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Louisiana sugar: a geohistorical perspective

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LOUISIANA SUGAR: A GEOHISTORICAL PERSPECTIVE

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ABSTRACT

The planting of sugarcane in Louisiana's southern parishes has persisted with stunning continuity since its introduction in the late eighteenth century. This industry, however, is an economic and agricultural anomaly. It is a relic of the sixteenth-century expansion of European capitalism in which granulated sugar, then a novel product, stimulated the Atlantic slave trade and contributed to the incorporation of the sugar-producing colonies of the Americas into an emerging European-world economy. The Louisiana sugar industry was launched in 1795 with a historic granulation from a new variety of sugarcane recently introduced into the Caribbean. From this early success, the industry grew rapidly as immigrants from the Caribbean poured into Louisiana to escape the unrest associated with slave revolts and incipient emancipation. The burgeoning industry contributed to a westward migration of U.S. populations into the newly opened Louisiana Territory as entrepreneurs responded to news of the enormous wealth made by successful sugar planters. The sugar industry of Louisiana also stimulated the expansion of intra-regional slave trade as eastern slaveholders sold surplus slaves to the widening slave economy of the state, putting in place institutions and values that remain problematic today. Sugarcane now contributes the largest share of the state's gross farm income, having surpassed cotton in year 2000. Its cultivation in the latitudes of Louisiana, however, is disadvantaged compared to that in tropical climates, where full maturation of the canes is not abbreviated by a short growing season. The Louisiana industry persists in this marginal climate because of tariff protection, price supports, and the on-going research to select and release ever-stronger and productive varieties with dependent on early maturation. When viewed from the national and global perspectives, given the eventualities of the NAFTA and trade-dispute resolutions with Cuba,

support for continued sugarcane cultivation in Louisiana is tenuous and the long-term future of the industry uncertain.

> From all the earth in all the time of human existence, we build a retrospective science, which out of this experience acquires an ability to look ahead.
>
> Carl O. Sauer, "Forward to Historical Geography"

CHAPTER ONE

INTRODUCTION

For over 200 years the landscape of south-central Louisiana has been shaped by the sugar industry. Ruinous sugar mills, "Big Houses" — some derelict, others continuously occupied or recycled by the tourism industry — and the occasional slave cabin bear witness to the past but the modern mills and continual planting of the original sugarcane fields signify the persistence of this eighteenth-century colonial enterprise. (Figure 1.1). The research presented here is a geohistorical analysis of this industry — its origins, its emergence and consolidation within the southern Louisiana environment, its contribution to contemporary state agriculture and the national sweetener sector, and its dependence on political intervention for continued viability. Particular attention is given to the climatic unsuitability of sugarcane cultivation in Louisiana's subtropical climate.

The planting of sugarcane in Louisiana's southern parishes has persisted with stunning continuity since a 1795 success at sugar production from a sugarcane cultivar newly introduced from the Caribbean. From this early success, the industry grew rapidly as American entrepreneurs were drawn into the newly opened Louisiana Territory to capitalize on the profits rumored to be had from the sugar enterprise. Immigrants from the Caribbean sugar islands poured into Louisiana to escape the unrest associated with political events of the time, adding their experience and know-how to the Louisiana industry. The burgeoning enterprise also stimulated a westward expansion of American slave regimes and, along with the expanding

