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Sustentabilidad en la agricultura familiar agroecologica: blackberry de Castilla en Sumapaz

Sustainability in agroecological family agriculture: Castilla blackberry in Sumapaz

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Resumen

La agricultura familiar genera empleo, crecimiento económico, desarrollo y competitividad, orientada a potenciar ventajas competitivas a través de alianzas productivas, alternativas de producción y especialización del mercado. Son numerosos los retos que tiene la cadena de valor de la blackberry de castilla (rubus glaucus) en Sumapaz, la cual debe orientar esfuerzos en el cierre de brechas. Dicha propuesta, evalúa la sustentabilidad y genera alternativas de asociatividad y comercialización. Ya que, los eslabones primarios no aplican un uso adecuado de prácticas agrícolas y empresariales, para afrontar cambios en los procesos de globalización de los mercados y adopción de nuevas formas de desarrollo empresarial.

Palabras clave: Agricultura familiar, asociatividad, desarrollo empresarial, prácticas agrícolas, sector productivo.

Abstract

Family farming generates employment, economic growth, development and competitiveness, aimed at enhancing competitive advantages through productive alliances, production alternatives and market specialization. There are numerous challenges facing the mulberry (rubus glaucus) value chain in Sumapaz, which must focus its efforts on closing gaps. This proposal evaluates sustainability and generates alternatives for associativity and marketing. The primary links do not apply an adequate use of agricultural and business practices to face changes in the processes of market globalization and the adoption of new forms of business development.

Keywords: Evaluation, pedagogical practices, training partner, reflective, development.

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1. Introduction

Within the study "Development of Fruit Growing in Cundinamarca", the fruit sector has had an important development especially in the Sumapaz region, Tequendama, Río Negro and some isolated municipalities such as Subachoque and Cota. In addition, it has collection centers in the municipalities of San Bernardo, Pacho, Anapoima, and to a lesser extent in San Antonio del Tequendama, Pasca, Cota, la Calera and Fusagasugá, these conditions make up a belt that supplies the great demand of Bogotá, within a comprehensive food scheme that includes all services derived from a megadiverse process in physical, economic and social terms (Asohofrucol, 2010).

The research generates guidelines for the strengthening of the productive sector of the blackberry of Castile, species *rubus glaucus*, orienting the study to agribusiness in the province of Sumapaz, to specify the operation of the value chain. Analizando el desarrollo de las actividades que se presentan en el ciclo productivo, el cual permite conocer la situación actual de la cadena y proponer nuevos mercados, tendencias y alternativas de consumo para fortalecer las estrategias de comercialización y mercadeo en la región (Fonseca & Vega, 2018).

It is pertinent to mention that at the national level there is an important study about the blackberry production chain in the department of Caldas (MADR, 2015) where shortcomings are identified such as dispersion of production, organizational deficiency of producers, excessive intermediation, and lack of training. However, opportunities were found such as export, agribusiness, permanent national production, human capital training, commercial alliances between agribusiness and the fresh market (Escobar, 2015).

It is important to highlight that according to a literary review, primary and secondary sources, there is no evidence of a study that integrates the production process, that strengthens marketing and commercialization strategies in the agro-business sector of the Sumapaz province, within a competitiveness model. , growth, and development. Hence the importance of managing efforts aimed at evaluating the sustainability of the blackberry value chain of Castilla.

In Sumapaz, an analysis of the territory was generated and the prioritization of the productive bet, blackberry of Castilla (Rubus glaucus) developed by the Chamber of Commerce of Bogotá, headquarters Fusagasugá and the provincial table of competitiveness of Sumapaz (CCB, 2016). These results are estimated to be a permanent crop found in nine of the ten municipalities that make up the region. (MADR, 2006). In turn, Sumapaz has excellent conditions for agricultural and agro-industrial production. However, the little productive specialization, the incipient added value in its products and the lack of strategies for competitiveness are evident in the penetration and maintenance of profitable markets.

