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ORIGINAL

Identification of learning styles in agricultural producers of the productive sectors in the department of Caquetá

Identificación de los estilos de aprendizaje en los productores agropecuarios de los sectores productivos en el departamento del Caquetá

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ABSTRACT

The agricultural sector in the department of Caquetá is crucial for the regional economy and food security. Understanding the learning styles of agricultural producers is fundamental for designing effective pedagogical strategies. According to Honey and Mumford (1968), learning styles refer to individual preferences in the acquisition and processing of information. Identifying them makes it possible to adapt teaching methods to maximize their effectiveness. Previous research, such as that of Smith (2012), highlights that knowing the learning styles of producers can avoid barriers in the educational process, improving the acquisition of technical knowledge. Brown (2015) suggests that educational strategies appropriate to these styles can foster the transfer of knowledge to daily practices, improving livestock productivity and sustainability. This study explores learning styles in the agricultural sector of Caquetá, with the objective of designing training strategies adapted to the needs of producers. The findings could strengthen agricultural production and foster more sustainable development. Recent data indicate that crop and livestock production occupies vast tracts of land in countries around the world. In Caquetá, the production of sugarcane, cacao, bananas, and cattle is significant. However, these sectors face challenges such as access to financing, climate change, obsolete production techniques, and competition in international markets. The study was conducted in the municipalities of Albania, San José del Fragua, Belén de los Andaquíes, Doncello and San Vicente del Caguán. The methodology includes surveys and interviews to identify learning styles of approximately 600 producers. The research seeks to provide specific recommendations to improve pedagogical practices in the agricultural sector of Caquetá, considering the diversity of learning styles. Understanding and adapting to these styles not only promotes the effectiveness of educational programs, but also strengthens the resilience and sustainability of agricultural practices in the region, contributing to sustainable agricultural development.

Keywords: Learning Styles; Agricultural; Sustainability; Caquetá; Sustainability.

RESUMEN

El sector agropecuario en el departamento del Caquetá es crucial para la economía y la seguridad alimentaria regional. Comprender los estilos de aprendizaje de los productores agropecuarios es fundamental para diseñar estrategias pedagógicas eficaces. Según Honey y Mumford (1968), los estilos de aprendizaje se refieren a las preferencias individuales en la adquisición y procesamiento de información. Identificarlos permite adaptar métodos de enseñanza para maximizar su efectividad. Investigaciones previas, como la de Smith (2012), destacan que conocer los estilos de aprendizaje de los productores puede evitar barreras en el proceso educativo, mejorando la adquisición de conocimientos técnicos. Brown (2015) sugiere que estrategias educativas

adecuadas a estos estilos pueden fomentar la transferencia de conocimientos a las prácticas diarias, mejorando la productividad y sostenibilidad ganadera. Este estudio explora los estilos de aprendizaje en el sector agropecuario del Caquetá, con el objetivo de diseñar estrategias de capacitación adaptadas a las necesidades de los productores. Los hallazgos podrían fortalecer la producción agropecuaria y fomentar un desarrollo más sostenible. Datos recientes indican que la producción agrícola y ganadera ocupa vastas extensiones de tierra en países de todo el mundo. En Caquetá, la producción de caña panelera, cacao, plátano y ganadería bovina es significativa. Sin embargo, estos sectores enfrentan desafíos como el acceso a financiamiento, cambio climático, técnicas de producción obsoletas y competencia en mercados internacionales. El estudio se realiza en los municipios de Albania, San José del Fragua, Belén de los Andaquíes, Doncello y San Vicente del Caguán. La metodología incluye encuestas y entrevistas para identificar estilos de aprendizaje de aproximadamente 600 productores. La investigación busca proporcionar recomendaciones específicas para mejorar las prácticas pedagógicas en el sector agropecuario del Caquetá, considerando la diversidad de estilos de aprendizaje. Comprender y adaptarse a estos estilos no solo promueve la efectividad de los programas educativos, sino que también fortalece la resiliencia y sostenibilidad de las prácticas agrícolas en la región, contribuyendo al desarrollo agrícola sostenible.

Palabras clave: Estilos de Aprendizaje; Agropecuario; Sostenibilidad; Caquetá.

INTRODUCTION

The agricultural production sector plays a fundamental role in the economy of the Department of Caquetá, contributing to regional development and food security. In this context, the study of learning styles becomes a valuable tool for understanding how individuals acquire and process information related to agricultural and livestock practices. Understanding learning styles can also facilitate the design of efficient and relevant pedagogical strategies in the agricultural sector.

