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Original article

Urban, suburban and family agriculture. Its contribution to the feeding of the Cuban population

La agricultura urbana, suburbana y familiar. Su contribución a la alimentación de la población cubana

Agricultura urbana, suburbana e familiar. Sua contribuição para a alimentação da população cubana

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ABSTRACT

Urban, suburban and family agriculture has become an important alternative for food security in an urbanized planet. In Cuba, it has been consolidated since 1994 as an intensive production system, whose mission is to contribute to local self-sufficiency in agricultural products. The purpose of this

article is to analyze the results of key indicators of the system of Urban, Suburban and Family Agriculture in Cuba and the role played by this system in meeting the food needs of the Cuban population. To this end, a review of documents was made, historical series of six indicators of this system were elaborated and trend analyses were carried out. In order to know the consumers' perception of the system and its role in the satisfaction of food needs, a survey of 10 direct, closed, multiple-choice and unipolar questions was designed and applied to a sample of 207 consumers in three provinces of the country. The main results were that, except for one indicator with a downward trend, the others showed an upward trend over the years analyzed, maintaining the production levels of fresh vegetables and condiments. Similarly, it was confirmed by the perception of consumers that urban, suburban and family agriculture is currently one of the main sources of fresh and safe food for the Cuban population.

Keywords: urban agriculture; suburban agriculture; organoponics; vegetables; backyards; plots.

RESUMEN

La agricultura urbana, suburbana y familiar se ha convertido en una importante alternativa para la seguridad alimentaria en un planeta urbanizado. En Cuba se consolida a partir de 1994 como un sistema intensivo de producción, cuya misión es contribuir al autoabastecimiento local de productos agropecuarios. El presente artículo tiene como objetivo analizar los resultados de indicadores claves del sistema de La Agricultura Urbana, Suburbana y Familiar de Cuba y el papel que desempeña este sistema en la satisfacción de las necesidades de alimentos de la población cubana. Para ello se hizo una revisión de documentos, se elaboraron series históricas, de seis indicadores de dicho sistema y se realizaron análisis de tendencias. Para conocer la percepción de los consumidores sobre el sistema y su papel en la satisfacción de las necesidades de alimentos, se diseñó una encuesta de 10 preguntas directas, cerradas, de respuesta múltiple y unipolar, que se aplicó sobre una muestra de 207 consumidores de tres provincias del país. Como principales resultados se obtuvo que, excepto un indicador con una tendencia descendente, los demás expresaron una tendencia ascendente a través de los años analizados, logrando mantener los niveles de producción de hortalizas y condimentos frescos. De igual manera, se confirmó por la percepción de los consumidores que la agricultura urbana, suburbana y familiar constituye, actualmente, uno de los principales sustentos de alimentos frescos e inocuos para la población cubana.

Palabras clave: agricultura urbana; agricultura suburbana; organopónicos; vegetales; patios; parcelas.

RESUMO

A agricultura urbana, suburbana e familiar tornou-se uma alternativa importante para a segurança alimentar em um planeta urbanizado. Em Cuba, ela se consolidou a partir de 1994 como um sistema intensivo de produção, cuja missão é contribuir para a autossuficiência local de produtos agrícolas. O presente artigo tem como objetivo analisar os resultados dos indicadores-chave do sistema de Agricultura Urbana, Suburbana e Familiar de Cuba e o papel que esse sistema desempenha na satisfação das necessidades alimentares da população cubana. Para isso, foi feita uma revisão de documentos, elaboradas séries históricas de seis indicadores desse sistema e realizadas análises de tendências. Para conhecer a percepção dos consumidores sobre o sistema e seu papel na satisfação das necessidades alimentares, foi elaborada uma pesquisa com 10 perguntas diretas, fechadas, de resposta múltipla e unipolar, que foi aplicada a uma amostra de 207 consumidores de três províncias do país. Como principais resultados, obteve-se que, exceto um indicador com tendência descendente, os demais expressaram uma tendência ascendente ao longo dos anos analisados, conseguindo manter os níveis de produção de hortaliças e condimentos frescos. Da mesma forma, foi confirmado pela percepção dos consumidores que a agricultura urbana, suburbana e familiar constitui, atualmente, um dos principais sustentáculos de alimentos frescos e seguros para a população cubana.

