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Original article

Local production and certification of seeds, a good practice in Mayabeque province

Producción y certificación local de semillas, una buena práctica en la provincia Mayabeque

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ABSTRACT: Within the framework of the Local Agricultural Innovation Project (PIAL) an idea was developed that would focus on stimulating the exchange of knowledge and skills in the search for practical solutions to agri-food needs, influencing the production of quality seeds of different species and crop varieties, as well as their local certification. Innovating in the appropriate use of quality seeds can substantially improve crop production and productivity, which, in turn, can improve food security, nutritional status, employment, and family income. The objective of this work was to identify the potential for local seed production and certification as an alternative for municipal sovereignty. The experience was developed in the San José de las Lajas municipality, Mayabeque province, starting work with a SWOT matrix and later identifying the potential of the municipality for local seed production and certification. It was identified that the main weaknesses were related to the non-correct functioning of the municipal seed farm, the lack of training in seed production and the low diversity of varieties in grain crops, which are essential in the daily diet of the farmers. Cubans. It was found that the municipality has four local seed banks that produce varieties of different crops, as well as a local certification committee that assumes responsibility for certifying the seed produced by producers and agricultural entities in the town.

Key words: cultivars, quality, innovation, agri-food systems.

RESUMEN : En el marco del Proyecto de Innovación Agropecuaria Local (PIAL) se gestó una idea que se focalizaría a estimular el intercambio de saberes y habilidades en la búsqueda de soluciones prácticas a las necesidades agroalimentarias, incidiendo en la producción de semillas de calidad de diferentes especies y variedades de cultivos, así como su certificación local. Innovar en el uso apropiado de semillas de calidad, contribuye a mejorar, sustancialmente, la producción y la productividad de los cultivos, lo que, a su vez, puede tributar a la seguridad alimentaria, el nivel nutricional, el empleo y el ingreso de las familias. El presente trabajo tuvo como objetivo identificar las potencialidades para la producción y la certificación local de semillas, como alternativa para la soberanía alimentaria municipal. La experiencia se desarrolló en el municipio San José de las Lajas, provincia Mayabeque, iniciándose el trabajo con una matriz DAFO y, posteriormente, identificando las potencialidades del municipio para la producción y la certificación local de semillas. Se identificó que las principales debilidades estaban relacionadas con la falta de funcionamiento de la finca municipal de semillas, la falta de capacitación en la producción de semillas y la baja diversidad de variedades en los cultivos de granos, los cuales son imprescindibles en la dieta diaria de los cubanos. Se constató que el municipio cuenta con cuatro bancos locales de semillas que producen variedades de diferentes cultivos, así como funciona un comité de certificación local, que asume la responsabilidad de certificar la semilla que producen los productores y las entidades agrícolas de la localidad.

Palabras clave: cultivares, calidad, innovación, sistemas agroalimentarios.

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INTRODUCTION

To meet the growing needs of the population, it is necessary to harmonize national policies, programs and plans in the Municipal Development Strategy (EDM), which is the instrument that integrates, from the local level, national, territorial and municipal policies, plans and regulations, based on their contextualization, according to the existing potential and barriers in the municipality (1).

The Local Agricultural Innovation System (SIAL), based on lessons learned from the Local Agricultural Innovation Project (PIAL), is a proposal for participatory management of innovation and development at the territorial level. It seeks to strengthen the innovation system in force in Cuba, by providing a model that has been built between people from science and agricultural production, with the purpose of promoting the agri-food development of the territories (2,3).

It is considered that the use of low quality seeds is one of the most limiting technological characteristics of higher production. According to experimental evidence, innovating in the appropriate use of quality seeds can contribute substantially to crop production and productivity, which, in turn, can contribute to food security, nutritional level, employment and family income.

In Cuba, seed production has become a strategic activity; to this effect, Guideline 188 of the Economic and Social Policy of the Party and the Revolution is aimed at promoting the production, processing, conservation and commercialization of quality seeds (4).

However, there are limitations in the country that prevent supplying demand for seeds, among them, the purchase of inputs necessary for the production of different crops (fertilizers and pesticides), as well as limitations on imports of parts, pieces and aggregates for the repair of machinery, harvesters and other agricultural implements (5). Therefore, it is necessary to encourage local production as an alternative that also allows bringing it closer to the places of consumption, for which a safe seed system should be established (6).