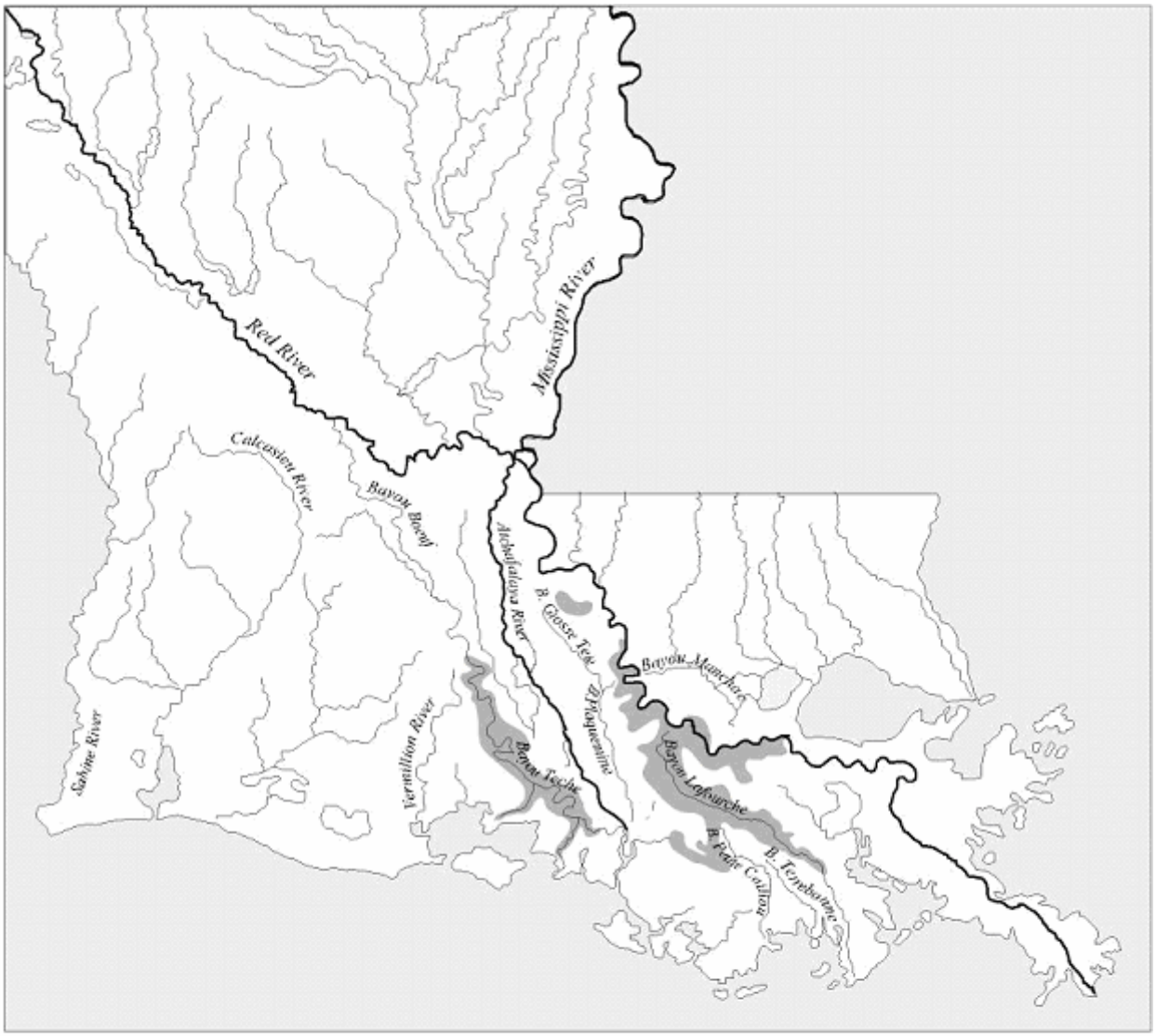


Figure 111. The Historic Louisiana Sugarcane Area. Redrawn from John Reheder, *Delta Sugar* (Baltimore, 1999). Map 2.2. The fortuitous association of arable land on the natural levees, easily accessable water transport, and the mild winters of the southern part of the state enabled sugarcane cultivation to take hold on this otherwise unlikely climate.

cotton sector, put in place problematic social and economic structures that endure to this day (Meinig 1993, Sitterson 1953a, Lachance 1988).

Sugarcane continues to be the most important agricultural product of the sugar-producing parishes and, once again, as in the historic past, sugar makes the largest contribution to the gross farm income of the state, having surpassed cotton in year 2000 (*Louisiana Summary* 2002).

Louisiana sugar also contributes significantly to the U.S. granulated sugar supply although this contribution is declining as beet sugar, Florida cane sugar, foreign sugar, and sugar substitutes continue to encroach on its share of the domestic sweetener market (Figure 1.2).

Despite its apparent successes, I argue that the present physical, economic, and political climates are unsuitable for the continued success of sugarcane cultivation in Louisiana. The industry is entirely dependent on on-going research to produce cultivars that are both vigorous in the subtropical climate and have adequate sugar concentration for competitive sugar extraction efficiencies. And it is entirely dependent on federal intervention to survive in a global sweetener market.

I also argue that the Louisiana sugar industry persists at significant opportunity cost to other local economies. Despite alternative enterprises — small manufacturing, commercial vegetable production, and, particularly, the petrochemical industry — the economic profiles of the contemporary sugar-producing parishes indicate that too little of parish resources reaches resident populations. Many of these people are among the poorest in the nation (Lower Mississippi Delta Commission 1989, U.S. Bureau of the Census 2001) (Table 1.1). Though living in an area of rich soils, benign climate, and seemingly optimum economic opportunity, many have yet to participate in the economic renaissance of the "New South" (Ayers 1992). Given these realities and the dim prognosis for the long-term viability of the Louisiana cane sugar industry, I argue for a reassessment of the continued dedication of resources to sustain a viable sugar industry in southern Louisiana. My contention is that Louisiana sugar is an anomalous agricultural system that persists because of tradition, high capital investment, and the inertia of dedicated resources. It is a marginal enterprise dependent on tenuous support. Simply put, there is more sugar produced in tropical locations throughout the world — at far less cost — than is demanded by the global market.