Palavras-chave: agricultura urbana; agricultura suburbana; organopônicos; vegetais; pátios; parcelas.

INTRODUCTION

Producing more food for the growing world population without increasing humanity's ecological footprint is a major challenge for the 21st century and it is believed that urban production of such food can help solve the challenge (De Simone et al., 2023; Drottberger et al., 2023; Jansma & Wertheim Heck, 2022; Opoku et al., 2024).

Urban Agriculture (UA) has emerged as an important sustainable alternative to improve food security on an urbanized planet, estimated to be able to provide 15-20% of the food needed globally and appears to align well with consumer values related to nature and sustainability (Califano et al., 2024).

Agricultural production in the urban environment is essentially multifunctional, and the functions it can provide are related to food production, well-being, water and air cycles, among others. Hosting biodiversity is also considered as an ecosystem service provided and favored by UA (Royer et al., 2023).

UA can be sustainable if it has environmental integrity, if it is economically resilient, if it promotes social welfare, and is backed by supportive government policies. A balanced approach that integrates technological innovation, economic viability, accessibility, and social impacts is needed to shape a sustainable and resilient urban agricultural landscape (Nesheli & Salaj, 2024).

As in many other countries, this modality of agriculture has been practiced in Cuba for a long time, although its development as an organized program began in 1987 with the establishment of the "organoponics" and was consolidated in 1994 as an intensive production system throughout the country, the Urban, Suburban and Family Agriculture System (AUSUF in Spanish), whose main mission is to contribute to local self-sufficiency in vegetables, viands, fruits and animal protein (Górna & Górny, 2020).

Its productive results over the years have varied depending on many factors, among them: the availability of spaces for production, the availability of organic fertilizers, the availability of seeds, among others. That is why this article aims to analyze the results of key indicators of the system of Urban, Suburban and Family Agriculture in Cuba and the role played by this system in meeting the food needs of the Cuban population.

MATERIALS AND METHODS

For the development of this work, a mixed research approach was used, with the use of qualitative and quantitative tools. Theoretical and empirical research methods (accumulated experiences of social actors and documentary analysis) and mathematical-statistical methods (descriptive statistics, trend analysis and non-parametric analysis of the variables under study) were used.

For the analysis of the results of indicators of the AUSUF system, the period 2019-2023 was selected, in which the country was affected by the world economic crisis and the COVID-19 pandemic and the need arises for the search and improvement of alternatives for food production. The following documents were consulted:

- AUSUF Annual Balance Reports, National Urban Agriculture Group, Ministry of Agriculture, Cuba (Years 2019, 2020, 2021, 2022 and 2023)
- Suburban and Family Urban Agriculture Program. National Urban Agriculture Group, Ministry of Agriculture, Cuba (Year 2023)

From these documents, information was obtained on the following six indicators considered key to characterize this type of agricultural system, based on the AUSUF guidelines for 2020:

1. Vegetables and fresh condiments area (ha)
2. Production of fresh vegetables and condiments (t)
3. Per capita vegetable production ($g.day^{-1}$)
4. Yield of organoponics ($kg.m^{-2}.year^{-1}$)
5. Organic fertilizer production (t)
6. Number of yards and plots (No.)

With the data obtained, time series were prepared for the five years evaluated to analyze the trends of the variables during the research period. The association between variables and years was studied through simple linear regression analysis ($p \leq 0.05$) using the SPSS statistical package, version 22.0. Microsoft Excel 2016 Tabulator was used for the corresponding graphs.

