

Cattle Ranching in Colombia: A Monolithic Industry?

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ABSTRACT

This article analyzes literature on the history of cattle ranching and agricultural innovation adoption in Colombia to understand how livestock production systems have evolved from the 1950s until today. Departing from new scholarship that has questioned the idea that cattle ranching has been only a land-grabbing strategy dominated by few elites, this article focuses on the adoption of improved pastures and the role of key institutions such as the CIAT on the transformation of practices and the shortcomings of technification. It shows that Colombia has had big transformations with the introduction of improved pastures, particularly *Brachiaria*, but these transformations did not translate into a radical change in the dominant extensive livestock production systems. Instead of promoting intensification, the adoption of *Brachiaria* has allowed producers to expand more, often resulting in large deforestation. One of the main contributions of this article is the analysis of economic, developmentalist, and institutional reports that are not often used to construct historical analysis. It can also serve to scholars interested on adoption of agricultural techniques.

Keywords: cattle ranching; technology adoption; livestock; agricultural practices; CIAT; *Brachiaria*.

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Cattle ranching in Colombia has been an important economic activity since colonial days. Yet, because studies of cattle ranching in Colombia have focused almost exclusively on its economic aspects and the question of land distribution, little attention has been paid to the material evolution of cattle ranching practices. As noted by the historian Shawn Van Ausdal, who has pioneered new interpretations on the topic, the traditional view of cattle ranching promotes the idea that this industry was a calamity for Colombia's economic development because it encouraged mass land grabbing, peasants' dispossession, and wasteful use of natural resources⁴ Reports written during the second half of the twentieth century also agreed that cattle ranching in Colombia had low productivity and efficiency due to the absenteeism of big landowners, violence, disregard for increasing productivity, and negligible technification.⁵ Although recent literature on the issue has added nuance to such views, there is a general lack of research regarding the evolution of practices and techniques. At first sight, livestock breeding seems monolithic, with few technological or structural changes across its long history – an industry that, in conventional understandings, has brought a negative balance to the development of Colombia's rural areas. However, regional variations in cattle ranching practices, and some of the programs for improving cattle ranching techniques, show that critical changes had indeed taken place in cattle production systems.⁶ This essay surveys current literature about cattle ranching in Colombia to reassess the evolution, impact, and structure of an industry on which millions of Colombians have relied for their livelihoods.

CATTLE RANCHING IN COLOMBIA

Bovines arrived in Colombia and Venezuela with the Spanish expeditions of the first half of the sixteenth century. Conquistadors brought cattle from Spain to the natural savannas in the Caribbean region, the Eastern plains (Llanos Orientales), the Patía River area in Southwestern Colombia, and the central areas near Tolima and

⁴ Shawn Van Ausdal, "Ni calamidad ni panacea: una reflexión en torno a la historiografía de la ganadería colombiana," in *El poder de la carne. Historias de ganaderías en la primera mitad del siglo XX en Colombia*, ed. Alberto G Flórez-Malagón (Bogotá: Universidad Javeriana, 2008), 27-29.

⁵ Gabriel Poveda Ramos, *Informe industria ganadera en Colombia* (Medellín: ANDI, 1961), 9.

⁶ Libardo Rivas and Federico Holmann, "Early Adoption of Arachis pintoi in the Humid Tropics: the Case of Dual-purpose Livestock Systems in Caquetá, Colombia," *Livestock Research for Rural Development* 12, no. 3 (2000); Federico J Holmann et al., "Evolution of Milk Production Systems in the Tropics of Latin America and its Interrelationship with Markets: An Analysis of the Colombian Case," *Livestock Research for Rural Development* 15, no. 9 (2003); José Roberto Álvarez Múnera, *Mercado, ganado y territorio. Haciendas y hacendados en el Oriente y el Magdalena Medio antioqueños (1920-1960)* (Medellín: Editorial Universidad de Antioquia, 2016).

Bogotá. No detailed studies have investigated cattle ranching during the colonial era, but according to tangential research, extensive production systems in the already existent savannas of natural grasses dominated the industry.⁷ Thus, farming cattle involved gathering dispersed cattle heads to be periodically selected, cured, marked, or discarded, but did not rely on improved pastures or opening new lands for sowing grass. Instead, natural grasses in the savannas were developed with some seasonal fires or cattle grazing, but not through selective planting of new pastures.⁸ This is the same process seen in much of the rest of the Americas, from Argentina to México.⁹

Historians agree that cattle ranching contributed, during the colonial period, to the constitution of *Haciendas*: enormous agricultural properties owned mainly by Spanish and creole elites. Besides beef and milk, Haciendas produced agricultural products for the internal markets, such as molasses, corn, yucca, cocoa, sugar, and plantain.¹⁰ Because scholars have focused mainly on the labor systems and the importance of Haciendas to Latin American elites' consolidation of social power, little is known about other concrete practices of cattle ranching that could have emerged during colonial times.¹¹ In present-day Southern United States and Northern Mexico, for instance, enslaved Africans contributed with crucial techniques that enabled the consolidation of a cattle ranching industry.¹² Enslaved Africans were the main labor force in Colombia, particularly in the Valle del Cauca and the Caribbean region. Since many enslaved Africans came from traditional cattle ranching areas in Africa, it is likely that their knowledge of African practices contributed to the establishment of cattle ranching in Colombia, but a full discussion of this is beyond the scope of this study.

⁷ Fabio Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial," in *Naturaleza en disputa: ensayos de historia ambiental de Colombia, 1850-1995*, ed. Germán Palacio (Bogotá: Universidad Nacional de Colombia e Instituto Colombiano de Antropología e Historia, 2001), 128-31; Víctor Manuel Patiño, *Historia de la actividad agropecuaria en América Equinoccial* (Cali: Imprenta Departamental, 1965).

⁸ Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial," 130.

⁹ Horacio Giberti, *Historia económica de la ganadería Argentina* (Buenos Aires: Ediciones Solar, 1961), 70-73; Alfred W Crosby, *Imperialismo ecológico: La expansión ecológica de Europa, 900-1900* (Barcelona: Editorial Crítica, 1988), capítulo 8; Andrew Sluyter, "Ganadería española y cambio ambiental en las tierras tropicales de Veracruz, México, siglo XVI," in *Historia ambiental de la ganadería en México*, ed. Lucina Hernández (Xalapa: Instituto de Ecología, A.C., 2001), 25-40; Robert W Wilcox and Shawn Van Ausdal, "Un continente cubierto de pasto: ganadería y transformación del paisaje," in *Un pasado vivo: dos siglos de historia ambiental latinoamericana*, ed. Claudia Leal, John Soluri, and José Augusto Pádua (Bogotá: FCE; Universidad de los Andes, 2019), 200-02.

