# Controlling Nature and Transforming Landscapes in the Early Modern Caribbean

Laura Hollsten

The Early Modern Caribbean is a highly interesting area for the global as well as the environmental historian.[1] The Caribbean islands were some of the most important colonies in the seventeenth century and part of the international trade network as one of the cornerstones of the so-called "triangular trade" between Europe, Africa and the Americas. The growth of markets

and buying power in Europe stimulated investments in sugar plantations. Westbound European ships, on their way to what they initially thought of as India, first arrived here bringing with them people, animals, diseases, arms and the beginnings of a new culture.

The Caribbean has sometimes been characterised as a place where people, plants and animals were acclimatised before they entered the mainland of America. Mary Louise Pratt's concept of a contact zone, designating an area of contact between different peoples in a colonial situation, can be applied to contacts between biotypes, animals and plants, as well as humans.[2] The seventeenth-century Caribbean was a contact zone for different peoples, as well as animals and plants. As a result, few places in the world have undergone such rapid landscape changes as some of the Caribbean islands. Their ecosystems were completely transformed in the course of a few decades, as sugar plantations were set up. As a colonial landscape, the Caribbean shows how world trade and European consumption influenced the island ecosystems.

An environmental perspective has proved useful in the study of the multifaceted relations between colonial powers and their colonies.[3] This approach also actualizes a complex set of questions concerning the emergence of consumerism and detrimental changes in

[1] The Caribbean includes all of the islands of the Caribbean Sea from the tip of the Florida Peninsula to the northern coast of South America. Islands studied in this article are the English Antigua, Barbados, Jamaica, Nevis, Montserrat, and the French Grenada, Guadeloupe, Martinique, St. Barthelemy, Saint Domingue and St. Lucia. In addition, St. Christopher and St Vincent were co-owned by Britain and France.

[2] M.L. Pratt, *Imperial Eyes: Travel Writing and Transculturation*, Routledge, London and New York 1992, p. 6.

[3] J. MacKenzie, "Empire and the Ecological Apocalypse: The Historiography of Imperial Environment", in *Ecology and Empire. Environmental History of Settler Societies*, T. Griffiths and L. Robin (eds), Keele University Press, Edinburgh 1997, pp. 215 ff. Alfred Crosby and others have drawn attention to how "ecological imperialism" worked in the colonies as Old World species invaded new terrain on other continents. See A. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900*, Cambridge University Press, Cambridge 1987; C.T. Kimber, *Martinique Revisited: The Changing Plant Geographies of a West Indian Island*, Texas A & M University, College Station 1988; R. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism,*

the environment. As a consequence of colonisation, the Caribbean islands were, by the end of the seventeenth century, no longer the same islands that for centuries had been inhabited by the Taino, the Ciboney, the Arawaks, and the Caribs. These changes had been brought about by the activities of the European colonial powers that used the islands to produce tobacco, cotton, ginger, indigo and, above all, sugar. As Richard Drayton has pointed out, the early modern history of the "sugar plantation complex" in the Caribbean is much more than the colonial history of a particular tropical area. The emergence of the plantation complex in the Caribbean can in fact be seen as the catalyst of a global development.[4] The rapid transformation of the Caribbean islands in the seventeenth century is one episode in the long process of European expansion that had begun with the long sea voyages of the fifteenth century. Not only did it affect people and power relations, but it also transformed ecosystems and landscapes. The economic structure of the islands changed when provisions and slaves were bought with the money that the sugar trade brought in. The ecosystem on the islands changed dramatically when new crops were introduced and replaced thousands of indigenous species. The need for workers stimulated immigration and the slave trade, and millions of Africans were shipped to the Caribbean. The growth of the plantation economy is an economic, ecological, cultural and political process that has resulted in a new kind of world order, new ecosystems in the colonies, and new ways of living and eating both in Europe and the colonies. This study focuses on changes in the Caribbean landscape caused by sugar cane agriculture as they are discernible in travel accounts and natural histories of the Caribbean, written by English and French travellers visiting the area in the seventeenth century.

*1600-1800*, Cambridge University Press, Cambridge 1995; R. Grove, *Ecology, Climate and Empire*, The White Horse Press, Cambridge 1997.

[4] R. Drayton, "The Collaboration of Labour", in *Globalization in World History,* A. G. Hopkins (ed.), Pimlico, London 2002, pp. 99-100.

## Indigenous people and settlers

At the time of European colonisation the Caribbean islands were populated by three major Indian groups: a group of hunter-gatherers, often described as the Ciboneys; the Arawaks; and the Caribs. The Arawaks, who inhabited many of the larger Caribbean islands, practised a small-scale agriculture called *conuco*. They lived in horticultural villages and had developed an advanced social structure. The cultivation methods varied in different areas, but often a multitude of crops in different microenvironments were grown. These practices had been developed over time in imitation of natural cycles in the ecosystem. The production of food was manual and conducted in a way that protected the soil and hindered erosion. The result was a diversified, mosaic-like landscape. Besides being skilful agriculturists, the Arawaks made pottery, constructed canoes, wove cloths out of fibres and manufactured gold ornaments.[5] Carib culture was not unlike that of the Arawaks, but the Caribs were more dependent on gathering, hunting and fishing.[6] The indigenous people of the Caribbean were gradually marginalised and finally made extinct by the European invasion.

European men and women started migrating to the Caribbean in the late fifteenth century. In the early days they were mostly Spanish, but during the following century the Flemish, Dutch, French and English began to visit the area. They were often "Protestant pirates", so-called privateers and buccaneers, sometimes refugees from

[5] D. Watts, *The West Indies: Patterns of Development, Culture and Environmental Change since 1492*, Cambridge University Press, Cambridge 1987, p. 53.

[6] In the travel literature the Caribs are depicted as more warlike than the peaceloving Arawaks. Peter Hulme has challenged this frequently presented interpretation where the "good" Arawaks are contrasted with the "bad" Caribs (the word "cannibal" is thought to derive from the word Carib). See P. Hulme, *Colonial Encounters: Europe and the Native Caribbean 1492-1797*, Methuen, London and New York 1986, pp. 14 ff. Archaeological research will hopefully cast more light on the history of the indigenous people of the Caribbean. See J. Sued-Badillo, "Facing up to Caribbean History", in *Facing Each Other. Part II. The World's Perception of Europe and Europe's Perception of the World*, A. Pagden (ed.), Ashgate Variorum, Aldershot 2000, pp. 467-473.

religious wars, or runaway sailors, seeking their fortune. The first of the English and French settlers came to the Caribbean islands in the 1620s. Their survival depended upon their ability to adapt to the environment and grow enough food to sustain themselves. Gradually, more emigrants arrived, bringing with them plants and animals. In the early days, living conditions were modest and life was hard. The Dominican missionary Jean-Baptiste du Tertre, visiting the Antilles in the 1640s, remarks that the English were better provided for upon arrival than the French, who had to wait for their newly planted seeds to produce victuals. A French party arriving at Guadeloupe were particularly unlucky – two months after their arrival they found themselves in the woods, without manioc, sweet potato or peas to grow. They finally had to go to St. Christopher to get plants.[7] The English captain John Poyntz suggests that the first six months after arrival should be spent clearing land and putting provisions into the ground.[8] Francis Bacon has compared the "planting of countries" to the planting of woods – it is no good giving up too soon, as no profit could be expected for at least twenty years.[9] This may have been the case at the beginning of the colonising of the Caribbean islands, when cultivation of first tobacco, and then cotton, ginger and indigo provided the livelihood for the emigrants. However, those who went to the "sugar islands" to set up sugar plantations after the middle of the seventeenth century could hope to make a profit sooner.

Starting a plantation on the other side of the world was a challenging project. The first difficulty had to do with the fact that the colonised regions in the Caribbean were, in many cases, already inhabited. Conflicting views on landownership and agriculture held by the indigenous people on one hand and the colonisers on the other often led to misunderstandings. According to European standards, the

[7] J. B. du Tertre, *Histoire générale des isles des Christophe, de la Guadeloupe, de la Martinique, et autres dans l´Amérique,* 5 vols. (1667-71), vol. I, T. Iolly, Paris 1667, pp. 78-79.

