Land Use in the Caribbean in the Colonial Period

Plantations and Livestock on the Islands

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Defining the Caribbean is a controversial issue that has much to do with different historiographical traditions and disciplinary approaches. The sea that gives it its name is bordered by the arc of the Antilles and the territories of Central America, Yucatan, and northern South America. Thus, to speak of the region without including the continental areas may offer a limited perspective. However, for many scholars, Caribbean belonging has more to do with the shared experience of slavery and plantation in the islands than with any other socioeconomic process that has taken place there (Moya 2007). Its territories can also be encompassed by the geographical concept of the Antilles Archipelago, which includes most of the islands in the Caribbean Sea (Palmié and Scarano 2011).

For the purposes of this chapter, the focus will be on the insular Caribbean with the aim to analyze the main land uses after the Spanish conquest until the beginning of the nineteenth century. Located on the Caribbean plate, the region comprises the Greater and Lesser Antilles – to which are usually added the Bahamas group and the Lucayas archipelago – the north of Cuba, and Hispaniola (therefore outside the Caribbean Sea), as well as Trinidad and Tobago and the islands north of Venezuela. This totals to an emerged surface of more than 7,000 islands, islets, reefs, and cays with an approximate extension of 234,000 km^2, representing less than 8 percent of the total area of the Caribbean basin, not counting the Gulf of Mexico. Therefore, the interaction of land and maritime zones is a central element in researching Caribbean societies.

The region is considered a space with its own geographic, economic, political, and cultural characteristics, which make it exceptional in world history as the starting point for the European colonization of the New World and the consolidation of the capitalist system. Therefore, if 1492 is adopted as the date of the beginning of the Anthropocene, its study becomes even more relevant. Although most of the islands have favorable conditions for agriculture or livestock farming, there are many local specificities between them. Rainfall is one of the most important factors affecting crop growth. In correspondence with its tropical and subtropical climate, two well-defined seasons can be identified: the rainy and the dry. But the duration of both

depends on factors such as their location within the Caribbean and their relief. The northern and eastern sides of higher elevation receive more precipitation than the southern and western slopes. Rainfall in the mountainous areas fluctuates between 1,500 mm and 2,500 mm as an annual average, although in some localities, it may be higher. On the other hand, on the islands with lower altitude and in lower areas, rainfall can be between 750 mm and 1,000 mm. Likewise, the size of the islands and seasonal rainfall caused by other effects such as convection have an influence.

The existence of two well-defined rainy and dry seasons played an important role in land use according to the period's technological conditions. The rainy season was more closely linked to the sowing season and the dry season to the harvesting of crops. Similarly, during the rainy season, livestock yields increased for meat and milk production. Other decisive factors included the proximity to the coasts for international trade, the relief, and the size of the islands. In any case, the location in the tropical zone has meant that most of the nutrients are found in the vegetation and not in the soils, where the decomposition of organic matter is faster than in other latitudes.

Christopher Columbus described the islands' lush, green, and fertile vegetation. It is estimated that approximately half of the region's forest cover corresponds to tropical and subtropical dry forests, which also boast a higher density and diversity of birds. Several types of tropical and subtropical humid and rainy forest are also represented, especially in mountainous areas. In turn, the soils' local characteristics influence the types of vegetation, based on their capacity to retain moisture. For example, the composition of savanna or natural grassland vegetation has more to do with soil types than with climatic conditions (Newson and Wing 2004: 20).

In the insular Caribbean, ferralitic soils and tropical podzols predominate, but over time the disappearance of the original vegetation has caused a marked loss of nutrients. These processes tend to be more pronounced in mountainous areas. It should be taken into account that about 75 percent of the Antillean territory is made up of mountains or elevations of different heights. Flat landscapes predominate only in Cuba, the Bahamas, Barbados, and other small islands in an inverse proportion. On the larger islands, some areas have alluvial soils, while in the smaller Antilles, volcanic soils can be found.

Before 1492, there was already ancient land use in the Antilles from the Amerindian communities' different waves of settlement. The first groups arrived on the islands from Central America to the Greater Antilles and from South America to the Lesser Antilles around 6,000 – 7,000 BP. From this period until about 2,500 BP, small communities were dedicated to gathering, hunting, and exploiting the marine environment without practicing agriculture. Then, the arrival of Arawak-origin ceramic groups from the Orinoco and other South American basins began; they lived in circular villages around a central plaza and practiced agriculture.

These communities and the subsequent migratory flows led to the formation of more complex societies, in which social stratification increased and agriculture intensified, although fishing still prevailed as a source of animal protein. The popular name given to these cultures, which inhabited a large part of the insular Caribbean prior to the 1492 encounter, is the Taíno and their nucleus, also known as Classic Taíno, was located on the islands of Hispaniola (Haiti) and Puerto Rico (Borinquen). Within the migrations of ceramic peoples, various arrivals of groups known as Caribs occurred, who have been characterized as more aggressive or warlike. Part of them began arriving in the Lesser Antilles from 700–800 BP, while another migration stream occurred around 1,300-1,400 BP from areas of present-day Colombia to the Greater Antilles (Morgan 2022).