¹⁰ Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial," 132-41.

¹¹ Germán Colmenares, *Cali: terratenientes, mineros y comerciantes* (Cali: Universidad del Valle, 1976).

¹² Andrew Sluyter, *Black Ranching Frontiers: African Cattle Herders of the Atlantic World, 1500-1900* (New Haven: Yale University Press, 2012).

Colombia's cattle ranching underwent a huge expansion during the second half of the nineteenth century. Large, agricultural regions of central Antioquia, such as the highlands of Rionegro, Marinilla, and La Ceja, dedicated themselves to cattle ranching. Other forested regions, such as the Magdalena Medio and Bajo Cauca in Antioquia, as well as the Sinú and San Jorge valleys in the Caribbean region, became enormous areas of pasture by the 1960s.¹³ Based on a state-paid Chorographic Commission in the 1850s and the first complete agricultural census of 1960, Van Ausdal draws a geographic evolution of cattle ranching, showing the above-mentioned pattern. While in places such as Antioquia, the number of head multiplied fourteenfold, in other areas such as Cundinamarca, cattle only tripled between 1850 and 1960 (See Table 1).

Table 1: Distribution of cattle herds in Colombia in 1850 and 1960. Source: Shawn Van Ausdal, "Un mosaico cambiante. Notas sobre una geografía histórica de la ganadería en Colombia, 1850-1950". In Alberto. G. Flórez-Malagón (Ed.), *El poder de la carne. Historias de ganadería en la primera mitad del siglo XX en Colombia* (Bogotá: Universidad Javeriana, 2008), 73-74.

Regions	Administrative Region	% of the national cattle herd		Growth Rate
		c.1850	1960	
Antioquia and the Caribbean region	Caribbean (Bolívar, Córdoba, Atlántico, Magdalena)	16	33	2,7
	Antioquia (Antioquia and Viejo Caldas)	7	17	2,7
	Subtotal	23	50	2,7
Western Departments	Cundinamarca	15	7	1,1
	Boyacá	28	21	1,5
	Santanderes	7	9	2,1
	Subtotal	28	21	1,5
Upper Valleys of the Cauca and Magdalena Rivers	Magdalena (Tolima and Huila)	18	8	1
	Cauca (Valle del Cauca, Cauca and Nariño)	18	10	1,2
	Subtotal	36	18	1,1
The Eastern plains (Llanos Orientales)	Meta	2	3	2,4
	Casanare	9	8	1,7
	Subtotal	11	11	1,9
TOTAL COLOMBIA				19

¹³ Van Ausdal, "Un mosaico cambiante. Notas sobre una geografía histórica de la ganadería en Colombia, 1850-1950," 72-80.

According to historians, the rapid expansion of cattle ranching after the 1850s arose from the revolution in pastures, the introduction of wired fences, and the introduction of new cattle breeds.¹⁴ The most important improved pastures introduced after the 1850s, all from Africa, were Pará (*Brachiaria mutica*) and Guinea (*Panicum maximum*), imported in the 1840s; Yaraguá (*Melinis minutiflora*), in the 1900s; and Kikuyo (*Penisetum clandestinum*), in the 1920s.¹⁵ According to the geographer James Parsons, who traced the routes of six of the most important African grasses introduced to America, contemporary observers considered the introduction of Guinea and Pará to be one of the most important economic events from the 1820s and the establishment of the coffee industry at the end of the nineteenth century.¹⁶ These pastures, known as improved or introduced pastures, were very invasive, and controlled the regrowth of forest better than native or so-called natural grasses. Still, as Shawn Van Ausdal observes, the extent to which these pastures caused a revolution accelerating the pace of cattle ranching encroachment in humid tropical forests in Colombia has yet to be fully analyzed.¹⁷

While some research about cattle ranching between 1850 and 1950 includes tangential information about the pastures, studies have yet to understand the mechanisms through which these pastures were adopted, the difficulties of adopting new cattle ranching techniques, or the impact of its adoption on the profitability of cattle ranching. Moreover, the number of hectares cultivated with artificial grasses before the census of 1960 remains unknown. In Antioquia, historian Roger Brew suggests that Guinea and Pará were introduced by elites, who, possessing disposable capital, experimented with different grasses.¹⁸ A similar process seems to have occurred in Cundinamarca, Huila, Tolima, and the Caribbean region, where the introduction of Pará, Guinea, and Yaraguá helped to expand cattle ranching into more

¹⁴ José Antonio Ocampo, *Colombia y la economía mundial 1830-1910* (Bogotá: Ediciones Uniandes-Universidad de los Andes, 2013), 369-70; Orlando Fals-Borda, *Capitalismo, hacienda y poblamiento: su desarrollo en la costa atlántica* (Bogotá: Punta de Lanza 1976), 35-38; Roger Brew, *El desarrollo económico de Antioquia desde la independencia hasta 1920* (Bogotá: Banco de la República, 1977), capítulo 4; Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial," 142-47.

¹⁵ Karen Enciso et al., "El rol de las instituciones en la investigación y difusión de tecnologías agropecuarias en Colombia. El caso de los forrajes mejorados," (2020), 12.

¹⁶ James J Parsons, "Spread of African Pasture Grasses to the American Tropics," *Journal of Range Management* 25 (1972): 14.

¹⁷ Van Ausdal, "Un mosaico cambiante. Notas sobre una geografía histórica de la ganadería en Colombia, 1850-1950," 62-9; Shawn Van Ausdal, "Productivity Gains and the Limits of Tropical Ranching in Colombia, 1850-1950," *Agricultural History* 86, no. 3 (2012): 8-15; Shawn Van Ausdal, "Reimagining the Tropical Beef Frontier and the Nation in Early Twentieth-Century Colombia," in *Trading Environments Frontiers, Commercial Knowledge, and Environmental Transformation*, ed. Gordon Winder and Andreas Dix (Milton Park: Routledge, 2015), 173-78.

¹⁸ Brew, *El desarrollo económico de Antioquia desde la Independencia hasta 1920*, chapter 4.

territories, often forested ones.¹⁹ Although these new grasses seem to have had an enormous impact on the profitability of the industry, according to contemporary observers, it is important to cast doubt on generalizing accounts that portray its universal adoption or a radical drop in the costs of establishing a cattle ranch. As Shawn Van Ausdal points out, the costs of felling and burning the forest, planting seeds, and weeding were still high, even with the improved African pastures. Therefore, the dissemination of these pastures cannot be taken as an organic and straightforward development.²⁰

While some Haciendas opened during colonial times in Cundinamarca, Valle del Cauca, Tolima, Huila, Casanare, and San Martín, most of the large-scale production units emerged out of the process of colonization of the vacant lands, undertaken after the 1850s.²¹ The development of the cattle industry in Colombia varied significantly, depending on the social and environmental aspects of each region. Following independence in 1821, most of Colombia's lands were vacant or public lands. The expansion of cattle ranching went hand in hand with the occupation of vacant lands, which, even at the end of the 19th century, represented most of Colombia's territory.²² Because most of the vacant lands were forested, both *colonos* (small-scale land settlers) and large landowners used slash-and-burn as the main practice to open new lands for crop cultivation or for grazing. Both elite landowners and small-scale cultivators, with or without titled lands, have relied on this system to improve their fields.