To learn about consumers' perception of the AUSUF system and its role in satisfying their food needs, a survey of 10 direct, closed, multiple-choice, unipolar questions was designed, which delved into aspects such as:

- Alternatives for consumer purchase of agricultural products
- Reasons for maintaining the presence of production and marketing units in the localities where they are located

The study was conducted in three provinces and six municipalities, representative of the three geographic regions of the country, between 2019 and 2020. In the western region, Havana province was selected (Playa and Boyeros municipalities), in the center, Villa Clara province was selected (Santa Clara and Placetas municipalities) and in the east, Santiago de Cuba was selected (II Frente and Palma Soriano municipalities). For the selection of the municipalities, their geographic location within the province was considered, as well as their historical results and productive stability in the implementation of this type of agriculture.

A non-probabilistic or targeted sample was used for the research. The survey was applied to a total of 207 consumers, guaranteeing a minimum of 30 respondents for each municipality.

The information obtained was processed using the SPSS version 22.0 statistical package, with which a descriptive statistical analysis of frequencies was performed, showing the results in graphs.

RESULTS AND DISCUSSION

The data obtained from the review of the documents used for the study are shown in table 1, while the results of the statistical analyses used to define trends over time (linear regression analysis) are shown in figure 1.

As can be seen in figure 1, in five of the six indicators there was a significant linear relationship between the dependent variable (indicators) and the independent variable (years).

The indicators area of fresh vegetables and condiments (A), production of fresh vegetables and condiments (B), per capita production of vegetables (C), yield of organoponics (D) and number of yards and plots (F), showed significance values (p) lower than 0.05 and high coefficients of determination.

Except for the organoponics yield, with a downward trend, the others expressed an upward trend throughout the five years analyzed.

The organic fertilizer production indicator (E) had a p-value greater than 0.05, which indicates that there is no significant linear regression between this indicator and the years analyzed, evidenced by an extremely low coefficient of determination and a not well-defined trend.

It is noteworthy that, despite the decrease in organoponics yields, the constant increase in the area dedicated to the AUSUF system and the production of vegetables and condiments that has been achieved, has ensured a growing trend in the per capita production of these vegetables. However, the established goal of a daily per capita consumption of vegetables of 400 g for the achievement of a healthy diet is still not reached (FAO et al., 2022).

Table 1. Historic series of selected AUSUF indicators in the period 2019-2023 for the whole country

Indicators	U/M	2019	2020	2021	2022	2023
Fresh vegetables and condiments area	ha	6 588	10 071	12 640	12 640	16 701
Production of fresh vegetables and condiments	t	1 277 517	1 286 722	1 300 000	1 318 131	1 351 110
Per capita vegetable production	$g.day^{-1}$	308.6	315.6	320.5	324.8	336.5
Organoponics performance	$kg.m^{-2}.year^{-1}$	21.1	20.1	16.6	12.8	11.9
Production of organic fertilizers	t	427 000	337 000	270 000	468 063	417 424
Number of yards and plots	No.	500 000	800 228	1 028 180	1 117 666	1 187 341

Source: Prepared by the authors, based on the documents analyzed

On the other hand, the significant increase in backyards and plots in the years analyzed demonstrates the perception of city dwellers on the need to supply to some extent their food requirements with healthy, fresh and wholesome products, while obtaining benefits related to health and general well-being, maintenance of cultural heritages and community development, which coincides with what was expressed by Poulsen and Spiker (2014).