According to this background, the objective of this study was to identify the potentialities for the production and local certification of seeds as an alternative for the municipal sovereignty of San José de las Lajas, Mayabeque province.

MATERIALS AND METHODS

The present work was carried out in San José de las Lajas municipality, located in Mayabeque province, Cuba, and the research was based on the concept of innovation to generate new knowledge for the production of quality seeds in local agricultural systems, based on information on production technologies, certification and commercialization of certified seeds.

The historical-logical method was used to contextualize seed production in the municipality. The analysis-synthesis method, based on the consultation of bibliographic materials, which allowed finding the main elements that are described in the theoretical and methodological references on the topic being addressed. Documentary analysis, used to gather the necessary information (7). Documents issued by:

- Council of the municipality Administration.
- Local Development Strategy
- Municipal Delegation of Agriculture.
- CITMA municipal office.
- Municipal ANAP.
- Scientific articles

With 35 participants, a workshop was held with actors from the municipality, including 7 decision-makers, 12 producers, 8 researchers, 2 professors and 6 specialists, in which the SWOT matrix for local seed production was constructed as a study tool. It was to analyze the internal characteristics (weaknesses and strengths) and the external situation (threats and opportunities) in a square matrix and, in turn, suggest actions to reverse the weaknesses.

RESULTS AND DISCUSSION

In the analysis of the territorial context for seed production in San José de las Lajas (Figure 1), it was found that from the combination of strengths and opportunities arise potentialities, which point to the most promising lines of action for strengthening seed production in the municipality. The limitations, determined by a combination of weaknesses and threats, constitute a serious warning. While the risks (combination of strengths and threats) and challenges (combination of weaknesses and opportunities), determined by their corresponding combination of factors, will require careful consideration when setting the direction that the municipality should take towards the desirable future, such as a greater adoption of new species and varieties of seeds.

It highlights as fundamental weaknesses those related to the lack of functioning of the municipal seed farm, the lack of training in seed production and the low diversity of varieties in grain crops, which are essential in the daily diet of Cubans. However, the municipality has the potential of the existence of a scientific-teaching complex that can contribute to minimize the aforementioned weaknesses.

According to the result of the SWOT matrix, the strategy proposed is of the offensive type (Figure 2), based on the high incidence of strengths-opportunities as a defensive strategy to minimize threats, in which the main objective will be to establish measures to promote local seed production.

Derived from the strategic analysis of the SWOT matrix, a group of actions is proposed that will contribute to promote local seed production, among which the following stand out:

- The sensitization of decision-makers and actors in the municipality with seed production, so that together they can identify the challenges or those problems or opportunities that become demands and drivers of development.

	STRENGTHS	WEAKNESSES
Internal analysis	-It has a Local Development Strategy -It exists with a Scientific-Teaching Complex -Availability of water resources and soils that can be used to ensure the agri-food development of the municipality -Sufficient human resources trained in the agricultural branch -Municipal University Center (CUM) -Agro-livestock Polytechnic Institute -It has a farm for the production of seeds OPPORTUNITIES	-Poor functioning of the municipal seed farm -Difficulty in the introduction of scientific-technical results -Lack of training in seed production -Low use of productive lands -Low availability and diversity of cultivars, especially grains -There is a high % of idle land -Low dissemination of existing good practices in the municipality
	OPPORTUNITIES	**THREATS**
External analysis	-There are opportunities to access different financing sources -Municipal Initiative of Local Development Projects -International collaboration -Plan and Budget -Tributes -Own, idle and waste resources -Non-state sector -State funds (soil conservation, FONADEF, etc.) -Contribution to 1% of the total sales of territory entities for Local Development -FONCI: Science Fund for Research -Bank credits	-Climate situations -Cuba-United States relations -World Economic crisis -Climate change -Latin American integration process -Updating of the Cuban economic-social model

Challenges **Potentials** **Limitations** **Risks**

Figure 1. Weaknesses, threats, strengths and opportunities related to seed production in San José de las Lajas municipality, Mayabeque