During the final days of the rainy season, just before the start of the dry season, the process began. First, groups of men used machetes to clear the underbrush in the selected lot of a given forest. Second, once only the most enormous trees remained standing, the men established a domino effect by felling the largest trees, which in turn razed others, thus minimizing ax work. Once cut down, they waited between one and three months to dry the fallen wood before burning it when

¹⁹ Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial," 145-47.

²⁰ Van Ausdal, "Un mosaico cambiante. Notas sobre una geografía histórica de la ganadería en Colombia, 1850-1950," 62-9.

²¹ Catherine LeGrand, *Colonización y protesta campesina en Colombia (1850-1950)* (Ediciones Uniandes-Universidad de los Andes, 2016); Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial," 151-55.

²² LeGrand, *Colonización y protesta campesina en Colombia (1850-1950)*.

the dry season ended and the rains came.²³ Once laborers burned the field, they harvested maize, beans, cassavas, plantains, and other crops for the consumption of workers or families. At the best of times, after one or two harvests of subsistence crops, they planted grass or a permanent crop such as coffee or cocoa. When resources to improve lands were scarce, after the fertility provided by the ash of burned forest finally faded, colonos or land entrepreneurs often moved to open a new patch of land, leaving the previous patch to be forested again.²⁴ Known as *roza* or *tumba*, this is the system most frequently deployed to open most of the lands for cattle production across Antioquia, the Caribbean Region, Valle del Cauca, and, nowadays, forested areas in Caquetá, Meta, and Guaviare in the Colombian Amazon foothills.²⁵ This system was not unique to Colombia but it has been a standard procedure for the tropics worldwide.²⁶ Another popular system for opening new lands with pastures was through the labor system of *aparcería*. The landlord rented a chunk of forested land and the *aparcero* took the forest down, burned it, planted two or three harvests of maize and beans, and handed the territory back to the landlord, planted with pastures.²⁷ In this colonization, colonos played a key role opening lands through the slash-and-burn system and titling small plots, but elite entrepreneurs often absorbed these patches through cheap purchases or violent displacement. In this way, large tracts of land ended up in the hands of the wealthy few, creating the infamous unequal land distribution patterns in Colombia.

Traditional historiography about cattle ranching in Colombia blames the unequal distribution of Colombia's lands on the lack of innovation adopted by cattle production systems.²⁸ According to this narrative, cattle ranching was predominantly an elite business, where absent elites dominated large swathes of underused land, with no incentive to adopt new techniques and technologies. While land distribution

²³ Rainy seasons are not uniform in Antioquia and Colombia. These descriptions correspond mainly with the rainy season in Northeastern Antioquia. Francisco Molina Ángel, *Tratado elemental teórico-práctico de agricultura* (Medellín: Imprenta del Departamento, 1891); Tulio Ospina Vásquez, *Agricultura colombiana: notas de un curso dictado en la Universidad de Antioquia* (Medellín: Imprenta de la familia cristiana, 1913).

²⁴ Ospina Vásquez, *Agricultura colombiana*; Marco Palacios, *El café en Colombia, 1850-1970: una historia económica, social y política* (México, D.F.: El Colegio de México, 2009), 314-16; Juan David Villa Monsalve, "Zea (Antioquia), 1849-1909: Trayectoria y desaparición de un municipio minero colombiano del siglo XIX" (BA, Universidad de Antioquia, 2014).

²⁵ Jeimar Tapasco et al., "The Livestock Sector in Colombia: Toward a Program to Facilitate Large-scale Adoption of Mitigation and Adaptation Practices," *Frontiers in Sustainable Food Systems* 3 (2019): 2.

²⁶ Wilcox and Van Ausdal, "Un continente cubierto de pasto."

²⁷ Salomón Kalmanovitz, *El desarrollo de la agricultura en Colombia* (Bogotá: Editorial La Carreta, 1978), 121.

²⁸ Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial."; Salomón Kalmanovitz, "El desarrollo de la ganadería en Colombia, 1950-1972," *Boletín Mensual de Estadística, DANE XXI*, no. 253-254 (1972).

has been unjust and violent in Colombia, the agricultural census of 1960 showed, as Van Ausdal notes, that 92.1% of farmers were small landowners owning less than 100 hectares of land, housing 40% of the national cattle herd. Moreover, 6.4% of cattle owners had lands measuring between 100 and 499 hectares and owned 28.9% of the national cattle herd.²⁹ Thus, even if land was concentrated in the hands of the few, a substantial portion of cattle did not belong to large landowners, indicating that small producers contributed significantly to the industry.³⁰

Zootechnician and veterinarian Luis Jair Gómez has shown that Haciendas constitute only one of many types of cattle production systems in Colombia. Besides Haciendas and cattle produced by small settlers, Gómez, writing in the early 1990s, categorized cattle ranching in Colombia according to the economic aspects of land tenure: cattle on the agricultural frontier; cattle supplementary to large and small agricultural estates; cattle of the urban frontier; communal cattle ranching; and cattle ranching in areas of poor agricultural fertility, but close to good markets.³¹ According to Gómez, only those areas where technified agriculture had increased land value, such as Cundinamarca, Tolima, and Santanderes, also intensified cattle ranching. In the others, low productivity prevailed in the 1990s because, among other reasons, cattle ranching had occupied a secondary role (after coffee) in the Colombian economy.³² This assessment is partially accurate; however, there were other places in Antioquia's highlands and lowlands (along the Magdalena River), where some efforts of technification also took place.³³

Because land has been cheaper than intensifying technologies and labor in most regions of Colombia and Latin America, a large portion of the livestock industry relied on expanding land rather than investing in improved pastures and other technologies to intensify ranching.³⁴ The image of the Hacienda and its extensive practices, even if

²⁹ Van Ausdal, "Un mosaico cambiante. Notas sobre una geografía histórica de la ganadería en Colombia, 1850-1950," 73-75.

³⁰ According to this classification a large landowner was someone who had more than 100 hectares. Those who had between 100 and 499 hectares are considered large landowners, which is arguable.

