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Production chain of common bean in agriculture and livestock cooperative: intervention proposal of the AGROCADENAS project

Cadena productiva del frijol común en cooperativas agropecuarias: propuesta de intervención del proyecto AGROCADENAS

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ABSTRACT
The support program for the strengthening of Agrifood Chains (AGROCADENAS) prioritizes the study in the common bean chain. In the Yaguajay municipality, in the province of Sancti Spíritus, it was found that there are deficiencies in the common bean production chain. The objective of the work was to design an intervention proposal to help mitigate the critical points ("bottlenecks") identified in the productive chain of common bean (Phaseolus vulgaris L.) in the Agroindustrial Grain Company "Valle de Caonao" in the Yaguajay municipality. A diagnosis was made based on the added value chain approach and the stages and steps of the proposed methodology for the diagnosis of AGROCADENAS were followed. To respond to the problem, a business plan was presented for the installation of an industrial plant for the benefit of drying,

RESUMEN
El programa de apoyo al fortalecimiento de Cadenas Agroalimentarias (AGROCADENAS) prioriza el estudio en la cadena del frijol común. En el municipio Yaguajay, de la provincia de Sancti Spíritus, se detectó que en la cadena productiva del frijol común existen deficiencias. El trabajo tuvo como objetivo diseñar una propuesta de intervención para contribuir a atenuar los puntos críticos ("cuellos de botella"), identificados en la cadena productiva del frijol común (Phaseolus vulgaris L.), en la Empresa Agroindustrial de Granos "Valle de Caonao", en el municipio Yaguajay. Se realizó un diagnóstico, basado en el enfoque de cadena, de valor agregado y se siguieron las etapas y pasos de la metodología propuesta para el diagnóstico de AGROCADENAS. Para dar respuesta a la problemática, se presentó un plan de

cleaning, grading, polishing and packaging of the grain. Among the benefits of the intervention is the introduction of a new technology in the country to benefit the bean grain adequately for the benefit of the population and for social consumption. It is expected to stimulate the production of corn, sorghum and chickpea, which will guarantee the sustainability of the plant during the non-productive cycle of the common bean. In addition, revenues amounting to $ 555 210 601.0 are generated for the entity, 60 new jobs, and the incorporation of women and young people into the productive process.

Keywords: Agrocadenas; value chain; common bean

negocio para la instalación de una planta industrial para el beneficio de secado, limpieza, clasificación, pulido y empaque del grano. Dentro de los beneficios de la intervención, se destaca la introducción de una tecnología nueva en el país para beneficiar el grano de frijol, adecuadamente, en beneficio de la población y para el consumo social. Se espera estimular la producción de maíz, sorgo y garbanzo, lo que garantizará la sostenibilidad de la planta durante el ciclo no productivo del frijol común. Además, se generan ingresos que ascienden a $ 555 210 601.0 para la entidad, 60 nuevos empleos y se propicia la incorporación de la mujer y los jóvenes al proceso productivo.

Palabras claves: Agrocadenas; cadena de valor; frijol común

INTRODUCTION

Food production in Cuba is a fundamental and, at the same time, controversial issue in any scenario of national debate on food security. The Food and Agriculture Organization of the United Nations (FAO) points out that agrifood chains are a necessary option for food production and defines them as "[...] the successive diverse transformations that food undergoes, from the moment in which the farmer sows the seed until the last stage in which it is sold to the final consumer...". (FAO, 2015).

The International Institute for Management Development (IMD, 2015) states that value chains are an option for integration between the entities and actors involved, from the generation of primary products to the consumer to meet customer demands. This is their main contribution, although greater competitiveness and the application of innovations of all kinds are also elements that distinguish them.

Line 185 of the Economic and Social Policy, adopted at the Sixth Congress of the Communist Party of Cuba (PCC, 2011) states: "Organize agrolivestock production in those activities that generate external income or that substitute imports, applying a systemic or production chain approach that includes not only primary production, but all the links that are articulated around the agro-industrial complex (...)". In this context, agrolivestock cooperatives and the rest of the producers have a preponderant place in the production chain in terms of achieving this objective.