[8] J. Poyntz, *The present prospect of the island of Tobago*, J. Attwood, London 1695, pp. 38-39.

[9] F. Bacon, *The Essays*, J.M. Dent & Co, London 1906 [1625], pp. 104-105.

indigenous peoples' agricultural methods were sometimes inefficient, albeit suited to the environment. This implied, from a European perspective, that they had more land than they needed. The Arawaks and Caribs, on the other hand, had difficulty understanding the European conception of land ownership.[10] French sources show that the Caribs were helpful and generous towards the newcomers in the beginning, but gradually became weary of their hunger for land.[11]

## The sugar cane

The colonies in the New World freed the Europeans from the restrictions of geography and climate that they had hitherto been subject to. Thanks to the tropical nature of the colonies it was possible to introduce new crops into the European markets. The most important of them was the sugar cane. The sugar cane (*Saccharum officinarum),* the wild form of which is thought to originate in Melanesia, is a perennial plant of 3-4 metres in height.[12] The most important part, economically, of the plant is the stalk, containing sucrose. It is customary to replant it every year by planting pieces of the stalk. If everything goes well the sugar cane can be harvested every nine months. The cultivation of sug-

[10] See U. Bitterli, *Cultures in Conflict*, Polity Press, Cambridge 1989, p. 31.

[11] See C. de Rochefort, *Histoire Naturelle et Morale des Isles Antilles de l'Amerique… Avec un Vocabulaire Caraïbe*, R. Leers, Rotterdam 1658, p. 266.

[12] Most authors agree that *Saccharum officinarum* originated in Melanesia. There are indications that *Saccharum officinarum* was domesticated from *Saccharum robustum* on New Guinea. From about 8000 B.C. the plant was then disseminated eastward via the Solomon Islands and the New Hebrides to New Caledonia, and about 2000 years later to Polynesia and Micronesia. Since 6000 B.C. the sugar cane spread westwards to the Philippine archipelago and via Indonesia and Malaya to China and India. During the Middle Ages *Saccharum officinarum* was disseminated westwards along three routes: to Hawaii with the Polynesian migrations about 500-1000; from Indonesia along the northern rim of the Indian Ocean via Southern Arabia to East Africa; and to Madagascar about 500 A.D. (and also to the interior of Eastern Africa in connection with the Bantu migrations). Finally, the plant spread in the Middle East about 500 A.D. and within the Mediterranean about 600-1400 A.D. See H. Blume, *Geography of the Sugar Cane*, Verlag Dr. Albert Bartens, Berlin 1985, p. 23.

ar cane is limited to hot and moist climates. The optimal temperature for cultivation is 25-33° Celsius, even though it can be considerably warmer without injuring the plant. If the temperature falls below 20°C however, the growth is delayed and at 15°C it stops entirely.

When the sugar cane reached the Caribbean in the last years of the fifteenth century – Columbus brought the sugar cane from Madeira to Hispaniola – the plant and humans already had a long common history. Sugar cane had been cultivated in plots for the production of sugar at least since the fifth century BC. Its cultivated variety is believed to originate on the Bengal coast of the Indian subcontinent, the area between the Ganges delta and Assam.[13] Since then, the sugar cane has slowly spread around the whole world. Although the sugar cane is an Asian plant, the "sugar plantation complex", to use Philip Curtin's term, is a European innovation.[14] During its journey around the globe, the sugar cane has changed the face of every landscape where it has been planted. Of the five plants which, according to Henry Hobhouse, transformed the world, the sugar cane has probably caused the most remarkable changes to the environment.[15]

The Caribbean "sugar revolution" started in the early 1640s on Barbados, an English colony since 1627.[16] Between 1645 and 1660, Barbados was transformed from a poor colony with few inhabitants, cultivating tobacco on a small scale, to a significant producer of sugar. Other islands followed in its wake, but Barbados was the first to experience the full impact of sugar production, due to its historical and geographical location. The necessary capital and en-

[13] G. Franke, *Nutzpflantzen der Tropen und Subtropen*, II, S. Hirzel Verlag, Leipzig 1967, p. 129.

[14] P. Curtin, *The Rise and Fall of the Plantation Complex: Essays in Atlantic History* Cambridge University Press, Cambridge 1990, pp. 4-8.

[15] Although the common cereals and the potato have caused even more profound changes in human history, the development in these cases has been slower. See H. Hobhouse, *Seeds of Change: Five Plants that Transformed Mankind*, Sidgwick, London 1986.

[16] Two persons claim to have brought the sugar cane from the Brazilian coast to Barbados, Peeter Brewer of North Holland in 1637 and Captain James Holdip in 1639. See D. Watts, "Origins of Barbadian Cane Hole Agriculture" in *The Journal of the Barbados Museum Historical Society*, 32, 1968, p. 151.

trepreneurs were already present here, and the island was relatively isolated, which made it fairly secure from possible Carib or Spanish attacks. The presence of Dutch merchant contacts in South America and Europe was also an important factor. In addition, the island was believed to be less affected by hurricanes than its neighbours. These favourable circumstances, together with the capability and persistence of the planters, and the very high sugar prices obtaining in the 1650s turned Barbados into a prosperous "sugar island".[17]

The first French colony in the Caribbean was St. Christopher (St. Kitts), where the French landed in 1624. The French had to share St. Kitts with the English, who had colonised parts of the island. Guadeloupe and Martinique became French colonies in 1635. Sugar cane agriculture on St. Christopher and Guadeloupe began in the 1640s. Saint Domingue, later to become the richest colony in the world, came into French possession in 1665, when a French governor took it over from the Spanish.

The annexation of Jamaica in 1656 greatly increased the English-controlled areas available for sugar cultivation.[18] Jamaica had the potential for producing more sugar than all of the other English islands put together. Its fertile soil yielded good harvests of sugar, cotton, maize, potato and yams. The Spanish had left hordes of wild hogs and horses and there was plenty of land and wood for everybody.[19] Nevertheless, sugar cultivation started slowly as the island was inhabited by English pirates causing unrest. Jamaica surpassed Barbados as the largest producer of sugar in the first decades of the 1700s. By then the French Saint Domingue had become one of the largest producers of sugar in the world.[20]

[17] Watts, *The West Indies* cit., p. 230.

[18] In fact, the first *ingenio de azúcar* (plantation), built by Spaniards with the help of Portuguese immigration from the Atlantic, appeared in Jamaica already in 1527. See C. Verlinden, "The Transfer of Colonial Techniques from the Mediterranean to the Atlantic", in *The European Opportunity*. *An Expanding World. The European Impact on World History 1450-1800,* vol. II, Ashgate Variorum, Aldershot 1995, p. 23.

[19] E. Hickeringill, *Jamaica Viewed*, R. Janeway, London 1661, pp. 13-14.

[20] R. Dunn, *Sugar and Slaves: The Rise of the Planter Class in the English West Indies 1624-1713*, Jonathan Cape, London 1973, p. 20.

The sugar production of the Caribbean displays a rising trend throughout the late seventeenth and eighteenth centuries.[21] At the same time, sugar consumption increased in Western Europe, almost doubling in England between 1663 and 1699.[22] As anthropologist Sidney Mintz has pointed out, sugar is addictive, a quality which has made it exceedingly popular all over the world.[23] The European expansion contributed to a permanent change in European food culture and consumption patterns as spices and sugar profoundly influenced eating habits, tastes and conservation methods. The new imports – chocolate, coffee and tea – all contain stimulants and taste bitter. None of them had been sweetened in their primary cultural setting, but in Europe they were combined with sugar.[24]

## The sugar plantation

The best source describing the early days of the Caribbean sugar boom is Richard Ligon's *A True and Exact History of the Caribby Islands*. According to his account, the sugar cane thrived on Barbados:

> I saw by the growth, as well as by what I had been told, that it was a strong and lusty plant, and so vigorous, as where it grew, to forbid all Weeds to grow very neer it; so thirstily it suck'd the earth for nourishment, to maintain its own health and gallantry.[25]

Much work was needed in order for the sugar cane to stay healthy. The production of sugar itself was even more demanding. When Ligon arrived at Barbados in 1647, sugar production had only just begun. According to him, the secrets of sugar making were not yet well

[21] For statistics, see Watts, *The West Indies* cit., pp. 285-288.

