

Original article

Proposal of actions to improve vegetable production capacity

Propuesta de acciones para mejorar la capacidad de producción de hortalizas

Ações propostas para melhorar a capacidade de produção hortícola

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Received: 9/06/2022

Accepted: 28/10/2022

ABSTRACT

The challenges in the production and commercialization of food in the local context are very great; in Cuba and its territories it is promoted as a necessity to increase food production to satisfy the consumption of the population. The objective of the present research was to elaborate a proposal of actions that contribute to the improvement of the production capacity of vegetables. The research involved the use of theoretical and empirical methods. The analysis of documents, the application of interviews, as well as the survey of opinions resulted in the need to seek new ways to increase vegetable production capacity in the localities. As part of the actions, urban, suburban and family agriculture should resume its leading role and recover idle, empty or deteriorated spaces in order to meet individual and local needs. To achieve this, more comprehensive policies and actions are required, conceived in the municipal development strategy under the leadership of the local government food group, agriculture or other institutions involved. Hence the importance and validity of the topic addressed in response to the Economic and Social Policy Guidelines of the eighth Party



Congress, the National Development Plan of the nation until 2030 and the fulfillment of the Sustainable Development Goals, in a prioritized sector such as agriculture in Cuba and, in particular, food sustainability.

Keywords: food security; production; production capacity; agriculture; vegetables.

RESUMEN

Los retos en la producción y comercialización de alimentos en el contexto local son muy grandes; en Cuba y sus territorios se promueve como necesidad incrementar las producciones alimentarias para satisfacer el consumo de la población. El objetivo de la presente investigación consistió en elaborar una propuesta de acciones que contribuya al mejoramiento de la capacidad de producción de hortalizas. La indagación conllevó a la utilización de métodos teóricos y empíricos. El análisis de documentos, la aplicación de entrevista, así como el sondeo de opiniones arrojó como resultado la necesidad de buscar nuevas vías para el incremento de las capacidades de producción de hortalizas en las localidades. Como parte de las acciones, se sostiene que la agricultura urbana, suburbana y familiar retome su papel protagónico y recupere espacios ociosos, vacíos o deteriorados con el fin de suplir las necesidades individuales y locales. Para este alcance, se requieren de políticas y acciones más integrales, concebidas en la estrategia de desarrollo municipal bajo la conducción del grupo de alimentos del gobierno local, la Agricultura u otras instituciones implicadas. De ahí la importancia y vigencia del tema abordado en respuesta a los Lineamientos de la Política Económica y Social del octavo Congreso del Partido, al Plan Nacional de Desarrollo de la nación hasta el 2030 y al cumplimiento de los Objetivos de Desarrollo Sostenible, en un sector priorizado como lo es la agricultura en Cuba y, en particular, la sostenibilidad alimentaria.

Palabras clave: seguridad alimentaria; producción; capacidad de producción; agricultura; hortalizas.

RESUMO

Os desafios na produção e comercialização de alimentos no contexto local são muito grandes; em Cuba e nos seus territórios é promovida como uma necessidade de aumentar a produção de alimentos para satisfazer o consumo da população. O objetivo desta investigação era elaborar uma

proposta de ações que contribuíssem para a melhoria da capacidade de produção hortícola. A investigação envolveu o uso de métodos teóricos e empíricos. A análise de documentos, a aplicação de entrevistas, bem como o levantamento de opiniões, resultou na necessidade de procurar novas formas de aumentar a capacidade de produção hortícola nas localidades. Como parte das ações, argumenta-se que a agricultura urbana, suburbana e familiar deve retomar o seu papel de liderança e recuperar espaços ociosos, vazios ou deteriorados, a fim de satisfazer as necessidades individuais e locais. Para o conseguir, são necessárias políticas e ações mais abrangentes, concebidas na estratégia de desenvolvimento municipal sob a liderança do grupo alimentar do governo local, Agricultura ou outras instituições envolvidas. Daí a importância e relevância do tema abordado em resposta às Orientações de Política Económica e Social do oitavo Congresso do Partido, ao Plano Nacional de Desenvolvimento da nação até 2030 e ao cumprimento dos Objetivos de Desenvolvimento Sustentável, num sector prioritário como a agricultura em Cuba e, em particular, a sustentabilidade alimentar.

Palavras-chave: segurança alimentar; produção; capacidade de produção; agricultura; legumes.

INTRODUCTION

In the current context of the food crisis phenomenon, high food prices are of considerable interest. For countries, mainly developing countries, there is a need to consider new strategies to provide a solution to food self-sufficiency and to promote nutrition education. On a global scale, a considerable number of people suffer from slight caloric deficiencies in proteins, minerals and vitamins, among other substances that are indispensable for the preservation of human health.

According to the Food and Agriculture Organization of the United Nations (FAO), humanity is currently facing the greatest challenge in modern history, with more than 15% of the world's population affected by chronic hunger or malnutrition. This serious situation exacerbates its growth trend in recent years, initially due to the large increase in food prices from 2011 to 2013 and, subsequently, due to the global economic and financial crisis that has affected purchasing power (FAO, 2019).

Likewise, this organization emphasizes the need to double global agricultural production to achieve food security for the millions of people currently suffering from hunger and to feed the world population, which is expected to grow by more than 40% (from 6.5 to 9.2 billion) by 2050. This

growth is predicted to occur in the regions of Africa, Asia and Latin America, where vulnerability and thus food security is most precarious (FAO, 2019).

In developing countries, increasing vegetable production is an option for food security. The possibility has been raised of solving certain food situations with small-scale vegetable production, based on the use of available organoponics, and on a large scale with the provision of usufruct land, among other ways. Family vegetable systems have spread in recent years as an important alternative to meet nutritional demands, both in rural and urban areas, as is the case in Cuba.