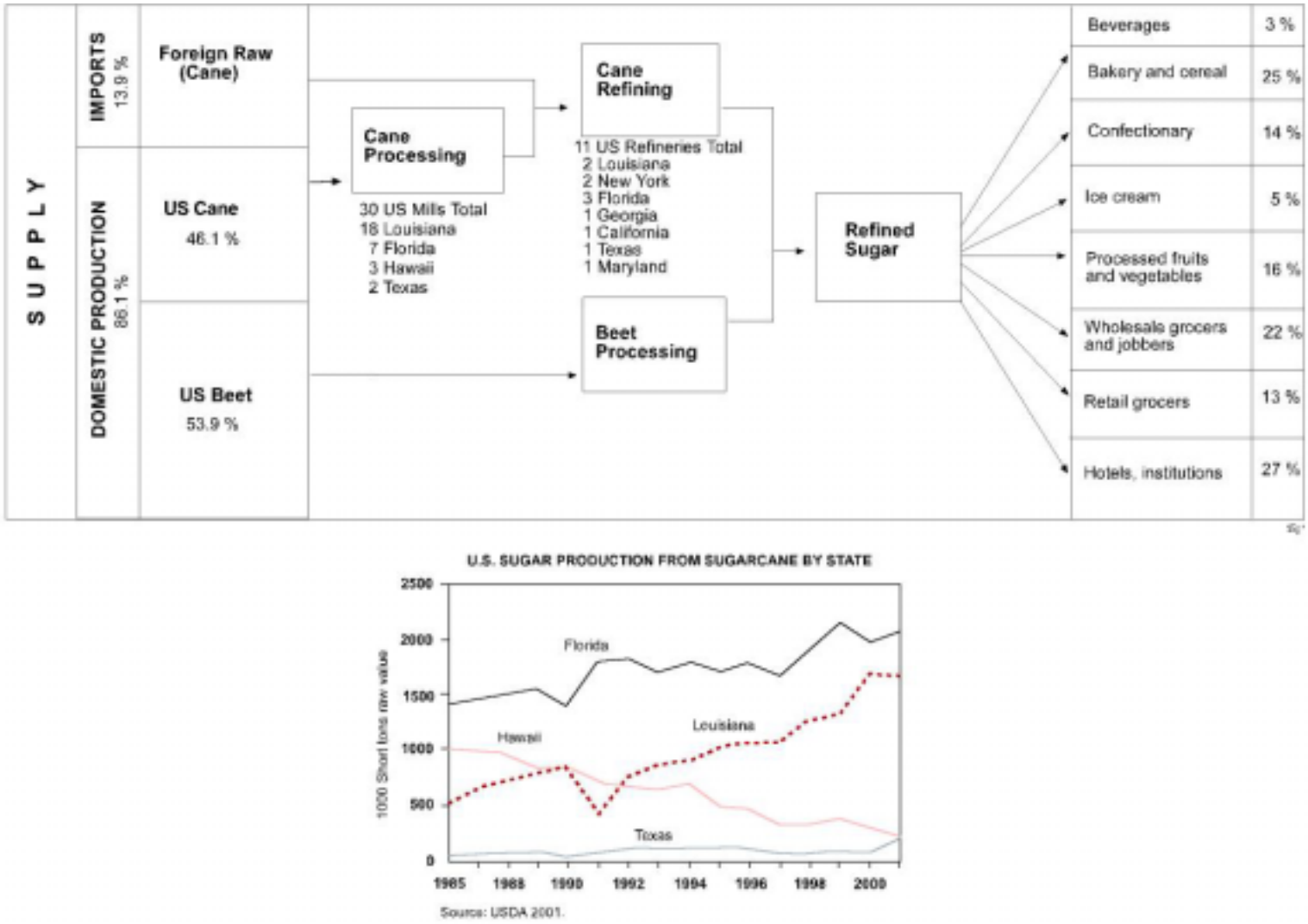


Figure 1.2. The US Granulated Sugar Sector and Sugar Production from Sugarcane by State, 2000. Source: USDA, Economic Research Service, 2001b. Note: Unlike cane sugar which is extracted by compression and reduction, beet sugar is extracted by solution. The final product of beet processing is the sucrose molecule identical to that of refined cane sugar.

Table 1.1. Louisiana sugar producing parishes, percentage population black, and percentage in poverty, 2001

Rank in sugar production	Parish	Population	No. Black	% Black	% In poverty*	Median household income ($US)
1	Iberia	73154	26154	36	21.6	26672
2	Assumption	23015	7349	32	22.0	26381
3	Iberville	31173	14385	46	24.5	25851
4	Saint Mary	47550	14532	31	21.5	24808
5	Saint Martin	57174	18337	32	23.9	26230
6	Lafourche	98324	10703	11	18.4	29478
7	Vermillion	52090	6956	13	21.0	24855
8	Saint James	21132	10357	49	20.2	28768
9	Pointe Coupee	23565	9275	39	23.7	25304
10	Ayoyelles	40846	28324	69	30.1	20252
11	Ascension	71628	13264	19	14.5	37334
12	W. Baton Rouge	20683	6993	34	17.6	30819
13	Lafayette	186631	36846	20	15.8	31681
14	St. John	42261	14419	34	17.9	33611
15	Terrebonne	104530	16032	15	20.1	28402
16	Rapides	126763	36805	29	22.1	25638
17	St. Landry	83816	32392	39		
18	Jefferson Davis	37607	5836	16		
20	St. Charles	48278	10253	21	12.7	38940
21	Acadia	57721	10179	18	12.7	38940

* Poverty threshold for 1997 = $16,400.

Source: U.S. Bureau of the Census, Area Profiles, 1998.

When viewed from the national and global perspectives — its history notwithstanding — the continuation of a Louisiana sugar industry is an irrational economic enterprise. Since the French began their colonization project in southern Louisiana early in the eighteenth century, agricultural production for export has met with marginal success (Harris 1987). Their early failures at indigo, tobacco, and cotton in the more southern latitudes of the state may finally be repeated by the contemporary sugar industry.

Literature Review

Various historical, cultural, and economic aspects of the Louisiana sugar industry have been treated by American scholars, though none has brought these together in a critical assessment of the crop within national and global perspectives. Many of these are chronologies of plantations or families, interesting cameo studies that illuminate issues of slavery and sugar production, but offer little in the way of sustained and critical analysis. Wade's *Sugar Dynasty: M. A. Patout & Son, Ltd. 1791-1993* (1995) and Whitten's *Andrew Durnford: A Sugar Planter in Antebellum Louisiana* (1981) are two of the more notable. Carlyle Sitterson's *Sugar Country: The Cane Sugar Industry in the South 1753-1950* (1953a) persists as the most thorough historical account of the Louisiana sugar industry to date. John Rehder is the current authority on the successional morphology of Louisiana sugar plantations. His recent monograph, *Delta Sugar: Louisiana's Vanishing Plantations* (1999), continues a topic treated in his dissertation (LSU 1971) and several later publications (1973, 1989).