With the Taíno, a more intensive agriculture emerged, contributing to the displacement of their settlements towards the interior of the islands. Ceramic groups from South America introduced a wide variety of food plants, especially fruits such as guava, papaya, soursop, and pineapple, but also other crops such as peanuts, pepper, sweet potatoes and tobacco. However, the most valuable plant was the cassava or manioc. Although it may have been introduced earlier, it was these groups who turned it into the most important staple food in their diet through the production of *casabe* (cassava bread). Several authors have emphasized the central role of cassava in Taíno horticulture, thanks to its high caloric value – three times greater than corn –, resistance to droughts and hurricanes, high yield, and the possibility of harvesting it year-round (Reynoso 1881; Sauer 1992).

The ceramic groups practiced the planting of their basic crops in polycultural *conucos* (small plot agriculture). One of the most praised techniques was the *camellones,* where soil and organic matter were accumulated for planting and which constituted a kind of permanent food store all year round. The riverbanks were among the most productive areas, and at the same time, water storage and irrigation techniques were used to cope with droughts. Forests were burned to establish cultivation areas but in a controlled manner that allowed the restitution of soil fertility. A fundamental difference with post-1492 land use was the non-existence of large domesticated mammals that would demand the opening of extensive pastures. Ceramic groups of the insular Caribbean domesticated terrestrial animals such as the *perros mudos* ("dumb dogs" so named for their inability to bark) and rodents such as guinea pigs, but their main source of protein came from fishing and marine resources (Morgan 2022).

After the Spanish conquest, newly introduced diseases, forced labor of the Indigenous people for gold mining, and violence led to the demographic collapse of the native populations in most of the insular Caribbean. Only small nuclei of Caribs survived in the Lesser Antilles, other parts integrating with the European colonizers and enslaved Africans in a long process of *mestizaje*. One of the consequences of the population decline in the Antilles was the natural reforestation of areas that had

been dedicated to agriculture, which may have contributed to the recovery of soil nutrients due to the cessation of grazing (Watts 1992). But at the same time larger and larger areas began to be deforested to make way for the new biota introduced by the colonizers.

The following pages focus on the evolution of farming and ranching practices from the beginning of European colonization until the early nineteenth century. Slave plantation agriculture was the most prominent element, whose long-lasting effects and legacies of colonialism led to the successive deterioration of ecosystems. Sugarcane, introduced by Christopher Columbus on his second voyage, was the most important crop, described as green or white gold when converted into a final product. During this period, other cash crops came about at different times, such as tobacco, ginger, cotton, or coffee, but none on the scale of the first. The reason for this was its agro-industrial character given the need to process the raw material in the fields to obtain sugar.

The plantations had a greater impact in terms of land use. However, if the Antillean archipelago is taken as a whole, it can be seen that most of the land was still covered by tropical forest, whether dry or humid, or dedicated to extensive cattle raising, conducted also to a large extent in the interior of the forested areas. This has to do with the fact that the classic plantation system began on some of the smaller islands of the Lesser Antilles in the mid-seventeenth century and, in the eighteenth century, spread to larger areas on the islands of Jamaica and the western half of Hispaniola. But on these two islands, and especially in Cuba, there were still extensive territories dedicated to other uses. Therefore, in an overall view of the region, plantations and sugar were not yet the central components of the landscape. Rather, the landscape was characterized by the forests and extensive cattle ranching of Cuba, Santo Domingo (in the east of Hispaniola), and Puerto Rico, whose combined area represents approximately 72 percent of the area of the insular Caribbean.

The *Hatera* Society in the Hispanic Insular Caribbean

Mainly coming from the Iberian Peninsula, with a long and powerful cattle-raising tradition, the Spanish colonizers were concerned from the beginning with the introduction of large domesticated mammals. In the second expedition organized by Columbus to the new lands, a few horses and pigs were transported. The following fleets were joined by horses and cattle shipped from Andalusia, together with sheep and goats from the Canary Islands. It is estimated that in the early days there was a preponderance of sheep in these shipments, in accordance with the livestock policy of the peninsula that favored the *Mesta*. But the species' difficulty adapting to the Antillean climate, together with the low demand in the local market, deepened the preference for porcine, equine, and bovine species. The rapid proliferation of these

domesticated animals in the Antilles made it possible to cover the domestic demand in Hispaniola and other Caribbean possessions in a short period of time. Additionally, it provided an economic alternative when gold mining began to decline in the second decade of the sixteenth century (Río Moreno 2012).

Since then, livestock began to be one of the most viable activities for the economic life of the Antillean colonies. On the one hand, the decline of gold mining in Hispaniola and its scarcity in other islands, along with the migration of many settlers to the mainland possessions, made it necessary to look for other sources of income. On the other hand, the multiplication of cattle offered the opportunity to take advantage of their excellent adaptation to local conditions with little labor. Thus began a "cattle cycle" that became the hallmark of the Hispanic Caribbean until the beginning of the nineteenth century, even during the commercials booms of crops such as sugar, tobacco, and ginger.

The rise of cattle raising in Hispaniola is linked to the need to supply meat to the local market and the provision of animals for the conquest of the continent. But as both demands were met, a need arose to find more viable alternatives. Among these were the export of hides to the metropolis and European markets, the supply of traction power to the nascent sugar plantations, and food. Over time, the contraband trade with subjects from other powers that began to arrive in the Caribbean acted as another major stimulus maintaining the cattle economy. Towards the end of the 1530s and the beginning of the 1550s, annual production of hides is estimated at over 30,000 units per year (Río Moreno 2012: 203).