³¹ Luis Jair Gómez, "Características actuales de la distribución espacial de los bovinos en Colombia," *Ensayos de economía* 1, no. 2 (1990); Luis Jair Gómez, "La ganadería Colombiana: Una nueva visión," *Ensayos de Economía* 2, no. 4 (1991), 82-3.

³² Gómez, "Características actuales de la distribución espacial de los bovinos en Colombia," 82-6.

³³ Álvarez Múnera, *Mercado, ganado y territorio*.

³⁴ Joyotee Smith et al., "Land Speculation and Intensification at the Frontier: A Seeming Paradox in the Colombian Savanna," *Agricultural Systems* 54, no. 4 (1997): 5-7; David Kaimowitz, *Livestock and Deforestation in Central America in the 1980s and 1990s: A Policy Perspective* (Jakarta: CIFOR, 1996); David Kaimowitz and Arild Angelsen, "Will Livestock Intensification Help Save Latin America's Tropical Forests?," *Journal of*

failed to account for the full picture, became the stereotype used by scholars such as Salomón Kalmanovitz and Orlando Fals Borda to argue that cattle production in Colombia had low productivity and efficiency.³⁵ The emphasis on how land ownership has negatively affected cattle production intensification can be explained by understanding that very few studies are fully committed to cattle ranching itself. Instead, the literature produced between the 1960s and the 1980s was more interested in solving agrarian issues about land tenure than studying cattle ranching practices.

DEVELOPMENTALISM, INSTITUTIONALIZATION, AND CATTLE RANCHING FROM THE SECOND HALF OF THE TWENTIETH CENTURY UNTIL TODAY

Secondary literature tackling the evolution of cattle ranching during the second half of the twentieth century is scarce, but there are abundant unexplored primary sources that help us to understand the changes and continuities in Colombia's cattle production systems. In 1953, the national government commissioned J.G. Randall, an American advisor who ended up living in Colombia, to assess the problems of the cattle ranching industry. Based on a questionnaire sent to eighteen cattle ranching regions, Randall reported that extensive livestock production systems dominated the industry. The pastures that held sway were still Pará, Guinea, Kikuyo, India, Yaraguá, and Melaza, with rare cultivation of fodder in Elefante and Guatemala. According to Randall, the main problem of the 1950s was not the adoption of new pastures, but the proper management of the already existent pastures. Native pastures and the improved pastures were high in carbohydrates and low in protein. To counterbalance this, he suggested that ranchers should refrain from cutting some legumes to increase the protein needed to fatten cattle. Nevertheless, the widespread practice among ranchers was to eradicate legumes during weeding, which decreased

Sustainable Forestry 27, no. 1-2 (2008); Douglas White et al., "Does Intensification of Pasture Technologies Affect Forest Cover in Tropical Latin America?: Inverting the Question" (paper presented at the CIFOR Conference on Agricultural Technology Intensification and Deforestation, Costa Rica, 1999).

³⁵ Kalmanovitz, *El desarrollo de la agricultura en Colombia*; Fals-Borda, *Capitalismo, hacienda y poblamiento*.

nutrition for cattle. Highlands, which specialized mostly in dairy products, had higher levels of technological adoption.³⁶

The Colombian government, in the 1950s, promoted the establishment of five experimental farms and six small subsidiaries all across the cattle ranching regions.³⁷ Yet, according to Randall's report, there was an urgent need for trade unionizing to educate farmers better. National efforts resonated with an international interest in food production and rural development. Research and institutionalization of the cattle production systems surged between the 1960s and the 1980s, when international institutions such as the Rockefeller Foundation and the World Bank emphasized the importance of improving agricultural practices to feed a growing population and alleviate poverty and malnourishment in so-called underdeveloped countries.³⁸

Numerous reports in the 1970s and early 1980s pointed to the need for state intervention in providing credit, education, and incentives for cattle ranching in Colombia.³⁹ Although the government sanctioned Law 5, 1973, which mandated that credits be granted hand in hand with technical assistance, the law did not significantly transform the low productivity of cattle production systems across most of the country.⁴⁰ According to FADEGAN (Federación Antioqueña de Ganaderos), these observations hold true in many recently-colonized regions such as Bajo Cauca in Antioquia, where thousands of hectares of forest were felled to open extensive cattle farms after the 1950s.⁴¹ In a report commissioned by Antioquia's government, cattle ranching in this area was found to have very low levels of productivity. The report concluded that poor soils, pastures, and lack of knowledge in efficient paddock rotation, as well as extensive cattle ranching with a low density of cattle heads, predominated in around 280 farms studied.⁴² According to the report, 50-60% of small producers could not fully commit to the farm because, given their low

³⁶ J.G. Randall, "Informe sobre la ganadería en Colombia," (Bogotá: 1953[?]).

³⁷ *Ibid.*, 100-109.

³⁸ Andra Chastain and Timothy Lorek, eds., *Itineraries of Expertise: Science, Technology, and the Environment in Latin America* (Pittsburgh: University of Pittsburgh Press, 2020), part I; Marcos Cueto, ed. *Missionaries of Science: The Rockefeller Foundation in Latin America* (Bloomington: Indiana University Press, 1994), chapters 4 and 5.

³⁹ FADEGAN, "Primer Foro Nacional Ganadero" (paper presented at the Primer Foro Nacional Ganadero, Medellín, 1978); Corporación para el Desarrollo Pecuario and Colegio de Veterinarios y de Zootecnistas de Antioquia, "Un modelo de desarrollo para la ganadería colombiana," (Bogotá, 1982).

⁴⁰ FADEGAN, "Primer Foro Nacional Ganadero," 4-6.

⁴¹ Michael Hill, *Oro y selva: Relatos del nordeste* (Medellín: Fondo Editorial Biblioteca Pública Piloto, 1998).

⁴² Fondo Ganadero de Antioquia S.A., "Productividad ganadera. Subproyecto 1, zona del Bajo Cauca," (Medellín: 1971), 30.

productivity, they had to work in other economic sectors to supplement their incomes. Moreover, there were not enough veterinarians or other professionals who could help popularize and disseminate innovations in cattle ranching. In addition, the commission appointed to visit Bajo Cauca outlined several geographical, economic, and sociocultural barriers to their work with farmers, including transportation, malaria, lack of shelter and food, illiteracy, and lack of sufficient capital for the adequate maintenance of cattle farms.⁴³

In this context of international cooperation, many countries in Latin America created institutions to foment innovation in cattle ranching such as Empresa de Pesquisa Agropecuaria (EMBRAPA) in Brazil and the Instituto Nacional de Investigaciones Forestales (INIFAP) in Mexico.⁴⁴ In Colombia, the Instituto Colombiano Agropecuario (ICA)⁴⁵ and the Centro de Investigación de Agricultura Tropical (CIAT) were created in 1963 and 1967 respectively. These two institutions, as well as regional research programs in universities, were fundamental for the research and development of innovation adoption, and for extension technician training.⁴⁶ Scholars who currently belong to CIAT have identified two distinct historical moments in the development of programs for research and development of agricultural innovation in Colombia. The first period, between the 1960s and the 1970s, was framed by the Cold War mindset and the program of the Green Revolution, which sought to increment the productivity and life quality of the countryside of the “developing world.”⁴⁷ Although not well known by the general public, important aspects of innovation in cattle ranching and agricultural practices started at this period. In 1974, the largest collection of germplasm of forages in the world started to be gathered in Palmira, Colombia, in the CIAT’s headquarters.⁴⁸ Not only forages, but also germplasm of different types of beans and cassava have been stored from 141 countries. Currently,

⁴³ Ibid., 16

⁴⁴ Wilcox and Van Ausdal, “Un continente cubierto de pasto,” 212.