Other doctoral dissertations have treated various aspects of the region: Edward Babin's "A Functional Typology of Louisiana Sugar Cane Production Units in 1969" (University of Georgia 1974); Philip Shea's "The Louisiana Sugarcane Industry, 1751-1972" (Michigan State University 1974); Louis Ferleger's "Technological Change in the Post Bellum Louisiana Sugar Industry" (Temple University 1978); James McGowan's "Creation of a Slave Society: Louisiana Plantations in the Eighteenth Century" (University of Rochester 1976); and Joseph Menn's "The Large Slaveholders of Louisiana, 1860" (University of California, Los Angeles 1964); Charles Roland's monograph, *Louisiana Sugar Plantations During the American Civil War* (1957), is a limited discussion of social and economic disruptions during Civil War conflict in the sugar country. Mark Schmitz focused on the prodigious prosperity of Louisiana sugar plantations

before the Civil War in *Economic Analysis of Antebellum Sugar Plantations in Louisiana* (1977) and on economies of scale associated with sugar production (1977a, 1977b). William Taggart's thesis, "Agronomic Practices and Their Influence on the Development of the Louisiana Sugar Industry" (LSU 1933), provides a valuable survey (with comments) on the sugar literature up to 1932. Richard Follet's "The Sugar Masters: Slavery, Economic Development, and Modernization on Louisiana Sugar Plantations, 1820-1860" (LSU 1997) focuses on the sugar planters, arguing that they were rational economic actors and aggressive capitalists who secured success through synchronization of agriculture and industrial innovation.

Gwendolyn Hall's *Africans in Colonial Louisiana: The Development of Afro-Creole Culture in the Eighteenth Century* (1992) provides valuable insight into early social relations in the region. Finally, journalist Patsy Sims in *Cleveland Benjamin's Dead: A Struggle for Dignity in Louisiana Cane Country* (1994) gives a historical update of the continuing struggle of agricultural workers behind the "cane curtain." The compelling nature of her writing has brought popular attention to the plight of present-day workers in the Louisiana sugar industry — many of whom are descendants of the slave-based agricultural system that delivered prodigious wealth to the more successful planters, but poverty and deprivation to the slaves who enabled the system by their forced labor.

Though spanning only ten of the thousand-odd pages in his opus, *History of Agriculture in the Southern United States to 1860*, Cecil Gray (1941) gives a tight, but thorough, summary of the history of sugar in Louisiana. His notes alone suggest a rich trove of primary sources relevant to early sugar cultivation. In *Modernization of the Louisiana Sugar Industry 1830-1910* (1987), John Heitman chronicles the application of scientific innovations to mechanical and cultural improvements in the Louisiana sugar industry.

The general history of sugar has been written by several scholars including Sidney Mintz: *Sweetness and Power: The Place of Sugar in Modern History* (1985). John Galloway, the present authority on Caribbean sugar, authored a historical geography of the sugarcane industry up to the first world war, *The Sugarcane Industry: An Historical Geography from Its Origins to 1914* (1989). Older, yet still valuable contributions are those of Ellen Deborah Ellis, *An Introduction to the History of Sugar as a Commodity* (1905); H. C. P. Geerligs, *The World's Cane Sugar Industry, Past and Present*; and H. C. P. Geerligs and , R. J. P. Geerligs, *Cane Sugar Production 1912-1937* (1938). Yet unmatched in scope and detail is Noel Deerr's 1949, 1950 two-volume *History of Sugar*. Helmut Blume's 1985 *Geography of Sugar* is a similar project. Blume has used a physical geographer's approach to the spatial distribution of sugarcane cultivation and, using Thörnthwaite's climate classification, has described sugarcane cultivation in the 80 producing countries according to their location in humid tropical, wet-dry tropical, humid subtropical, or wet-dry subtropical climates. This study, however invaluable to the contemporary researcher, heightens admiration for Deerr's more detailed and comprehensive review completed without the modern research tools available to Blume.

The nexus of slavery and sugar has been exhaustively treated. The very significant contributions of Eugene Genovese (1967, 1968, 1969, 1973, 1976, 1979, 1994) and Eugene Genovese and Elizabeth Fox Genovese (1983) address the social and economic impact of slavery in the Caribbean and the U.S. These works also chronicle expansion of the sugar industry into the new world. Of the significant volume of work devoted to the legacy of modern African slavery, much of it is relevant to sugar culture; of the estimated ten million slaves brought to the Americas, ninety percent were destined for the Brazilian and Caribbean sugar industry (Curtin 1969). Other authors who have made notable contributions to the institution of slavery in the New World include, David Brion Davis (1966), Richard Dunn (1972), W. E. Du Bois (1935),

Robert Fogel and Stanley Engerman (1974), Robert Fogel (1989), Manuel Fraginals (1976), Andre Gunder Frank (1967, 1975, 1978, 1979, 1999), Jay Mandle (1978, 1992), Orlando Patterson (1982, 1991, 1998), Richard Sheridan (1974), Frank Tannenbaum (1947), Eric Williams (1944), and Kenneth Stamp (1956).

Other important studies that treat the role of sugar in constructing the social and physical landscape include Peter Eisenberg's *The Sugar Industry in Pernambuco: Modernization Without Change, 1840-1910* (1974), Francisco Scarano's *Sugar and Slavery in Puerto Rico: The Plantation Economy of Ponce, 1800-1850* (1984), and Ramiro Sanchez's: *Sugar and Society in the Caribbean: An Economic History of Cuban Agriculture* (1964).