In the second half of the seventeenth century, there was a drop in cattle numbers in many territories of Hispaniola, influenced as well by smuggling and the activity of the buccaneers that prowled the Caribbean. As a consequence, there was a shortage of meat for the colony's population and it became necessary to adopt measures for livestock recovery. With this objective in mind, the slaughter of cows and their calves was frequently prohibited, and a registry was created to prevent the inclusion of female cattle in the leather trade. Even in 1580, a more drastic measure was adopted by the Council of the Indies at the request of the town council of Santo Domingo to suspend the slaughter of cattle for a period of six years (Río Moreno 2012).

The sugarcane plantation boom from 1518 to the 1570s represented an important demand for cattle and other livestock. Breeding was a source of accumulation that made it possible to invest in the sugar agroindustry, but the most important thing was its complementary nature. The mills required a constant supply of oxen to move them and the wagons that carried raw material to the factories or the final product to the shipping ports. There was also a high demand for meat to provide for the *dotaciones* (enslaved labor force in the mills).

Cattle ranching in the Hispanic Antilles had its ups and downs during this period, but it remained the predominant land use in most of its territories, especially those farthest from the centers of colonial power. The chronology may vary from case

to case. In Puerto Rico, three phases of colonization can be identified between the sixteenth and eighteenth centuries; the first, from 1508 to 1542, centered on gold mining with *encomienda* and Indian slavery; the second, from 1540 to the mid-seventeenth century, saw the sugar mill prevail with African slave labor; and the third, from 1660 to 1770, experienced the rise of the *hatera* (cattle ranching) economy based on a mixed labor system of slavery and peasant servitude (Moscoso 2020).

Similar processes took place in Cuba. From the beginning of the seventeenth century to the 1680s, there was a boom in the sugar agroindustry in the territories near the town of Havana, followed by a period of increased tobacco cultivation between the end of that century and the first decades of the following one. But this in no way signifies the decline of the cattle herds, which provided animals for both activities and above all to supply the oxen for the mills and wagons, as well as meat for the dotaciones. The sugar mill owners used to be part of the hatera aristocracy, and even the owners of tobacco plantations and mills appear among the major cattle owners. Most of the island was divided up for cattle raising in lands granted by the *cabildos* (Spanish colonial municipal unit) from the middle of the sixteenth century, while cultivated areas were concentrated in small areas around the main towns. From 1729, the Spanish crown sought to put an end to the cabildos' land distribution, but the practice continued for several years amid conflicts with the town councils (Balboa 2013).

Land grants in Cuba were ratified and regulated by means of the *Ordenanzas de Cáceres* in 1574, which established the concession of two leagues of radius for large cattle herds and one league of radius for small cattle corrals. The equivalence to the metric system reveals the great extension of these units: 226 km² for the former and 56 km² for the latter. This is an ideal measure that was rarely complied with, but it reflects the degree of land concentration on the part of the authorities that used to control the cabildos. Over time, there was also a tendency to create mixed units for large and small livestock.

The distinction between herds and corrals had to do with the differences between free-range cattle and swine systems. The herds used to be linked to the existence of open land, known as savannahs, whether of natural or anthropogenic origin. This does not mean that the entire extension of the *haciendas* had these characteristics, in fact wooded areas were predominant. In the rainy season, the open spaces were key for the *rodeos*, the time when the animals were gathered for the little attention they received each year. Some of the activities included counting, branding, or curing, taking advantage of the greater availability of natural pastures. On the other hand, during the dry season, the animals could enter the wooded areas to feed on fallen or foraged fruits.

Although it is not possible to go in depth into the land occupation by the Hispanic Caribbean hatera society, some of its peculiarities can be noted here. First, this occupation was part of a concept that included the community of uses of mountains,

waters, and pastures, according to the Castilian peninsular tradition. For this reason, there were tensions from the beginning between the private use of the land by the beneficiaries of the grants and the royalist precepts that considered these grants as a usufruct of the crown. These interpretations were in conflict until 1819 when full private ownership of the old grants was accepted (Balboa 2013).

Regardless of the common uses, herds and corrals evolved in two main directions. Due to the opportunities for accumulation made possible by the system of the Spanish treasury fleets that landed in Havana from the 1540s on, the cattle ranches (*haciendas*) in the west were controlled by the most powerful individuals, with some even owning several such ranches. On the other hand, in more distant territories, many of these original haciendas tended to be subdivided by inheritance or sale, giving rise to what was known in the nineteenth century as *haciendas comuneras*.

Without fences, these divisions were virtual. Instead, they were constituted by a right of use based on the individual *pesos de posesión* within the community. In this way, common use of pastures, watering places, and forests remained. The *hacienda comunera* system had less weight in Puerto Rico since the beginning of the nineteenth century, but was preserved in several territories of central eastern Cuba until that century's end and in the Dominican Republic until the first decades of the twentieth century. A large part of their territories was covered with forests, such that logging was one of the most widespread activities within the original cattle ranches.

These haciendas were subject to limitations such as the obligation to supply the internal market of the cities through the *rueda* or *pesa* system. At the beginning, this system functioned without major setbacks, but as the population increased and new possibilities for agricultural activities opened up, it was seen as an onerous burden for the farmers. Another restriction for the cattle ranches in Cuba was the preferential right granted to the Spanish Royal Navy for the exploitation of their forests, with the aim of guaranteeing the supply of wood for shipbuilding in Havana (Funes 2008).

