This manure comes from the slaughterhouse of Niamey or from breeders situated near the right riverside of the Niger River. This enrichment is completed with fertilizers (Nitrate-Phosphorus-Potassium; Di-Ammonium-Phosphate; Urea). The cost price of the enrichment with the manure is \$1.51 per 10 kilos. The cost of the manure coming from breeders situated near the right riverside is made up of the buying cost (\$1) and transport by land or by river (\$0.51). The producers use a basin to irrigate. They fill the basin at the power-driven pump and the market gardeners irrigate the "planks" with watering cans. Each market gardener puts phytosanitary products on the "plants". Three phytosanitary products are liquid (Decis, Malathion and Karate) and two are solid (Kanifor and Kalimal). The sowing is realized on a "plank" and this "plank" is named a nursery. The plants of the nursery are transplanted on the "planks". The investigations have showed that the harvest operation is not an activity practised by the producer. Finally, the harvest is generally realized by the traders and it stretches over the sale period.

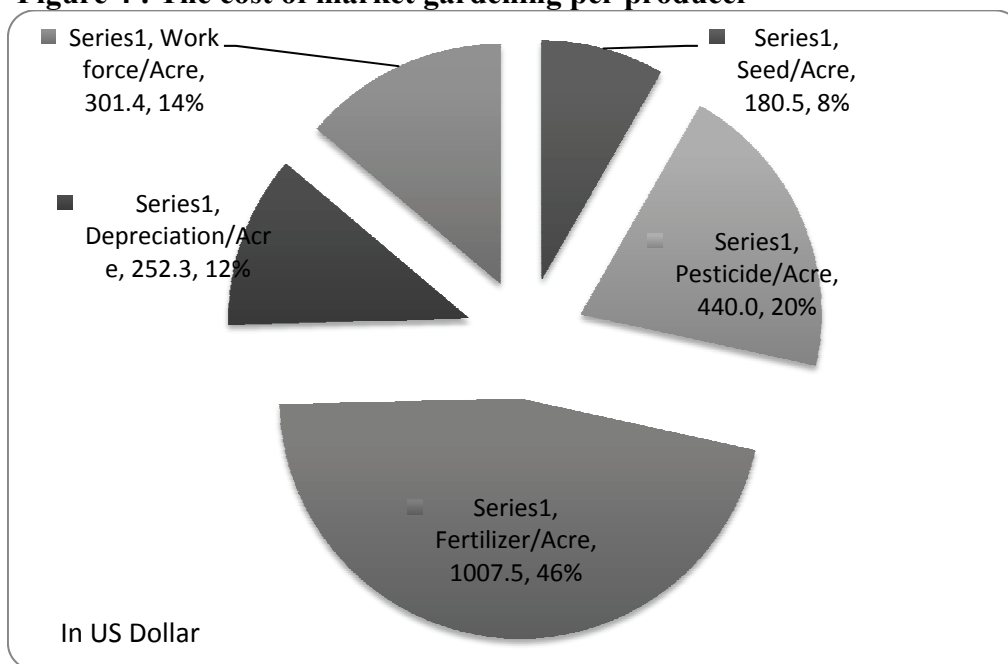
4.2. The gross margin of market gardening producers

The work force is subdivided into two groups: the family and the wage-earning force. The average work force per producer is four persons compose of two family members and two wage-earning workers. The average income of one wage-earning worker is estimated at \$22 per month. According to Otegbulu and Babawale (2011. p 239) "The depreciation of agricultural equipment is calculated with the straight-line method [under which] the asset is depreciated by dividing the depreciable base by the number of years of the estimated life of the tool to determine the depreciation expense per

year”. The investigations have identified eight agricultural equipment types: power-driven pump, spreading equipment, modern and local watering-cans, hoe, barrow, rake and shovel. Except for modern and local watering-cans, the producers have on average one tool of each agricultural equipment type. The period of depreciation is very short (two years)[§].

The highest cost of production is the fertilizer cost (\$1,007/acre) followed by the pesticide cost (\$440/acre) and the work force cost (\$301/acre) (Figure 4). The average cost per producer is \$2,182/year/acre and the gross margin per producer is \$2,805/year/acre. The standard deviation of this gross margin is \$2,127/year/acre. This standard deviation is high because it is influenced by many variables: different products per producer; the number of months of production; the variation of prices during the year and the costs per product.

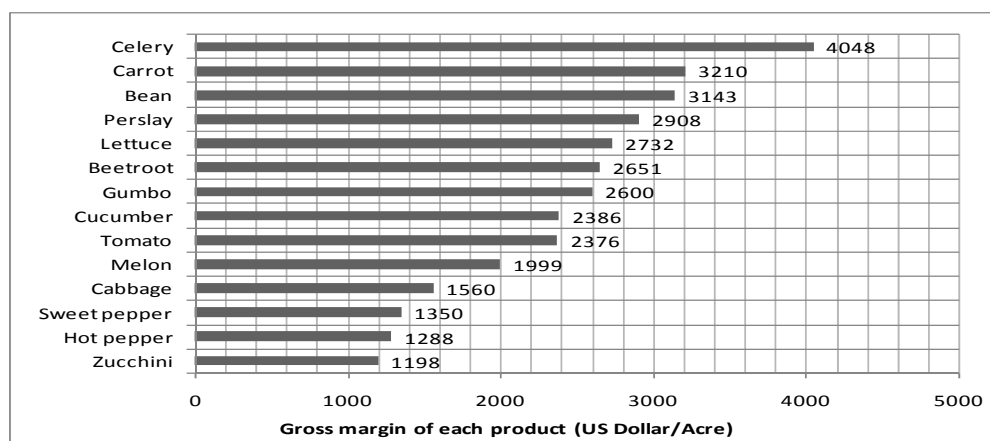
Figure 4 : The cost of market gardening per producer