[22] C. Shammas, "Changes in English and Anglo-American Consumption from 1550 to 1800", in J. Brewer & R. Porter (eds), *Consumption and the World of* Goods, Routledge, London and New York 1994, pp. 181-182.

[23] S. Mintz, *Sweetness and Power: The Place of Sugar in Modern History*, Penguin Books, Harmondsworth 1985, p. 132.

[24] Ibid., pp. 108-109.

[25] R. Ligon, *The True and Exact History of the Island of Barbadoes*, Frank Cass, London 1998 [1657], p. 87.

understood and the quality of the sugar was poor.[26] The planters acquired their skills by trial and error and by learning from the example of Brazil, where sugar plantations had been established as early as the 16th century. Sometimes people came from Brazil to teach the planters, sometimes Barbadians went over to Pernambuco in Brazil to augment their knowledge of the art of making sugar. They returned with more plants and better knowledge, but still, Ligon notes, they did not know enough about planting, gathering and making sugar.[27] During Ligon's stay on the island (1647-1650) however, methods were modified and Barbados planters learned to make high-quality sugar.

After a few decades of sugar cane cultivation, planters had, thanks to good advice, trial, error, and experience, learned to optimise the sugar making process. All the various field operations and factory tasks needed to be integrated into a regular annual routine. The plantation was a world in itself, a production complex reminiscent of the *latifundia* of late antiquity. Dr. Trapham speaks of them resembling villages:

> The stranger is apt to ask what village it is (for every completed sugar-work is no less, the various and many buildings bespeaking as much at first sight) for besides the more large mansion house with its offices, the works, such as the well contrived Mill, the spacious boiling House, the large receptive curing Houses, still House, Commodious Stables for the grinding cattle, lodgings for the Over-Seer, and white servants, working Shops for the necessary smiths, others for the framing Carpenters, and Coopers: to all which when we add the streets of the Negroes Houses, no one will question to call such completed Sugar-Work a small Town or Village.[28]

Ligon, who witnessed the early days of the sugar boom in Barbados, describes a plantation belonging to a Colonel Modiford: "In this Plantation of 500 acres of land, there was imployed for sugar somewhat more than 200 acres; above 80 acres for pasture, 120 for

[26] Ibid., p. 85.

[27] Ibid., pp. 87-88.

[28] T. Trapham, *A Discourse of the State of Health in the Island of Jamaica*, R. Boulter, London 1679, p. 26.

wood, 30 for Tobacco, 5 for Ginger, as many for Cotton wool, and 70 acres for provisions; *viz.* Corn, Potatoes, Plantines, Cassavie, and Bonavist; some few acres of which for fruit; viz. Pines, Plantines, Milions, Bonanoes, Gnavers, Water Milions, Oranges, Limon Limes, *&c.* most of these only for the table".[29]

Ligon had a clear idea about the proper way to set up an "Ingenio" or "Sugar-work". He recommends that it should be built on the brow of a small hill. There should be a four and a half foot descent from the grinding place to the boiling house, a seven and a half foot descent from the boiling house to the fire room, and a little descent to the still house.[30]

The Dominican Jean-Babtiste Labat's model for running a successful plantation is even more detailed.[31] It must be assumed that Father Labat knew his subject, having managed a sugar plantation on Martinique for a few years on behalf of his order in the 1690s. The best site for a sugar plantation, according to Labat, was by a river or by the sea shore. This made the transportation of the final product easier. Between the shore and the first cultivated field, Labat advised, a 50 m strip of woodland and some open grassland should be left for shelter. Behind it, the plantation house was to be built, preferably on a small hill. A garden should surround the big house while storehouses and offices were to be built on the edges. A suitable place for the estate factory, according to Labat, was some distance behind these. One or two streets of slave accommodations were to be built downwind from the estate, with the animal pens nearby, so that the slaves could look after them. The proper size for the complex of buildings and gardens was ca. 300 square meters. Two major cane fields, one on either side of the estate, were to be cleared, each one measuring 300 m x 350 m. Behind these, further inland, there should be a larger field measuring 1000 m x 400 m. The first two fields should cover an area of 21 ha and

[29] Ligon, *The True and Exact History* cit., p. 22.

[30] Ibid., p. 87.

[31] J-P. Labat, *Nouveau voyage aux isles de l'Amerique*, vol. III, Hague 1722, pp. 450 ff. Labat discusses sugar and describes the various aspects of sugar making. See pp. 100-510.

the third 40 ha, which added up to 61 ha of sugar cane. This way the mill and the boiling house were optimally situated in relation to the cane fields. Each of the larger fields was to be divided into 100-square-meter plots with 6 m roadways in between.

The slaves' gardens were to be constructed behind the large cane field. This meant that they were rather far away and took up time from the already long working hours of slaves. If possible, some virgin forest should be left at the far end of the plantation to provide timber for future use. On the forest edge a cocoa walk might be planted, Labat suggests.[32] He does not give any directions concerning the cocoa walk, but the English publisher Richard Blome's account provides detailed instructions for setting up and managing a cocoa walk on Jamaica (500-600 acres of land, six slaves, four white servants and an overseer were necessary for the operation, the exact costs of which had been calculated by the former Governor).[33]

In Father Labat's experience, 120 slaves and 100 horned beasts were needed to operate the plantation. In addition, 12 horses were needed, as well as a small herd of sheep and goats. Some of the plantations in the area were larger than Labat's idealised version. According to John Ogilby, the Governor of St. Vincent kept 900 slaves and 100 Frenchmen to work on his three sugar mills, to till his ground, and for his household service.[34]

## Domestic animals from the Old World

European animals brought to the Americas played an important part in the transformation of the continent.[35] The Spanish had in-

[32] Lasserre has made a sketch based on Labat's instructions; see G. Lasserre, La Guadeloupe. *Étude Géographique,* Union française d'impression, Bordeaux 1961, cit. in Watts, *The West Indies* cit., p. 387.

[33] R. Blome, *A Description of the Island of Jamaica; with the Other Isles and Terrotories in America, to which the English are related, viz. Barbados, St. Christopher,* London 1672, pp. 7 ff.

[34] J. Ogilby, *America, being the latest and most accurate Description of the New World*, London 1671, p. 385; see also Labat, *Nouveau voyage* cit., II, pp. 448 ff.

[35] For animals in the colonisation of America, see E. Melville, *A Plague of*

troduced swine onto the islands to ensure provisions for their ships. The swine thrived in the Caribbean and reproduced rapidly. The early modern swine that were brought to the New World, as Alfred Crosby notes, were the "lean, fast, tusked boars and sows of medieval Europe. So much food was available to them in the Antilles that veritable swine explosions took place".[36] The cattle were equally successful, as Crosby observes: "The Spanish cattle took to the meadows and savannas of the Antilles like Adam and Eve returning to Eden".[37] Writers of that period comment on the abundance of cattle, horses and wild hogs on Jamaica and Saint Domingue.

For a sugar plantation to be successful, certain domestic animals were necessary. Among the animals represented on Richard Ligons's map of Barbados are horses, donkeys, cows, sheep, hogs and, somewhat surprisingly, two camels. In the surrounding sea swim two huge monstrous fish, almost the same size as the two ships on the map. Ligon begins his account of the animals of Barbados with the camel, the largest animal on the island. The camel, he explains, was a convenient beast of burden that could carry sugar to the landing stage and return with a load of wine, beer and vinegar. It secured a safer transport of fragile goods on the bad roads than horses and "negroes", Ligon states pragmatically. Unfortunately, camels failed to thrive on Barbados as people did not know how to feed them.[38] This shows that not all animals adapted to the new circumstances, while Ligon's observation concerning the slaves shows that these were considered to be little more than animals.