The rise of the hatera economy and society based on free breeding connects also to the trade of contraband with other European powers that occupied Caribbean islands since the mid-seventeenth century. Many of the inland cities in the Hispanic Antilles and its regions prospered in the heat of this illicit trade that compensated for the limitations of the Spanish commercial monopoly of Atlantic traffic through a single port. This monopoly prevailed until the first openings in 1765 and the commercial liberalization within the empire that started in 1778. Until then, smuggling was a determining factor in the extensive cattle ranching of the Hispanic Antilles, and this, in turn, was key to the success of the foreign colonies' plantations (Giusti 2014).

The existence of cattle ranching, logging, or smuggling does not imply the absence of cash crops in the insular Hispanic Caribbean. In fact, it can be said that the American slave plantation had its beginnings in Hispaniola. The early decline of

gold mining led the Spanish encomenderos to start growing sugarcane in the area of present-day Santo Domingo, where the plant was introduced to America in 1493. From there, sugarcane expanded to other islands of the Hispanic Caribbean and the mainland. In 1515, the encomendero Gonzalo de Vellosa founded a horse-driven cylinder mill on the banks of the Nigua River, hiring Canary Island technicians and employing slave labor (Rodríguez 2012).

Thus, commercial sugar agriculture burst into the New World following the model of the Atlantic plantations of the Canary Islands, Madeira, and Sao Tomé. In 1517, Seville received the first shipment of sugar from Hispaniola. In this first stage, the *trapiche* referred to mills powered by animal power, while the *ingenio* referred to those operated by hydraulic power. In 1535, Santo Domingo had more than 30 ingenios and just as many trapiches, some employing 100 African slaves or more (Rodríguez 2012). In Puerto Rico, the first sugar boom occurred between 1540 and 1550 with the founding of a dozen ingenios that produced around 170 mt of sugar (Cabrera, 2010). Cuba joined the sugar industry with a loan from the Spanish crown in 1602 to Havana residents interested in the business.

The initial sugar plantations took advantage of the *camellones* system practiced by the aborigines. The choice of land was determined by proximity to water supply sources and ports, rather than soil type. Agribusiness represented an increase in deforestation due to its demand for soils for crops, fuel, and construction timber. This early incursion of the sugar plantation in Hispaniola ended between 1580 and 1585 due to lack of capital, a reduced demand in the metropolis, and an insufficient labor force, together with the competition of exports from Brazil. This was despite the fact that the Crown facilitated loans and the introduction of equipment, technicians, and the trafficking of enslaved Africans to supply the dwindling Indigenous labor force (Rodríguez 2012).

From the beginning, the processing of cane sugar had an agro-industrial character due to the need to process the raw material on site in less than 24 to 36 hours after cutting the stalk of the plant in the fields. After this time, the juice deteriorates and the sugar content is lost. This explains why the mill and other manufacturing facilities were located adjacent to the sugar cane fields. To process the juice or *guarapo*, boilers or boiler houses were required. Here, the juice was cooked to prepare it for its later crystallization process, which lasted about a month in the "purge house."

In addition to this, forest reserves were needed to provide firewood to fuel the boilers and pasture areas to maintain the animals. With various driving forces and some technological changes, this initial type of plantation, which brought together the agricultural and manufacturing sectors, remained largely unchanged until the end of the eighteenth century. One could speak of a pre-industrial plantation within the framework of organic agriculture, dependent on solar energy through photosynthesis and an enslaved labor force, reliant also on the energy of wind, water, and animal traction.

Sugar and Slave Islands

Towards the middle of the seventeenth century, the sugar plantation model resurfaced with renewed force in the Caribbean, this time promoted by other northern European powers, particularly the kingdoms of Great Britain and France, which shortly before had begun the occupation of several of the Lesser Antilles considered useless by the Spanish crown. An impulse in this regard came from the Dutch model during their occupation of Northeastern Brazil, centered in Recife, between 1630 and 1654. After Portugal's recovery of those territories, the Dutch subjects migrated to the Caribbean.

The Pernambuco Dutch brought to the new British and French possessions of the insular Caribbean their knowledge of sugar cultivation and trade and an entrepreneurial mentality associated with the beginnings of capitalism. This connection is further illustrated by the case of Barbados, occupied since 1627 by the British. In 1637, the Dutch introduced sugarcane and contributed capital, machinery, and technicians, as well as commercial networks and slave labor until 1650. Thus began a rapid transformation, taking advantage of a moment of the local settlers' relative autonomy from their British metropolis (Klein and Vinson 2013).

With an area of 430 km², Barbados is considered the archetype of the classic seventeenth century slave plantation model. It was the first stage of the "sugar revolution" that would later be repeated in different periods and scales in most of the larger islands of the Caribbean archipelago. According to Higman (2000), this revolution implied a shift from diversified agriculture to monoculture, from small farms to plantations, from the free labor of European settlers to the African slave trade, and from subsistence crops to crops with high commercial value. This was correlated with the rise of the African slave trade, the triangular trade, and the growing European interest in their tropical colonies. These changes are linked to the emergence of new eating habits in Europe and the transition of sugar from a luxury item to a commodity for mass consumption in the midst of the Industrial Revolution's birth in England (Mintz 1985).