⁴⁵ The ICA is the precursor of current national Corporación Colombiana de Investigación Agropecuaria (Agrosavia).

⁴⁶ John K Lynam and Derek Byerlee, *Siempre pioneros—CIAT: 50 años contribuyendo a la sostenibilidad alimentaria futura* (Cali, Colombia: 2017), 11-27.

⁴⁷ Enciso et al., “El rol de las instituciones en la investigación y difusión de tecnologías agropecuarias en Colombia. El caso de los forrajes mejorados,” 11; Lynam and Byerlee, *Siempre pioneros—CIAT*, 103.

⁴⁸ Enciso et al., “El rol de las instituciones en la investigación y difusión de tecnologías agropecuarias en Colombia. El caso de los forrajes mejorados,” 12; Lynam and Byerlee, *Siempre pioneros—CIAT*, 110-13; Rainer Schultze-Kraft, Michael Peters, and Peter Wenzl, “A Historical Appraisal of the Tropical Forages Collection Conserved at CIAT,” *Genetic Resources* 1, no. 2 (2020).

CIAT's Genetic Resources Program continues being the largest repository of germplasm of beans, tropical forages, and cassava in the world.⁴⁹

Linked with the collection of germplasm, in the late 1970s, CIAT created one of the most effective projects for cattle ranching in the last decades of the twentieth century: the Programa de Pastos Tropicales (Tropical Pastures Program). This program has been fundamental in producing a second revolution in pastures in Colombia, which came with diverse species of *Brachiaria*, an African grass introduced first to Brazil in the 1950s and later to Central America and Mexico in the late 1980s through a collaboration between CIAT and national institutions. In Colombia, various reports hint that, during the same decade (the 1980s), important varieties of *Brachiaria* evaluated by CIAT were released, such as the *Brachiaria dactyloides* (Pasto Llanero, 1987), *Brachiaria brizantha* (Libertad, 1987), and *Brachiaria humidicola* (Humidicola, 1990).⁵⁰ CIAT's experimentation farms, particularly Carimagua in Colombia's Eastern Plains, were fundamental in introducing different types of *Brachiaria* that were later adopted in other regions such as Antioquia's lowlands and the Caribbean cattle ranching areas. Moreover, CIAT collaborated with EMBRAPA, the Brazilian institution of agricultural research, to provide seeds that have been distributed by formal and informal channels in Colombia and have revolutionized cattle ranching in Brazil as well.⁵¹

Although CIAT started as an internationally funded institution, there was a period between 1993 and 2008 in which Colombia was the main investor in CIAT's projects. This second period was marked by a critical decline in international investment in research in agriculture and it is linked with neoliberal politics. However, CIAT's projects, mainly on improved pastures financed by the Colombian government in the Eastern plains, seemed to have a large impact on the development of successful pastures, generating a high return.⁵² During this period, key species of *Brizantha* germplasm that were evaluated and developed by the CIAT were released via national

⁴⁹ Lynam and Byerlee, *Siempre pioneros—CIAT*, 110-13.

⁵⁰ Enciso et al., "El rol de las instituciones en la investigación y difusión de tecnologías agropecuarias en Colombia. El caso de los forrajes mejorados," 11; Karen Enciso et al., "On (Dis)Connections and Transformations: The Role of the Agricultural Innovation System in the Adoption of Improved Forages in Colombia," *Frontiers in Sustainable Food Systems* 5 (2022).

⁵¹ Angie Hurtado et al., "El sistema de semillas para la ganadería en Colombia," (2020), 12.

⁵² Lynam and Byerlee, *Siempre pioneros—CIAT*, 28-38.

institutions for adoption in Colombia, Brazil, and other countries in Central America. According to CIAT's researchers, the species developed at CIAT in Colombia had an astonishing impact in Brazil's cattle ranching productivity, which after 1985 grew exponentially with the adoption of CIAT's and EMBRAPA's improved pastures and CIAT's research to control spittlebugs, the scourge of many tropical forages.⁵³ Few previous studies have analyzed the structure, connections, and impact of these institutions on innovation adoption in Colombia and its connections with other Latin American countries. The majority are publications produced by the institutions themselves, but a historical analysis of this period has yet to be undertaken.

Excepting Brazil, where adoption rate of improved pastures is almost 80%, Colombia has one of the highest rates of improved pastures adoption in the region (62%).⁵⁴ A large proportion of improved pastures used in Colombia by 2017, mainly different varieties of *Brachiaria*, were introduced or selected by CIAT research (35%) and were about 17 years old or more.⁵⁵ This indicates the importance that this institution have had for the implementation of innovation in cattle ranching practices, such as adoption of improved pastures.

Pastures have played a key role in transforming cattle ranching practices. Yet historically, Colombian institutions and guilds put greater stock in improving breeds than in pasture management. In magazines about cattle ranching and reports about the statal experimentation sites across Colombia, discussion about breeds supersedes information about pastures.⁵⁶ Preliminary research on the history of improving breeds in Colombia show that there was a widespread adoption of Zebu breeds after the late 1940s, when the government started to promote its importation.⁵⁷ Overcoming debates among elite breeders of purebred cattle of different breeds and national defenders of the creole breeds, Zebu cattle prevailed over creole cattle.⁵⁸ This happened thanks to state protectionist policies and the biological characteristics of the cattle, which were very well adapted to extensive ranching practices in hot lands,

⁵³ Ibid., 110-14

⁵⁴ Ricardo Labarta et al., "Assesing the Adoption and Economic & Environmental Impacts of *Brachiaria* Grass Forage Cultivars in Latin America Focusing in the Experience of Colombia" CIAT; Michigan State University; Universidad de los Andes (2017), 22.

⁵⁵ Ibid., 24

⁵⁶ *Cartas Ganaderas: Revista del Banco Ganadero*, 1976-1978.