In Ligon's opinion donkeys, like camels, were superior to horses as draft animals. A hard-hoofed Azorean breed of donkey called the assinigoe was used. They managed well on the island's rough roads

*Sheep,* Cambridge University Press, New York 1994; V. DeJohn Anderson, *Creatures of Empire: How Domestic Animals Changed Early America*, Oxford University Press, New York 2004.

[36] A. Crosby, *Germs, Seeds, and Animals: Studies in Ecological History*, M.E. Sharpe, Armonk, New York 1994, pp. 53-54.

[37] *Ibid*.

[38] Ligon, *The True and Exact History* cit., pp. 58-59.

and could find their own routes in the woods. Ligon compares the donkeys to bees − the bee fetching home honey, the donkey sugar.[39] Apart from the donkey being more intelligent than the horse, it was easy, Ligon remarks, for two slaves to help it up in case it fell and he explains that it was actually common practice to employ two slaves as assistants to the driver, who normally was a Christian.[40]

Even though camels and donkeys might have been more practical for many tasks, horses were needed as draft animals and for riding. Horses could not be imported from England until 1648, when permission was granted after the Civil War. Transporting horses to the New World was far from easy – they refused to go on board ship so that a specially constructed device was necessary – and many died during the trip. They were often debilitated when they arrived and thus susceptible to disease. When the vessel Black Horse put into Bridgetown in January 1661 with 48 of the 52 horses loaded in Amsterdam, it could be considered a successful crossing. The horses were sold in two days at a great profit, according to Dr. Felix Spörri who participated on many sea voyages in his capacity as veterinary.[41]

Horses and oxen were used to turn the rollers of the sugar mill. This meant that the animals had to walk in a small circle, struggling to drive the heavy system of cogs, wheels and gears. This gruelling labour killed many animals. Whistler notes in 1654: "The mills they now use destroy so many horses that it begors [beggars] the planters".[42] In consequence, it was necessary to keep as large a number of mill animals as possible.

The colonists experimented with English sheep, but these did not adapt to the climate as well as pigs and cattle.[43] Long-haired West African sheep were brought from the Guinea coast in the 1640s, as

[39] Ibid., p. 89.

[40] Ibid., pp. 58-59.

[41] A. Gunkel, J. Handler, "A Swiss Medical Doctor's Description of Barbados in 1661: The Account of Felix Christian Spörri", in *The Journal of the Barbados Museum Historical Society*, 33, 1969, pp. 3-13.

[42] Cit. in Watts, *The West Indies* cit., p. 197.

[43] Ligon, *The True and Exact History* cit., p. 58.

well as goats from the Mediterranean. In addition there were dogs, cats, domestic rabbits, chicken, and rats.[44] The introduction of European animals in the Caribbean islands often caused changes in the ecological equilibrium. The newly introduced animals, cattle, close-cropping sheep and goats with their grazing and trampling habits, caused soil compaction and erosion.[45]

## Working to control nature

On the Caribbean sugar islands the sugar plantations were developed into an efficient production apparatus combining a South-East Asian crop, Middle Eastern and European agricultural techniques, the Caribbean soil and climate, and African labour. With the help of European capital and through resourceful and ruthless utilisation of these components, sugar production steadily increased in the area. A statement by a slave on Barbados, reputed to be often quoted also by the English, aptly describes this utilitarian mentality:

> The Devil was in the Englishman, that he makes everything work; he makes the Negro work, the Horse work, the Ass work, the Wood work, the Water work and the Winde work.[46]

It is not difficult to perceive the slave as a part of a process where the whole of nature was put to work for the planter, so as to provide the European market with the end product – sugar. The white man made use of all the links below him in the Great Chain of Being: the slave, the horse and donkey; the wood, the water and the wind. All the elements of nature were harnessed in the service of the planters and the capital investors so that they could make as much money as possible. For the other "cogs in the machinery", to use a mechanistic image, "the work goes on, from Monday morning at one o'clock, till Saturday

[44] Watts, *The West Indies* cit., p. 164.

[45] Crosby, *Germs, Seeds, and Animals* cit., pp. 54-56; Grove, *Green Imperialism* cit., pp. 63-64.

[46] Anonymous, *Great Newes from the Barbadoes*, London 1676, p. 6.

night, (at which time the fire in the Furnaces are put out) all houres of the day and night, with fresh supplies of Men, Horses, and Cattle".[47]

Taking control over nature was not always easy. Initially, the difficulties encountered by the planters had to do with a lack of knowledge about how the tropical nature of the Caribbean functioned. These problems were not necessarily "environmental" in the modern sense of the word, although they were clearly connected to the relationship between human beings and nature. They came about partly because cultivation or production techniques were not fully developed, but sometimes also because the forces of nature simply were so much more powerful than men and women. When a hurricane (from the Arawak word *hurikane*) strikes down on a plantation, there is little that can be done except wait for it to pass and then assess the damage. Drought, or excessive rainfall and tropical cyclones, were more or less frequently occurring meteorological hazards. The greatest natural disaster to hit the area during the 17th century was the earthquake of Port Royal. The capital city of Jamaica, Port Royal was hit by a devastating earthquake and tsunami in 1692. The city was destroyed as two thirds of it to sank into the Caribbean Sea. The earthquake and tsunami killed between 1000 and 3000 people, over half the city's population. Attempts to rebuild the city were hampered first by a fire in 1704 and several hurricanes in the first half of the eighteenth century.

In addition, planters encountered biological problems such as diseases and pests. Consequently, even if the sugar production process was carefully planned and tailored to run at a maximum level of efficiency, things often went wrong.

On the whole, sugar cultivation was considered to be a risky business. In 1690 Dalby Thomas described the setbacks and difficulties a planter could expect to meet before the canes had ripened sufficiently to be cut and pressed. To begin with, he warns that the growing canes might easily be eaten or damaged by ants and other noxious insects. If weeding was neglected and weeds and climbers

[47] Ligon, *The True and Exact History* cit., p. 91.

were allowed to grow, they tended to pull the canes to the ground, a problem Richard Ligon has given some attention to.[48] Too little or too much rain at the wrong time meant failing harvests. If the rains came too late however, which according to Thomas was often the case, the whole year's work could go to waste.[49]

Even if the planter managed to avoid these mishaps, Thomas points out that there was always the risk posed by the hurricanes that every three or four years shook the islands like a "fit of agues". According to Alison J. Reading and Rory P.D. Walsh, tropical cyclone activity across the Lesser Antilles was minimal in the period 1650-1764 and followed a broadly similar pattern across Hispaniola and Puerto Rico.[50] There are, however, several reports of hurricanes from this period and earlier. As early as in 1624 the first tobacco harvest on St. Kitts had been destroyed by a hurricane and many sugar crops met the same fate.[51] In the case of a hurricane, not only the harvest but also the mills and other buildings were likely to be damaged. In Jamaica in 1690, a hurricane destroyed planter Helyar's plantain walk and the earthquake of 1692 further increased the damage by shaking down many of the plantation buildings.[52]

Another alarming possibility was fire − either caused by an accident, or set by desperate escaped slaves who wanted revenge. Once the fire was set it devoured the fields in a matter of minutes and there was nothing to be done about it. Even if everything had gone

[48] Watts, "Origins of Barbadian Cane-hole Agriculture" cit., p. 147.

[49] D. Thomas, *An Historical Account of the Rise and Growth of the West-India Colonies. And the Great Advantages they are to England in respect to Trade*, London 1690, pp. 20 ff.

[50] See A. J. Reading, R. P. D. Walsh, "Tropical Cyclone Activity within the Caribbean Basin since 1500", in *Environment and Development in the Caribbean. Geographical Perspectives*, D. Barker and D.F.M. McGregor (eds), The University of the West Indies Press, Barbados, Jamaica, Trinidad and Tobago 1995, pp. 131-132.