Peter Honey and Alan Mumford (1968) state that "learning styles refer to individual preferences for certain ways of acquiring and processing information." These learning styles can be identified through various assessment tools, such as questionnaires and direct observations. Knowledge of learning styles can allow for adapting teaching and training methods to maximize their effectiveness (Coffield et al., 2004).

Previous research has highlighted the importance of considering learning styles in the agricultural field. For example, Smith (2012) mentions that "through knowledge of producers' learning styles, potential barriers in the teaching-learning process can be avoided, thus enhancing the acquisition and effective application of new technical knowledge." Similarly, Brown (2015) argues that "the design of educational strategies that suit the learning styles of farmers can encourage the transfer of knowledge to their daily practices, and in turn, contribute to the improvement of livestock productivity and sustainability.

The objective is to explore the different learning styles in the agricultural productive sector of the department of Caquetá to provide relevant information that will allow the design of training and information strategies adapted to the needs and preferences of the producer. The findings obtained are expected to contribute to strengthening agricultural production in the region and more sustainable development.

According to recent data, it is estimated that there are around 10 million hectares dedicated to cocoa cultivation, mainly in countries such as Ivory Coast, Ghana, Indonesia, and Nigeria. On the other hand, it is estimated that approximately 1,5 million hectares are dedicated to the production of panela, mainly concentrated in Latin American countries such as Colombia, Brazil, and Mexico (Food and Agriculture Organization (FAO). As for banana cultivation, statistics indicate that around 10 million hectares are cultivated worldwide, with countries such as India, Uganda, Ecuador, and the Philippines as the primary producers. Finally, the livestock sector occupies around 1,4 billion hectares worldwide, mainly for cattle breeding (Admin & Admin, 2021).

The purpose of these crops and livestock activities varies. Cocoa is mainly used for the production of chocolate and other derivative products (Liliana, Q. R. M. (n. d.) 2004), panela is used as a natural sweetener, bananas are consumed both fresh and processed in different industries, and livestock is focused on the production of meat and dairy products. These productive sectors benefit a large number of families around the world. However, several problems affect their development. Some of these problems include lack of access to financing, climate change and its effects on the crop, lack of modern production techniques, unfair competition in international markets, and the presence of intermediaries that reduce the benefits for producers.

Sugarcane: The Asociación de Cultivadores de Caña de Azúcar de Colombia (Asocaña) reported that 24,3 million tons of sugarcane were harvested in 2020 in an area of 226 000 hectares, with most of the production concentrated in the departments of Valle del Cauca, Cauca, Risaralda and Caldas (Asocaña, 2022). Panelera cane was grown on 6100 hectares in Caquetá in 2017, but only 3500 hectares were used, and a production of 17 326 tons was obtained (ICA, 2017).

Cocoa: The National Federation of Cocoa Growers (Fedecacao) reported that, in 2020, cocoa production reached 67 000 tons, grown on an area of 212 000 hectares, with emphasis on the regions of Santander, Antioquia, Arauca, Huila, and Tolima (Minagricultura, 2020). In 2017, in the department of Caquetá, cocoa planting was recorded, covering 4312 hectares, generating a production of 9701 tons (ICA, 2018). According to a ProColombia report, the most prominent municipalities in cocoa production in the department of Caquetá are San Vicente del Caguán, Cartagena del Chaira, Florencia and San José del Fragua (Procolombia, 2022).

Plantain: According to data from the Ministry of Agriculture and Rural Development (MADR) for 2016, plantain production reached 3,9 million tons, covering around 500 000 hectares (AGROSAVIA, 2022). The areas of most excellent cultivation were Antioquia, Arauca, Caldas, Córdoba, and Chocó. In 2020, the Department of Caquetá planted 10 000 hectares of plantain, producing 85 086 tons (AGROSAVIA, 2022). According to data from the Colombian Agricultural Institute (ICA), the most critical municipalities for plantain production in Caquetá are Currillo, Belén, Florencia, Doncello, and Puerto Rico (ICA, 2020).