In order to ensure compliance with the Sustainable Development Goals and the 2030 Agenda, the nation's strategy is to provide food for the population, at least basic food, without leaving anyone stranded, with the fairest and most equitable distribution possible. In this regard, this document states: "We need a profound reform of the global agriculture and food system if we are to feed the 925 million hungry people who exist today and the additional two billion people who will be living in 2050" (ECLAC, 2019, p. 21).

As background for this research, the contributions made by different scholars on the subject are important. Such is the case of Nova González (2006), who is one of the leading exponents of studies on agriculture in Cuba. In his work, *La agricultura en Cuba 1959-2005*, he outlines the different stages of the development of this branch in the country, emphasizing its particularities. Other authors such as Figueroa Pedraza (2005) and Valdés Paz (2009) start from the criterion that Cuban agriculture would require economic, structural and organizational transformations, taking into account the importance of increasing food production for the welfare of the population. For their part, Torres Páez et al. (2022) point out the need for the food sovereignty plan that the Cuban nation is currently applying at the local level to change the paradigm of agricultural production, which is generally very dependent on inputs. In addition, these researchers add that it is essential to eliminate the sectoral and vertical approach that has predominated in the country in recent decades in terms of food production and marketing.

On the contraction of production, Vila Pérez (2018) specifies the existing disconnection between production and consumption and how this constitutes today one of the most acute problems presented in the Cuban reality, eroding the distribution processes and, along with this, consumption not only at the social level, but with direct affectations to the population.

Studies have been carried out on food production from the territorial and local dimension. In this matter, it is essential to highlight the role played by local actors, especially in the achievement of food sovereignty, as well as the necessary correspondence that must exist between scientific and technical capacity. Likewise, the intensive use of knowledge, technology and social innovation become key variables for the growth of territories, taking into consideration the social or economic transformations that arise. For Vila Pérez et al. (2021), the processes of dissemination and adoption of technologies, the use of science and innovation, the strategic vision and the links of the various forms of ownership with universities and scientific centers are still insufficient, so that they can jointly develop projects or strategies that involve greater food production at the local level.

The increase in vegetable production is one of the fundamental challenges that the country's current economic policy and, in particular, the agricultural sector as a strategic pillar should promote, specifying that this is an issue that responds to national security. Several actions have been implemented to improve the nutritional quality and the need to stimulate producers for local self-sufficiency. The Resolution of the 8th Party Congress on the Updating of the Conceptualization of the Cuban Economic and Social Model of Socialist Development bases the need for: "raising the level and quality of life is a permanent priority objective, with emphasis on food and energy security, education and health, among others" (PCC, 2021, p. 5).

Similarly, the Food and Nutritional Sovereignty Plan conceived in the country for the present and future years provides a response to this task. Therefore, the objective of this work is to elaborate a proposal of actions that will contribute to the improvement of vegetable production capacity.

MATERIALS AND METHODS

Theoretical and empirical methods were used for the research. Among the theoretical methods, the logical history was used to systematize the evolution of agricultural production in Cienfuegos. The analysis and synthesis allowed an evaluation of the production capacity and the determination of achievements and limitations of the increase of these capacities for the production of vegetables.

The analysis of documents, as part of the empirical methods, contributed to the statistical analysis of productions in several years, established comparisons in different stages and made inferences and deductions on the subject under study. Through the opinion survey technique, information was gathered to corroborate the current state of vegetable production capacity and to present the

problems that influence these production levels. Interviews were also conducted with specialists from the Delegation of Agriculture, Provincial Directorate of Economy and Planning, Statistics, University of Cienfuegos, Sugarcane Institute, among others, who contributed with their information to the elaboration of the proposal of actions, as well as their opinions and agreements on it.

Through the opinion survey technique, information is collected from a group of specialists of the Delegation of Agriculture (9), with the objective of knowing the current state of vegetable production capacity.

RESULTS AND DISCUSSION

In order to guarantee the improvement of the population's nutritional levels and quality of life, the demand for food must be met in relation to that produced from an efficient support of the production and distribution capacity of agricultural products. Similarly, Decree 33/2021 related to the strategic management of territorial development promotes the use of endogenous resources, giving a primary role to the municipalities and, within its priorities, food production is placed as the most urgent problem to be solved. Likewise, the country had already been working on it from the Post Covid-19 Strategy, issued by the Ministry of Economy and Planning (2020) to promote the economic and social development of the nation. The Agriculture sector is supported within its 16 key sectors and is accompanied by a group of actions already implemented, where the encouragement to producers, technological packages, science and innovation and flexibility in marketing to develop food sovereignty take place.

In terms of production capacity, it is essential to have the necessary technological equipment and infrastructure to help achieve this objective. Despite all the organizational, legal, structural and functional changes, and thus the improvement in the living conditions and general welfare of agricultural producers, there are still aspects that limit the achievement of favorable results for the Cienfuegos economy. Some of these are listed below:

- Little or no satisfaction of the population's demands for food of agricultural origin
- Increased spending on food purchases abroad. This has been one of the most analyzed aspects of economic policy in relation to the agricultural sector. For more than 60 years, the country has shown a tendency to increase imports, thus incurring enormous expenses for the Cuban state

- Low vocation and availability for the export of agricultural products
- Low economic efficiency in this sector and low availability of scientific and technical advances
- Low utilization of existing arable agricultural land
- Insufficient means and tools for work, as well as stimulation and remuneration of workers, although there has been a notable improvement in the last decade

Consequently, the aforementioned factors have brought about a decrease in vegetable production in the municipality of Cienfuegos, which has had an impact on the dissatisfaction of the population and a significant rise in prices. The delivery of idle land as a policy to increase agricultural production implies a fragmentation of the territory and leads to a new model with the predominance of non-state producers, which show a discrete growth in the harvest of this item. At present, there is a need to continue improving the implementation of scientific and technological advances in the agricultural sector and, particularly, in vegetable production capacities to meet nutritional demands in rural and urban areas.