[51] J. Smith, *The true travels, adventures and observations of Captain John Smith, In Europe, Asia, Africa, and America, from Anno Domini 1593 to 1629,* [Facsimile], Da Capo, New York 1968, [1630], p. 51.

[52] R. Dunn, *Sugar and Slaves: The Rise of the Planter Class in the English West Indies 1624-1713*, Jonathan Cape, London 1973, p. 220.

well and the cane stood ripe and ready to be cut, a hard rain could still ruin the enterprise by causing the harvest to rot. Dalby Thomas paints a gloomy picture of the scene:

> The Slaves and servants all stand idle looking upon their Masters decaying Fortune, and at last are only Employ'd in clearing the Ground again from that useless Rubbish in which all that years hope is perished.[53]

Planter Christopher Jeaffreson's situation was even more unfortunate after his plantation had been ravaged by a hurricane. "It left me not a house or Sugar-worke standing on my plantation. It broke and twisted my sugar-canes, roed up my cassava, and washed the graine and newplanted puttatoes", the planter complains.[54]

Natural disasters did not merely cause distress to individuals: they affected entire islands. Father du Tertre describes a famine at Guadeloupe caused by a hurricane that ravaged the island, tearing up all planted victuals from the ground. The inhabitants of Guadeloupe could not have survived without help from neighbouring Martinique, which was spared, enjoying a pleasant calm while other islands were left desolate.[55] From the earliest days of colonisation, there had been periods of famine. In the first stages of colonising an island, famine was usually caused by lack of provisions and knowledge of how to make use of local natural resources. Later on, war, natural hazards and epidemics were the main causes.

The power of nature was nowhere more apparent than in the effects of pests, diseases and natural disasters like hurricanes and earthquakes. Controlling nature must have seemed a distant dream to the planters who struggled with the "forces of the elements". They learned to manage as best they could under the circumstances and accept that some things had to be considered "occupational hazards" in the business of sugar production.

[53] Thomas, *An Historical Account* cit., pp. 20 ff.

[54] J.C. Jeaffreson (ed.), *A Young Squire of the seventeenth century from the papers (a.d. 1676-1686) of Christopher Jeaffreson*, Hurst and Blacket, London 1878, p. 280.

[55] du Tertre, *Histoire générale* cit., p. 30.

## Vanishing woods

Misuse of natural resources through deforestation and overexploitation altered natural landscapes in the Caribbean. As geographers Barker and McGregor have noted, small-scale island ecosystems can sometimes be irreversibly altered by insensitive resource mismanagement.[56] The environmental problems directly caused by human action were not as dramatic as the effects of fires and hurricanes experienced by the early sugar planters. They became visible only gradually but in some cases eventually led to serious problems.

The effects on the environment were becoming obvious in the latter half of the seventeenth century, first on Barbados and later on other islands. The tropical rainforest was cut down almost completely so that by around 1665 only small areas of forest were left in marginal areas. During the early years of colonisation the pioneers had to work extremely hard to clear land in the dense jungle vegetation. According to Richard Ligon, who came to Barbados in 1647, older inhabitants still remembered how impenetrable the rain forest had been: "so overgrown with wood, as there could found no Champions, or Savannas for men to dwell in". By the time of Ligon's arrival, the establishing of sugar cane agriculture was well under way. Still, some forest remained, for Ligon describes the view from his ship: "then we saw the high, large and lofty trees, with their spreading branches, and flourishing tops".[57]

Although Barbados must be regarded as an extreme case, landscapes were radically transformed on other islands as well. Father du Tetre compares the Guadeloupe of the time he first came to the island in the 1640s to that of the year 1656, when on passing the island he noticed that much larger parts of it now were opened up and cultivated.[58] He observes the same development on Martinique, where it was now easy to ride everywhere on horseback, something which previously would have been unthinkable.[59] The latter part of

[56] Barker, McGregor, *Environment and Development* cit., p. 8.
[57] Ligon, *The True and Exact History* cit., p. 20.
[58] du Tertre, *Histoire générale* cit., p. 13.
[59] Ibid., p. 28.

the seventeenth century was a time of intense land clearing on Martinique. Slash and burn techniques were used mainly on dry woodland and seasonal forests along the coast and on lower hills.[60]

In most tropical environments, the main store of nutrients is to be found in the vegetation rather than the soil. Therefore the cutting down of forests will gradually lead to a decrease in the nutrient store of the system.[61] On the sugar islands this was not obvious during the initial stages of sugar cultivation, as the nutritious ashes from the burnt wood were added to the surface layer. After this however, the structure and texture of the soils changed as a result of the loss of its protective forest cover. Nutrients were lost and washed down the slopes during the rainy season. Another problem arose as a result of monoculture: growing one single crop year after year made the loss of nutrients even more rapid.

The first sugar islands, particularly Barbados, were so intensely exploited that the forests disappeared in just a few decades. As early a visitor as Ligon, (in the 1640s) recommends that ships bound for Barbados take "Sea-coals" as ballast "for it is a commodity was much wanting when I was there, and will be every day more and more, as the Wood decayes".[62] In the 1650s, when Barbados was already more densely inhabited than any agricultural area in Europe, sugar planters expressed their concern. Colonel Modiford was one of them: "This island of Barbados cannot last in an height of trade three years longer especially for sugar, the wood being almost already spent".[63] The Colonel proved to be wrong however and the sugar trade continued on the island with the help of timber importation from other islands.

Another visitor to comment upon the lack of forests on Barbados is Dr Hans Sloane: "They at Barbados want Wood very much, both for all manners of uses in Building, and for Fewel. For Building the Inhabitants go to Santa Lucia, and an island within sight of this, to

[60] Kimber, *Martinique Revisited* cit., p. 120.

[61] Watts, *The West Indies* cit., p. 221.

[62] Ligon, *The True and Exact History* cit., p. 110.

[63] CPS Col. AWI, 1574-1660, I, p. 374, cited in Robert Carlyle Batie, "Why Sugar? Economic Cycles and the Changing of Staples on the English and French Antilles, 1624-54", in Journal of Caribbean History, 8, 1976.

Tobago, where it is plenty, and the other neighbouring islands".[64] A vicar writing in the middle of the eighteenth century, Griffith Hughes, makes the same observation: more robust timber for construction purposes had to be brought to Barbados from Santa Lucia and Tobago at a high cost.[65] As a compensation of sorts, Barbados could benefit from its position on the windward side and use windmills instead of horses or oxen.

The situation was better on larger islands. Richard Blome remarks that the larger Jamaica had the capacity to receive colonists from "used up" islands: "This island being so large and fertile, it is capable of receiving those great numbers of people that are forced to desert the Caribbee isles: Their plantations being worn out, and their woods wasted".[66] Settlers from Barbados were in fact often welcomed to other islands because of their experience and know-how concerning the running of sugar plantations. While in the sixteenth century early experts of sugar cane agriculture in the New World were recruited from the Mediterranean islands or the Canary islands, and during the first half of the seventeenth century from Brazil, Barbados had during the latter half of the seventeenth century become the place where knowledge about planting sugar was being developed.

Although there was a growing concern for the forests, their removal was often done in a crude way. As clearing the forest was such hard work, even good timber was not always preserved, but burned with the rest. Jean-Baptiste Labat complains that most people cut the trees down and set fire to them, without bothering to check if the time was right and whether there were trees that should be saved for other purposes. In Labat's opinion it would have been wise to take the time to examine which trees would be suitable for carpentry and other useful things, as wood for building was both scarce and expensive.[67]

[64] CPS Col. AWI, 1574-1660, I, p. 374, cited in Robert Carlyle Batie, "Why Sugar? Economic Cycles and the Changing of Staples on the English and French Antilles, 1624-54", in *Journal of Caribbean History*, 8, 1976.

[65] G. Hughes, *The natural history of Barbados*, London 1750, pp. 29-32.

[66] Blome, *A Description of the Island of Jamaica* cit., p. 5.