Cattle ranching: According to 2020 data from the Ministry of Agriculture, Colombia registered a cattle population of 28 245 262 head distributed over approximately 34 800 000 hectares (Minagricultura, 2020). The main cattle breeding centers were located in Antioquia, Córdoba, Casanare, and Meta, although 2 225 152 heads were also estimated in the department of Caquetá (Minagricultura, 2020).

In the department of Caquetá, the productions mentioned above have different impacts on producers ' examples:

Sugarcane: this crop has significant economic relevance in the region, which opens the door to considering the option of introducing agroforestry systems that combine sugarcane with native species. These systems would take advantage of the local climate and soil conditions to generate additional income for farmers while contributing to the preservation of the environment (IGAC, 2023).

Cocoa: cocoa cultivation stands out in the department due to its extensive cultivated area and the high quality of its beans; this crop offers important advantages for farmers in Caquetá, as it gives them access to markets both nationally and internationally, the possibility of obtaining quality and sustainability certifications, participating in technical and financial support programs, and strengthening their trade associations; in addition, cocoa plays a fundamental role in the recovery of degraded soils and the preservation of biodiversity (Todacolombia, 2019).

Plantain: this fundamental crop in Caquetá occupies extensive planting areas and is a vital source of food and resources for numerous rural families. Its production, which is significant in the region, has a positive impact by allowing the diversification of cropping systems and the optimal use of local resources; in addition, it contributes to supplying both local and regional markets (Vargas, 2017). Despite these benefits, banana cultivation faces challenges such as low productivity, insufficient road infrastructure, phytosanitary risks, and competition with other producing departments (Vargas, 2017).

Cattle ranching: the predominant economic activity in Caquetá is cattle ranching, with a considerable number of cattle and vast tracts of land dedicated to it. This sector benefits local inhabitants by providing a stable income, access to genetic and sanitary improvement programs, and a form of investment and savings. However, it is vital to note that cattle ranching has a substantial environmental impact, being the leading cause of deforestation, erosion, and pollution in the region. It is also exposed to market variations, legal insecurity, and the threat of armed violence (Beltrán-Barreiro, Torrijos-Rivera, & Muñoz-Ramos, 2012).

The municipalities in the department of Caquetá where sugar cane, cocoa, and plantain are produced in addition to contributing to livestock activity are the following:

Sugarcane: according to the Colombian Agricultural Institute (ICA), Caquetá has approximately 6100 hectares of sugarcane, of which only 3500 are in production; these crops are located in the 16 municipalities of the department, primarily concentrated in San Vicente del Caguán, Cartagena del Chaira, Florencia, San José del Fragua, Solano, Belén de Los Andaquíes and Albania (ICA, 2017).

Cocoa: according to Semana Sostenible magazine, El Doncello, La Montañita, and Puerto Rico are betting on the production of export-type cocoa, a sustainable production project led by the Departmental Association of Cocoa and Timber Species Producers of Caquetá (Acamafrut) (Semana, 2021). Other cocoa-producing municipalities are Belén de los Andaquíes and San José del Fragua, where the Asociación Orgánica Agrícola de Cacaoteros del Municipio de San José del Fragua (Asoacasan) has signed a commercial agreement with a German gourmet chocolate company (DW, 2022).

Plantain: according to the ICA, the department's main plantain-producing municipalities are Currillo, Belén, Florencia, Doncello, and Puerto Rico (ICA, 2020).

Cattle ranching: according to figures from the 2022 Livestock Context, all municipalities in Caquetá are involved in cattle raising, but some are clearly in the lead, such as San Vicente (910 976 cattle), Cartagena del Chaira (372 815 cattle) and Puerto Rico (204 908 cattle) (Rivera Torrijos, R, 2022).

The companies that commercialize these products are responsible for providing technical assistance, strengthening participation, marketing, and more in the production of sugarcane, cocoa, bananas, and livestock:

Asopanela: an association of panela producers in Caquetá that seeks to improve the quality and competitiveness of this product, which is characteristic of the area (Gobernación del Caquetá, 2022).

Acamafrut: acamafrut is a non-profit public interest organization representing cocoa growers in the Caquetá region. Its mission is to foster trade progress, provide technical and social support, and promote the commercialization of cocoa and its derivatives at the local, national, and international levels (Wiconnect, 2022).

Corpoamor: the Corporación para el Desarrollo Socioambiental de la Amazonia y la Orinoquia Colombiana (Corpoamor) has as its main task the implementation of projects where plantain production plays a prominent role (ICA, 2020).