Based on this new policy, it is necessary to carry out a series of transformations focused on enhancing the Cuban economy, taking into account the urgent need to substitute imports. The results of the producers are not able to supply the growing demand of basic products for the food of the population, such as rice, corn and beans, Cuba being one of the main importers of these products at the international level. Inter-American Institute for Cooperation on Agriculture (IICA, 2014).

The chain approach is a useful tool for ensuring a systemic approach to the food issue in Cuba. It allows for intersectoral, demand-oriented planning and management in line with the objectives set by the process of updating the country's economic and social management model. This approach helps to have a broad and comprehensive view of the evolution and performance of a product, from production to consumption; it contributes to a better understanding of the dynamics of the chain, its internal processes and the external factors that affect it (Álvarez, 2016).

Anaya (2015), highlights, in the current context, threats to the articulation of production chains in the Cuban agricultural sector, say, the existence of a rooted culture of independent work by the different actors, the fact that a diversity of ministerial structures intervene in agro-industrial chains, whose planning and strategies have traditionally been conceived in an isolated rather than a systemic manner, the presence of a complex and not very stimulating regulatory and normative environment, the penalties, in material terms, suffered by the chain actors and the few degrees of freedom for their management.

The United Nations Industrial Development Organization (2004), Salazar and Van der Heyden (2004), Romero and Santos (2006) and Angulo (2007), define production chains as a structured set of production processes that have the same market in common and in which the technoproductive characteristics of each link affect the efficiency and productivity of production as a whole. Hence, production chains are subdivided into links, which comprise sets of enterprises with specific functions within the production process.

In this sense, the country developed the Program to Support the Strengthening of Agrifood Chains (AGROCADENAS), an international cooperation initiative jointly promoted by the United Nations Development Program (UNDP) and the Ministry of Agriculture (Minag), with the collaboration of the Ministry of Domestic Trade (Mincin) and the Ministry of Food Industry (Minal) and financial support from the European Union (EU) and the Swiss Agency for Development Cooperation (SDC), with the involvement of agricultural cooperatives in the municipality. This project develops an experimental process that applies a value chain approach in some agrifood chains; priority is given to the provinces of Sancti Spíritus, Villa Clara, Granma and Santiago de Cuba. In order to determine the current situation of the production chains in these provinces, a diagnosis was made of the maize, beef, milk and bean chains; the latter will be the subject to be dealt with in the present work (National Technical Team of the Program to Support the Strengthening of Agrifood Chains at the local level, 2014).

According to García (2003), in Cuba around 110 thousand tons are imported per year to satisfy the internal demand and considerable sums of money are destined to its import, due to the fact that

it represents one of the main dishes within the food culture of the population. The behavior of bean import costs, during the period from 2007 to 2015, moves from 812 USD/t to 1308 USD/t and with average annual growth rates of 6.8%.

In this sense, certain policies, such as the increase in the purchase price of beans from the producer and the delivery of idle land to the non-state sector, have generated a dynamization of this agrifood chain, to a greater extent in territories with a tradition of cultivation, as is the case of the municipality of Yaguajay, in the province of Sancti Spíritus.

The bean chain in Cuba is composed of five links that represent the main processes through which the product passes to reach different destinations (seed multiplication, production, drying-benefit, storage and distribution-marketing).

When the strategy for the common bean chain in the central region of Cuba (Villa Clara and Sancti Spíritus) was constructed, it turned out that the main critical point of the chain in Yaguajay is in the dried link-benefit, which is done by hand, which influences the quality of the grain and generates losses estimated between 6-7%. There are also losses in the process of marketing and storage, estimated between 4 - 5%.

Therefore, the objective of the work was: to design an intervention proposal to contribute to attenuate the critical points ("bottlenecks") identified in the production chain of the common bean (Phaseolus vulgaris L.) in the Agroindustrial Company of Grains "Valle de Caonao", in the municipality of Yaguajay.

MATERIALS AND METHODS

A diagnosis was made, based on the value-added chain approach. The methodology used was participatory. To this end, local actors validated and systematized the steps and tasks carried out, as the diagnosis progressed, with specialized technical-methodological support.

