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## Peri-Urban Agriculture in the Metropolitan Area of Rabat, Morocco: Potentials and Constraints

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### Abstract

*Peri-urban agriculture (PUA) comprises a broad set of agricultural activities carried out in cities or in close proximity to cities. With increasingly permissive approaches to diverse livelihood strategies and open markets in agricultural inputs, services and products, urban dwellers are engaging in a range of agricultural practices. However, farming in the peri-urban is under strong pressure from urbanization. The economic, social and environmental roles of farming need to be better understood in order to integrate peri-urban agriculture into urban planning.*

*The current study was aimed to assess practices, potentials and constraints of PUA in Rabat Metropolis. Fifty respondents were selected randomly to obtain significant information. Data collection from farmers was based on field observation, interviews and field surveys. Descriptive statistics such as frequency distribution, Chi-square test, tests of normality and homogeneity of variances and Principal Component Analysis (PCA), were used. According to the major findings of the study, the major types of peri-urban farming practices in the study area includes: horticulture or production of fruits and vegetables, crop farming and some livestock rearing such as beef farming, sheep farming and poultry farming. The survey result reveals that there are various significances of PUA in the study area: it contributes to the economic development of the metropolis as it generates income for farmers, creates employment, contributes to food supply and enhances economic use of land and environmental beautification of the city. Results reveal also that legal constraints mainly the absence of laws regulating this activity and the obligation of some farmers in the peri-urban area to pay housing taxes and technical constraints such as insufficient workforce and high labor costs, difficult access to irrigation water, lack of training and technical supervision and support from the concerned body were the restraining forces to peri-urban agriculture growth in the area.*

**Keywords:** Peri-Urban Agriculture, urbanization, Rabat, Morocco.

### INTRODUCTION

Food security and income generation, in the context of current and prospective increased urbanization, are some of the positive outcomes related to the widespread practice of peri-urban agriculture as a poverty alleviation strategy. Food security and income generation, in the context of current and prospective increased urbanization, are some of the positive outcomes related to the widespread practice of urban agriculture as a poverty alleviation strategy.

An inclusive definition of peri-urban agriculture, which is under consideration in this current document, describes peri-urban as "an industry located on the fringe of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-) using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area" (Mougeot, 2000).

The Food and Agriculture Organization (FAO) has assigned the acronym PUA (Peri-urban Agriculture), to "peri-urban agriculture" designating the agriculture which develops in the zones surrounding the cities (FAO, 2001; Nugent, 2000).

Characterized by its multifunctionality, peri-urban agriculture offers multiple advantages and services. It has been found to play an important role in many cities around the world (De Bon *et al.*, 2010), though it is often under-reported. It represents an important issue to meet the food needs of the cities; it participates in the

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generation of direct and indirect income, in the reduction of unemployment and the improvement of the living environment in urban spaces. (Aubry *et al.*, 2012; Bunwaree, 2000; De Bon *et al.*, 2010; De Zeeuw *et al.*, 2011; Dubbeling *et al.*, 2010; Zasada, 2011).

Interest in urban agriculture as a policy tool has considerably increased in recent years due to two global demographic milestones. In 2008, the world's urban population exceeded that of the rural for the first time in history (UNDESA, 2010) and in the late 2019, global population surpassed seven billion (UNFPA, 2020). This trend is expected to continue and eventually peak in the 2050s at approximately eleven billion, with 7 billion living in cities (UN, 2018). The Global South will absorb 90% of future urban population growth, notably in Asia and Africa. Annual rates of population increase of 5% are not an exception in the cities of these regions, meaning that the population doubles within approximately 14 years. Urban population growth between 2000 and 2020 in developing countries was 11.7 percent, 2 times higher than the rate of growth recorded in developed countries; in the least developed countries, it was 7.6 percent (UNDESA, 2020). This growth occurs against a backdrop of volatile food prices and increasing food insecurity, with over 821 million people globally classified as malnourished; critically, a growing proportion of this number now occurs in urbanized areas (FAO *et al.*, 2018).

These developments raise serious global, regional, and local challenges for employment, education, social cohesion, urban development, the environment, and food security.