The U.S. sugar program is increasingly attracting public attention and promises to be *the* sugar story of the future. This program constitutes a complex set of regulations and provisos — understanding their structure and consequence is a daunting task even though little in them has changed for over six decades. John Dalton's 1937 analysis of the U.S. sugar industry remains an excellent introduction to the current sugar program. In *Sugar: A Case Study of Government Control*, Dalton not only provides a history of the U.S. sugar program from the Civil War to the Depression, but also details the political context within which the 1934 Sugar Control Act — essentially still in effect — was constructed. D. Gale Johnson's *The Sugar Program: Large Costs and Small Benefits* (1974) continues Dalton's chronicle up to the 1973 shift in U.S. sugar policy from the Sugar Control Act to the successive Farm Bills that now include sugar policy in their broad agricultural agendas. A plethora of economic analysis has since followed, each arguing for or against U.S. governmental protection of sugar (USDA 2000c; Christy et al 1990; Ortego 1995).

Studies that focus on sugar as a politicized commodity include W. R. Aykroyd's *Sweet Malefactor* (1967); Alfred Eichner's *The Emergence of Oligopoly: Sugar Refining as a Case Study* (1969); Thomas Heston's *Sweet Subsidy: The Economic and Diplomatic Effects of the U. S.*

Sugar Acts 1934-1974 (1987); George Abbot: *Sugar* (1990), and Stephen Marks and Keith Maskus' *The Economics and Politics of World Sugar Policies* (1993). The anthologies edited by Bill Albert and Adrian Graves, *Crisis and Change in the International Sugar Economy, 1860-1914* (1984) and *The World Sugar Economy in War and Depression 1914-40* (1988) provides insight into government price support schemes in selected sugar-producing countries. Edited by Scott MacDonald and Georges Fauriol, *The Politics of the Caribbean Basin Sugar Trade* (1991), underscores the impact of the U.S. quota system on various sugar producing countries. These works have contributed to various aspects of the sugar industry, but no work has focused on the emergence, persistence and viability of the Louisiana sugar industry within a national and global context. This research attempts to fill this void.

Methodology

Using the materials cited above as a research base, this project draws from the data bases the U.S. Bureau of the Census, the sugar analyst F. O. Licht, and The International Sugar Organization. Literature and data from the American Sugarcane League and Louisiana State University Agricultural Extension Service are used extensively. Numerous government documents including reports of the General Accounting Office, the Congressional Budget Office, and reports to Congressional subcommittees provide invaluable information about the U.S. Sugar Program. The periodic studies by government agencies, made available to the public through both paper and web publication, afforded valuable insights in constructing this argument. Among these are the Congressional Budget Office (CBO 1999;) and the General Accounting Office (GAO 1999, 2000). The 2000 GAO cost and benefit analysis of the Sugar Program provided much data as well as links to many related policy papers. The USDA's generous data sets are drawn upon regularly for supporting and investigative materials. I also draw from a larger literature including

the history of the U.S., the U.S. South, and Louisiana; the general history of capitalism; agricultural and economic theory; and social and development theory.

The theoretical framework best describing this study is critical analysis. I have tried to go beyond the repetition of historical facts by contextualizing events that led to the implantation of sugar industry as a commercial system in Louisiana. I examine selected aspects of the Louisiana sugar region: its origins within a Caribbean context that connects back to the Mediterranean, its consolidation within environmental and political constraints, and its functioning within the larger national context. This investigation led inexorably to the international sugar trade within the larger world-system. My intent was to construct a profile of Louisiana sugar that contributes to historical understanding of agricultural choices in the past and present.

This study also draws upon geography's sub-disciplines in creating a comprehensive regional geography. In focusing on a specific industry and the region it crafted, I have responded to calls from prominent geographers for a return to the region as research subject (Earle 1989, Johnston 1987, and Terlouw 1994). I have positioned this study within the intersections of history, agricultural economics, sociology, and geography, and include geologic and climatological data where appropriate to my argument. I have drawn from several theories in constructing my analysis and framing my conclusions: world systems (Wallerstein 1974, 1980a, 1980b, 1983, 1989), dependency (Frank 1967, 1975, 1978, 1979, and regional-system theory (Skinner 1985, Smith 1976, Fox 1972). The principal informant is world-system theory in which human economic activity across the globe interacts as a system — "a set of elements standing in interaction" (Terlouw 1994, 149). I use world-system theory as framed by Braudel and Wallerstein with their focus on the functioning of a capitalist world-economy. This is a world consisting of a division of labor, an inequitable distribution of wealth, and a tri-polar spatial configuration (exploited periphery, semi-periphery, and enriched core) that has created tensions

between the "West" and non-Europeanized countries (North and South). And it is an economic system whose historical evolution, via European-dominated maritime commerce (arising from a Mediterranean template), that has come to encompass the contemporary world (Braudel 1977, Hoekveld 1993, Wallerstein 1980a).

This dissertation considers the origins of the Louisiana sugar industry as well as its prospects. It examines the role of Louisiana sugar within the present state and world sugar economies as well as its historic contribution to the emergence of capitalism as a system of exchange and wealth-accumulation.

My study area, which I call Louisiana "sugar country" in deference to Sitterson's *Sugar Country* (1953a), focuses on the core area of persistent sugarcane planting in the south-central Louisiana parishes. A periodization of this history is suggested by the significant events that shaped the industry:

1795-1815, extension of the Caribbean sugar economy into Louisiana

1816-1827, initial expansion

1828- 1860, consolidation into a sugar region

1861-1866, Civil War collapse

1867-1880, reconstruction and labor challenges

1870-1910, technological innovation and growth

1906-1930, disease and decline

1935-1974, recovery under the U.S. Sugar Act

1975-2000, global competition and political dependency (See Figure 1.3.)