⁵⁷ Stefania Gallini, "El atila del Ganges en la ganadería colombiana," *Nómadas* 22 (2005): 195.

⁵⁸ Ibid., 186-97

with little water and low nutritious pastures.⁵⁹ For instance, in Antioquia, where BON (Blanco Orejinegro) and creole breeds predominated in the 1960s and 1970s, today Zebu dominates beef production in the temperate and hot lands (Author's observations). This is not only a consequence of promoting certain cattle breeds, but also reflects on the movement of cattle ranching from the highlands to lowlands where *Brachiaria* substituted forest and where Zebú cattle thrives. The transformation of cattle ranching practices that occurred side-by-side the geographical expansion of cattle ranching in the twentieth century and the symbiosis between *Brachiaria* and Zebú adoption deserves a deeper study.

ON ADOPTION OF PASTURES AND MEETING THE CHALLENGES OF CLIMATE CHANGE

The impact of institutions and programs such as CIAT or ICA to improve cattle ranching practices have been often assessed in terms of pasture adoption and cattle ranching productivity.⁶⁰ As mentioned above, economists and historians concluded that Colombian cattle ranching has not been productive.⁶¹ But measuring adoption is a highly difficult task, and, productivity, as Shawn Van Ausdal shows, could be a relative measure.⁶² Reviewing the literature on cattle ranching in Colombia from the perspective of developmentalist researchers, often linked to CIAT's research on pastures, two problems stand out: first, it is exceedingly difficult even to estimate the extent to which new technologies and practices for cattle production, such as improved pastures and paddocks rotation, have been adopted.⁶³ Second, research on the adoption of innovative practices of cattle production in Colombia has focused too heavily on improved grasses as a measure of innovation adoption.

⁵⁹ Van Ausdal, "Reimagining the Tropical Beef Frontier.," Shawn Van Ausdal, "Labores ganaderas en el caribe colombiano, 1850-1950," in *Historia Social del Caribe*, eds. José Polo Acuña and Sergio Paolo Solano (Cartagena: La Carreta, 2011).

⁶⁰ Jairo Hernando Arias Puerta, *La ganadería en la formación social colombiana: entre el atraso y la competitividad*, vol. 199 (Bogotá: Republica de Colombia, Ministerio de Agricultura, 1996); Federico Holmann et al., "Impact of the Adoption of *Brachiaria* Grasses: Central America and Mexico," *Livestock Research for Rural Development* 16, no. 12 (2004); Instituto Colombiano Agropecuario ICA, "Pastos y ganados para la costa Atlántica," ed. Centro Nacional de Investigaciones Agropecuarias Turipana (Cereté, Córdoba: Instituto Colombiano Agropecuario ICA, 1967); Labarta et al., "Assesing the Adoption and Economic & Environmental Impacts of *Brachiaria* Grass."

⁶¹ Salomón Kalmanovitz and Enrique López, "La agricultura en Colombia, 1950-2000," *Borradores de Economía* 76, no. 912 (2003); Onel López-Vigoa et al., "Los sistemas silvopastoriles como alternativa para la producción animal sostenible en el contexto actual de la ganadería tropical," *Pastos y forrajes* 40, no. 2 (2017).

⁶² Shawn Van Ausdal, "Pasture, Profit, and Power: An Environmental History of Cattle Ranching in Colombia, 1850–1950," *Geoforum* 40, no. 5 (2009).

⁶³ Lynam and Byerlee, *Siempre pioneros—CIAT*, 103.

Contrary to Mexico, Brazil, and Central America, for which we possess superior statistics on improved pasture adoption from the 1980s onwards, complete reports on Colombia's improved pasture adoption are sorely lacking.⁶⁴ Such uncertainty is probably related to the process of distribution of improved pasture seeds, which, in the case of Colombia, follows both formal and informal routes.⁶⁵ For instance, the subregions of Antioquia called Northeastern Antioquia and Bajo Cauca, which make up one third of the department, were converted with several species of *Brachiaria* between the 1980s and the present (more than 2 million hectares). This subregion invests mostly in extensive beef or dual-purpose cattle ranching and lacks significant state or institutional intervention through extension programs or credits. There, innovation adoption materialized via word-of-mouth among farmers who started seeing the benefits of *Brachiaria* – mainly *brizantha*, *humidicola*, and *decumbens* – on managing forest regrowth and improving beef production (Author's observations through discussion with ranchers in Northeastern Antioquia). Thus, it is likely that there are many areas of the country that remain undercounted, distorting perceptions about the adoption of agricultural technologies. Additionally, some scholars estimate the number of hectares planted with improved pastures using statistics on seeds sold, assuming that farmers replant *Brachiaria* every eight to ten years.⁶⁶ In most of Colombia's lowlands, however, farmers traditionally do not replant *Brachiaria* and rely only on natural regrowth and the mechanical and chemical removal of weeds.

Departing from the idea that adoption of improved pastures has not been optimal, CIAT's researchers have studied the obstacles to get a wider adoption of improved pastures in Colombia in the last four decades. The few articles on the topic, focuses on the Colombian Amazon and the Caribbean regions and have overlooked regions such as Northeastern Antioquia, where informal channels of adoption predominate.⁶⁷ In these studies four aspects stand out. First, in the absence or

⁶⁴ Holmann et al., "Impact of the Adoption of *Brachiaria* Grasses."; Lynam and Byerlee, *Siempre pioneros–CIAT*, 104.

⁶⁵ Enciso et al., "El rol de las instituciones en la investigación y difusión de tecnologías agropecuarias en Colombia. El caso de los forrajes mejorados," 9; Enciso et al., "AIS and forage technology adoption."

⁶⁶ Holmann et al., "Impact of the Adoption of *Brachiaria* Grasses," 5.

⁶⁷ Holmann et al., "Evolution of Milk Production Systems in the Tropics of Latin America."; Rivas and Holmann, "Early Adoption of *Arachis pintoi* in the Humid Tropics: the Case of Dual-purpose Livestock Systems in Caquetá, Colombia."; White et al., "Does Intensification of Pasture Technologies Affect Forest Cover in Tropical Latin America?."; Tapasco et al., "The Livestock Sector in Colombia."

weakness of organized groups of farmers, which is the most predominant case in some areas of Colombia, multinational companies or private actors that increased the demand of cattle products have incentivized small and medium-scale farmers to introduce improved pastures. That has been the case of farmers in the Amazonian region of Caquetá, Colombia, when the multinational milk production company Nestle started operations in the zone, in the mid-1980s. Promoted by Nestle, cattle ranchers turned into the use of forage legume *Arachis pintoi*, a perennial forage peanut, in order to increase their productivity.⁶⁸

Second, in the study of the Amazonian region of Caqueta, found that farmers who adopted *Arachis pintoi* were wealthier, had larger farms, and were less dependent on farm-income than non-adopters. Interviewed farmers in the late 1980s also affirmed that they needed more technical aid in management and establishment of improved pastures and better access to credits not to plant the improved pastures but to invest in livestock. Even when the area more than doubled the acreage of improved pastures between 1986 and 1997, the farms were understocked due to the lack of capital to buy more cattle.⁶⁹ This is important to understand why farmers have adopted improved pastures such as *Brachiaria* but this adoption did not often lead to intensive cattle ranching.