In this situation, local provision of food, medicines, fibers and timber is a sheer necessity for the survival of many. Moreover, agricultural land can provide environmental, social and economic benefits such as generating fresh air that cools hot inner cities, offering places for recreation as well as opportunities for the generation of income and entrepreneurial activities in a mostly informal economy. However, the pressures of urban growth make it difficult to conserve farmland; but what is perhaps more problematic is that decision-makers and planners apparently still fail to recognize its value (Pauleit *et al.*, 2019).

In Morocco the percentage of urban population increased from 43% to 55% between 1982 and 2004 (HCP, 2004) and will probably reach 70% in 2050. This urbanization is increasing mainly at the expense of lowland areas with high agricultural potential already irrigated or easily irrigable, phenomenon observable in most of the coastal plains of Morocco but also in the other countries around the Mediterranean.

The annual agricultural area consumed in Morocco by the different forms of urbanization is estimated at 4,000 hectares, 2/3 of which for real estate operations (Tarik, 2012), despite the town planning law 12/90 advocating the principle of the preservation of highly productive agricultural land, and its translation into local planning and urbanism documents.

Like most major cities in the world, the metropolis of Rabat embodies the three challenges: urbanization, population growth and food security. Over the past 20 years, the metropolis has experienced significant urbanization during the 2000-2020 period to the detriment of rural / agricultural space. This phenomenon is mainly attributed to the demographic growth of the urban population of the Rabat-Salé-Kénitra region and to the rural exodus.

Few systematic studies have been carried out on peri-urban agriculture in Rabat and in Morocco in general. However, the continued growth of the metropolis indicates that a broader and more systematic understanding of the PUA is necessary to determine its importance and to help determine the best way to develop this type of agriculture in order to contribute to sustainability and food security for the city and the country in the future. This study represents the first known analysis of peri-urban agriculture on the fringes of the metropolis of Rabat with the aim of providing information on the importance of this activity and characterizing this type of agriculture. It will help also identify the various problems and challenges constituting an obstacle to the development of this sector. The results could also be used in future researches and in future planning policies to reflect on the best way to incorporate the sustainability of peri-urban agriculture into future city planning.

## **MATERIALS AND METHODS**

### **Administrative structure, geography and climate of the metropolis of Rabat**

The region of Rabat-Salé-Kénitra, including the capital of the kingdom, is one of the 12 regions of Morocco, created by the new territorial division of the regions in 2015.

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It is the result of the fusion of the ex-region of Rabat-Salé-Zemmour-Zaer and the ex-region of Gharb-Chrarda-Beni-Hssein. It is bounded to the north by the region of Tanger-Tetouan-Al Hoceima, to the southeast by the region of Fès-Meknès and to the south by the two regions of Casablanca-Settat and Beni-Mellal-Khénifra and to the west by the Atlantic Ocean (HCP, 2016).

The area of Rabat city is 118 km<sup>2</sup>. The peri-urban area includes two prefectures and one province: the prefecture of Salé (672 km<sup>2</sup>), the prefecture of Skhirate-Témara (485 km<sup>2</sup>) and the province of Khémisset (8,305 km<sup>2</sup>) (HCP, 2016) (Fig. 1).

The region's climate is temperate and semi-arid, favorable to agricultural activity despite the relatively low rainfall. It has a Mediterranean climate with a cold and rainy winter and average temperatures ranging between 0 and 5 °C at night and can reach 17 ° during the day. Summer has an oceanic climate with nights refreshed by the humidity coming from the ocean and days temperature around 30 °C. Exceptionally in spring or summer and during 3 or 4 days, the “Chergui” coming from the desert can raise temperatures up to 40 °C.

Rainfall is highly variable from year to year, with a maximum of 1168.2 mm in 2010 and a minimum of 92.3 mm in 2017 and an average of 434 mm between 2009 -2019. Rainfall in the region generally varies between 900 mm and 300 mm.