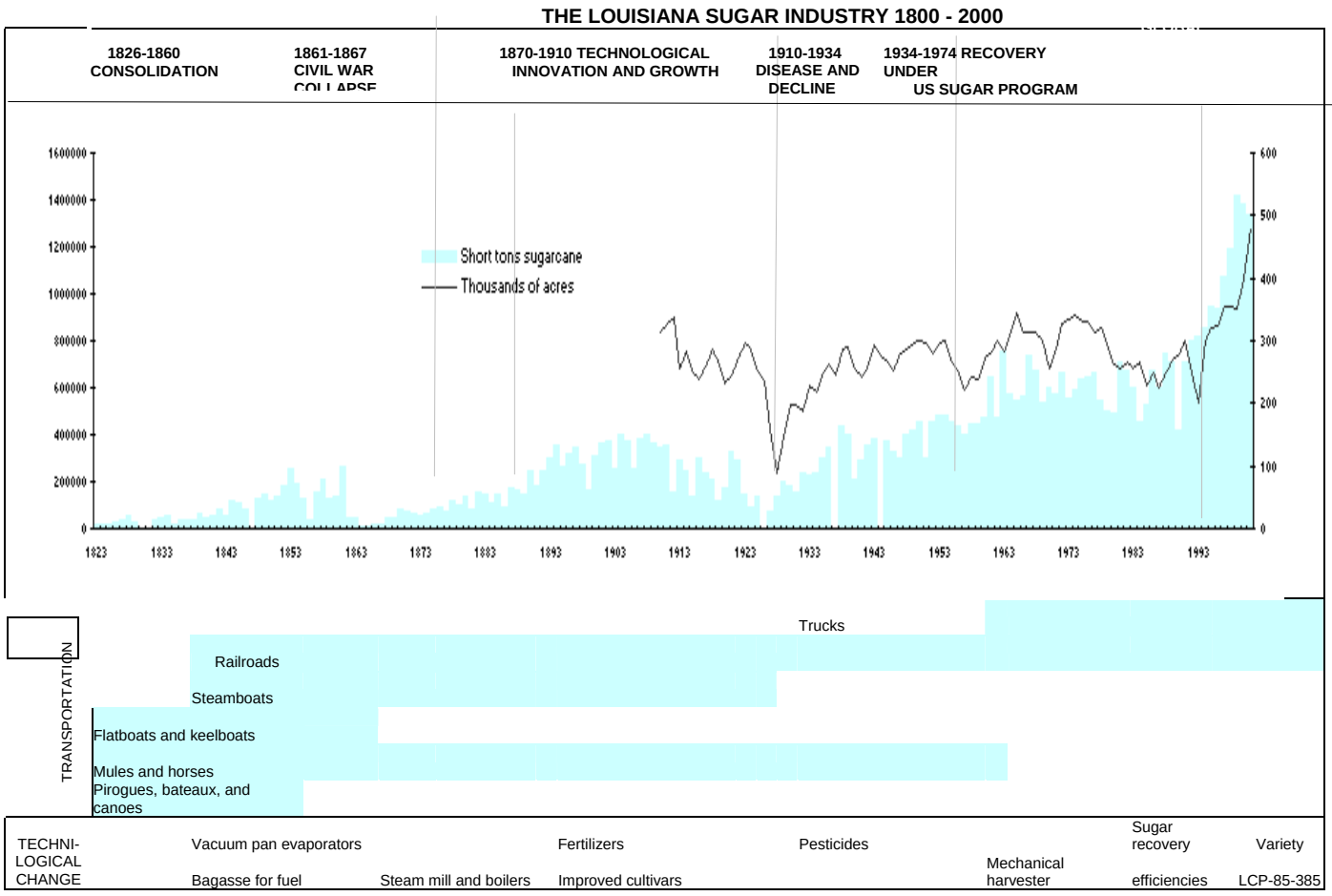


Figure 1.3. The Louisiana Sugar Industry 1823-2000. Sources: historic sugar production in Louisiana 1823 to 1908, Noel Deere, *The History of Sugar,* Vol. I (London, 1949), 250; sugar production 1909-1985, Lonnie Fielder, Steve Kelly, and Bergen Nelson, *Agricultural Statistics and Prices for Louisiana, 1909-1985* (Baton Rouge, 1986), Table 11; historic transportation, Fred Kniffen and Sam Hilliard, *Louisiana, Its Land and People* (Baton Rouge, 1988), 147; technological change, John Heitman, *The Modernization of the Louisiana Sugar Industry* (Baton Rouge, 1987).

By setting this periodization within widening regional contexts, I chronicle changes in external forces that helped shape the industry through time. Chapter two focuses on the origins of the industry, its move into the Caribbean, and its role in stimulating European capitalism. Chapter three discusses the manufacture of sugar and the requirements of the sugarcane plant. Chapter four focuses on the extension of the Caribbean industry into colonial Louisiana and its consolidation within a national context. Chapter five discusses the U.S. sugar program and the political strategies that have enabled the crop to survive these 200 years. Chapter six discusses

the uncertain future of cane sugar in the U.S. These chapters establish the context for my culminating argument that Louisiana sugar production is not an appropriate agricultural enterprise for the region and that it is continued at substantial opportunity cost to local agriculture. Despite its long and significant history, I maintain that the Louisiana sugar industry should not be encouraged in its resistance to national and global processes that have operated historically to adjust agricultural enterprise to the most suitable and competitive environments. The Louisiana sugar industry should be encouraged to use its resources to initiate planned adjustments to other enterprise with more secure prospects.