[67] Labat, *Nouveau voyage* cit., III, pp.14, 46-47.

## Impoverished soils

The cultivation of sugar cane, particularly in a monoculture, requires much fertilisation, as the soil quickly loses its nourishment. As early as the 1640s, Ligon observed of the sugar cane that "so thirstily it suck'd the earth for nourishment, to maintain its own health and gallantry".[68]

At the beginning it seemed as if the soil in the West Indies would be infinitely fertile. Henry Whistler, for example, observed in 1654 that the earth on Barbados was very rich and always green. Hans Sloane even found the earth on Jamaica too rich. In connection with a visit to Barbados however, he remarks that the soil had lost its fertility.[69] An early indication of a decrease in soil fertility is found in a letter from Thomas Modiford to John Bradshaw (1652), almost immediately following the introduction of trench planting, where sugar cane cuttings were placed in trenches.[70] Soil loss became a serious problem in the succeeding decade. The demand for natural fertiliser increased, and in 1665 it became more profitable on some estates to sell dung than to raise a commercial crop.

By the end of the century the inhabitants of Barbados were complaining that their land had become poorer. By 1685, yields on several Barbados estates had been reduced by half. Many moved to Jamaica where there was still plenty of virgin soil. Through continuous fertilising, many planters nonetheless managed to keep their soils productive. Edward Littleton writes in 1689 that the sugar fields in Barbados needed thirty loads of dung per acre for which reason the planters had to keep a great number of cattle and sheep. Terraces were built to keep the soil from being washed away.[71] For as long as

[68] Ligon, *The True and Exact History* cit., p. 87.

[69] Sloane, *A Voyage* cit., p. xv.

[70] Letter from Thomas Modyford to John Bradshaw, *Calendar of State Papers, Colonial Series, America & the West Indies* (1574 to 1660), p. 374. Trench planting, where twin cuttings of sugar cane were placed in trenches, replaced an earlier method were cane cuttings were put in small holes. See Watts, "Origins of Barbadian Cane-hole Agriculture" cit., pp. 147-148.

[71] E. Littleton, *The groans of the Plantations; or a true account of their grievous*

trench planting remained common however, the application of dung did little to prevent the proliferation of areas affected by erosion.

French sugar production lagged behind, although land was cleared for sugar cane in Martinique and Guadeloupe from the mid-seventeenth century onwards. Contrary to Barbados, the French islands had large Carib populations. It has been estimated that more than two thirds of the land area of Martinique was affected by Carib activities of burning and shifting agriculture.[72] Thanks to the larger size of Martinique, its sugar planters could allow fields to lie fallow for extended periods, instead of fertilizing them. This alternation of intensive cultivation and long fallow periods eventually led to soil erosion and exhaustion in the eighteenth century.[73]

Jamaica, Martinique and, above all, French St. Domingue became important producers of sugar in the eighteenth century. The deteriorating quality of the soils of Barbados and Jamaica was one of the reasons St. Domingue surpassed them as the largest sugar producer in the area by the mid eighteenth century. A comparison between the English and French islands made by the government's agents in Barbados indicates that on the French islands thirty to forty slaves and a few horses and cows were sufficient to cultivate the same area that on Barbados required a hundred slaves, fifty or sixty cattle, and twelve horses.[74]

## Changing ecosystems

The vegetation of the Caribbean islands changed radically. The rainforest, seasonal forest, and coastal shrub were totally destroyed. At the same time, new species were introduced, including many heliophytic herbaceous and shrub weeds.[75] According to David Watts,

*and extreme sufferings by the heavy impositions upon sugar and other hardships relating more particularly to the island of Barbados*, M. Clark, London 1689, p. 16.

[72] See J.F. Richards, *The Unending Frontier: An Environmental History of the Early Modern World,* University of California Press, Berkeley, Los Angeles and London 2003, pp. 429-430; Kimber, *Martinique Revisited* cit., p. 109.

[73] Kimber, *Martinique Revisited* cit., pp. 199-200.

[74] Watts, *The West Indies* cit., p. 397.

[75] Ibid., p. 223.

at least two of the taller tree species became extinct: a palmito palm and the mastick, a valuable timber tree. Several smaller shrubs and ground plants disappeared, together with some species of fungi that played an important role in the food chain.[76] The eliminated species were replaced with imported ones, including many weeds. Guava and coconut spread rapidly.[77] Many animals lost their natural environment and became extinct. The monkey population was decimated. Several newly imported plants adapted well. Ligon reports that herbs and plants brought from England, such as rosemary, thyme, marjoram, parsley, camomile, sage, lavender, garlic, onion, cabbage, radish, and salad, thrived on Barbados. The leek and the rose bush were less successful.[78]

Many bird populations of the forest canopies lost their natural habitat when the higher trees disappeared.[79] Ligon mentions only a few birds − mainly sea birds.[80] The French priest Antoine Biet observed that a wood pigeon previously seen on the island had become extinct by 1654.[81] The German servant Heinrich von Uchteritz remarks on the absence of birdsong in 1652.[82] The reports show that Barbados in this respect differed from many other islands which still had large bird populations. Later, several species of macaws (*Ara*) disappeared on other Caribbean islands.

As forests were cleared, both microscopic organisms and large and small land animals were decimated. The largest of these were possibly the monkeys. These were also hunted – Father Labat, for instance, mentions that he had the opportunity to shoot monkeys on St. Christophe. On the same occasion another clergyman, Father

[76] Ibid., p. 219.
[77] Ibid., p. 221.
[78] Ligon, *The True and Exact History* cit., p. 99.
[79] Watts, *The West Indies* cit., p. 219.
[80] Ligon, *The True and Exact History* cit., p. 60.
[81] J. Handler, "Father Antoine Biet's visit to Barbados in 1654", in *The Journal of the Barbados Museum Historical Society*, 32, 1967, p. 65.
[82] A. Gunkel, J. Handler, "A German Indentured Servant in Barbados in 1652: The Account of Heinrich von Uchteritz", in *The Journal of the Barbados Museum Historical Society*, 33, 1970, pp. 91-99.

Cabasson, took a baby monkey who had lost its mother to hunters as a pet.[83]

The changes in the environment caused by sugar cultivation and production had other consequences as well. As John McNeill has noted, the sugar plantation was the perfect breeding ground for *A. aegypti*, a mosquito that lives in close proximity to humans and breeds in water containers, preferably clay-bottomed ones.[84] *A. aegypti* requires very specific conditions. This originally African insect needs a temperature above 10 ºC to survive, above 17 ºC to feed, and above 24 ºC to prosper. Moreover, it needs water. The humid tropics are ideal for it, as long as it can find human blood (it can live on sucrose, but needs blood in order to procreate). What makes *A. aegypti* interesting for a historian is that it spreads the yellow fever virus. Occurrence of an epidemic of yellow fever, however, requires a sufficient number of people who are not immune to the virus.[85]

It is not known when *A. aegypti* crossed the Atlantic and established itself in the Caribbean, but the first yellow fever epidemic occurred in 1647. Interestingly, it hit Barbados, which at the time was the only island that had begun sugar cane cultivation on plantations. Plantations provided a good breeding ground for *A. aegypti*, because deforestation meant fewer birds, and hence fewer predators for mosquitoes. Moreover, in the 1640s Barbados attracted an increasing population of non-immune young men (the group most vulnerable to the virus), while ships from Africa brought in more mosquitoes. In addition, the sugar production process involved a large number of clay pots which would stand empty for part of the year, collecting water where specimens of the *A. aegypti* species could breed.[86]

After Barbados, the yellow fever epidemic traveled on to Guadeloupe, St. Kitts, Hispaniola, the Yucatan, and the east coasts of

[83] Labat, *Nouveau voyage* cit., V, pp. 183-184.

[84] J. R. McNeill, "Ecology, Epidemics and Empires: Environmental Change and the Geopolitics of Tropical America, (1600-1825)", in *Environment and History*, 5, 1999, p. 178.

[85] Ibid., pp. 176-179.

[86] *Ibid*.