Fig. 1: Map representing the urban area of the Rabat-Salé-Témara region (Google Earth image May 2020)

### Study Site

The study area was delimited to a radius of 40 km from the urban core of the city of Rabat in order to remain within the peri-urban perimeter while ensuring the presence of farms with the majority of existing speculations in the region.

Data collection from farmers was based on field observation, interviews and field surveys. For this, a questionnaire of a series of 83 questions was developed and administered to 50 farmers.

The nature of the data was qualitative and quantitative. Both primary and secondary data sources were used. The primary sources of data for this study were collected from sample households that practice peri-urban agriculture. The secondary sources of data were sourced from various published and unpublished documents of the regional agriculture department office and public administration offices of Rabat and from annual statistical reports.

### Statistical Analysis

Data used in analysis were systematically organized, summarized, processed and interpreted using appropriate data analysis techniques to make them meaningful and to draw sound conclusion based on the research findings. The data collected through questionnaire are quantitatively tabulated, interpreted and presented by using statistical methods such as frequency distribution, Chi-square test, Tests of normality and homogeneity of variances, means comparison test and Principal component analysis (PCA) were used for the analysis of the data collected. All analysis and calculations were performed on the SPSS version 26 (Statistical Package of Social Sciences, V26.0) and Ms Excel.

## RESULTS AND DISCUSSION

Economic profitability is a determining factor in characterizing the importance of peri-urban agriculture. The survey result reveals that there are various significances of peri-urban farming in the study area: it contributes to the economic development of the metropolis as it generates income for farmers, creates employment opportunities, contributes to food supply and enhances economic use of land and environmental beatification of the city. Same results were confirmed by several studies (Jouve and Padilla, 2007; Aubry *et al.*, 2012; Bunwaree, 2000; De Bon *et al.*, 2010; De Zeeuw *et al.*, 2011; Dubbeling *et al.*, 2010; Zasada, 2011)

### Socio-economic role of PUA in the Metropolis of Rabat

Peri-urban agriculture is the main income source for almost 78% of the households interviewed, which indicates its important role for urban livelihoods as well as for employment opportunities (figure 2). According to a study carried out in Dar Es Salaam, Tanzania, peri-urban agriculture provided an estimated 20% of all jobs in the town (Sawio, 1998). In Lomé, Togo, the mean monthly income of a market gardener amounted to that of a senior public servant (Abutiare, 1995), and in Nairobi, peri-urban agriculture used to provide the highest self-employment earnings in small-scale enterprises and the third highest earnings in all of urban Kenya (House *et al.*, 1993).

### Crop production

In peri-urban areas of Rabat, the farmers conduct different types of agricultural practices in view of increasing their income through different ways.

As information obtained from the key informants and sample respondents, the most dominant speculation in the peri-urban area in the metropolis of Rabat is vegetable crops, with 56% of the respondents who practice vegetable crops. While arboriculture, field crops and fodder crops represent 44% of total food production.

With regard to the proportion of the destination of crops grown by farmers. The dominance of crops destined for sale is clear. They represent 60% of the total sample. Results of the survey indicate that 28% of the surveyed population sell only a part of their production while the rest is intended for self-consumption. Food crops represent 12% and are mainly fodder crops intended for animal feed.

Both cash and food crops are mainly vegetable crops and cereals such as common wheat, potatoes, tomatoes, etc.

Using the Student's T-test, the averages of yields in PUA are equal to those in conventional agriculture (table 1). This can be explained by the use, in PUA, of the same technical operations of conventional agriculture, in particular organic and chemical inputs, phytosanitary products, methods of spreading fertilizers, phytosanitary treatment techniques and irrigation of crops.

### Livestock practices

The survey result reveals also that livestock is a practice less regarded by farmers in the region: 54% of respondents do not practice livestock while 46% who do it have only a small herd.

In general, the most common types of livestock farming practice in the study area includes: beef farming, sheep farming and poultry farming practices. Such types of farming activities are kept in both peri-urban and rural areas of the country for various uses including milk and milk products, meat, eggs, food, cash and various cultural uses (Power *et al.*, 2004).