Barbados had soils suitable for sugarcane and water sources. It was also uninhabited at the time of its occupation. The island contained a large number of wild pigs that reproduced from previously abandoned specimens. In 1644, sugar production was estimated at 8 percent of the value of all cash crops (tobacco, cotton, indigo). Five years later, sugar accounted for 100 percent. Richard Ligon estimated in a work from 1674 that 40 percent of the land was devoted to sugarcane in the mills of Barbados. In 1680, 175 large landowners held 54 percent of the land with 100-acre plantations and an average of 60 slaves (Klein and Vinson 2013: 146).

The mills were established on the coast and in the valleys. In about two decades, the island was deforested to make way for large plantations, after the coastal scrub vegetation and seasonal rainforest were cleared. Intense deforestation not only al-

tered soil fertility, but also facilitated erosion and salinization. Likewise, much of the native fauna disappeared and the new introduced plants gradually displaced the native ones. However, in some cases, such as guava and campeche, they became pests (Watts 1992: 223).

The rapid irruption of sugar was repeated in other islands occupied by the British since the seventeenth century, such as St. Christopher or St. Kitts (1624), Nevis (1628), or Antigua and Monserrat (both in 1632). By 1700, these islands were exporting some 22,000 mt to the mainland, of which Barbados accounted for just over half. Nevertheless, this share would fall during the eighteenth century, due both to the rise of other producing islands and to the decline of Barbadian exports, which in 1748 was 6,442 mt (Sheridan 1998).

By the 1680s, planters were already complaining about the loss of soil fertility, so to counteract this they began to build terraces and use fertilizers. Environmental deterioration made Barbados a leader in sugar industry innovations in the eighteenth century. The colony introduced windmills and single-fire boiler trains (*trenes de caldera a un solo fuego*) that consumed less wood or could be fed with the leftover cane residue after grinding. This was accompanied by the planting of new varieties of sugarcane, irrigation, and later inorganic fertilizers (Galloway 1985: 334–351).

The sugar revolution also spread to the small Antilles occupied by France, such as Martinique, Guadeloupe, and part of St. Kitts, shared with Great Britain. In the early days, the contribution of the Dutch was also vital. For example, in Martinique, colonized since 1635, the first mill was installed by a Dutchman in 1640. A few years later, in 1654, 600 Dutchmen settled in Guadeloupe with 300 slaves. In 1680, there were a total of 350 plantations in Martinique producing 8,000 mt (Klein and Vinson 2013). It is said that from the beginning the French islands had a greater diversity of plantation crops, even if sugar was the dominant production (Burnard and Garrigus 2016).

The limited territorial scale of the Lesser Antilles caused the nucleus of the slave plantation model to move to new territories in the insular Caribbean, such as the island of Jamaica and western Hispaniola, both in the Greater Antilles. Jamaica, with 10,911 km², was a Spanish colony until 1655, when it was occupied by the British. Half a century later, with the Treaty of Ryswick in 1697, the Spanish Crown ceded to the Kingdom of France another portion of its territories in the Caribbean, giving rise to Saint-Domingue (later Haiti) in an area de facto colonized by the French, with an extension of 27,750 km².

Jamaica had a slower start with sugar than the other British possessions. At the beginning of the eighteenth century, it exported slightly less than 5,000 mt, equivalent to one-fifth of the sugar coming from the British West Indies. In 1748, its export amounted to 17,399 mt, 40 percent of all the sugar shipped to the metropolis from the West Indies. This leap entailed the multiplication of the number of mills, a greater number of slaves per unit, and the use of new technologies to increase the productive

scale. In 1670, the island had 57 mills, a number that rose to 455 in 1746. In 1774, some 40,000 mt were produced in 775 mills. By the end of the 1780s, production reached about 60,000 mt, and in 1804, it reached a record 100,000 mt coming from about 700 plantations (Higman 2021).

The expansion of the African slave trade was vital to these production increases. The number of enslaved people in Jamaica increased from less than 40,000 to more than 300,000 in the course of the eighteenth century. The average per unit of sugar production was 150 to 300, far higher than any other plantation crop in British America at the time (Burnard and Garrigus 2016: 38). In the second half of the century, the slave plantation in the British West Indies reached its peak thanks to the expansion of sugar plantations on Jamaican soil, heavily dominated by absentee owners. Between 1748 and 1815, its share of imports from the metropolis grew from 21 to 28 percent of the total. Sugar was the main imported product from the 1750s, when it replaced flax, until the 1820s, when it was surpassed by cotton. This had to do with a considerable increase in the per capita consumption of sugar in the metropolis, from 4 pounds in 1700 to 10 pounds in 1748 and 20 pounds in 1800 (Ward 1998).

In Saint-Domingue, the sugar revolution occurred more rapidly than in Jamaica. The French colony recorded an increase in production from just over 10,000 mt in the early 1720s to 60,000 mt in the 1760s. Its size, about 25 times the size of Martinique, allowed for the optimal use of space, available resources, and technology. At the beginning of the eighteenth century, the island had a much smaller number of enslaved people than Jamaica, but by the beginning of the 1750s, the ratio was about 162,000 in the former to 106,592 in the latter. As early as 1740, Saint- Domingue's sugar production (40,000 mt) exceeded that of all the British Isles (35,000 mt) (Burnard and Garrigus 2016: 35).