Due to the weak integration of the links, all academic - productive interests must be focused on the resilience and functioning of the productive chain, to generate a dynamic approach in the development and improvement of emerging agri-businesses, for which the proposal seeks to generate actions that contribute to the identification and characterization of the actors that make

up the Blackberry chain in Sumapaz, as well as challenges and potentialities based on the needs of a market, with the aim of contributing to the competitiveness of the agricultural and agro-industrial sector and establishing alternatives for closing gaps, opening new markets, fair prices, innovation and development (MADR, 2006).

2. Theoretical framework

The Blackberry de Castilla is one of the most representative fruit in terms of geographical coverage and hectares sown in the country, (12,281 hectares in 2013 at the national level), the department of Cundinamarca represents the territory with the largest area planted with Blackberry and therefore with greater production; it represents about 30% of the planted area and 34% of the national production. In Sumapaz, the municipalities with the highest production volume stand out: Fusagasugá, San Bernardo, Arbeláez, Silvania, and Pasca (Escobar, 2015).

The ministry of agriculture and rural development carried out a study in 2015 to define the productive chain of the blackberry of Castile at the national level, within the results generated the weak integration of the links that compose it was evidenced, these actors do not generate processes standardized production to generate added value, product differentiation, agro-industrialization, in favor of the constant search for strategic allies (Escobar, 2015).

In turn, a study by ASOHOFRUCOL (2010) shows that the main weaknesses in the blackberry chain are the dispersion of production, lack of producer organizations, excessive intermediation, little training, small opportunities in the sector to compete in a national and international market, lack of interest on the part of supermarkets and blackberry processing companies to establish market alliances. For this, the opportunities for the cultivation of blackberries are conceived, such as permanent national production, the wide potential for consumption, vocation towards cultivation and possibilities of agro-industrialization (juices, nectars, jams, soft drinks, ice cream, pulps, compotes) (ASOHOFRUCOL, 2010).

3. Methodology

Participatory methods in production systems (actors in the value chain), mixed research (qualitative and quantitative) of a descriptive nature, primary and secondary sources and information capture techniques, with the purpose of generating an integrative agro-business model for the development and strengthening of the blackberry de Castilla productive bet.

The fieldwork was carried out in the province of Sumapaz, which is located in the southwest of the Department of Cundinamarca, which has an area of 183,865 Hectares and a population of 189,309 inhabitants, of which 108,259 belong to the urban area and 81,138 to the rural area. It is made up of ten municipalities: Arbeláez, Cabrera, Fusagasugá, Granada, Pandi, Pasca, San Bernardo, Silvania, Tibacuy, and Venecia (Albarracín, Fonseca-Carreño, and López, 2019). All the municipalities are part of the hydrographic basin of the Sumapaz River, which is born in the Páramo del Sumapaz.

In the first stage, a participatory diagnosis is carried out for agricultural producers who make up the provincial competitiveness table, made up of associations that produce and sell blackberry from Castile. Based on

participatory methods (Geilfús, 1997) and some activities to promote rural development. Agro ecosystems and productive practices of the blackberry of Castile are identified and characterized. Within the participatory tools, the map of natural resources at the farm level and the systemic farm model were taken into account.

In the second stage, the value chain of the blackberry of Castilla is characterized, the structure and the actors that compose it are identified, the links that make it up, and the possible agribusinesses that are generated within the production cycle are characterized. In the third stage, sustainability indicators are proposed based on the "Framework for the Evaluation of Natural Resource Management Systems Incorporating Sustainability Indicators" (MESMIS), which starts from the premise that it is a participatory activity that requires a perspective and an interdisciplinary work team (Astier, 2006). Therefore, the evaluation team includes both external evaluators from the University of Cundinamarca and rural producers from each farm under study.