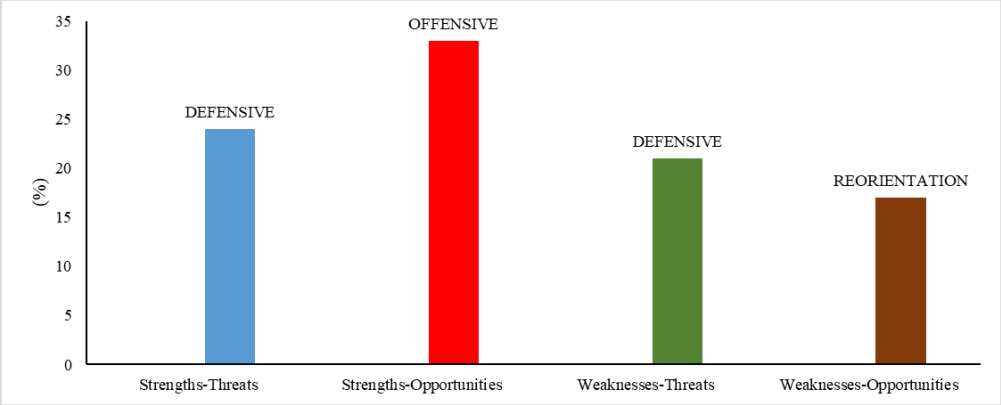

Figure 2. Level of incidences and types of strategies according to SWOT matrix result

- Develop action learning cycles such as agrobiodiversity fairs and farmers' schools, where a wide diversity of cultivars are exhibited, including commercial cultivars, pre-commercial cultivars, advanced lines and local cultivars.
- Advice and train producers involved with seed production in the municipality.
- Train local seed certification committees in order to ensure the quality of the seed obtained and in the new standards issued by the regulatory body of the activity.

A seed system can be defined in general terms as the combination of components, processes and their organization for the production and marketing of one or more seed species (8). Research on this subject identifies two production systems, the formal system that provides seeds of uniform varieties that have been evaluated for their adaptation to certain systems and under certain growing conditions; the structure of this system is guided by the scientific methodologies of plant breeding and multiplication controlled by specialists (9).

On the other hand, the informal or local seed system refers to the production of seeds by farmers based on the genetic resources available from their own harvests. It gives rise to the use of local crop varieties, which through empirical processes of improvement and selection are adapted to local agro-climatological conditions and to the needs of farmers and their families (10).

It is considered that the use of low quality seeds is one of the most limiting technological characteristics of increased production. According to experimental evidence, innovation in the appropriate use of quality seeds can substantially improve crop production and productivity, which, in turn, can improve food security, nutritional levels, employment and income of rural families (11).

In view of the weaknesses, strengths, threats and opportunities, as part of the actions of the PIAL project in the municipality, the strengthening of local seed production (PLS) has been promoted and with it the creation of local seed banks (BLS), with the purpose of having a diversity of species and cultivars of economic importance in the hands of farmers.

Local seed banks (BLS) are sites (farms or groups of farmers' farms, backyards and others) where the high diversity of crop seeds, varieties and technologies, both native and improved, that exhibit local adaptation (resistance to drought, salinity, pests and others) are introduced, experimented, conserved, rescued, restored, revitalized and disseminated at a minimum cost. They can be maintained and multiplied in a sustained manner by the communities involved (12).

These BLS are sustained by the diversity coming from the formal and local seed system, as well as from donations received from research centers or collections, all of which has allowed diversifying the agricultural systems related to the project and having four local seed banks in San José de las Lajas (Table 1).

In some way, some influences of the PLS can be described related to:

- Improvement of the local economy in BLS areas with the generation of jobs associated with seed production management.
- Economic benefits have been generated for seed multipliers.
- The increase in the cooperative-business network has had direct consequences in terms of improving the living conditions of farmers by increasing their income.
- Agricultural production has been encouraged on the farms with the delivery of inputs (seeds, tools, training, workshops, national and international exchanges, participation in events), stimulating and dignifying work in the agricultural sector.
- The mission and capacity of agricultural cooperatives to manage and provide services to their members has been strengthened.

In general, the official certification bodies do not include in their system the production of seeds of varieties for local use. The company specialized in this activity is not considered profitable and is not prepared to produce and store small quantities of seed of different varieties. One way of guaranteeing the quality, purity and identity of the new improved varieties obtained or selected through participatory plant breeding is based on local seed production, which is carried out by organized groups of small farmers and by seed committees, which may be made up of farmers, inspectors and local agricultural authorities (12,13).