In relation to this, the expansion of livestock operations near the city poses environmental challenges, thus the need for regulation to limit air, soil, and water pollution as well as the spread of diseases (De Bon, Parrot, and Moustier, 2010). Despite these risks, PUA remains necessary and important as past studies indicate that it provides 95% of the poultry, pork, eggs, and milk consumed in a city (Moustier, Vagneron, and Bui Thi, 2004; Moustier and Danso, 2006; Van Veenhuizen and Danso, 2007).

In addition to improving food security and providing economic opportunities, UPA has additional environmental benefits: reduces the urban heat effect, thereby lowering temperatures; increases carbon sequestration; improves water quality; prevents erosion; and reduces the severity and recurrence of floods by providing buffer zones and storing excess water (Aubry *et al.*, 2012; Dubbeling, de Zeeuw, and van Veenhuizen, 2010).

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Results of the survey indicate that PUA in the metropolis of Rabat has a significant environmental impact that must be taken into account when implementing policies concerning this activity. It participates in the development of open spaces that are difficult to build, thus contributing to the creation of a beautiful landscape for urbanites. It limits the building pressure and maintains green belts for the urban population seeking green spaces for relaxation. PUA also has an important role in the recycling of livestock products by using the organic manure in the agricultural production process.

Table 1. Average yields of some crops grown in PUA and conventional systems in the metropolitan area of Rabat

Average yield	PUA	Conventional agriculture
Bean q/ha	10,5	9
Soft wheat q/ha	17,17	18,7
Potato t/ha	22,14	32,5
Tomato t/ha	34	32,2
Zucchini t/ha	10	13,5
Carrot t/ha	18	20
Avocado kg/tree	36,17	50
Corn t/ha	12,25	35
Barley q/ha	35,6	11,9
Green bean t/ha	7	8,5
Oats q/ha	20	30
Alfalfa t/ha	47,5	62
Onion t/ha	20	19,5
Pumpkin t/ha	11,33	37,5
Citrus Kg/tree	60	70
Pea t/ha	4	6,5
Eggplant t/ha	22	40
Plum kg/tree	31,5	34,3
Peach kg/tree	40	28,8
Vine t/ha	37,5	45

### Constraints faced by peri-urban growers in the Rabat metropolis

By encroaching upon agricultural land, taxing water resources and enticing rural people away from farming, urbanization poses a threat to agriculture within both the built-up and peri-urban areas. (Boischio *et al.*, 2006). According to the major findings of the study, peri-urban agriculture in the metropolis of Rabat faces several constraints such as: legal constraints mainly related to the absence of laws regulating this activity at the national level and the obligation of some operators in the peri-urban area to pay housing tax. It is also subject to a certain number of technical constraints: insufficient workforce and high labor costs, lack of technical supervision and support from the concerned body and it mainly suffers from difficult access to irrigation water. The presence of arid and semi-arid conditions in disparate locations such as the West African hinterland, northwest India, coastal Chile, the Middle East, and North Africa endows PUA in such regions with certain shared characteristics that make water supply a more crucial issue than in most other regions. Consequently, water availability, access, usage restrictions, and cost all tend to play a greater role in the decisions of property owners and farmers (Smit *et al.*, 1996). Therefore, alleviating such problems will improve the productivity and production of PUA in the metropolitan area of Rabat.

### Conclusion

Peri-urban agriculture is indeed multifunctional, ensuring both a food production function (fruits and vegetables) intended for sale in the metropolis of Rabat, a socio-economic function and an environmental function. It allows the creation of employment for the benefit of the region's youth and the generation of income for farmers. According to the major findings of the study, the major types of peri-urban farming practices in the study area includes: horticulture or production of fruits and vegetables, crop farming and livestock rearing such as beef farming, sheep farming as well as poultry farming. Peri-urban agriculture

contributes also to the recycling of livestock products and the development of open spaces thus contributing to the creation of a beautiful landscape for urbanites.

This study does not only help us to characterize the peri-urban systems, but also to identify the potential growth and limitations of these systems. It is hoped that such evaluation of resources, constraints and opportunities of the PUA systems will help policy makers to meet the food needs of megacities in general and Rabat in particular, without damaging the natural resource base of peri-urban areas.

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