To evaluate the sustainability criteria and indicators with the MESMIS method, seven basic attributes were used which are derived from the properties of the production systems, for which Gutiérrez et al., (2011), describe them as: ***productivity:*** is the efficiency of production systems; ***reliability:*** conservation and appropriation of natural resources; **adaptability**: functionality to adapt to changes in the macro and micro environment; ***self-management:*** minimization and dependence on external resources and joint decision making; v) **equity:** responsibilities, rights and duties; stability: perseverance of the productive system in the face of fluctuations and environmental cycles and ***resilience:*** ability of the system to maintain productivity in the presence of stress or disturbance.

The determination of the critical points, the participatory exercise allows us to know the conditions of the production systems, from the socio-economic and environmental perspective, where the SWOT diagnosis - Strengths, Opportunities, Weaknesses, and Threats - was used to identify, analyze and visualize the current situation of the farms. With this information, the critical points that were framed within each category of analysis (attributes and dimensions of sustainability are detected).

4. Results

4.1 Diagnosis of the blackberry value chain of Castilla species *Rubus glaucus* in Sumapaz

Through the generated diagnosis, the following findings were obtained:

a) The region has 20 associations that produce and sell blackberry from Castile, Silvania with 6 and Pasca with 4 associations
b) The number of producers that make up the associative groups varies according to the productive commitment of each municipality, within which Silvania stands out with 24 and Fusagasugá with 21 producers
c) The annual production of the Sumapaz province in 2018 was 6,328 tons, the production cycle is permanent, with two weekly harvests, within which Silvania produces 3,400 tons, followed by Pasca with 2,400 and
d) The hectares planted in the province are estimated at 771 hectares planted. The most representative area is the Frusan association of the municipality of San Bernardo with a territorial extension of

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294 hectares, equivalent to 38% of the area planted in the province, which is generated by the optimal agro-ecological conditions (Figure 1).

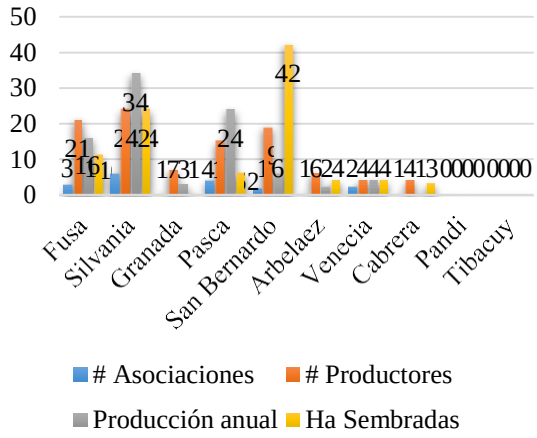

Figure 1. Diagnostic results of blackberry producers in the province of Sumapaz. Source: self-made

4.2 Blackberry value chain of castilla species Rubus glaucus in Sumapaz

The identification of the value chain generated development and ordering for the planning and execution of strategies in the production and marketing of the product. The links are integrated into an environment of high social, economic, political and cultural complexity, which determines the nature and success of commercial transactions within the chain.

The value chain of figure 2 is made up of the links: production (associations, individual producer), intermediary, wholesaler, retailer, and end customer. The value chain development approach analyzes the market dynamics and the relationships of the different actors that compose it, with the aim of strengthening the entire market system, business relationships, financial networks, support functions, regulatory rules, and the business environment, to ensure benefits to the links, growth and economic development for Sumapaz.