Conceptual elements about agricultural food production and its production capacity

Production is any type of activity aimed at manufacturing, processing or obtaining goods and services. From the point of view of economics, production constitutes a value-creating activity and results in an end. Production is one of the indispensable socioeconomic processes, since without production, material goods for use and consumption are not produced, and food is one of the basic elements for human subsistence.

Agricultural production is oriented in principle to the creation of use values, of a plant or animal product that satisfies a specific human need. Historically, agricultural activity has gone from the production of use values to satisfy the direct needs of the producer, to the creation of products required by non-agricultural populations, continually expanding the production of exchange values according to Parra Vázquez (1986), always taking human consumption as a fundamental component. It has varied a lot throughout history, achieving significant improvements thanks to the implementation of different tools and processes.

In the case of vegetable production, it is clear that its production cycle is of short duration, so it is important to take into account the productive capacities according to the needs and demands of the population. Also, in the domestic consumption of the country, these vegetables are a fundamental

component of the diet. Various institutions consume this food, such as hotels, hospitals or other welfare centers, semi-boarding schools, part of the business system, among others.

Another essential definition in the approach to this subject is production capacity, which is the maximum production possible in a given period in the nomenclature and quality demanded by customers, making full use of the equipment and productive areas available, in accordance with the standard work regime. Chariguamán Arteaga and Real Pérez (2022, p. 1) start from the criterion that "...from the business perspective, it is more frequent to define capacity as the amount of production that a system can achieve during a specific period, where operations managers must take into account the inputs of resources and outputs of products".

Other authors define it as productive capacity, specifying that "it is the quantity of products or services destined to satisfy the needs of the client or society, which can be obtained by a productive unit in a certain period of time (Kalenatic et al., 2009, p. 2).

Vegetables in Cuba are harvested in areas belonging to the state and non-state sector. The state sector includes agricultural enterprises, especially in enterprises of various crops. The private sector includes Basic Units of Cooperative Production (UBPC in Spanish), Agricultural Production Cooperatives (CPA in Spanish), Credit and Service Cooperatives (CCS in Spanish), dispersed private producers (peasants) and estimated household yards and plots, according to notes consulted in the National Statistics Office (Onei in Spanish, 2021). Figures issued by this institution specify that legal land holders in 2020 in Cuba were distributed as follows: farms and companies reach the figure of 2561, UBPCs 1691 legal persons. For the case of CPAs and CCSs 962 and 2306 respectively and in the category others (scattered farmers, yards and plots are included), the figure of 1054 corresponds. All this amounts to a total of 8,578 land holders, based on the Balance of Land Use and Tenure, prepared by the Ministry of Agriculture.

The structural change in favor of non-state ownership is linked to the measures introduced in the agricultural sector since the reform of the 1990s, such as the granting of usufruct land to individual farmers and the conversion of the Basic Units.

In the territory of Cienfuegos, the agrarian structure is organized through an Agricultural Enterprise, five UBPC (Guanaroca, Belmonte, Limones, Carolina and La Josefa), two CPA (Románico Cordero and Mártires de Barbados) and five CCS (Dionisio San Román, Jorge Alfonso, Manuel Ascunce, Juan González and Luis Pérez), among which are the lands given in usufruct.

Diagnosis and characterization of agricultural and livestock production in Cienfuegos

The municipality of Cienfuegos is located in the south-central part of the province of the same name, occupying a territorial extension of 355.6 km², which represents 8.2% of the provincial total. The territory presents diverse natural potentials, both for the development of human activity (residential, industrial, maritime-port, agricultural, forestry, fishing, tourism-recreational and others), as well as for the conservation of unrepeatable ecosystems in the province with great floristic and faunistic value, such as those found in the Guanaroca protected area.

According to the genetic classification of the Soil Institute, carbonate soils predominate in the municipality, with brown, humic, red rendzinas and, to a lesser extent, fersialitic and alluvial soils. In relation to agroproductivity in the municipality, high quality soils do not prevail, with only 19% corresponding to category I (very productive) and II (productive) (Fig. 1).