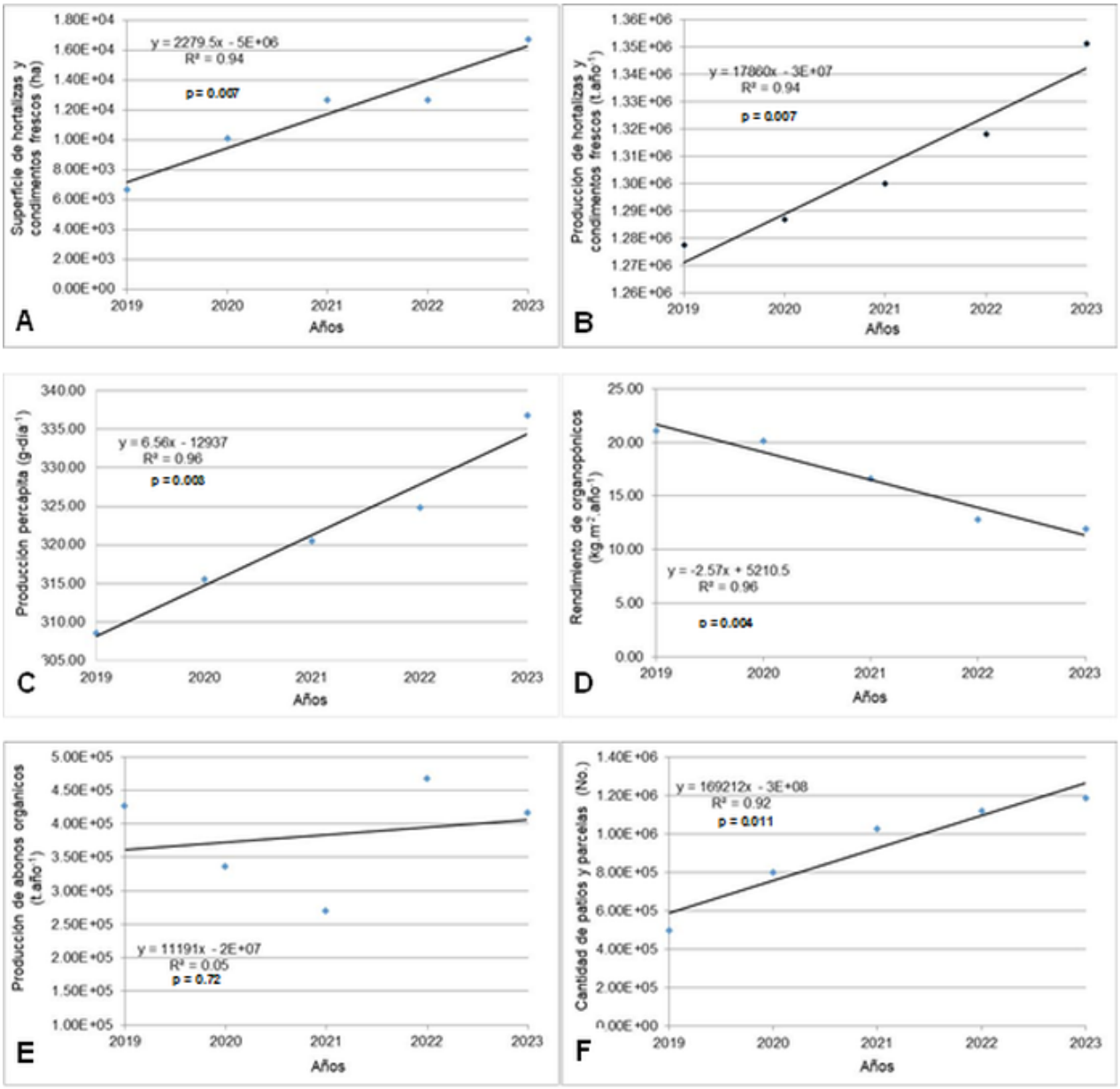

Figure 1. Relationship between selected AUSUF productive indicators and years, in the period 2019-2023 ($p \leq 0.05$)

Legend: A: Area dedicated to fresh vegetables and condiments, B: Annual production of fresh vegetables and condiments, C: Per capita production of vegetables, D: Yields in the organoponics, E: Production of organic fertilizers, F: Number of yards and plots within the system

Source: Own elaboration

This positive perception of the population regarding the consumption of these products has been achieved, in part, by an awareness campaign carried out in recent years by various institutions in the country, covering different levels of education, as well as by the media and national and international projects that develop motivational talks in the territories in which they have an impact.

In a negative sense, the yield of organoponics (D) stands out, with a strong tendency to decrease in the years evaluated, reaching values well below 15 $kg.m^{-2}.year^{-1}$. Such a result may be due, among other causes, to the low availability of nutrients in the substrate, due to the inability to replenish or complete at the appropriate times, the demand for them by the crops, due to the low production of organic fertilizers, as shown in table 1. The practice of urban agriculture has shown that the use of organic fertilizers is a determining factor for production with high yields, without the need to apply chemical fertilizers (Bello et al., 2022).