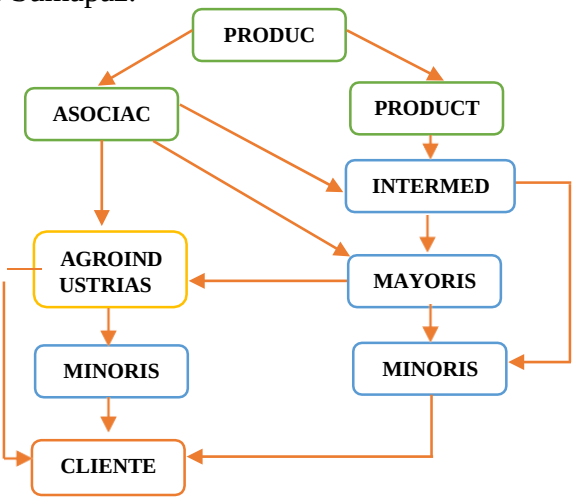

Figure 2. Actors that make up the blackberry value chain of castilla in the Sumapaz region. Source: self-made.

The study identifies and characterizes the farms that have blackberry crops with agro ecological characteristics and productive practices that include economic, social and environmental indicators, based on participatory methods and some activities to promote rural development and conservation of biodiversity of the participatory tools used in table 1 are the following:

Table 1. *Tools for diagnosis and characterization of blackberry agro-ecosystems in Sumapaz*

Participatory Tool	Description	Purpose
Map of Natural Resources at farm level.	Graphically shows the different elements of the use of space, focusing mainly on natural capital. Productive areas,	Generate a shared conception about the use of space and natural capital. In addition, identify the potentialities of agricultural production and the

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	sources of flora and fauna, water tributaries, fallow areas, forests, construction of social infrastructure and farm boundaries are divided and established. Where through an inventory the productive practices are identified.	underutilization of this.
Systemic farm model.	It graphically shows the Agro-ecosystem diagram indicating the elements (agricultural products) that go out for the market and self-consumption, indicated by means of flows (arrows), where they come from and where they go; towards the family for self-consumption, towards the outside for the market.	Characterize Agro-ecosystems (inputs, practices, outputs), in order to determine which systems are interrelated and the energy work performed by each member of the family.

Source: self-made.

4.3 Sustainability assessment of agro-ecosystems in Sumapaz

Based on the participatory diagnosis, the evaluation criteria and indicators are defined and prioritized to measure sustainability according to the attributes of MESMIS, as indicated in table 2, which proposes a series of diagnosis criteria and indicators for future sustainability studies are evaluated, within the economic, social and environmental dimensions.

The MESMIS is a flexible and adaptable structure to different economic, technical and access to information conditions, part of a systemic and multidimensional approach, the blackberry agro-ecosystems were evaluated with seven attributes or properties which allowed: i) to recognize the different subsystems and their respective interrelations, ii) the family was taken into account as a unit of control, iii) interaction of internal and external flows of self-sufficiency, which allows the peasant family to work with scarce economic resources and family labor, which reduces costs and increases profits. In this way, agricultural productivity is sustained in the medium and long term, soil, water and biodiversity resources are conserved and / or regenerated.

Table 2. *Proposed indicators to measure sustainability in blackberry de castilla agroe-cosystems in Sumapaz*

ATTRIBUTES	CRITERIOS DE DIAGNOSTICO	CRITICAL POINTS - (F.O.D.A)	INDICATOR
PRODUCTIVITY	PRODUCTIVITY	Low agricultural productivity	performance
	INCOME	Low income	Agricultural Income

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	EFFICIENCY	Resource efficiency	Efficiency in the production system
	CONSERVATION	Low soil conservation	Soil quality
	VULNERABILITY	High food vulnerability	Nutritional rate
STABILITY RESILIENCE RELIABILITY		High biological vulnerability	Rotation and fallow
		Low monetary income	Non-agricultural sources of income
	DIVERSITY	Diversity of crops and activities	Productive diversity
	DISTRIBUTION OF RESOURCES	Good distribution of resources	Income distribution
EQUITY	POWER OF DECISION	Poor decision making	Joint decision making
	CHANGE CAPACITY	Low capacity for technological innovation	Access to technology
ADAPTABILITY	CONSERVATION OF NATURAL RESOURCES	Low conservation of natural resources	Inventory of natural resources
SELG-MANAGEMENT	SELF-SUFFICIENCY	High dependence on external inputs	Dependence on external inputs
	ORGANIZATION	Organizational deficiencies	Community Assemblies Participation
		Educational management trainings	Assistance to educational programs

Source: self-made.