A third aspect that stands out in the developmentalist literature about innovation in cattle ranching is the silence about violence and social conflict. Cattle ranching in Colombia been affected by the internal conflicts for around a century. Only studies on the adoption of the legume *Arachis pintoi* in Caquetá, Colombia insinuate that violence and social conflict has influenced farmer's decisions on investing in the region and on adopting technological developments but there are not full assessments to the extent to which violence deters agricultural technology adoption.⁷⁰ This social aspect must be analyzed for a complete assessment of the ways in which farmers and ranchers in Colombia have been prone to invest in innovative agricultural technology or are open to technical and institutional aid. The last aspect goes back to the issue of measures of innovation adoption. As mentioned above,

⁶⁸ Rivas and Holmann, "Early Adoption of *Arachis pintoi* in the Humid Tropics: the Case of Dual-purpose Livestock Systems in Caquetá, Colombia."

⁶⁹ *Ibid.*,

⁷⁰ *Ibid.*, 18

developmentalist have focused too heavily on improved pastures adoption as a measure of innovation adoption. In Colombia, as in other Latin American countries, the adoption of new improved grasses such as *Brachiaria* species has certainly led to improvements in milk and beef production.⁷¹ However, improved pastures have not necessarily intensified cattle production or the adoption of other innovative technologies. Even with improved pastures, cattle are still managed with set stocking and very large paddocks. Several studies emphasize that as long as the expanding frontier remains open, which is still the case in many areas of Colombia, intensification is unlikely to happen.⁷² Scholars have compared three sites in Perú, Colombia, and Costa Rica where the program Tropileche works, to understand not only whether the adoption of improved pastures drives intensified cattle production systems but also if improved pastures help to preserve forest cover. The first case study, in Perú, evaluates an undeveloped market featuring expensive land, abundant forest and deforestation, and small farmers who rarely adopt improved pastures. The second case study, in Colombia, surveys a region where land prices were increasing, and adoption and deforestation depend upon the payoffs between land prices and the cost of intensification. The market in Colombia involves a higher demand than in the first case study, Peru, but less than in the third, Costa Rica, where land is expensive, and forests scarce. The adoption of intensive pasture technology in Costa Rica is widespread, and the market is considered developed.⁷³ In the Peruvian case, scholars found that the adoption of *Brachiaria* did not necessarily lead to intensification in Peru. Instead, the propagation of *Brachiaria* “has become a weed and flammable fuel that often permits fire to spread into the surrounding forest”.⁷⁴ In Costa Rica, which has seen widespread adoption of improved pastures, deforestation and extensive cattle systems are no longer an issue, but, as the authors suggest, there is no correlation between adoption and forest protection. Instead, political measures to protect the remaining scarce forests, and the prohibitive costs of land, discourage

⁷¹ Holmann et al., "Evolution of Milk Production Systems in the Tropics of Latin America."

⁷² Kaimowitz, *Livestock and Deforestation in Central America*; Susanna B Hecht, "The Logic of Livestock and Deforestation in Amazonia," *Bioscience* 43, no. 10 (1993); Sam Fujisaka et al., "Slash-and-burn Agriculture, Conversion to Pasture, and Deforestation in Two Brazilian Amazon Colonies," *Agriculture, Ecosystems & Environment* 59, no. 1-2 (1996); White et al., "Does Intensification of Pasture Technologies Affect Forest Cover in Tropical Latin America?."

⁷³ White et al., "Does Intensification of Pasture Technologies Affect Forest Cover in Tropical Latin America?."

⁷⁴ *Ibid.*, 17-19

deforestation and foster intensive cattle practices. For the Colombian case-study, they deemed that pasture technology has reduced pressure upon forests. Using only two studies, they claim that forest cover in the farms increased from 7% in 1986 to 10% in 1997, while improved pasture increased from 26% to 58%. Therefore, the surplus of biomass discouraged farmers' expansion into the surrounding forest.⁷⁵ However, this is not necessarily the case in other areas in Colombia, where, as in Peru, *Brachiaria* has allowed farmers to expand their dominion into the Amazon basin or erase the forest almost entirely, as proven in Northeastern Antioquia and Bajo Cauca. In the present day, the adoption of new practices of cattle ranching is a pressing issue. According to the latest statistics, Colombia has 34.4 Mha of pasture of which at least 27.9% are unmanaged.⁷⁶ Still, as previously emphasized, improved pastures do not equal intensified cattle production. The average carrying capacity in Colombia is about 0.86 heads per hectare, and extensive cattle ranching dominates the industry⁷⁷ Unsustainable practices of cattle ranching such as expansion of extensive livestock production into forested areas or other unsuited environments, which in Colombia predominates, have been blamed as significant contributors to climate change. According to FEDEGAN research, the El Niño Southern Oscillation (ENSO) caused losses of 1.8 billion dollars in the last decade, killing 377,000 head of cattle and displacing 5.6 million head because of the damage of 46.1 Mha of pasture. Elevated temperatures predicted due to climate change will cause losses through cattle fatalities and decreases in milk and beef production.⁷⁸

To thrive, cattle production in Colombia should move into appropriate pasture management and silvopastoral systems (SPS) to meet the challenges of climate change. SPS constitute methods to increase tree cover on farms and landscapes and are considered a necessary shift from extensive pasture-based cattle production systems. Despite their proven record of benefits in the ecological rehabilitation of deforested land by extensive cattle farming, SPS are still uncommon in Colombia.⁷⁹

⁷⁵ *Ibid.*, 18

⁷⁶ Tapasco et al., "The Livestock Sector in Colombia," 2.

⁷⁷ *Ibid.*, 3

⁷⁸ *Ibid.*, 2-4; M Peters et al., "Tropical Foragebased Systems to Mitigate Greenhouse Gas Emissions," in *Eco-efficiency: From Vision to Reality*, ed. C.H. Hershey (Cali: CIAT, 2012), 2.