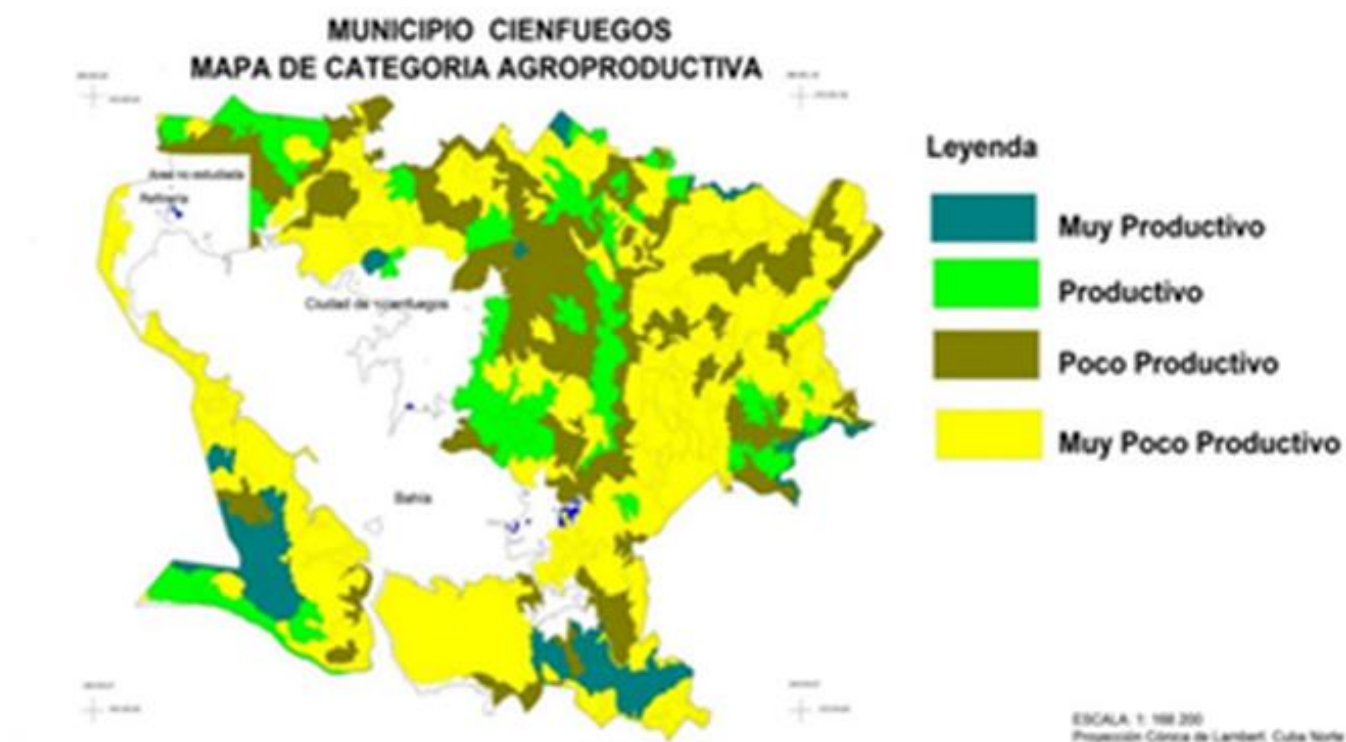


Fig. 1 - Agro-productive categories of the soils in the municipality of Cienfuegos

Source: Soil Institute. Ministry of Agriculture, 2018

As part of the diagnosis, it is supported that agricultural production has shown growth in some crops when comparing 2013 with 2018. In viands, corn and beans, a growth of around 2,000 tons was experienced. This was favored by the high prices in the market compared to others, where the Credit and Service Cooperatives have a greater participation. However, with the cultivation of vegetables there was a decrease of approximately 20,000 tons, production that fell mainly on the state sector, related to the development of urban and suburban agriculture that, since the delivery of land in usufruct of state areas, such production did not meet the planned.

There are also sub-programs for vegetable production where there are organoponics, intensive semi-protected orchards, plots and patios that continue to operate throughout the year. Of the 71 organoponics created at present, only 21 are in operation, the others are in the process of recovery. In the case of intensive orchards, there are 1219; of these, 1135 are planted and 84 are empty. The productions obtained from the semi-protected orchards are carried out in 324 beds and 17 are in disuse, for a total of 341 manufactured beds. This indicates that priority has not been given to the recovery of the organoponics and flower beds that are empty and have not been exploited to their full potential because they are in poor condition. Tables 1 and 2 show what has been discussed in this commentary.

Table 1 - Semi-protected orchards in the municipality of Cienfuegos

| Type | Flowerbed | Sown | Void |
|-----------------------------------|------------|------------|-----------|
| Semi-protected Pueblo Grifo Viejo | 28 | 28 | 0 |
| Semi-protected Circunvalación | 27 | 23 | 4 |
| Semi-protected Chard 1 and 2 | 30 | 28 | 2 |
| Semi-protected 5 de septiembre | 23 | 21 | 2 |
| Semi-protected El Alba | 69 | 65 | 4 |
| Semi-protected Gastronomía | 88 | 85 | 3 |
| Semi-protected Pueblo Grifo Nuevo | 76 | 74 | 2 |
| Total | 341 | 324 | 17 |

Source: Department of Urban, Suburban and Family Agriculture, Ministry of Agriculture, 2019.

Table 2 - Intensive orchards

| Orchards | Flowerbed | Sown | Void |
|------------------------|-------------|-------------|-----------|
| Orchard T-15 | 310 | 279 | 31 |
| Pepito Tey Orchard | 650 | 600 | 50 |
| Hydroponic Garden | 100 | 100 | 0 |
| Cuatro Caminos Orchard | 84 | 84 | 0 |
| La Esperanza Orchard | 51 | 48 | 3 |
| La Amalia Orchard | 24 | 24 | 0 |
| Total | 1219 | 1135 | 84 |

Source: Department of Urban, Suburban and Family Agriculture, Ministry of Agriculture, 2019.

According to what has been proposed to achieve in terms of food security, our country since 2019, in Cienfuegos, has worked to achieve the 30 pounds per person.

The following table explains this distribution in detail.

Table 3 - Compliance with self-supply by municipality and province of Cienfuegos at the end of January 2020

| Municipalities | Consumers | Meal plan 15 pounds / pc | Vegetable plan 10 pounds /pc | Fruit and citrus plan 3 pounds / pc | Grain plan 2 pounds / pc | Total production in tons | Total per capita 30 pounds |
|----------------|-----------|--------------------------|------------------------------|-------------------------------------|--------------------------|--------------------------|----------------------------|
| Cienfuegos | 49184 | 142.3 | 175.9 | 42.1 | 24.3 | 384.6 | 17.0 |
| | pound/pc | 6.3 | 7.8 | 1.9 | 1.1 | | |
| Cumanayagua | 67109 | 186.3 | 203.4 | 46.8 | 27.4 | 463.9 | 15.0 |
| | pound/pc | 6.0 | 6.6 | 1.5 | 0.9 | | |
| Cruces | 48000 | 126.7 | 132.9 | 38.7 | 24.1 | 322.4 | 14.6 |

| | | | | | | | |
|---------|----------|-------|-------|------|------|-------|------|
| | pound/pc | 5.7 | 6.0 | 1.8 | 1.1 | | |
| Rodas | 44158 | 96.2 | 125.4 | 33.7 | 10.8 | 266.1 | 13.1 |
| | pound/pc | 4.7 | 6.2 | 1.7 | 0.5 | | |
| Abreus | 87255 | 216.4 | 254.8 | 69.9 | 31.2 | 572.3 | 14.3 |
| | pound/pc | 5.4 | 6.3 | 1.7 | 0.8 | | |
| Palmira | 45421 | 123.6 | 121.1 | 32.4 | 16.7 | 293.8 | 14.1 |
| | pound/pc | 5.9 | 5.8 | 1.6 | 0.8 | | |
| Aguada | 45187 | 115.1 | 128.3 | 35.9 | 18.1 | 297.4 | 14.3 |
| | pound/pc | 5.5 | 6.2 | 1.7 | 0.9 | | |
| Lajas | 31991 | 71.2 | 89.2 | 25.1 | 9.2 | 194.7 | 13.2 |
| | pound/pc | 4.8 | 6.1 | 1.7 | 0.6 | | |

Source: Own elaboration based on data provided by the Directorate of Provincial Economy and Planning, 2020.