The results of the analysis of the indicators to determine the levels of sustainability in the production systems are presented graphically through the construction of radar-type maps that show the behavior of the set of criteria evaluated (each one made up of indicators according to the dimensions evaluated).

4.4 Assessment of sustainability indicators - Environmental dimension

Table 3. *Value of Environmental indicators*

Indicator	Value
performance	3
Soil quality	2
Rotation and fallow	3
Productive diversity	3
Natural resources	3
Environmental Dimension Value	**2.8**

Source: self-made.

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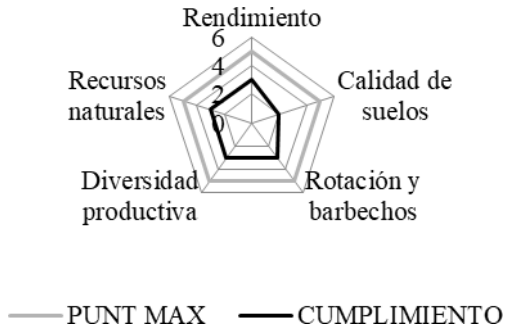

Figure 3. Environmental radars. Source: self-made.

In the environmental dimension (figure 3 - table 3) the indicators as a whole are classified as moderately sustainable, with an index of 2.8. This dimension is affected since the production systems develop mainly monoculture production systems, under conventional practices, based on the green revolution model; intensive use of chemical synthesis substances, expansion of the agricultural frontier, increased migratory processes, economic vulnerability. Therefore, agricultural practices are the activities that most contribute to altering ecosystems, said production indicated as a cause of loss of biodiversity.

In the case of the production systems under study, there are no measures or implementation of practices to minimize the damage caused by traditional production systems, which generate environmental and socioeconomic impacts that put the sustainability of peasant agro ecosystems at risk. This sustainability seeks alternatives that avoid environmental deterioration, which is generated by the application of inappropriate practices, whose ecosystem impacts have accelerated the unsustainable use of natural capital, this type of practices cause contamination of surface water, erosion, soil compaction and alleged loss of biological diversity.

4.5 Assessment of sustainability indicators - Social Dimension

Table 4. *Value of Social Indicators*

Indicator	Value
Nutritional rate	3
Joint decision making	5
Access to technology	2
Participation in community assemblies	3
Assistance to educational programs	5
Value Social Dimension	**3.6**

Source: self-made.

The social dimension shows (table 4; figure 4) a sustainability value of 3.6, a value located in the range of "moderately sustainable". The main characteristic associated with the multi-functionality of production systems is the multiple activities of families, understood as the *"Combination of occupational activities, as a subsistence strategy, given the precarious conditions that characterize agricultural production in Colombia" (Piñeros, 2016).*

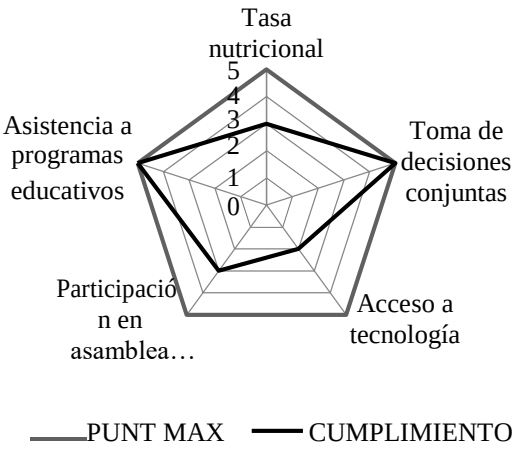

Figure 4. Social Radar. Source: self-made.