On the other hand, it can be considered that it has not always been possible to achieve the necessary moisture in the substrate, an issue that, according to Zhang et al. (2021), is of vital importance in urban green spaces to achieve good plant growth. These authors argue that it is not only a matter of applying water, but also of efficiently managing the moisture in the substrate, for which organic materials can be used as ground cover, which can effectively absorb water and suppress its evaporation from the soil. This practice is not always carried out in the AUSUF production units.

When analyzing the development and fulfillment of these indicators in the production units of the system, it becomes evident the complexity of maintaining a constant production of fresh and safe products at the territorial level, for which multiple efforts are made, since the consumption of these foods is an express demand of the population, which are marketed through different channels (Figure 2).

As can be seen, more than 70% of those surveyed expressed a preference for acquiring the necessary agricultural products at points of sale within the production units themselves or directly from the producers. When analyzing the reasons, it could be inferred that both ways can guarantee more affordable sales prices to the population, while avoiding or minimizing the loss of product quality, due to the transportation used in longer commercialization chains, such as markets and agricultural fairs.

These results correspond with what was reported by González Azcárate et al. (González Azcárate et al., 2021), on the current trend towards the development of alternatives that provide the population with quality local products, mainly through short food supply chains, which recreate forms of proximity relations between producers and consumers.

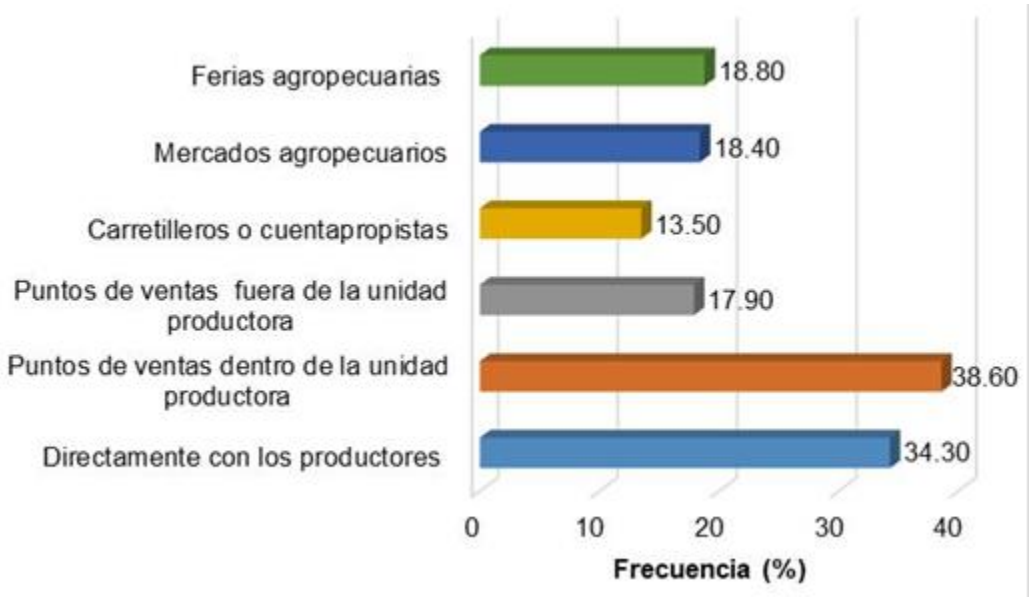

Figure 2. Alternatives for consumer acquisition of agricultural products
Source: Own elaboration

In relation to this issue, Feldmann and Hamm (2015) highlighted that consumer interest in local food has been steadily increasing in recent years, and that local food is seen as cheap. An important source providing local food is urban agriculture, where many farmers sell their products directly to consumers (Grebitus et al., 2017).

There is no doubt that this form of production enjoys great popularity among the population, which has become more aware of the importance of consuming vegetables and fresh food at affordable prices, making it an enduring demand (Figure 3).