Table 3 shows the difference between what was planned and what was obtained in January of this year. The country proposed to obtain 30 pounds per capita between viands, fruits, vegetables and grains to distribute it to the population and improve their food security. In this month under analysis, it can be seen that no municipality of Cienfuegos manages to reach the figure planned by the country's top management.

Table 4 also shows the sale of vegetables in the month of January 2020 in the province of Cienfuegos.

Table 4 - Vegetable sales in the province of Cienfuegos (pound/pc)

| Municipalities | Consumers | Vegetable plan (pounds/pc) | | Total 10 pounds pc | Total tons |
|----------------|-----------|----------------------------|--------------------------------------|--------------------------|---------------|
| | | Acopio | Production form and sales outlets | | |
| Cienfuegos | 49184 | 34.5 | 175.9 | 9.3 | 210.4 |
| | pounds/pc | 1.5 | 7.8 | | |
| Cumanayagua | 67109 | 110.9 | 203.4 | 10.2 | 314.3 |

| | | | | | |
|--------------|------------|-------|--------|-----|---------|
| | pounds/pc | 3.6 | 6.6 | | |
| Cruces | 48000 | 86.3 | 132.9 | 9.9 | 219.2 |
| | pound/pc | 3.9 | 6.0 | | |
| Rodas | 44158 | 46.1 | 125.4 | 8.4 | 171.5 |
| | pound/pc | 2.3 | 6.2 | | |
| Abreus | 87255 | 139.2 | 254.8 | 9.8 | 394.0 |
| | pounds /pc | 3.5 | 6.3 | | |
| Palmira | 45421 | 82.3 | 121.1 | 9.7 | 203.4 |
| | pounds /pc | 3.9 | 5.8 | | |
| Aguada | 45187 | 76.2 | 128.3 | 9.8 | 204.5 |
| | pounds /pc | 3.7 | 6.2 | | |
| Lajas | 31991 | 27.9 | 89.2 | 8.0 | 117.1 |
| | pounds /pc | 1.9 | 6.1 | | |
| Total | 418305 | 603.4 | 1231.0 | 9.5 | 1834.36 |
| | pounds /pc | 3.1 | 6.4 | | |

Source: Prepared by the authors based on data provided by the Cienfuegos Provincial Economics and Planning Directorate, 2020.

The province's supply was 95% met, i.e., of the planned 10 pounds per capita, 9.5 pound/pc were achieved. Of this total, Acopio (Enterprise of the agricultural products collection) contributed only 603.4 tons to the markets and sales points, which represents 32.9% of the total self-supply. The rest of the sales amounted to 1231 tons, which represents 67.1% and was made by the productive forms in the established sales points and fairs. A comparison between the municipalities shows that Cumanayagua surpasses the plan, reaching a figure of 10.2 pound/pc, which puts it in a better position in terms of food supply in this type of vegetable.

Another of the results of the diagnosis is the information collected through the opinion survey technique to a group of specialists of the Delegation of Agriculture, which specify the problems that influence the production capacity; among them are: low labor productivity, lack of labor force dedicated to these tasks, few arable lands dedicated to this type of vegetables, lack of fertilizers to

protect against pests and other insects, insufficient irrigation systems for their cultivation and certified seeds, obsolete and scarce technology, among other reasons.

The interviews were carried out with 13 specialists in different areas, with the objective of finding out the causes of the decrease in the production capacity of vegetables in the municipality of Cienfuegos, as well as the actions that could be taken to counteract this problem. Among the areas that stand out are the following:

- 2 of the Department of Urban, Suburban and Family Agriculture (Provincial Delegation of the Ministry of Agriculture)
- 1 specialist in Medicinal Plants
- 2 of the Directorate of Economics and Planning
- 2 of the Provincial Statistics and Information Office
- 2 from the Research Center (Sugar Cane Research Institute)
- 2 of Dirección Provincial de Planificación Física
- 2 Ph.D. in Economics from the University of Cienfuegos