The Departmental Committee of Cattle Ranchers of Caquetá (CDGC): this is a trade organization that looks after the interests of cattle ranchers in the Department of Caquetá. It offers technical advice, promotes sustainable projects, coordinates fairs and activities, and actively participates in the dairy and meat industries (Rivera Torrijos, R, 2022).

The main objective of this work is to identify the learning styles of agricultural producers in the production sectors of sugarcane, livestock, cocoa, and banana in the municipalities of Albania, San José, Belén de los Andaquíes, Doncello and San Vicente del Caguán in the department of Caquetá.

METHOD

Location

The study will be carried out in the department of Caquetá, specifically in the municipalities of Albania, San José del Fragua, Belén de los Andaquies, Doncello and San Vicente del Caguán, with associations such as ACAMAFRUT (departmental association of producers of cocoa and timber species of Caquetá) El Doncello, The study will focus on producers of cocoa and timber species in El Doncello, the Simon Bolivar neighborhood, the integral cooperative of cattle ranchers producing meat and dairy products in Puerto Lozada in San Vicente del Caguán, the Banana Producers Association of Belén de los Andaquies (Ciudad Modelo neighborhood), and ASOPANELA (Association of Panela Producers) in San José del Fragua and Albania, Caquetá. The study will be oriented to producers of the different agricultural productive sectors, which are approximately 600 producers.

Type of Research

The type of research to be carried out is descriptive, since studies are conducted with the objective of describing the characteristics, behaviors or Phenomena of a population, without modifying or influencing the variables involved. A descriptive research uses techniques such as observation, survey, document analysis, among others, to collect quantitative or qualitative data that allow it to provide an accurate and detailed representation of its research topic or problem (Muguira, 2022).

Approach

It will be of a mixed type since it combines the production of qualitative and quantitative data.

Specific Objective 1: the learning styles of agricultural producers will be identified (Analytical empirical approach). In order to obtain a result and this will be evaluated to provide a solution to the problem established in the work.

Specific Objective 2: the possible factors that affect the learning style (historical hermeneutic approach). Here we will analyze the answers and look for the reason why the producers have that learning style.

Specific Objective 3: recommendations will be generated to optimize the learning style of the producer surveyed (critical social approach). Based on the evaluation and because the producers have an ingrained learning style, alternatives will be sought to improve how they learn so that, in training, workshops, teaching, and learning processes dictated by the different organizations, this information is retained and is functional, all this understanding that each person learns differently.

The learning styles of the producers were identified. To gather this information, an interview tool (figure 1) was used to obtain qualitative data that would provide an estimated baseline for identifying the learning styles of agricultural producers in each of the production chains to which they belong, including variables such as I expect the training, I prefer to carry out activities during training, and I learn more easily when I learn, among others.

With the results obtained from interviewing producers about their learning styles, specific recommendations were created based on these data. The following steps will be used to create the recommendations:

Review the information collected

Review the responses and observations obtained during the interview to clearly identify the preferences and characteristics of the producer's learning style.

Identify the predominant learning style

Determines which learning style predominates in the producer. It may be visual, auditory, kinesthetic or other.

Strengths and weaknesses

Identifies strengths associated with the predominant learning style and possible areas for improvement or weaknesses.

Provides specific strategies

Suggest specific learning strategies that align with the producer's preferred style. For example:

Visual

Use graphs and diagrams to represent information.
Find educational videos related to the topics of interest.
Take colorful notes and highlight key information.

Auditory

Listen to podcasts or lectures on relevant topics.
Participate in group discussions or group study sessions.
Record and listen to their own explanations of important concepts.

Kinesthetic

Conduct hands-on activities or experiments.
Participate in practical situations, such as workshops or demonstrations.
Use didactic and manipulative cards to reinforce concepts.

METHOD

A structured survey of 10 questions (figure 1) was used to collect data from the producers. The ATLAS. ti 23 application was used to follow an order of steps with the information collected from the interviews. It began with the plain text where the most important aspects of what was collected were synthesized; in the exploratory analysis, the cloud of information was extracted (figure 2); then, the network diagram was used (figure 3 and 4) and finally, the Sankey diagram was used to obtain the correlation diagram (figure 5).