By 1791, the French colony was exporting some 80,000 mt of sugar, representing half of the world total. The proportion was even higher in the export of coffee, its second largest plantation crop. In this case, as in other cash crops, large investments in land, labor, and technology were not required, such that they could be grown in smaller units. In 1789, there were 793 sugar plantations, 789 cotton plantations, 3,171 indigo plantations, and 3,117 coffee plantations (Garrigus 2006). At the time, Saint-Domingue was considered the richest and most successful colony in the world. But that wealth depended on a constant flow of enslaved Africans and deep social stratification. Against the backdrop of the French Revolution in 1789, a major revolution of enslaved people broke out in the northern sugar plains in August 1791, leading to the proclamation of the new independent state of Haiti in 1804.

At the beginning of the revolt, the population of the colony was 520,000, of which 90 percent were enslaved, compared to 40,000 whites and 28,000 mulattos or free Blacks (Moya 2008). Sugar plantations occupied the best lands in the plains and some interior valleys, while coffee began to enter the mountainous areas. The revolution implied first and foremost the ruin of sugar production, which in 1800 barely

reached about 10,000 mt (Higman 2011: 166). On the other hand, the fall of coffee was less pronounced and, in a few years, it had become the basis of the Republic of Haiti's exports, together with what was left of precious woods.

The collapse of the plantations during the revolution in Saint-Domingue made Jamaica the main exporter of sugar in the world during the transition from the eighteenth to the nineteenth century. For a short time, it was also a leader in coffee production, despite not reaching the figures of the neighboring colony. As noted by Burnard and Garrigus (2016: 3–4), both symbolize the apogee of the slave plantation from 1740 until the Haitian revolution and the end of the slave trade for Jamaica in 1807, which contributed to the development of capitalism in the Atlantic world and represented a proto-industrial model for the Euro-Western metropolises. The integrated sugar plantation dominated the economy and society of both colonies, although with its own peculiarities.

In both Jamaica and Saint-Domingue, sugar factories were located in more accessible areas such as the coastal plains, which facilitated the movement of the final product to shipping ports. In the second half of the eighteenth century, these lands became even scarcer, so sugar plantations were established more frequently in the interior valleys. These formed a kind of niche in the middle of the mountainous topography of both islands. It is estimated that this new location reduced profit margins; in times of crisis, they also were the first to be abandoned (Higman 2011: 166). Mountainous and inland territories were often preferred for other cash crops or livestock. This occurred with the expansion of coffee in Haiti, where a Swiss visitor noted around 1780 that coffee plantation owners had already exhausted half of the mountains they cultivated, modifying the colony's climate (D'Ans 2011: 185). About Jamaica, the planter and historian Bryan Edwards wrote in a work published in 1794 that it was difficult to find 300 acres of uniform soil to establish plantations.

This situation was different in Cuba, which began its sugar boom in the second half of the eighteenth century. Not only is it the largest of the Antilles, with an area about ten times that of Jamaica and four times that of Haiti, but its landscapes are dominated by vast plains, more than 75 percent of the Cuban archipelago. Since the 1740s, the Havana-centered sugar industry had begun to recover from a long crisis, and after the eleven-month occupation of the city by the British in 1762, a sustained sugar boom began. The revolutions in the thirteen North American colonies and Haiti were definitive moments for the Spanish colony to be the scene of a new sugar revolution in the Caribbean.

The great availability of forested land and the extensive plains were a fundamental part of the optimism about Cuba's potential for the plantation leap. In 1768, the military engineer Agustín Crame pointed out that the lands of Jamaica, which are inferior to those of Havana, and are already tired of producing sugar, need almost every year that new cane be sown in them and that they be fertilized with manure. In

those of this island, that work is not necessary for a long time, nor this cultivation, because the cane fields last 12 and 15 years in their vigor. (Fernández 2009: 64)

In 1807, Cuba's sugar production amounted to just over 41,000 mt (Moreno 1978), which represented about half or less of what was obtained in Jamaica in those years. But its prospects were far superior in the long term. Two decades later, it met the amount obtained by Saint- Domingue at the time of the revolutionary outbreak, and in a few more years, it had already surpassed the 1804 record of Jamaica several times. As was to be expected, this growth in sugar took place at the expense of the forest frontier and produced ecological and socioenvironmental consequences similar to those of the other Caribbean slave and sugar islands (Funes 2008).

Although sugar is the dominant crop because of its scale of production, the large interests involved, or its high profits, it cannot be thought of as having an absolute monopoly on land use. Its greater or lesser share compared to other crops or agricultural activities had to do with market conditions, the size of the islands, topography, and the sociopolitical particularities of each colony. Saint-Domingue had a more diversified plantation economy with several cash crops. Jamaica was more focused on sugar, but also had other crops, a significant livestock presence, and a tendency towards crops for self-consumption in plots of land given by the owners as part of their *dotaciones*. In Cuba, sugar had to compete for several years with the Royal Navy's monopoly on forest exploitation (Funes 2008).

Alternative cash crops to sugar plantations expanded unevenly throughout the territories of the insular Caribbean. The oldest was tobacco, which was present in the islands when Europeans arrived. By 1530, it was established in Hispaniola and from there it spread to other Hispanic colonies. In the seventeenth century, the British and other European powers promoted plantations for short periods of time, as was the case in Barbados. Tobacco was important in the French colonies and in Saint-Domingue until 1690.