Analysis of interview results

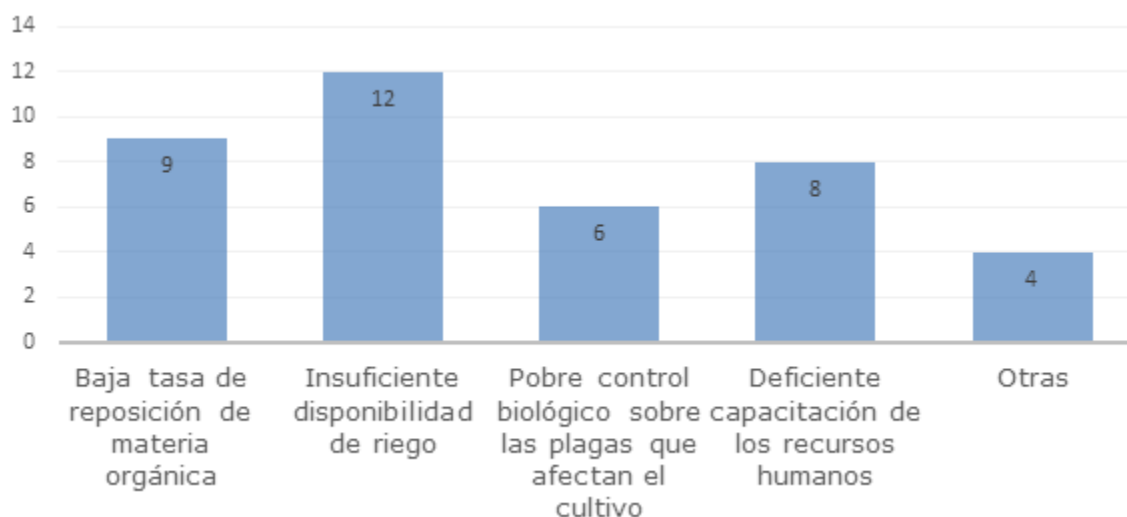


Fig. 2 - Causes exerting the greatest influence on vegetable production capacities

Source: Own elaboration based on interview data, 2020.

Question number one yielded the result shown in Figure 2, where it is evident that the three most common causes of the decrease in vegetable production capacity in the municipality of Cienfuegos, according to the 13 specialists, are, in the first place, insufficient availability of irrigation, followed by the low rate of organic matter replenishment and, finally, the deficient training of human resources.

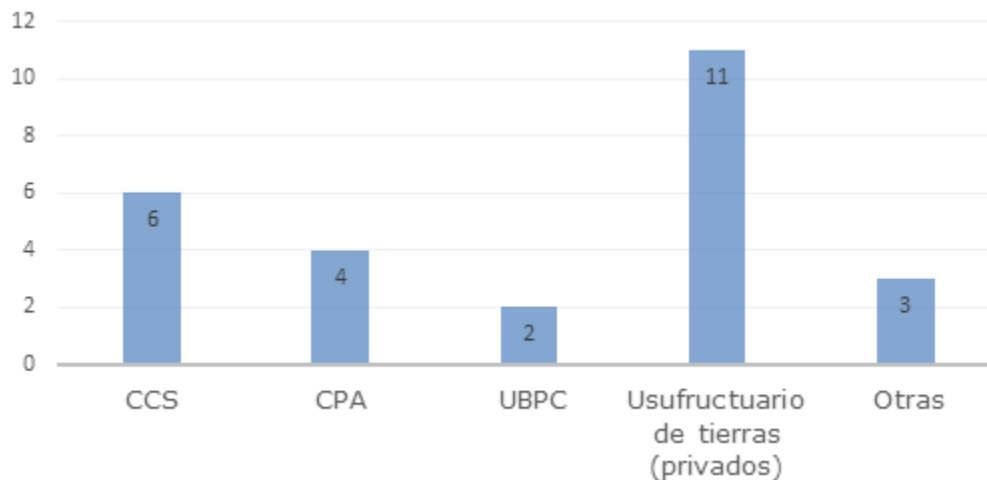


Fig. 3 - Production forms considered to be the most important in the production of vegetables

Source: Own elaboration based on interview data, 2020.

Figure 3 shows that the most important forms of production in vegetable production in the territory are private producers working on usufruct land, accounting for 11% of production, followed by Credit and Service Cooperatives, with a contribution of 6% of that year's harvest.

Another topic discussed in the interview was urban, suburban and family agriculture and the options for increasing vegetable production in the most viable way. The results are related in the following figure where the four aspects under analysis are presented.

In this case, the specialists agree that studies should be carried out to increase the number of organoponic or deteriorated beds in this type of production, especially in urban and suburban areas. Eleven specialists (out of a total of 13) agree to create several urban points of sale where vegetable seeds can be acquired by the population, as well as by those companies that wish to carry out these tasks to supply their canteens, and even to sell to interested people who live in that area. The aspect referring to making the population aware of the importance of vegetable consumption and creating

a place to produce a greater quantity of seeds was the one with the least consensus among these specialists (only 6 support this approach). Figure 4 shows the above.