1 What do you expect from training?
2 What activities do you prefer to do in a training?
3 When do you find it easiest to learn in training?
4 What actions do you take when a problem on the farm needs to be solved?
5 What is your reason for participating in training?
6 How do you prefer to have the topics covered in a training explained to you?
7 What tools do you suggest would be necessary to implement in order to reinforce teaching methods in producers?
8 Why do you like to participate in training activities?
9 How do you expect to implement what you learn during the training on your farm?
10 What is a topic of interest that you believe should always be addressed in training sessions?

Figure 1. 10-question structured survey

RESULTS AND DISCUSSION

Training was the main word, which is very important because producers seek to attend training in order to acquire new knowledge. In other words, their preference is to obtain important information for solutions or improvements to their processes, but they do not necessarily want to put it into practice. In the network diagram, we find the farmer as the main factor in learning styles due to their different learning styles and their experiences, the environment in which they have grown up, and the way they adopt knowledge (Ingram, 2010; Schmelkes, 2006). According to Smith et al. (2019), informed decision-making and implementing modern agronomic techniques are fundamental to improving productivity and reducing environmental impact.

The producer is responsible for planning and programming production and the work he/she carries out. He/she is in charge of production management and chooses how the crop will be managed and what amounts of fertilization, species, variety, or breed, in the case of livestock farmers, will be implemented. Efficient crop management involves the application of strategies that maximize yields without compromising soil health.

It is important that pest control is appropriate for production, does not contaminate and damage water

sources, and is the right one for production. This remains a crucial challenge for growers. Garcia et al. (2021) propose an integrated control approach that combines biological, chemical, and cultural methods. This approach seeks to minimize the use of pesticides and preserve biodiversity.

Proper water management is essential to ensure the long-term viability of agriculture. Smith and Brown (2018) highlight the importance of adopting water-efficient practices, such as drip irrigation and rainwater harvesting, to address the challenges of scarcity and climate variability.

According to Rodríguez and Martínez (2020), constant feedback based on data collected during the different cultivation phases is essential to adjust practices and optimize production. This point is also critical to know what went wrong and to do it again but with the problems solved.

In order to have an efficient, prosperous, and quality agriculture, these factors must be obvious, so it is important that the producer, as the main factor of the whole network, attends all the workshops that the different entities dictate so that he can learn and adopt what he has learned on his farms.