The actors of the common bean production chain were identified and a survey was carried out of the criteria that distinguish them. In addition, the organization and coordination mechanisms among the actors in the chain were evaluated.

The stages and steps of the methodology proposed for the diagnosis of AGROCADENAS (National Technical Team of the Program to Support the Strengthening of Agrifood Chains at the Local Level, 2014) were followed according to the following stages:

- Stage I. Diagnosis: This refers to the strengthening of local capacities of intersectoral groups to adopt the chain approach and to diagnose bottlenecks and develop local strategies, action plans and intervention proposals to improve the functioning of the chains.
- Stage II. Implementation: Refers to the selection and implementation of the intervention proposal elaborated, providing inputs, equipment and technical and managerial knowledge.
- Stage III. Evaluation: It refers to the evaluation of the impacts achieved in the chains and the implementation of a sustainability and follow-up strategy that allows the continuous improvement of the chains.

Information was collected in situ, through interviews with experts, brainstorming, surveys, search and consultation of primary sources of information, process diagrams, weighting and prioritization matrices, among others.

RESULTS AND DISCUSSION

In the study of the Program of Integral Development of Grains of the province of Sancti Spíritus, it was possible to appreciate a detailed diagnosis of the territory, in reference to the common bean chain; in this way, four different productive forms were identified: the Cooperatives of Agrolivestock Production (CPA), the Cooperatives of Credits and Services (CCS), the Basic Units of Cooperative Production (UBPC) and the Base Entrepreneurial Units (UEB), grouped in 5 companies and 121 productive bases.

In the municipality of Yaguajay, there are three enterprises dedicated to agricultural and livestock production and, within them, to the production of common beans and other grains that contribute to the national balance, to the self-sufficiency of the territory and control all the production of the productive bases that they represent. These enterprises are Empresa Agropecuaria "Obdulio Morales", Empresa Pecuaria "Venegas" and Empresa Agroindustrial de Granos (EAIG) "Valle de Caonao", which is the proponent of this intervention. Also considered are the Agricultural and Livestock Enterprises of Cabaiguán and Taguasco with their corresponding productive forms that they represent.

From the foregoing, it can be seen how the strengthening of the bean production chain is in line with the development policies of the municipality and the territory, by supporting the existing demand for this service.

The proposed intervention is in line with the Integral Development Program of the municipality of Yaguajay (2014-2020) which assumes food production as a strategic line and is presented at the key objective level: to develop production chains that, according to the potential of the territory, allow the participation of all agents involved in the production, transformation and distribution of an agricultural product.

Consequently, the fundamental objective is: "To promote the economic and productive development of the territory, through the optimum use of existing potentialities in accordance with the requirements of environmental protection, which will strengthen the infrastructure that will serve as the basis for increasing the processing of productions, the reactivation of productive forces and the application of science and technology, facilitating the generation of income and promoting the development of the territory".

The EAIG "Valle de Caonao", at this moment, is dedicated only to the production of grains and the rendering of services to the productive base of the entity and others. It does not carry out the gathering and commercialization activity because it does not have the benefit of drying, cleaning, classification, polishing and packing the grain.

At present, the benefit is carried out in an artisanal way by the producers themselves, all of which brings with it unproductiveness, bad selection and quality of the final product and inefficiency of the productive process, in addition to an inadequate commercialization when

offering it in formats of 46 Kg, practically without benefiting.

In the agricultural sector, the municipality of Yaguajay is facing a notable process of ageing of its human resources and is subject to the emigration of its population. To minimize its effect, the government authorities have drawn up a comprehensive strategic plan to incorporate women and young people into agricultural and industrial production. An example of this is the construction, assembly and start-up of a grain processing plant that would generate 60 jobs and, fundamentally, can be occupied by women and young people as a priority.