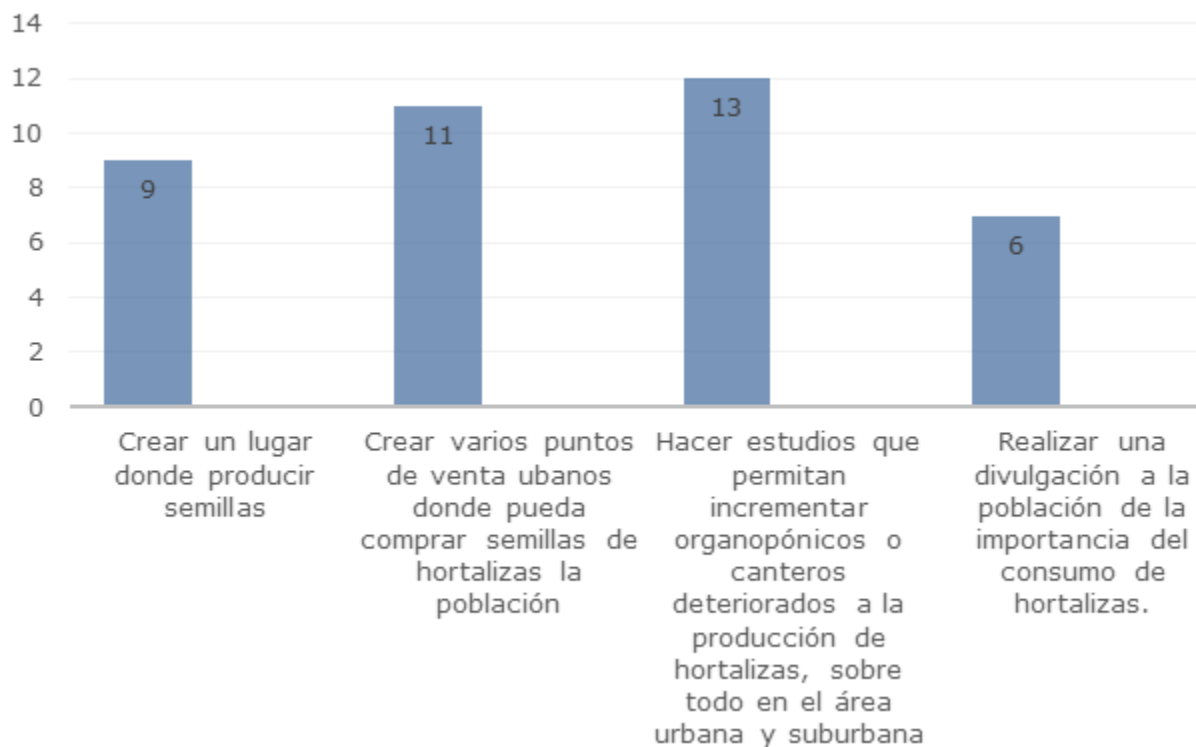


Fig. 4 - Ways for increasing vegetable production

Source: Own elaboration based on information provided by interviewees, June 2020.

In order to contribute to the increase of vegetable production capacity, the specialists suggest several aspects to be solved, among which the following stand out: the planting of empty chambers and beds that are in good condition and are not being used. The importance of recovering and incorporating new units is another of the basic needs to increase production. Organic fertilizers should also be guaranteed and irrigation systems should be rescued for this activity. The creation of new urban farms and the incorporation of new people to work in the entities related to agriculture and vegetable production need to be trained to carry out these tasks. This analysis also includes the incorporation of new areas and yields per square meter in all types of vegetable production. Similarly, experts consider the possibility of guaranteeing seeds to promote these productions, including spicy and medicinal plants.

In the interview with the specialists, other related topics are discussed, such as the work system that has been implemented from the base in urban, suburban and family agriculture, where the representative of the Popular Council informs the Municipal Urban Farm about the situation of the different sub-programs that they manage. This representative is in charge not only of having control over the yards and plots that exist in their locality, but also of providing them with seeds, fertilizers, organic soils and other materials they need for their productions. It is necessary to clarify that this information provided elements that favored the proposal of actions.

Proposal of actions to increase production capacities in the municipality of Cienfuegos

The Cuban economy needs to solve the agri-food problem. Achieving a growing and sustainable economic and social development depends, to a large extent, on the solution of the Cuban agrarian problem, so actions are proposed from the municipalities, which result in the improvement of the production capacity of vegetables.

The following steps were taken into account for the implementation of the proposal:

- a. Diagnosis based on the opinions of specialists, through opinion polls and interviews.
- b. Conducting interviews with specialists in the topic
- c. Conduct several workshops with the participation of selected specialists to achieve a first approach to the proposal.
- d. Final writing of the proposal of actions taking into account the results of the workshop.

Chart 1 - Proposed actions to increase vegetable production capacities in the municipality of Cienfuegos

| Objective: Contribute to the improvement of vegetable production capacities in Cienfuegos | | |
|--|--|----------------------------|
| Actions | Responsible institution | Compliance deadline |
| 1. To achieve the control, regulation and use of land according to its agro-productive capacity in the production of vegetables in the municipality of Cienfuegos. | Agricultural Delegation (Minag), Provincial Directorate of Physical Planning, Municipal Government | Short |

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| 2. Control at different levels, the application of legislation on the use, management and control of pests and diseases, management of biopreparations, biological media, use, management, rehabilitation of soils and control of irrigation water, including its quality as part of the available resources in order to know exactly the available demand vs. capacity. | Citma, Ministry of the Interior, Delegation of Agriculture (Minag), National Institute of Hydraulic Resources, Municipal Government, Ministry of Agriculture (Minag). | Short |
| 3. Develop agro-technical practices that increase the sink effect and counteract the greenhouse effect and, in addition, increase crop masses that correspond to this production of vegetables in different varieties. | Minag, University | Short |
| 4. Establish on scientific, economic and social bases the most efficient ways of land exploitation, which includes establishing specific models in the mixed exploitation combinations where, among other crops, those dedicated to vegetable production are included. | University, Minag | Short and medium |
| 5. Organize local agro-industries and supply chains in order to economize transportation and eliminate product losses to increase production and the use of derivatives of these agricultural products, so that they reach the points of sale in good condition for consumption by the population. | Ministry of the Interior, Minag, Empresa de Semillas, Instituto Nacional de Recursos Hidráulicos, Municipal Government, University, etc. | Medium |
| 6. Optimize inputs in such a way that maximum yields are achieved with the least use of inputs. Apply the most satisfactory technologies and agronomic measures to achieve high and ecologically viable yields. | Minag, Instituto Nacional de Recursos Hidráulicos, Municipal Government, University, etc. | Short |
| 7. Develop crop rotation systems that allow better use of soil fertility, reduce the incidence of diseases | Citma, Minag, Municipal government | Short |

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| and pests and maintain high and stable yields in the production of this type of crop. | | |
| 8. To increase the delivery of land under usufruct conditions for the harvest of this type of crop. | Minag, in coordination with the Ministry of Labor and Social Security, in coordination with the Ministry of Labor and Social Security. | Medium |
| 9. Identify the production chains and thus the value chain, allowing the study and behavior of prices and the new value created throughout the production cycle. | Ministry of Economy and Planning, University | Medium |
| 10. Increase vegetable production in urban and suburban spaces (patios, rooftops, abandoned buildings), socializing vertical agriculture models and begin to implement them immediately for personal consumption and commercialization. | Minag, Municipal government | Short |
| 11. Create a wholesale market for inputs, equipment and services, where producers of the different productive forms can buy what they need to successfully close the cycle in the event of insufficient or lack of capital. | | |
| 11.1 One alternative that has been suggested by the new economic actors is the participation of foreign investment in the provision of financing for the supply of certain inputs (variety of seeds, equipment), for which it would be necessary to request offers of participation in conjunction with other actors in the territory and the business system. | Municipal government, Minag, Comex, Ministry of Economy and Planning and Ministry of Finance and Prices. | Medium and long term |
| 11.2 Promotion of this type of activity based on linkages between the private and state sectors and, in turn, the formation of a mixed company or | | |