Contribution

The entrenchment of the cane sugar industry in the southern parishes is a potentially significant problem for the Louisiana agricultural economy. While cotton, soybeans, and rice have adjusted to their environmental constraints, herculean efforts continue to adapt the sugarcane plant to its ill-fitting Louisiana environment — even encouraging expansion in the past five years. Today's sugarcane contribution to the Louisiana agricultural economy, however, could be lost with one stroke of a presidential pen killing the U.S. price supports and causing abrupt and painful adjustment. Any work that causes a reexamination of the industry in southern Louisiana is of value because of the dim prognosis for this crop. Alternative sweeteners are on the rise, excessive tropical cane sugar production continues to depress world sugar prices, and much larger acreage (in the temperate climate of the United States) is available for sugarbeet production. All this being the case, the continued federal support price upon which the industry depends seems tenuous indeed.

Sugar production, however, is a difficult enterprise to abandon and change is resisted. The processing of the harvested product involves great sunk costs — the harvesting, milling, and refining facilities alone costing millions. Once this industry is in place, fields, transport devices,

processing facilities, and continued profit (and arguably employment stability) are tied to continued, if not increasing production. The sustained power of the special-interest lobbies secures a generous price support program that continues the insularity of the U.S. industry, eliminating the economic pressures that normally encourage adjustment in agricultural enterprise.

Contemporary Louisiana has yet to join the ranks of the more prosperous states within the Union. Persistent economic and social disparities that place Louisiana next-to-last in conventional measures of quality of life (Figure 1.4) cannot be reversed without an understanding of their origins. In 1995, when plans were drafted to celebrate the Louisiana sugar bicentennial, the Center for Louisiana Studies at the University of Southwestern Louisiana decided to:

> limit the exhibit to history, technology and architecture, *leaving out the sociological aspects* (emphasis added). The enormously complex question of agricultural workers has yet to be studied with detachment and impartiality, and any attempt at pictorial interpretation would inevitably have reflected personal biases (Center for Louisiana Studies 1995, vii).

Not only were sociological aspects avoided, so was the very use of the word "slave." It was yet another missed opportunity to cultivate understanding of the problems of a painful past in ways that could contribute to future resolution. If Louisianans downplay the powerful role of federal and state support for sugar, they cover up important social and political issues still challenging the region today. Social inequalities embedded in the era of slavery are with us today. These issues are of great significance to contemporary U.S. social science and are the highest justification for academic research.

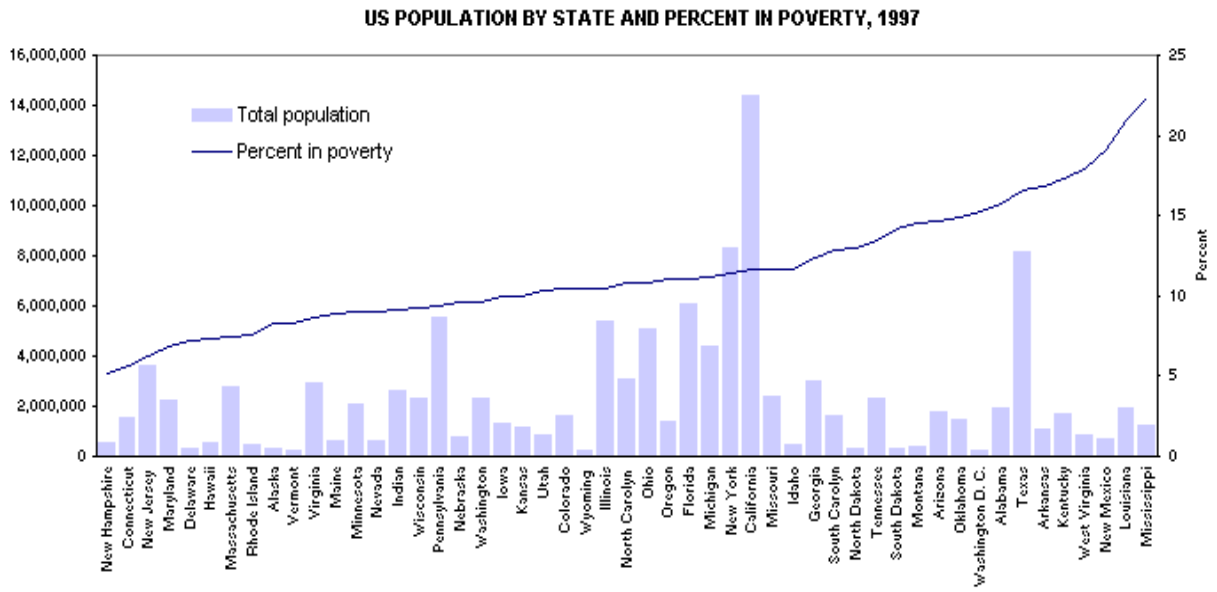


Figure 1.4. U.S. Population by State and Percent in Poverty, 1997. Source: U. S. Bureau of the Census, 2000.

