Sugarcane: Between the air and the mule

Panela was introduced to Colombia in the 16th century and its development was due to the effort of muleteers and their mules. Today, the most productive region for panela sugarcane in the country is located in the middle basin of the Suárez River. However, despite its importance, the product is still transported on the back of the mules. The Corporación Colombiana de Investigación Agropecuaria (Agrosavia) (Colombian Corporation for Agricultural Research) led the design of a cabling system that optimizes the transport of sugarcane in the area, but its implementation is not applicable to all panela producers, so the help of this loyal animal remains indispensable for them.

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One afternoon in September 1980, a man made the world turn its eyes to Colombia. That day, the cyclist from Bucaramanga Alfonso Flórez Ortiz became the first non-European rider to win the Tour de l'Avenir, and upon receiving the award he said a phrase that resonated in the imagination of all of Colombia: "Behind that triumph are also two boxes of panela."

With this expression began to consolidate an identity of the country within the framework of cycling competitions, and strengthened the link we have with the precious food derived from the processing of sugarcane. Thus, the power of Colombian "beetles" who pedaled incessantly and began to win titles on the mountain routes of international competitions, began to be attributed to the energy provided by the consumption of the panela.

→ With the implementation of the system of mobilization by air wiring the performance increases to achieve the transport of 2 600 kg of sugarcane per hour, about ten times more than what was achieved with the mules alone.

It is not surprising, then, that Flórez, being from Santander and member of a team mostly composed of riders from Boyacá, credited his victory to this product from his region, given that between these two departments extend the municipalities of the middle basin of the Suárez River, the flagship territory of the panela sector of the country.

In the departments of Boyacá and Santander, the highest percentage of national panela production is concentrated, accounting for a total of 28 percent (Boyacá, 13.07 percent; and Santander, 14.96 percent) according to data from the Sistema de Información Panelera (Panela Information System, Sipa) of the Federación Nacional de Productores de Panela (Fedepanela). Therefore, and according to a study developed by Jorge Andersson Ahumada González, as part of his master's thesis in Environment and Development at Universidad Nacional de Colombia, the production of sugarcane in the Suárez River basin has been technified to achieve greater yield per unit area. And one of the factors that allows to optimize this performance is associated with the way this sugarcane is transported.

There is an old saying, "It is older than panela." Perhaps this refers not only to the origin of this precious food, but also to the fact that in that area of our geography the transport of

sugarcane as a raw material for the production of panela is still based on a very old method: the use of mules.

The origin of sugarcane as a "domesticated plant" for agriculture dates back 6000 years before Christ, in New Guinea (an island in the Indo-Pacific), later spreading through Asia and the Mediterranean Europe. It was the Arabs who introduced it to Spain during the 9th century, and later the Spanish took it to America during the colonial era, at the end of the 15th century. Specifically, in the department of Santander, according to the data collected in the Manual of Sugarcane for Panela Production, the sugarcane was integrated into the "new lands" from Venezuela, thanks to the movements of the muleteers and their mules through horseshoe trails. The continued reliance on this mode of transportation persists due to the rugged geography of the region; for this reason, the difficulties for the mobilization of the stalks from the sugarcane fields clearly slow down the production of panela in the area.

The Colombian Corporation for Agricultural Research (Agrosavia) has studied various technologies to optimize the transport of sugarcane between the mountainous regions of the Suárez River basin, and that is why Alfonso Cubillos Varela, mechanical engineer and researcher of the Corporation, led the design of a cable transport system that facilitates transport from one point to another across the complex geography of the panela-producing area. Two types of systems have been considered for this location: one that uses pulleys and gravity force, and another that uses a 15 horsepower engine to move the load. The purpose is to take advantage of both alternatives, in addition to mules, to optimize the production of panela there.

The cultivation and all the production processes of sugarcane panela in the Suárez River basin generate a carbon footprint that it is expected not increase with the use of these technologies. Didier Camilo Sierra, director of the Territorial School of Water (ETA) at Universidad Antonio Nariño and a doctoral candidate of Universidad Jorge Tadeo Lozano de Bogotá, carried out a study –as part of the first chapter of his doctoral thesis– to determine the environmental impact of sugarcane transport systems on the production of panela in the region. Sierra, along with Cubillos and Carlos Alberto Franco, professor in the School of Business Administration at Universidad del Rosario, measured the impact of both types of cable transport and mule-mediated transport to determine whether greater efficiency in product mobilization also implied a greater environmental impact. The study was published in the journal Clean Technologies and Environmental Policy.

↑ Aerial sugarcane transport system designed by Agrosavia, used in the middle basin of the Suárez River. This system allows for the transportation of a greater amount of sugarcane per unit of time.

The results showed that this is not the case and that the three systems cause very similar environmental loads, so their implementation in the Suárez River basin can be promoted among local producers, which, undoubtedly, will help to obtain greater efficiency in this activity.

However, not all producers can benefit from these initiatives. Why do some benefit while others do not? Professor Franco explains: "We evaluated the impact that these technical methodologies can have on a sugarcane producer, so that a decision-maker can determine whether it is good or not for their region. Although new systems can provide positive aspects for optimizing production – among other advantages, they save costs associated with the use of mules and improve mobilization– they can lead

"We evaluate the impact that these technical methodologies can have on a sugarcane producer, so that a decision-maker can determine whether it is good or not for their region...", explains Professor Carlos Alberto Franco from the School of Business Administration at Universidad del Rosario.

to additional costs resulting, for example, from the maintenance of the cable system in the long term. For this reason, it may not be beneficial for all sugarcane and panel producers to invest in such technologies."

To reach this conclusion, the team used multicriteria statistics in order to run a multivariate hierarchical model that comprised different environmental, economic, financial, logistic, social and technical variables (of cultivation), among others. Thus, the variables were crossed to obtain a statistical profile of each producer and determine whether it can be benefited by the use of cable-mediated transport technology. "In this way, it was determined that not all sugarcane producers are eligible to implement it," Franco says.

However, some farms have already benefited from these new practices. Data from Agrosavia indicate that mule-mediated transport in the Suárez River basin has a yield of 52 percent, as a mule loads an average of 141.5 kg of sugarcane per trip, with an average yield of 4.1 kg per minute (approximately 246 kg per hour). With the implementation of the system of mobilization by air wiring the performance increases to achieve the transportation of 2600 kg of sugarcane per hour, about ten times more than what was achieved with the mules alone.

"However, it is key to understand that while a technology can be good for improving the industry, not all producers benefit from a particular one. Therefore, these models are effective in determining who are the real favors of a technology, in the long term", adds Franco.

Although technology is currently optimizing the production of panela in the Suárez River basin, the mules that carry the sugarcane on their backs will continue to move along the mountainous slopes of this region, serving as a reminder of the Colombian "beetles" who also travel the area on their steel horses with the illusion of reaching a title someday. An illusion fueled by a delicious and energizing 'pocillado' (cup) of panela water or a good piece of the sweet fruit of the sugarcane.