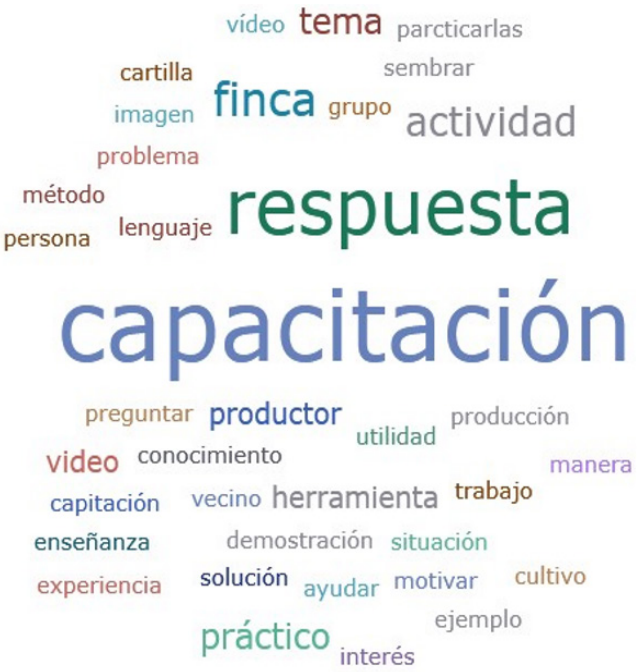

Figure 2. Information cloud

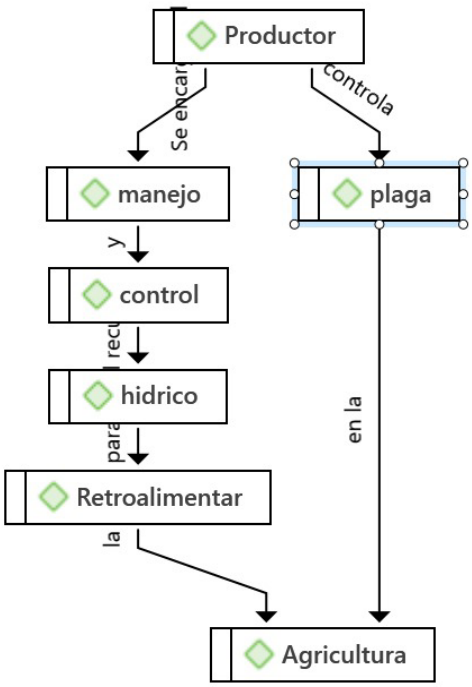

Figure 3. Network diagram

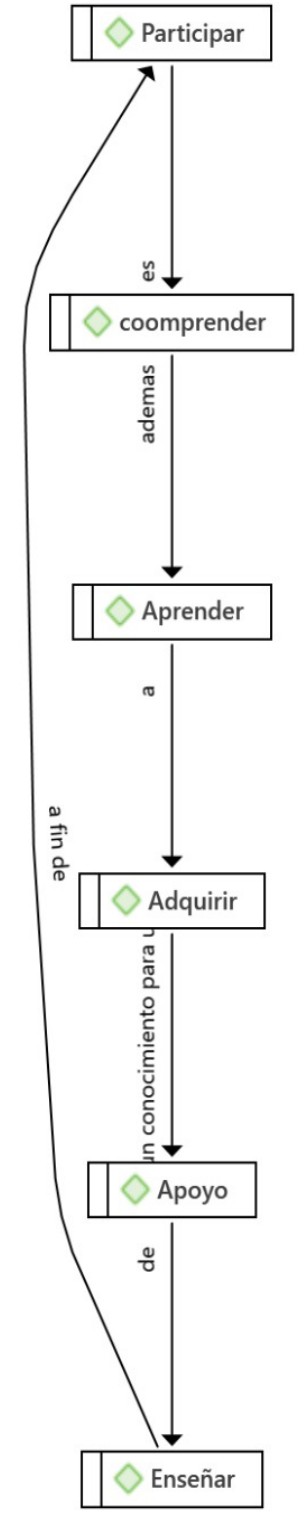

Figure 4. Network diagram

The participation of producers in the different workshops is important for them to innovate and enhance their skills in each of their practices. According to Pérez et al. in 2020, implementing practical pedagogical approaches in the workshops and field days facilitates knowledge transfer. It strengthens farmers' capacity to adopt sustainable practices. Understanding the workshops is fundamental because what is learned in the workshop will be put into practice on the farm, and farmers acquire and enhance the skills they already have.

According to Rodriguez et al. (2021), understanding in workshops helps the acquisition of new skills, familiarization with emerging technologies, and adaptation to climate change, which are crucial aspects of long-term sustainability. Learning new techniques helps the agricultural environment constantly evolve and improve the way things are done.

According to Pérez et al. (2020). Implementing practical pedagogical approaches facilitates knowledge transfer and strengthens farmers' capacity to adopt sustainable practices.

Teaching innovative strategies is critical to equip farmers with the necessary skills (Pérez et al., 2020). Implementing practical pedagogical approaches facilitates knowledge transfer and strengthens farmers' capacity to adopt sustainable practices.

According to Yong W. et al. (2007) state:

"Training farmers through alternative methodologies such as Farmer Schools, where they play an essential role in on-farm experimentation and participatory innovation, becomes a qualitative step towards strengthening environmental, social, and economic indicators. In addition, using tools from other sciences at specific moments of participatory research enriches the scientific quality of the whole process." (p. 5)

In this way Pantoja Ospina, Duque Salazar and Correa Meneses, (2013), say that significant learning, motivation, participation and empowerment of farmers are favored, which translates into an improvement of their capacities to manage their natural resources and their productive systems in a sustainable and innovative way.