⁷⁹ Tapasco et al., "The Livestock Sector in Colombia," 2-3, Hannes Karwat et al., "Residual Effect of BNI by *Brachiaria Humidicola* Pasture on Nitrogen Recovery and Grain Yield of Subsequent Maize," *Plant and Soil* 420, no. 1 (2017); Eduardo Vazquez et al., "Gross Nitrogen

The adoption of SPS has been limited by socio-economic, political, and external barriers such as a lack of understanding of the long-term benefits, fears of a highly risky and complex practice⁸⁰, lack of technical and financial assistance, and poor communication between producers and institutions.⁸¹ Since SPS require specialized knowledge contingent on each ecology, local technicians and training must be enhanced to scale up the adoption of this cattle production system. Furthermore, other barriers perceived by farmers include misconceptions regarding planting trees or keeping parts of the forest mixed with pasture, as well as concerns about technical implementations on farms. Notwithstanding these barriers, there have been multiple attempts to escalate SPS adoption on farms across Latin America, specifically in Mexico and Colombia, where such practices have recently been implemented in a few places with noted success.⁸²

CONCLUSIONS

Cattle ranching in Colombia has relied significantly upon extensive production systems which, at first glance, appear monolithic. Yet, when grasping the extent to which planted pastures were adopted, and the logic behind the assumed low rate of adoption, it is critical to understand the actors and the structure of cattle ranching in Colombia in each period. Additionally, practices, pastures, cultures, and innovation adoption have varied historically between different regions and types of cattle ranching. For instance, in areas dedicated to dairy production –often close to markets, credit, and roads – cattle ranching has been more intensified than in regions dedicated to beef production, which are often located in isolated areas, receiving little

Transformations in Tropical Pasture Soils as Affected by Urochloa Genotypes Differing in Biological Nitrification Inhibition (BNI) Capacity," *Soil Biology and Biochemistry* 151 (2020); Alicia Calle, Florencia Montagnini, and Andrés Felipe Zuluaga, "Farmer's perceptions of silvopastoral system promotion in Quindío, Colombia," *Bois et Forêts des Tropiques* 300, no. 2 (2009); Zoraida Calle et al., "A Strategy for Scaling-up Intensive Silvopastoral Systems in Colombia," *Journal of Sustainable Forestry* 32, no. 7 (2013); David R. Lee, "Adoption potentials and barriers of silvopastoral system in Colombia Case of Cundinamarca region," (2020); Karen Enciso et al., "The Inclusion of *Leucaena Diversifolia* in a Colombian Beef Cattle Production System: An Economic Perspective," *Tropical Grasslands-Forrajes Tropicales* 7, no. 4 (2019); Seonhwa Lee et al., "Adoption Potentials and Barriers of Silvopastoral System in Colombia: Case of Cundinamarca Region," *Cogent Environmental Science* 6, no. 1 (2020)

⁸⁰ Seonhwa Lee et al., "Adoption Potentials and Barriers of Silvopastoral System in Colombia: Case of Cundinamarca Region," *Cogent Environmental Science* 6, no. 1 (2020).

⁸¹ Tapasco et al., "The Livestock Sector in Colombia."

⁸² Zoraida Calle et al., "A Strategy for Scaling-up Intensive Silvopastoral Systems in Colombia," *Journal of Sustainable Forestry* 32, no. 7 (2013); López-Vigo et al., "Los sistemas silvopastoriles como alternativa para la producción animal sostenible en el contexto actual de la ganadería tropical.," Enrique Murqueitio, "Incentivos para los sistemas silvopastoriles," *Avances en Investigación Agropecuaria* 13, no. 1 (2009).

state intervention.⁸³ Scrutinizing the narrow evidence of *Brachiaria* adoption, this essay has broadened existing analyses, pointing to the need of shifting focus from the mere adoption of improved grasses to other factors such as paddock rotation, water and soil management, and improved cattle breeds, among others.

Reviewing the literature on the evolution of cattle ranching practices in Colombia, it is clear that there have been two key, transformative moments: the introduction of Guinéa, Pará, Yaraguá, and other African grasses between 1850 and 1950, and the introduction of *Brachiaria* species after the 1970s. As with the adoption of improved pastures, new breeds of cattle, such as Holstein and Zebu, have also played a major role in transforming the cattle industry, aspect that needs to be researched side-by-side the changes in pastures and the shift to cattle ranching in the lowlands.

Although scholars have focused on the adoption of new pastures as a means of measuring the adoption of agricultural innovation in Colombia, new pastures alone should not be taken to indicate Colombia's cattle production. Improved pastures, such as *Brachiaria*, are proven to improve milk and beef production as well as the quality of soils, carbon sequestration, and weed control, among others. However, one of the most important contributions of this article is to highlight how the adoption of such pastures has not brought radical changes to broader practices of cattle ranching in Colombia as developmentalist from key institutions such as CIAT envisioned in the 1980s and 1990s. With few exceptions, extensive cattle ranching continues to dominate the industry in the lowlands, driving the damaging practice of expanding ranches into forests instead of intensifying already opened lands. Improved pastures allow ranchers to hold more cattle, but their adoption, without other policies of intensification and investment, such as in SPS, living fences, and smaller paddocks, makes Colombia's cattle ranching unsustainable and unsuited to meet the challenges of climate change.

⁸³ Álvarez Múnera, *Mercado, ganado y territorio. Haciendas y hacendados en el Oriente y el Magdalena Medio antioqueños (1920-1960)*; Yepes Perez, "Ganadería y transformación de ecosistemas. Un análisis ambiental de la política de apropiación territorial."

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La ganadería Bovina en Colombia: ¿Una Industria Monolítica?

RESUMEN

Este artículo analiza la literatura sobre la historia de la ganadería y la adopción de innovaciones agrícolas en Colombia para comprender cómo han evolucionado los sistemas de producción ganadera desde la década de 1950 hasta la actualidad. Partiendo de nuevos estudios que han cuestionado la idea de que la ganadería ha sido solo una estrategia de acaparamiento de tierras dominada por unas pocas élites, este artículo se centra en la adopción de pastos mejorados y el papel de instituciones clave como el CIAT en la transformación de prácticas y las deficiencias de la tecnificación. Muestra que Colombia ha tenido grandes transformaciones con la introducción de pastos mejorados, particularmente *Brachiaria*, pero estas transformaciones no se tradujeron en un cambio radical en los sistemas dominantes de producción ganadera extensiva. En lugar de promover la intensificación, la adopción de *Brachiaria* ha permitido que los productores se expandan más, lo que a menudo resulta en una gran deforestación. Una de las principales contribuciones de este artículo es el análisis de informes económicos, desarrollistas e institucionales que no suelen utilizarse para construir análisis históricos. También puede servir a académicos interesados en la adopción de técnicas agrícolas.

Palabras clave: ganadería bovina; adopción de tecnologías; prácticas agrícolas; *Brachiaria*; Colombia; CIAT.

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