Through the exchange with the actors of the chain, it was possible to appreciate that the common bean chain in the municipality goes through several problems related to the following aspects:

- Need to guarantee the industrial processing in the common bean chain with the contribution of greater added value to the final product for its commercialization.
- There are no providers for this specialized service in the region.
- Ignorance of other suppliers of raw materials (common bean) that are located in areas adjacent to our municipality and that, because of its proximity, could benefit from this business.
- The entity must use market techniques (communication and advertising) that enable its recognition and increase the services of drying, processing and packaging.
- The entity must achieve the purchase of the common bean that is produced in the north central pole for subsequent industrial processing and achieve its commercialization through identified distribution channels.

In order to respond to the problem, a business plan was presented with the fundamental objective of closing the production chain of common beans and other grains, through the installation of an industrial plant for the benefit of drying, cleaning, classification, polishing and packaging of the grain. In this way, it contributed to the increase of production, its efficiency, quality and a good selection of the final product, achieving the incorporation of women to the stable productive process. In addition, a new specialized service was added to the grain chain, on a local scale, which included other productive entities within a radius of 60 km.

Industrial activity in grains and the common bean chain does not exist in the country and with the start-up of the grain drying, cleaning, sorting, polishing and packaging processing plant, the main problem identified in the diagnosis of the common bean production chain is solved.

The Yaguajay productive pole comprises the municipality of Yaguajay and the northern part of the municipalities of Taguasco and Cabaiguán, within a 45 km radius. Only the municipality of Yaguajay produces 34% of the total common bean production of the province of Sancti Spíritus and the productive pole, in its totality, produces 72%, constituting the main productive pole that will pay to the plant for its industrial processing.

In 2015 the productive pole Yaguajay reached a production of 2717.6 t. of common bean; a growth of 18.2% is expected in 2019, with respect to 2015, where 3211.8 t. will be produced. This increase will be due to the introduction of new irrigation technologies, seeds, soil,

agricultural machinery, extensionism and the industrial benefit foreseen in the Grain Development Program until 2019, approved by the Ministry of Economy and Planning, which contributes to the strengthening of the productive bases of this productive pole.

With the installation of the industrial benefit, it is expected to stimulate the production of corn, sorghum and chickpea, which ensures the sustainability of the plant during the non-productive cycle of the common bean.

In 2015, corn and sorghum production of 6741.4 t. was achieved, which foresaw a growth of 8914.4 t. in 2019, which represents an increase of 32.2% and, in the case of chickpea, production was 79.7 t., in 2015 and in 2019 will be 93.1 t., with an increase of 16.8%.

The company is responsible for buying the production of grains from the productive base, after contracting, for its subsequent industrial benefit and the result of it will be marketed to the following destinations:

- Ministry of Domestic Trade (Mincin), for the consumption of the population
- Ministry of Internal Trade (Mincin), for social consumption
- Collection for sale in state agricultural markets (MAE)
- System of collection stores in currency and hotels

The levels of production to be contracted and benefited per year are reflected in table 1.

Table 1 - Production volume (t) to be processed at the Yaguajay production pole plant

Year	Bean	Corn	Chickpea	Total
2015	2717.6	6954.8	79.7	9752.1
2016	2901.0	7358.4	86.1	10345.5
2017	3059.9	7921.5	96.4	11077.8
2018	3103.9	8657.9	101.2	11863.0
2019	3211.8	8914.4	104.3	12230.5
TOTAL	14994.2	39807.0	467.7	55269.0

Source: Own elaboration

Bearing in mind that a plant, for the industrial benefit of grains, is functional for cleaning, drying, storing, classifying and packaging the final product of any grain (bean, chickpea, corn and sorghum), it was proposed and defined to work with a plant whose processing technology would be for the common bean and its technological capacity would be for corn. With the expected results of the production per year and the production cycles of each crop or grain in which the common bean (January-March) and corn (June-December) do not coincide, it was evaluated that the most adequate plant is the 40.0 t/day of reception for the common bean and corn.

The industrial benefit plant is projected on the basis that it works 20 hours a day and between 24 and 26 days a month in each crop cycle, thus making it work 11 months a year.