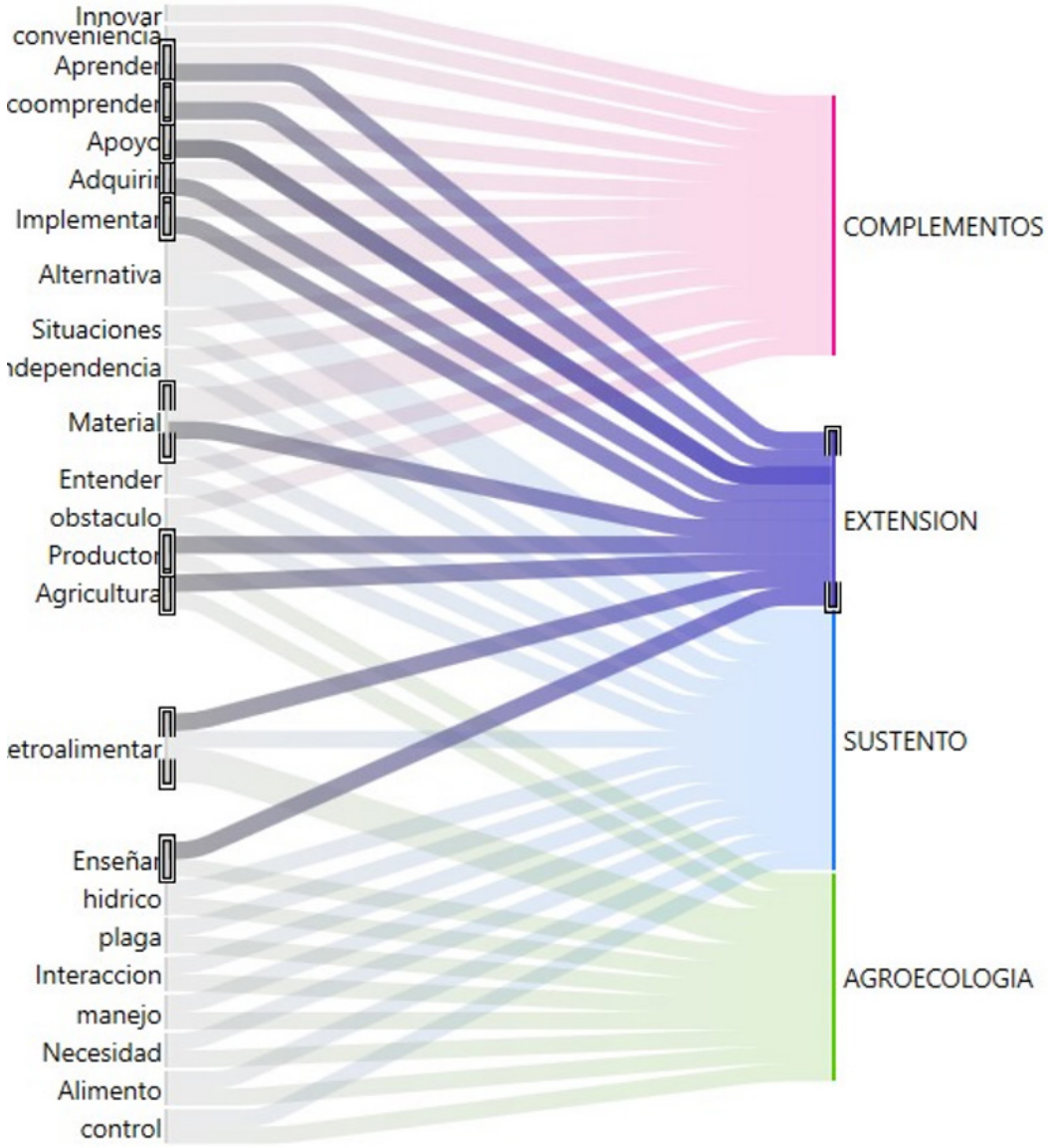

Figure 5. Sankey diagram

CONCLUSIONS

The identification of learning styles among agricultural producers in the department of Caquetá reveals the diversity of approaches they adopt to acquire knowledge and skills in their agricultural activities. This recognition process is a key component for designing more effective educational and support strategies adapted to the specific needs of farmers in the region.

The main conclusion is that no single approach to learning applies uniformly to all agricultural producers in the department of Caquetá. The diversity in learning styles suggests the importance of customizing educational and training programs, recognizing individual preferences, and encouraging methods that align with these characteristics.

This identification can facilitate the implementation of more inclusive and effective pedagogical practices, addressing differences in how producers assimilate and apply new knowledge. In addition, it allows directing resources and efforts towards educational approaches that are more attuned to the learning styles prevalent in the agricultural population of Caquetá.

Ultimately, understanding and adapting to the specific learning styles of agricultural producers in the department of Caquetá promotes the effectiveness of educational programs and contributes to strengthening the resilience and sustainability of agricultural practices in the region. Participation, deep understanding, continuous learning, acquisition of specific knowledge, community support, and innovative teaching form an interconnected network to promote sustainability in agriculture.

Proper identification of and attention to these learning styles can be considered a fundamental pillar for sustainable agricultural development in the aforementioned geographical area.

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