Central America, killing 20-30 % of the local population. After this, epidemics of yellow fever did not occur in the area for some 40 years, except for an epidemic among English troops on Jamaica in 1655, who, as newcomers, lacked immunity.[87] The French Antilles lost a third of their population to a viral epidemic, which is likely to have been yellow fever, in 1647-8.[88] After this, work force was scarce, which might be one of the reasons for the slower start of the laborious business of sugar production in this area.

If the newly arrived whites suffered most from yellow fever, Africans died of a variety of causes, ranging from cholera to nutritional ailments and chronic illnesses brought over from Africa. Although mortality among slaves was high, the demographic performance of whites was even worse. As Kenneth Kiple has pointed out, this had to do with their vulnerability to two diseases of African origin: yellow fever and malaria.[89] It was generally believed that Barbados was free from malaria, due to the clearing of the forest. However, the real cause, according to Richard Sheridan, may in fact have been a fish species that fed on mosquito larvae.[90] At any rate, especially in the beginning of colonization, the clearing of forests was considered beneficial for economical, cultural and health reasons.

[87] Yellow fever hit the English troops conquering Jamaica in 1655 hard, killing 47 % of the troops in some six months. On the whole, yellow fever played a significant role in Caribbean early modern warfare. See McNeill, "Ecology, Epidemics and Empires" cit., pp. 175-184. In the same year, French forces out to occupy St. Lucia suffered badly from yellow fever. Of 1500 men only 89 were alive a few months later. K. Kiple, *The Caribbean Slave: A Biological History*, Cambridge University Press, Cambridge 1984, p. 166.

[88] R. Schomburgk, *The History of Barbados*, Longman, Brown, Green and Longmans, London 1848, p. 215.

[89] Kiple, *The Caribbean Slave* cit., pp. 161-162.

[90] R.B. Sheridan, *Sugar and Slavery: An Economic History of the British West Indies*, Caribbean Universities Press, Barbados 1974, p. 154. According to Kiple, malaria plagued Cuba, Jamaica, Santo Domingo, Guadeloupe, Dominica, Martinique, St. Lucia, Grenada, Trinidad, and Tobago while it was rare in the Bahamas, Antigua, and St. Vincent. On Barbados it may have been rare or nonexistent, as it probably was on St. Kitts and Anguilla. See Kiple, *The Caribbean Slave* cit., pp. 164-165.

## Problems and solutions

An awareness of these environmental problems gradually emerged and efforts were made to solve them. Important innovations during the period 1665-1720 included first of all manuring, known all over the world and used in the West Indies since around 1670.[91] Another innovation brought over from Europe was the windmill, in use from around 1665. Many of the innovations however were local, developed on the plantations in response to the needs there. Some of the earliest of these included the establishment of dung farms; the use of *bagasse* (the fibrous by-product left over after the canes had been pressed) as fuel; the so-called Jamaica train; and a method of planting called "cane holing".

The dung farm was an innovation which, according to Watts, was restricted to Barbados.[92] Many ginger planters abandoned this crop as the price went down, and turned to dung farming instead. The product consisted of the excreta of cattle, pigs and horses mixed with maize, grasses, cane trash, and other vegetable materials. The dung farms were usually small family farms who sold their product in situ. Labat mentions the custom of selling dung on Barbados in the 1690s, remarking that the mixture of dung and vegetable matter was sold for a good price.[93] As Watts has concluded, the dung farms declined after 1710. One reason for this was a cattle disease that killed a great number of animals during the second decade of the eighteenth century. In addition, prices for Barbadian sugar were very high between 1713 and 1718, so that many small farmers, and notably dung farmers, turned to sugar production.[94]

The practice of using *bagasse* for fuel instead of wood began in the 1680s. Although an English merchant visiting Barbados, Thomas Tryon, thought the use of *bagasse* produced lower quality sugar, it was in fact a form of what we might call "environmentally friendly

[91] Watts, *The West Indies* cit., pp. 444 ff.

[92] Ibid., p. 400.

[93] Labat, *Nouveau voyage* cit., IV, p. 406.

[94] Watts, *The West Indies* cit., p. 401. The prices soon went down again in 1719 as French sugar production increased.

recycling".[95] The practice soon spread to other areas in the eastern Caribbean, and the sight of *bagasse* drying by the sugar mill became common. The French islands still had forest to burn in the late seventeenth century, but by 1720 they too had resorted to using *bagasse*. The exception among the English islands was Jamaica, where scarceness of wood would not become a problem until much later.[96]

Another innovation, the "Jamaica train", was a fuel-economy measure. It involved heating the dishes used in the process of crystallising the sugar extract. Sugar masters had previously, according to Richard Ligon, heated up each dish separately as it stood in a row, so that the last one received the most heat.[97] As Watts has observed, this system was modified in the 1680s and 1690s. Instead of separate fires, there was now a single fire from which the heat was conveyed to the other vessels by means of a long flue.[98]

Thomas Tryon suggests that only half of the cultivable area should be used for growing sugar, while other useful crops, such as wheat, rice or corn, should be grown on the rest of the fields. This way food could be produced locally instead of importing it. Moreover, growing sugar cane year after year had impoverished the soil, and leaving fields fallow, or rotating crops would help correct the situation.[99]

A better understanding of the nature of the tropics, together with practical knowledge developed during the process of cultivating sugar cane and making sugar, led to innovations which in some cases, as with burning *bagasse*, were more "eco-effective" than previous practices. The solutions to these "environmental problems" were, however, part of a drive to make sugar production as efficient as possible. The corrective measures were not implemented to conserve nature for the sake of conservation, but so as to use the limited resources more efficiently.

[95] T. Tryon, "Letter to a gentleman", in *Tryon's Letters, Domestick and Foreign, To several Persons of Quality: Occasionally distributed in Subjects Philosophical, Theological, and Moral*, Geo.Conyers and Eliz. Harris, London 1700, pp. 200 ff.

[96] J.H. Galloway, *The Sugar Cane Industry: An Historical Geography from its Origins to 1914*, Cambridge University Press, Cambridge 1989, pp. 93 ff.

[97] Ligon, *The True and Exact History* cit., p. 84.

[98] Watts, *The West Indies* cit., p. 399.

[99] Tryon, *Tryons Letters* cit., p. 187.

The plantations, the problems, the solutions and the acquired forms of knowledge travelled from island to island. It may be noted however, that each island was different in character, and they were not all as intensively exploited. Areas of sugar cultivation were limited by topography. Smaller islands characterised by lowland features, such as Barbados, Antigua and St. Croix, were rapidly cleared, while planters on the more mountainous islands, such as most of the smaller Antilles, St. Domingue and Jamaica had to restrict their sugar cultivation to the coastal areas and the valleys. Planters preferred to set up plantations on the coast for reasons of ease of transport; moreover, plantations were first built on the sheltered leeward side, so that the inland areas of the larger islands were left in peace.

## Transformed landscapes

Colonisation transformed the landscape of the sugar islands. The interaction of island environments and human activities created typically Caribbean rural landscapes, particularly on the mountainous Greater Antilles and the Windward Islands.[100] The resulting agricultural dualism was a result of geography and political economy. Larger farms and plantations tended to be situated on the fertile coastal plains, while small-scale farming was consigned to marginal areas.[101]

The forest was not cut only to clear the ground for sugar cane. Richard Grove has observed that clearing of land in Britain had been associated with social and cultural improvements. By the mid-seventeenth century, clearing and tilling the land was regarded as desirable for both economic and aesthetic reasons.[102] John Poyntz recommends that the newcomer immediately upon arrival starts considering "the Improvement of the said Land", beginning with the clearing of it.[103] Father Labat thought St. Vincent looked wild, disagreeable and covered with forest. Santa Lucia looked so wild and

[100] Barker and McGregor, *Environment and Development* cit., p. 8
[101] *Ibid*.
[102] Grove, *Green Imperialism* cit., pp. 65-67.
[103] Poyntz, *The Present Prospect* cit., pp. 38-39.

desolate to him that he did not even want to go ashore while lumber was loaded onto his ship. In contrast, he speaks favourably of Hispaniola, admiring the abundance of its nature. Hispaniola, colonised, inhabited and cultivated for nearly two hundred years, must have appeared much safer to the clergyman.