The capacity analysis carried out for the common bean revealed the following aspects:

- Peak production month: March
- Estimated total production in March: 980.0 t
- Full working days: 24.5 days

- Average production per month: 803.0 t
- Average production days per month: 20.08 days
- Production of the production cycle for the common bean in 2019: 3211.8 t

Besides, for corn it was next:

- Peak production month: July-August
- Total estimated production in August: 1350.0 t
- Full working days: 33.7 days
- Average production per month: 1273.5 t
- Average production days per month: 31.8 days
- Production of the production cycle for corn in 2019: 8914.4 t

According to forecasted production estimates, it was diagnosed that the plant would not have the capacity to respond to production in the peak month. It was evaluated that the corn drying technology achieves the expected result.

In order to achieve these productive results, the productions shown in tables 2, 3 and 4 are linked to the Yaguajay productive pole.

Table 2 - Estimated volume of common bean production in the Yaguajay productive pole, from 2015 to 2019

MUNICIPALITIES	ESTIMATED PRODUCTION ACCORDING TO GRAIN PROGRAM (t)					TOTAL
	2015	2016	2017	2018	2019	
Yaguajay	1283.6	1359.2	1443.3	1476.1	1559.8	7122.0
Taguasco	598.0	642.9	671.7	684.7	702.4	3299.7
Cabaiguán	836.0	898.8	944.9	943.1	949.7	4572.5
TOTAL	**2717.6**	**2901.0**	**3059.9**	**3103.9**	**3211.8**	**14994.2**

Source: Own elaboration

Table 3 - Estimated volume of corn production in the Yaguajay production pole, from 2015 to 2019

MUNICIPALITIES	ESTIMATED PRODUCTION ACCORDING TO GRAIN PROGRAM (t)					TOTAL
	2015	2016	2017	2018	2019	
Yaguajay	3851.1	3873.2	4443.8	4816.6	4922.1	21906.8
Taguasco	1600.4	1690.5	1814.9	2048.9	2104.4	9259.1
Cabaiguán	1503.3	1794.7	1662.8	1792.4	1887.9	8641.1
TOTAL	**6954.8**	**7358.4**	**7921.5**	**8657.9**	**8914.4**	**39807.0**

Source: Own elaboration

Table 4 - Estimated volume of chickpea production in the Yaguajay productive pole, from 2015 to 2019

MUNICIPALITIES	ESTIMATED PRODUCTION ACCORDING TO GRAIN PROGRAM (t)					TOTAL
	2015	2016	2017	2018	2019	
Yaguajay	-	-	-	-	-	-
Taguasco	79.7	86.1	96.4	101.2	104.3	467.7
Cabaiguán	-	-	-	-	-	-
TOTAL	**79.7**	**86.1**	**96.4**	**101.2**	**104.3**	**467.7**

Source: Own elaboration

The transfer of the grain, from the productive bases to the industry, will be carried out in accordance with what has been agreed between the parties, who will fix in the contract which of the parties will locate the transport and the tariffs, according to Resolution 476/2012.

The grain will be purchased with a maximum of 26% humidity and 10% impurities, according to Resolution 239/2015. For producers who request the service, the cost for the provision will be $ 217.00 CUP/t.

Among the benefits of the intervention is the introduction of a new technology in the country to benefit the bean grain, which allows pre-cleaning, drying, cleaning, sorting, packaging and marketing adequately for the benefit of the population and for social consumption. The final packaged product will have the formats 0.25, 0.50, 1 and 50 kg, which manages to meet the standards of presentation and marketing.

There is a greater availability of beans due to the reduction of losses in drying-benefit, storage and marketing, recovering 1499.4 t. in the 5 years studied. The complete productive cycle of the bean chain is closed, reaching a total control of the production and its destinations, under established quality norms.

With the installation of the industrial benefit, it is expected to stimulate the production of corn, sorghum and chickpea, which will ensure the sustainability of the plant during the non-productive cycle of the common bean, in addition to obtaining a final product that meets the quality standards, established according to the Cuban Quality Standard 782/2010.

In addition, income is generated amounting to $ 555 210 601.0 for the entity, 60 new jobs and encourages the incorporation of women and youth to the production process.

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