In this sense, it is evident that more than 95% of those surveyed say that these production units should remain in the communities, and more than 35% even want them to be increased in their localities. This would prevent consumers from having to travel considerable distances to purchase

the products offered in these units. These results corroborate what Companioni et al. (2017) expressed, regarding the need and scope of the AUSUF system and its contribution to local food self-sufficiency, and indicate the level of community commitment to this modality of agriculture, which is a basic element for achieving success in projects aimed at food production in urban environments (Poulsen & Spiker, 2014).

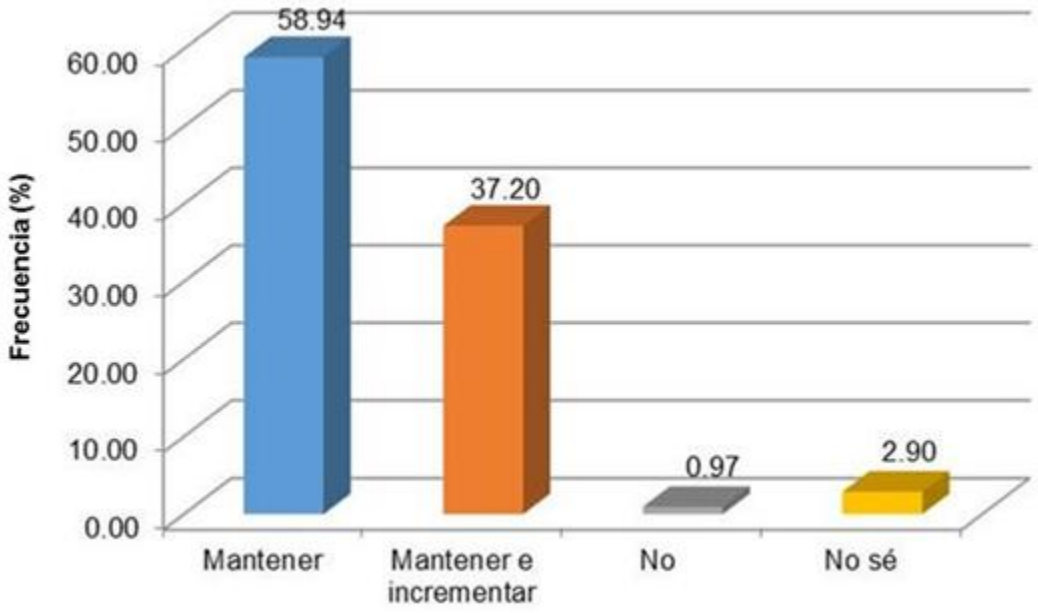

Figure 3. Consumers' opinion on the presence of production and marketing units of the AUSUF system in the locality
Source: Own elaboration

In general, the assessment made by consumers suggests that the AUSUF system in Cuba is an important source of food acquisition for the population, which also showed a high degree of satisfaction with the products marketed in it, mainly to provide the community with fresh, healthy and varied products. Referring to consumer access to the system, Enthoven and Van den Broeck (2021) have pointed out that the transition to more inclusive, resilient and sustainable food systems guarantees consumer access to safe and nutritious food.

Considering the results of this work, it can be concluded that, despite the difficult situation created by the COVID-19 pandemic and the economic crisis suffered by the country in recent years, Cuba's AUSUF system maintained its vitality and achieved its production levels of fresh vegetables and

condiments from the increase in the area dedicated to this purpose, which is an important component of the food systems, resulting in satisfying, to a good extent, the population's demand for vegetables and greens. On the other hand, consumers of agricultural products have a positive perception of the system of the AUSUF in Cuba, manifested in their demand for them to maintain and increase the producer units at the community level and their preferences for marketing modalities that establish proximity relations between producers and consumers, such as points of sale within the producer units and direct purchase from the producer.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

All authors designed the study, analyzed the data, and prepared the draft; they were involved in data collection, analysis, and interpretation. Everyone reviewed the manuscript and approved the version finally submitted.