The word "garden" is used in travel accounts to describe positive developments on the islands. Richard Blome calls Barbados "a Spatious and Profitable Garden" in 1672 as well as "exceedingly fertile".[104] The author of *Great Newes from the Barbadoes* (1676) compares the situation to Ligon's days in the 1640s and declares that the island had changed for the better: "My own experience of Barbados, in a time when it had Received the most Improvement it was capable of".[105] The improvement theme recurs in seventeenth and eighteenth-century travel accounts, just as it is found in studies of history, agriculture and science from the same period.[106]

A "useful" drained agricultural landscape was regarded as safer and healthier than marshy grounds and wetlands. The wetter the land, the more it produced illness provoking vapours, the argument went.[107] In the opinion of the "American Physitian", William Hughes, Jamaica should follow the example of Barbados and do away with the forests as a health promoting measure.[108] It was commonly understood that nature needed input from men and women to appear at its best. The cultivated landscape was thus considered to be more beautiful and healthy. Not only was a cleared landscape more productive, but it was also easier to defend against incursions from hostile indigenous people, rivalling nations and escapee slaves. Shaping the landscape can also be a way of forming identities and creating

[104] Blome, *A Description of the Island of Jamaica* cit., p. 67.

[105] Anonymous, *Great Newes from the Barbadoes* cit., pp. 3-4.

[106] For the theme of improvement, see R. Drayton, *Nature's Government: Science, Imperial Britain, and the "Improvement" of the World*, Yale University Press, New Haven and London 2000.

[107] An interesting discussion on the European culture's relationship to wetlands is found in R. Giblett, *Postmodern Wetlands. Culture, History, Ecology*, Edinburgh University Press, Edinburgh 1996.

[108] W. Hughes, *The American Physitian*, London 1672.

national symbols.[109] Moreover, a productive farm landscape meant material security. Clearing large areas made it possible to inhabit them, and it was easier to claim ownership of cleared land.

The sugar plantation was the most industrialised, efficient system of agriculture yet developed. The difference between the agricultural methods of the indigenous people and the Europeans was striking. As the Europeans conquered areas on other continents they often inherited traditional, well-adapted cultivation systems, such as the Arawak *conuco* agriculture. The difference between indigenous and European agricultural methods is commented upon by a correspondent from St. Kitts in 1625. He notes that the Caribs wisely left shady groves in the fields, while the French cut and slashed all over, as fast as they could, without leaving behind any protection from the sun. The same commentator is concerned about the French way of tearing up the virgin earth and inhaling unhealthy vapours secreted thereby, which could be fatally dangerous to the exhausted workers.[110] His main concern is with the well-being of his compatriots – that they may be sheltered from the sun and avoid unhealthy miasma – rather than aesthetic aspects or "environmental" protection.

The contrast between Arawak garden agriculture and Labat's model plantation is striking. Even though the real plantations were not as regularly laid out as their idealized model, the rectangular layout represents a radically different use of nature than the native *conuco* agriculture. With European settlers and European culture the indigenous, mimetic consciousness was replaced by an analytical, visual consciousness.[111] Indigenous people tend to experience their environment through all of the senses, while the Europeans trust vision more than the others. This is shown by Richard Ligon's detailed geometrical drawings of the sugar production technology

[109] J.P. Greene, "Changing Identity in the British Caribbean: Barbados as a Case Study", in *Colonial Identity in the Atlantic World*, N. Canny, A. Padgen (eds), Princeton University Press, Princeton 1987, p. 213.

[110] Watts, *The West Indies* cit., p. 167.

[111] See C. Merchant, *Ecological Revolutions: Nature, Gender, and Science in New England*, University of North Carolina Press, Chapel Hill and London 1989, p. 108.

and Labat's sketch of the ideal plantation. Where the Arawaks and Caribs imitated the processes of nature changing the landscape only slightly, the Europeans forced their "efficient" agricultural model upon the landscape, thereby radically changing it. This often meant that forests were cut down and replaced with rectangular fields.

## Nature conservation

Certain measures undertaken in order to rationalise the cane cultivation and sugar production might, from a modern perspective, be called "eco-effective", and be perceived as conservationist. If nature conservation is about careful use of existing resources with a long-term perspective, such measures can be characterised as conservationist. According to a widely accepted definition, nature conservation is the management of human use of the biosphere so that it may yield the greatest sustainable benefit while maintaining its potential to meet the needs and aspirations of future generations. This definition would hardly apply to the motives and strategies of the sugar planters, even if we were to substitute "biosphere" with "a particular ecosystem". Although they certainly must have been interested in managing their plantations in a way that would ensure resource availability in the immediate future, it is unlikely that they thought about future generations. At least those among the planters who embraced the common seventeenth century view of a deteriorating earth may have thought that decreasing yields were the irreversible result of agriculture. They had left their countries to seek new opportunities and new virgin land, and may well have thought that future generations should do the same thing. In the early days of colonisation this was a rational way of reasoning, as there was not only new land in the colonies, but also the possibility of colonising new "undiscovered" areas.

Richard Grove has shown that the earliest cases of "environmental legislation" are to be found on tropical islands such as Mauritius and some of the Caribbean islands – limited land areas which had been intensively used. Some educated observers criticised the devastation of "paradise islands", and notably deforestation, which was thought to cause climatic changes. Physicians and colonial servants watched

with concern as one species after another became extinct while tropical islands were transformed into sugar fields. Grove's thesis, based on administrative material, is that these salutary warnings and the accompanying critical observations were important factors in the development of conservationist attitudes.[112] This concern, however, is less visible in seventeenth-century travel literature about the Caribbean. The idea of protecting nature for it own sake is rarely articulated by European visitors to the area. There are hardly any references to extinct or endangered species and no mention of protecting plant or animal species. This is not surprising, considering that there was no such conception as the extinction of species in the seventeenth century. The idea that any of God's creations could disappear from the face of earth was unthinkable to natural historians at the time.[113]

There must, however, have been an awareness, based on observation, of species becoming extinct in limited areas, such as certain species of birds on some of the Caribbean islands. In addition, new sensibilities about animal suffering began to develop in seventeenth century Europe.[114] Still, protection of certain animal species and concern for animal welfare did not feature in the mind-set of sugar planters, or were much in evidence in seventeenth-century Caribbean travel accounts. Apart from a few rare expressions of sympathy towards animals, they were looked upon as resources to be handled in the most economical fashion.[115] Kindness to animals was unusual, protecting them almost unheard of.

Planters and other observers had a good opportunity to witness

[112] See Grove, *Green Imperialism* cit., pp. 474-475.

[113] One of the rare exceptions was Robert Hooke, curator of experiments at the Royal Society in the 1660s and 70s, who was one of the first to consider the possibility that fossils could have belonged to extinct organisms. Georges Cuvier (1769-1832) is the natural historian usually credited with formulating the concept of extinction.

[114] K. Thomas, *Man and the Natural World: Changing Attitudes in England 1500-1800*, Penguin Books, Harmondsworth 1984, p. 173.

[115] See L. Hollsten, *Knowing Nature: Knowledge of Nature in Seventeenth Century French and English Travel Accounts from the Caribbean*, Doctorate thesis, Åbo Akademi Library, Turku (Finland) 2006.

what happened when a limited area of land was intensely exploited. Problems such as deforestation, soil erosion, and the extinction of species were matters that were noticed and commented upon by some of the visitors to the Caribbean. They were, however, most often understood in terms of climatic, agricultural or economic issues. Therefore, measures taken with a view to making sugar cane production more effective and sustainable cannot be characterised as "nature conservation". More accurately, it can be said that, just as certain measures were taken to control nature, others were taken to provide solutions for problems caused by overexploitation of the various components of the sugar making apparatus.