The gross margin per product is obtained by subtracting the cost price from the selling price. The cost price includes the cost of fertilizers, the pesticides and the seeds. In this calculation, we have not integrated the work force and the depreciation of equipment because they are shared by several products. The gross margin per product varies between \$1,198/acre/cycle for the Zucchini and \$4,048/acre/cycle for Celery. These gross margins show the importance of diversifying the production in order to increase the producers' gross margin. Additionally, the market gardening producers should produce several products all the year round in order to increase their gross margins (Figure 5).

[§] In the investigations, the market gardening producers had difficulties to estimate periods of depreciation but given the difficult climatic and soil conditions, we have kept this estimation.

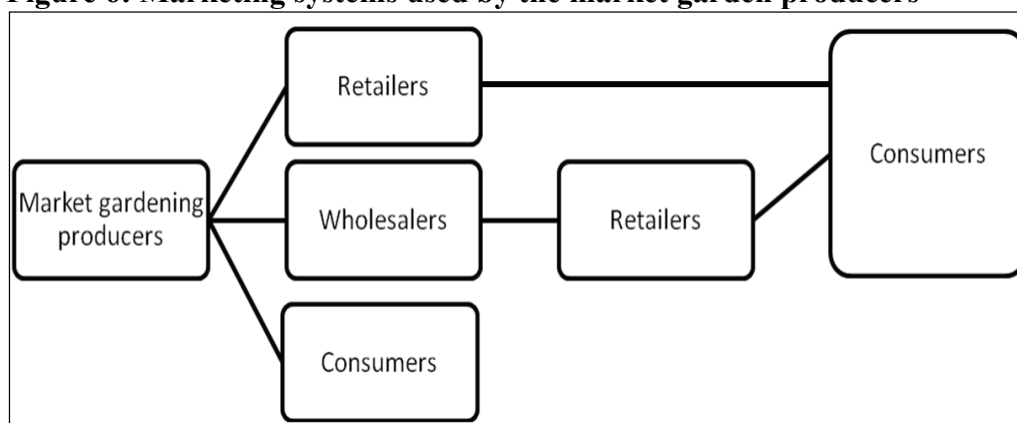
Figure 5: Gross margins of the different market garden products



4.3. Marketing systems used by the market gardening producers

The producers use three marketing systems to sell their market gardening production: zero intermediary; one intermediary and two intermediaries. Those commercialization systems are characterized by the “proximity” between the production area and the consumers in Niamey (Comps et. al., 2011. pp. 2-3). This local production makes the flow of the market gardening products easier and reduces significantly the storage duration of the products. The producers sell several "planks" of the market gardening products to the consumers or the retailers or the wholesalers. This practice lowers the cost of the commercialization and encourages the local consumption of market gardening products (Figure 6). During the investigation, the producers indicated that the importation of market gardening products strongly reduces the price of their production. Verifying this finding is difficult because the importation of vegetables into Niamey is typically informal. However, according to Rodrigo et. al. (2011), vegetables are usually imported to Niamey from Madaoua city (Niger), Ghana, Nigeria, Benin and Burkina Faso. The higher demand for market gardening products in Niamey drives up the demand for imports to complement the available local supplies from market gardening. This importation is facilitated by the “elimination of the national barriers trade” but the costs of trade road increase with the informal custom controls. Their Controls prevent the development of the Sub-regional market gardening trade (Agbodji, 2008; Observatoire des Pratiques Anormales, 2010).

Figure 6: Marketing systems used by the market garden producers



The relationship between the producers and the urban authorities is complicated. Although the authorities collect taxes from the producers, they sometimes evict them without paying any compensation. In such circumstances, it is the traditional chief of Gamkalle, doubling as the representative of the producers, who negotiates with urban authorities to ensure the return of the producers (Motcho Kokou, 2004; Rodrigue et al., 2011). Given that, in Gamkalle, urban agriculture supports other urban uses, it is argued that the urban authorities should create a town plan that supports the market gardening *producers inter alia* by offering them secure land tenure.

5. Conclusion

In conclusion, the high demand for market gardening products in Niamey is a tremendous opportunity for the producers of Gamkalle. Furthermore, the attractive prices during different periods of the year should allow to develop market gardening but the environmental degradation (industrial pollution) is a big problem for the development of this production. The future development programmes and policies should encourage the market gardening producers to produce all the year round because the attractive prices will increase their gross margins. However, the annual gross margins per are have already risen significantly. Indeed, the producers say that this activity is very lucrative and its gross margin covers the expenditures but the market gardening production is reduced on account of restrictions and expenses for input locations (pesticides, seeds and fertilizers). Besides, the big challenge for market gardening producers is the pressure on land tenure exerted by urbanization and industrial activities. Additionally, the products which have the best gross margin should be promoted among the producers. For the future, another study should be realized for each product in order to analyse the economical parameters of cost production per product.

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