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4.6 Assessment of sustainability indicators - Economic Dimension

Table 5. *Value of Economic indicators*

Indicator	Value
Efficiency in the production system	3
Non-agricultural sources of income	4
Income distribution	4
Dependence on external inputs	3
Agricultural income	3
Value Economic Dimension	**3.4**

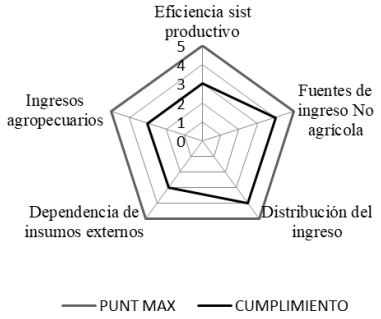

Figure 5. Economic Radar. Source: self-made.

In this dimension, a balanced behavior is observed between the indicators and the perception of rural producers (Table 5; Figure 5), it also reflects an assessment classified as "moderately sustainable", with an index of 3.4. Within which synergies are generated for the execution of agricultural activities inside and outside the farm. Said primary activities (production, transformation, and commercialization) are generated as a strategy to improve the living conditions of the rural family, which originate based on the intensification of existing production patterns; Intensification is defined as "increased physical or financial products, including crops, livestock and other productive activities", for which production systems associate it with an increase in production performance, optimization of resources (raw material, inputs, infrastructure) and efficiency in labor productivity.

4.7 Presentation and integration of results

It is determined that the production systems are *"moderately sustainable"*, the score of indicators yielded a value of 3.3 (table 6) which indicates that there is a good interrelation between subsystems and proper management of these.

Table 6. *Approximate values of the proposed indicators*

Dimension	Indicator	Value
Enviromental	performance	3
	Soil quality	2
	Rotation and fallow	3
	Productive diversity	3
	Natural resources	3
Social	Nutritional rate	3
	Joint decision making	5
	Access to technology	2
	Participation in community assemblies	3
	Assistance to educational programs	5
Economical	Productive system efficiency	3
	Non-agricultural sources of income	4
	Income distribution	4
	Dependence on external inputs	3
	Agricultural income	3
VALUE OF SUSTAINABILITY		**3.3**

The results obtained in the measurements of the indicators are presented in an integrated way by means of a radar-type multi-criteria map (figure 6). The maximum degree of sustainability is obtained when all the indicators acquire a value equal to five. The sustainability of the system is represented by the dark-colored irregular polynomial. The Amoeba type radial diagram allowed to graphically visualize the deficiencies of each subsystem.

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Figure 6. Sustainability indicator radars. Source: self-made.

This research was based on joint criteria to address and understand the productive and economic dynamics of the peasant production systems in Sumapaz, figure 6 estimates that several indicators obtained scores of 3, which contrasts the information collected through participatory tools with rural producers - according to their way of perceiving and understanding their environment - where they identified the critical points at the farm level (resilient activities).

6. Conclusions

The cultivation of blackberry from Castile represents alternatives for closing technological, social and economic gaps, for which it is evidenced that i) producers derive their livelihood from the cultivation of blackberry, ii) there is no union culture among producers, iii) the market is very limited through unionization, other markets could be explored to generate better income, iv) the region offers optimal agronomic conditions for the cultivation of blackberries, v) post-harvest processes, storage, transportation, and sales are made in a rudimentary way, which does not allow the default to be preserved, on the contrary, it causes a greater degradation of the product, vi) there is no adequate relationship between the actors in the chain since some of the members do not identify themselves Clearly, the producers, assume the transport and marketing activities, carry out the sale directly to the end customer. Through the respective studies the opportunities of the default chain are significant, it can be generated i) State Policy, ii) export, iii) agroindustry, iv) alternative consumption, v) permanent national production, vi) competitiveness, gap broad technology, vii) reduction of production costs, viii) clean production, sustainable development, ix) research and technology transfer, x) technological innovation and xi) formation of commercial alliances between producers and agro-industries or the fresh market.

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