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| association. Mandatory complementation of the public sector with the private sector. | | |
| 12. The different forms of production (CCS, CPA, UBPC, state enterprise, private producers, land usufructuaries) should cover all the links in the chain: production (including seed, nurseries), processing, transport, conservation, retail market (marketing), with a view to reducing costs and eliminating unnecessary intermediaries. | Minag, Municipal government | Short |
| 13. Create marketing cooperatives that belong to and represent producers (CCS and CPA cooperatives, usufructuaries, private producers). | Municipal government and agricultural cooperatives, usufructuaries and other forms of production. | Short |
| 14. Conduct a consumption study on likes, preferences, nutritional needs and vulnerable groups for each municipality and plan production based on these parameters. | Minag, Ministry of Economy and Planning | Short |
| 15. To carry out actions that contribute to improve the attitude in relation to its consumption and the adoption of appropriate eating behaviors with full awareness of the relationship of these with health, due to the nutritional contribution of vitamins, minerals and fibers. This leads to changing or introducing new eating habits in some segments of the population. | Minag, municipal governments, the Ministry of Public Health, the Ministry of Health | Medium |
| 16. Disseminate safe techniques to conserve surpluses in the stages of major vegetable production; for this purpose, support can be given to community projects that have an active educational work in food conservation. | Minag, University, Mined, Polytechnic Institutes (Ipa), | Short |

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| 17. The search for varieties of vegetables that are resistant to pests. The adaptation of some of them to the tropical climate, the search for varieties with higher nutritional content. Also, the introduction of species little known in our environment and to prolong the availability of species of marked seasonality. | Minag, Seed Enterprise, Comex, the various forms of production (cooperatives, usufructuaries, independent farmers) | Medium |
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Source: Own elaboration, July 2020

As an essential result achieved in the research, the need to periodically evaluate the behavior of the production capacities of vegetables, especially to increase them, in order to increase food consumption. This is relevant for the diet of the Cuban family, which results in better health and an increase in the culture of eating habits.

The proposal of actions designed covers several aspects: achieving the control, regulation and use of land according to its agro-productive capacity in the production of vegetables in the municipality of Cienfuegos is one of the essential objectives to be achieved in order to increase the production of these vegetables. It is also recurrent the promotion of new varieties, among other options. It also seeks to establish, on scientific, economic and social bases, the most efficient ways to exploit the land, as well as to optimize inputs, in such a way that maximum production is achieved with the least use of these.

Of connotation in this result is the proposal to use vertical agriculture on a larger scale, where it could be foreseen to increase the capacities in yards, plots and rooftops where several families live together and can be self-sufficient in the production of vegetables.

For their part, the specialists consulted during the research consider that this proposal, if well received by the competent bodies and well implemented, will help to increase this type of food.

Finally, the research conducted considers the limitations and achievements of vegetable production in the municipality of Cienfuegos.

Limitations and achievements in vegetable production

In the municipality of Cienfuegos, one of the most widespread problems that limit vegetable production is the inadequate use of soil, since its use does not correspond to its potential. In most cases, there are major inconsistencies, either due to overuse or underuse. Incoherence in land use is the product of a production logic that derives from conditioning factors, related, above all, to the pattern of land distribution and tenure and to the functioning of markets. All this negatively affects the producer-work-income-consumption-consumption-distribution-needs satisfaction relationship.

Another significant aspect is that the production capacities in the municipality are not always clear to managers or others involved, and therefore do not always correspond to territorial planning.

Problems persist in the contracting and marketing of the products that influence the failure to fully capture production.

Another limitation is expressed in the inadequacies in transport and packaging in the different productive forms for the collection and transfer of production to the collection and distribution points in the territory. This affects the distribution of the products in the various markets, organoponics, points of sale, institutions and social consumption. The authors point out that there is still a lack of linkage between the different links that go from the field to the table. Various mechanisms should be established to ensure that the loss of products in the fields or planted areas is reduced, among other elements.

Another factor conspiring against increasing vegetable production levels is the absence of basic inputs such as fertilizers and pesticides that were conceived in the 2018, 2019 and 2020 Economy Plan, but there has not been the financial capacity to support them.

Despite the limitations, farmers and cooperatives have made a great effort to meet the food needs of the territory. The following are some of their achievements:

- Better organizational and resource distribution conditions have been created to increase vegetable production
- Even though the production obtained does not meet the demands of the population, new seed variants are being sought for this type of production

- This activity provides employment for workers, thereby reducing unemployment levels, including women and young people, and contributes to improved water management and nutrient recycling
- The use of flower beds, plots, intensive and semi-protected vegetable gardens and urban spaces, as well as the granting of land in usufruct encourage the reduction of unproductive, idle or underutilized spaces that can be used to produce the seeds required for vegetable cultivation. All this makes it an objective, balanced and sustainable alternative to achieve food and nutritional sovereignty for the population

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<https://doi.org/10.32457/jmabs.v3i1.1571>

Conflict of interest:

Authors declare not to have any conflict of interest.

Authors' contribution:

Olga Lourdes Vila Pérez and Jesús René Pino Alonso contributed in the realization of the article from its conception and design, as well as in the collection of the information used; they were also in charge of the writing and revision of the document.

Alexander Brito Brito contributed in the design of the instruments and the collection, analysis and interpretation of data, as well as the preparation of tables and figures that allowed outlining the information obtained.

Vivian Varens Albelo contributed to the workshops for the proposal and the critical review of the manuscript.

All the authors reviewed the writing of the manuscript and approve the version finally submitted.



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