Its production in Cuba stands out. It replaced sugar as the first crop for several decades between the end of the seventeenth and the beginning of the eighteenth century. Of great importance was the cultivation of the Vuelta Abajo area, at the western end of the island. Between 1632 and 1844, Spain implemented the tobacco *estanco*, a monopoly that lasted until the nineteenth century. In Cuba, as in other Hispanic colonies, tobacco was cultivated mostly by free peasants in small plots, although slave laborers were also employed, and later larger-scale plantations arrived (Ortiz 1940).

Ginger, a plant from tropical Asia, was introduced in Hispaniola around 1525. In the mid-1540s, the first exports to the metropolis took place, and after the decline of the sugar industry, it became the main export crop. In 1582, it was cultivated in Puerto Rico, where it was grown by poor and enslaved people. The plant, highly sought after in the European market, was less demanding in terms of soil conditions, and its production cost was low. Until the middle of the seventeenth century,

the plant was the object of conflicts and disputes with sugarcane cultivation (Gil-Bermejo 1970). It was also present in islands such as Nevis, Barbados, and Jamaica.

From its introduction by the French colony of Martinique in 1723, the coffee bush spread to the other Caribbean possessions of France and, from there, to the English and Spanish colonies. By far the largest producer and exporter in the world at the end of the eighteenth century was Saint- Domingue, where there were more than 3,000 coffee plantations with an average of 33 slaves. Its export volumes increased from about 3,100 mt in 1755 to 32,000 mt in 1790. After the revolution, emigrants from the colony contributed to the coffee boom in Jamaica and Cuba, which both maintained some primacy in the world market for a short period (Marquese 2017). Another crop that boomed in the insular Caribbean was cotton, as the West Indies in the 1780s became the main source of this raw material for the British textile industry's rapid expansion (Ward 1998).

Jamaica and Puerto Rico are illustrative of the cultivation of melegueta pepper. The latter produced for the Spanish market starting in the first half of the eighteenth century. In 1777, a Royal Order requested that some trees be sent to the Botanical Garden of Madrid for acclimatization and subsequent propagation in the southern coastal areas of Spain. The spice is one of the distinctive ingredients of Caribbean stews and dishes born in the sugar plantation era (Gil-Bermejo 1970).

Several crops associated with the transatlantic trade, such as rice, yams, okra, and pepper, had an important presence in the Caribbean fields (Carney and Rosomoff 2011; Fernández 2021). These cultivars were part of the dynamism of land use and the practices and knowledge in accordance with global and local markets. The enslaved Africans and their descendants dedicated themselves to the cultivation of many subsistence crops in the *conucos*, contributing to ensure their diet. But at the same time, this small-plot agriculture was also part of exchanges in the plantation areas and could even produce income later used to buy freedom.

Cattle Ranching in Plantation Colonies and Smuggling

Spanish colonization concentrated on the larger Antilles (as well as Trinidad) and abandoned the smaller islands of the Antillean arch for being "useless." On several of these islands, there were Indigenous populations that had already adopted the European domestic animals. In addition, on their coasts, buccaneers hunted wild cattle to send hides to Europe and to make salted meat. At the beginning of colonization, horses and other animals were imported from the metropolis and Atlantic islands such as Madeira and Cape Verde. But due to the sugar revolution in the Lesser Antilles, the demand for animals and their by-products skyrocketed.

Satisfying this growing demand from these same islands of limited space became increasingly difficult, and it was. Therefore, essential to turn to external

sources to supply needed traction cattle and foodstuffs. However, livestock farming was not entirely absent and, in some cases, was a relevant activity. For example, due to the accelerated deterioration of soil fertility, the "manure farms" (*granjas-estercoleros*) appeared in Barbados between the last third of the seventeenth century and the first decades of the eighteenth century. This name was given to units that raised cows, pigs, and horses to supply fertilizers to the sugar factories.

In 1720, these farms began to disappear due to an epidemic that decimated livestock and the increase in the price of sugar, which led small landowners to dedicate themselves to planting sugarcane. On the other hand, since 1730, official efforts have been made to encourage cattle raising by the planters themselves (Watts 1992: 444–445). One of objective was to guarantee traction cattle for the plantations, including those destined to move the mills. There was a tendency to replace horses and mules with oxen, whose slower movement allowed more juice to be extracted from the canes. By 1710–1712, out of a total of 485 sugar factories, 76 employed animal-powered mills and the other 409 windmills (Shepherd 2009: 30). By the 1760s, however, the mills of the first type had disappeared, attributed not only to the advantageous location for wind power but also to the scarcity of pasture areas for animal maintenance (Higman 2021: 127).

The free-range system was not absent from the Lesser Antilles, but its presence was greater in larger islands such as Jamaica. During the Spanish occupation, the land was designated as cattle ranches, and one of its main purposes was the export of hides with shipments to Havana and Spain. The decline of the colony and its sparse population explain the proliferation of feral cattle. When the English settlers arrived, a large number of wild animals were available to them that could be captured to supply their food needs. Likewise, the leather industry continued for many decades. By 1768, 2,287 skins were exported to markets in North America, increasing in 1774 to 8,636 (Shepherd 2009: 4–6).