Local seed certification (CLS) is the process of verifying the identity, production, benefit and quality of seeds, in accordance with the provisions of the Law, in order to ensure their purity and genetic identity, as well as adequate levels of physical, physiological and sanitary quality, under the supervision and control of the seed inspection and certification service (14).

In this regard, in 2017, the municipal administration council (CAM) and the national association of small farmers (ANAP) of the municipality approved the local seed certification committee (CCLS), made up of five members. Two belong from the municipal directorate of agriculture (coordinated by the plant health specialist), a specialist from the National Institute of Agricultural Sciences (INCA) and two producers who are responsible for BLS. This CCLS has among its functions the following (15):

- Establish the potential demand for seed by variety, among local producers and possible future demands.
- Supervise the production fields, the verification, in plant and in laboratory, of the quality of the seed.
- Manage the local foundation seed of the varieties to be increased, before state institutions.
- Approve seed production protocols.
- Select the farmers who are seed breeders and discuss with them the seed production protocol to be applied by the committee.

Then, the members of the certification committee should be trained in disease recognition, identification of off-types, and recognition of seed affected by diseases, germination evaluation and field sampling techniques. They should also be trained in marketing strategies, as well as in the efficient operation of seed processing equipment and storage conditions (12). Thus, local seed production and certification in San José de las Lajas municipality follows the following work cycle, where it is articulated with different local actors whose demand for innovation is to obtain and certify the seed produced in the territory (Figure 3).

Tables 2 and 3 show examples of seeds certified between 2017-2018 and 2020-2021 by CCLS, at the request of INCA as a state institution and producers with commitments to seed production, it is evident how production and certification increased from one period to the other.

Undoubtedly, farmers face the challenge of self-sufficiency and supplying native, creole and agroecological seeds to the locality. This challenge posed to the Agroecological Movement of Latin America and the Caribbean the need to build strategies for seed production in conjunction with organizations formed by family farmers, peasants and ethnic communities with agroecological production, based on their needs and knowledge (16).

As a strategy, the creation of Networks and Community Seed Houses (CCS) emerged as a concrete action of the

Table 1. Local seed banks in San José de las Lajas municipality, Mayabeque.

BLS	Crops	Responsible (producers)
Farm El Mulato	Grains, vegetables, grasses, green manures, protein plants	Yoel Hernández
Farm Robeba	Grains, vegetables	Nivio Pérez
Farm La Chivería	Grains, vegetables, grasses, coffee	Jorge Medina María Luisa García
Farm El Tamarindo	Fruit trees	Oneida Calvo

Figure 3. Cycle for the planning and local certification of seeds in San José de las Lajas, Mayabeque province

Table 2. Area planted and production certified by the CCLS of San José de las Lajas, years 2017-2018

Crops	Area (ha)	Production (kg)
Beans (*Phaseolus vulgaris* L)	5.0	5 500
Corn (*Zea mays* L)	2.0	2 100
Chickpea (*Cicer arietinum*)	0.5	100
TOTAL	**7.5**	**7 700**

Source: CCLS from San José de las Lajas

Table 3. Seed of different crops certified by the CCLS in San José de las Lajas, 2020-2021

Crops	Cultivars	Quantity of certified seed (kg)
Corn (*Zea mays* L)	Dorado	23 000
Tomato (*Solanum esculentum* L)	Mara, Mariela, Amalia, Vyta, Elbita y MR-2,3,5,7	1.36
Beans (*Phaseolus vulgaris* L)	Velazco largo y Cuba-cueto (rojo, negro, blanco, rosado).	7 000
Soy (*Glyxine max* L)	INCASoy-1,2,24,24,35,36,27 modificada	522.99
TOTAL		**30 524.35**

Source: CCLS from San José de las Lajas

organizations of peasants and ethnic communities, faced with the loss of agro-biodiversity and contamination by transgenics. This strategy becomes an alternative not only to solve the problem of seed supply for agroecological processes, but also to achieve food security and sovereignty for communities in general (17). Measures based on this activity can be integrated into national or regional action plans and include the right strategies to achieve the objectives of seed security policies (18).

CONCLUSION

San José de las Lajas municipality has the potential for seed production and certification at the territorial level. However, it is essential to accompany and train the actors in the process in order to achieve a quality seed that, in turn, contributes to municipal self-sufficiency.

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