The profits generated by the hatera cattle ranching became one source for the subsequent reinvestment in the sugar agroindustry in Jamaica. But unlike other British Isles, livestock farming remained an important economic activity to supply the sugar plantations. There was a close complementarity, although not without conflict, between the advance of the plantations and that of the cattle ranches or paddocks. One of the reasons was that in Jamaica, animal-drawn mills prevailed over other sources of energy. In 1804, out of a total of 1,077 mills in 830 complexes, the majority fell into this category (656), followed by water (333) and then wind (88) (Shepherd 2009: 31).

In 1684, there were 73 haciendas or paddocks. A century later, the number had increased to around 300. Their location and distribution usually followed that of the plantations, with a tendency to be located in areas less conducive to sugar. In many cases, they settled in savannah lands or marginal and mountainous areas. These haciendas characteristically produced for the domestic market (especially of ani-

mals and pasture for plantations), rather than for export. Their owners tended not to be absentees, as were many planters. Their farms were more diversified and contributed to the self-sufficiency of the colony. One of their products was manure to replenish soil fertility. For this purpose, "mobile paddocks" emerged where animals were gathered and fed with guinea grass and fodder in order to later collect their excrement (Higman 1995).

Although the Jamaican cattle ranches satisfied a large part of the demand for animals for traction and food, the island was no stranger to smuggling with the Spanish Antilles. In fact, the owners of the paddocks used to claim the increase of import duties on the animals of that origin. The cattle ranching areas on the southern coast of Cuba supplied cattle and mules, as well as timber for different uses. During the eighteenth century, the Hispanic colonies of the continental Caribbean provided a large part of the animals required by the plantations of the insular Caribbean. Alexander von Humboldt wrote that through the Port of Cabello in Venezuela alone some 10,000 *mules* were smuggled annually to the eastern Caribbean islands and Saint-Domingue (Giusti 2014: 29).

Nowhere was this interdependence between the Hispanic Caribbean cattle ranching and the plantations of other European powers more evident than in Hispaniola. The occupation of the western part of the island by the French had to do with the growing smuggling of furs in the northwest of the island to sell to merchants in northwestern Europe and the activity of the buccaneers who began to settle in this area, engaging in animal husbandry since 1670. After the French occupation, there was a progressive differentiation of the two colonies.

The planters of the western part required a growing supply of draft animals for the mills and wagons, as well as food for the dotaciones, while the herdsmen and peasants of the eastern part found a flourishing market to sell their livestock and hunting. This trade was illegal for several decades, but in 1762, the monthly sale of 800 cattle from the Spanish side to the French side was authorized. By 1780, of the 15,000 head of cattle purchased abroad by the colony of Saint-Domingue, some 12,000 came from the neighboring colony of Santo Domingo, the rest coming from Puerto Rico, Cuba, and other Hispanic colonies on the continent (Giusti 2014: 21–24). The presence of French and Spanish troops during the Seven Years' War (1756–1763) increased the demand for cattle, often affected by epidemics and diseases that decimated the herd. In addition, animals were stolen in the border area to alleviate the cuts in official cattle shipments, with the goal to eliminate shortages on the Spanish side (González 2011: 125–139).

Brief Conclusions

This text has analyzed land use in the insular Caribbean between 1492 and the beginning of the nineteenth century. A general look allows the conclusion that plantation agriculture – that aimed at producing tropical fruits through the use of enslaved Africans for the foreign market – and cattle ranching were the two economic activities that modified the landscapes of the region in the period, although this occurred unevenly across the islands. In some cases, the sugar plantation coexisted with other cash crops (tobacco, indigo, cotton) and subsistence crops. Extensive cattle ranching was also more important in the Hispanic Antilles and Jamaica.

The sugar revolution – which began in Barbados in the 1640s and spread to other islands of the Lesser Antilles in the same century, to Jamaica and Saint-Domingue in the 1700s and, finally, to Cuba in the 1800s – resulted in a great socioecological, economic, and demographic transformation of the Caribbean region. The expansion of the slave sugar plantation caused deforestation based on the slash-and-burn system for cultivation, with the consequent use of forest income to guarantee high sugar yields and the intensive use of firewood. The depletion of soils and the alteration of both the hydrological system and biodiversity were a constant that was repeated in all the producing islands at different times of their sugar development.

With the consolidation of plantations, soil degradation, and loss of fertility, there was a parallel process of technological innovation in manufacturing and the agricultural sector. On the one hand, single-fired boiler trains were introduced and the use of bagasse as fuel was extended, along with the generalization of wind and water mills wherever possible. On the other hand, new varieties of sugarcane were brought in and irrigation was used, as well as fertilizers for the recovery of the depleted land.

Plantation agriculture and livestock farming depended on each other throughout the period. Even so, unlike the British, French, or other northern European colonies, the "cattle cycle" was the most characteristic feature of the Hispanic Caribbean until the beginning of the nineteenth century, even during the cash crops' period of expansion. More intensive cattle raising grew in response to the demand for leather in Europe, the internal consumption of the populations, smuggling, and the needs of the sugar plantation in the region.

It should be noted that while the northern European Caribbean colonies were already experiencing high levels of soil deterioration and falling yields, the Spanish colonies, which were much larger, presented a promising horizon for sugar and plantation expansion. In contrast to the intensive land use by plantations, extensive cattle ranching only compromised to a very limited extent the natural fertility potential derived from the tropical forest.

Translated by Eric Rummelhoff and revised by Omar Sierra Cháves.

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