CHAPTER TWO

THE PERSPECTIVE OF HISTORY

Sugarcane arrived in Louisiana at the end of a long and circuitous dispersion from New Guinea to the Americas. A map of the circuits of the European world-economy during the fifteenth century lends a perspective to this arrival (Figure 2.1). Special attention should be given to the westward Atlantic route that terminates at the island of Madeira. At the close of the fifteenth century this island was Europe's principal source of sugar, having been transformed from the "wood island" to the largest sugar provider to the European region. It was on this route, probably engaged in transport of sugar, that a Genoese instrument merchant, still honing his navigation skills, met and married the daughter of a sugar planter. This same Genoese, Christopher Columbus, later gained entry to the Spanish court where he proposed a reconnaissance journey to determine the feasibility of a westward route from Europe to the East Indies. At the time Mediterranean trade was driven largely by luxury items imported from the East Indies via overland routes controlled by Islamic traders. Eager to enlarge their share of this trade, and equally eager to spread Catholicism, the regents of Spain, Ferdinand and Isabella, extended support to Columbus in a gesture that was to have immutable consequences not only for Spain and other European states, but for the peoples of the continent that lay between them and their desired trade as well as for the peoples of the African continent (Watts 1987, 1993; Meinig 1986).

After his successful reconnaissance, Columbus returned to Hispaniola with seventeen ships and 1500 participants to establish a settlement in what they assumed was unoccupied territory on the eastern side of India. The Europeans anticipated a permanent implantation to enlarge their economic arena and, in the pattern to which they were accustomed in the

Figure 2.1. Major European Trade Routes, circa 1500. Redrawn from Fernand Braudel, *Wheels of Commerce*, Vol. II (New York, 1984), 28.

Mediterranean, they anticipated a supply of tropical products to complement those produced in their temperate climate. In addition to the provisions specially selected for their survival in the new location, the Europeans brought sugarcane "seed" (stalk segments) and 20 field specialists and sugar makers to continue the lucrative industry of the east Atlantic (Deerr 1949). This

privileged plant, selected and cultivated by humans because of its habit of concentrating unusual quantities of sugar, was on the final leg of a journey that was to connect East to West in patterns of dramatic and unforeseen consequences.

The Europeans who made landfall on Hispaniola ("Little Spain") in 1493 were from a society experiencing a transformation of its economic and social systems. The tribute and reciprocity mode of feudalism that had endured in Europe for four centuries was giving way to the economic system of capitalism that is now embraced by societies worldwide. Methods of exchange for self-provisioning gave way to methods of exchange to generate "surplus value" from which more surplus value is generated in an ever-enlarging accumulation of wealth (Braudel 1977, 21). The concern for a commons that prevailed in the earlier time was being subordinated to the freedom of the individual as he engaged in competition for personal wealth accumulation. The resulting shift from group-oriented to individual-oriented behavior was to contribute to a paradigm shift in human attitude towards natural resources that has contributed to the transformation of human society and physical environments worldwide. Capitalist exchange was to involve more and more participants on the European continent until the whole of that region was engaged and, with innovations in sea navigation, extended to the East and to all of the Americas. (Wallerstein 1974, 1980a, 1983; Braudel 1970). And it was to cause the states of Europe to engage in four centuries of warfare and shifting alliances that brought about the political boundaries of the contemporary western world.

Capitalism, as an economic system, has engaged scholars of many stripes (Braudel 1977, 1982 [1979], 1985 [1979], 1988 [1986], 1992 [1979], 1995a [1949], 1995b [1949]; Marx 1965 [1858], Wallerstein 1980a). Braudel (1977) has distilled from capitalist performance three key characteristics: 1) it occupies a limited geographic space; 2) it has a pole (or center) represented

by one dominant city: and 3) it is divided into successive zones, a center and a periphery of subordinates. Wallerstein (1974, 1980a, 1980b, and 1989) expanded Braudel's characterization: [the capitalist world-economy] 1) expands to cover the globe; 2) manifests cyclical patterns of expansion and contraction; 3) involves shifting geographic locations of economic roles manifested in the rise and fall of hegemonies, the relocation of core, periphery and semi-periphery; and 4) undergoes processes of secular transformation involving technological advance, industrialization, proletarianization, commercialization of land, and the emergence of structural political resistance. These characteristics, identified by Braudel and Wallerstein, provide a framework for the following discussion of the rise of the sugar economy of the Americas, its role in the incorporation of the Caribbean into the European world-economy, and its eventual transfer to Louisiana.

The Emergence of Capitalism

The transition towards the capitalist world-economy is generally agreed by Braudel and Wallerstein to have begun during the economic upturn of the "long" sixteenth century (1450-1640) and to have extended to the mid-1700s when "capitalism proper" was clearly in place, indicated by an identifiable core and contributing periphery (Braudel 1977, Wallerstein 1980b). This sixteenth-century window includes some of the more significant events in human history, including the European "contact" with the Americas and the great voyages of discovery that transferred peoples, plants, and animals far from their continents of origin. For the Europeans a major economic consequence of these eventualities was the addition of the Americas to their realm of economic exchange. Not only was their sphere of economic activity enlarged, but the transformation from the prevailing feudal economic system toward a universal capitalism was accelerated.

We can position this transition in Fernand Braudel's economic schema (Figure 2.2) in which he divides human history into three major periods: the earliest, termed "material life" in which self-provisioning characterized most human behavior; an intermediate period termed "incipient capitalism" in which intermittent exchange characterized an increasing dependence on articles not self-provided; and the present era of capitalism proper, Braudel termed "economic life" in which humans are entirely dependent on materials produced by others in complex webs of divided labor and acquired by currency. In this system, the accumulation of currency is the major impetus for continued production and exchange.

> At this level, one enters a shadowy zone, a twilight area of activities by the initiated which I believe to lie at the very root of what is encompassed by the term capitalism; the latter being an accumulation of power (one that bases exchange on the balance of strength as much as or more than on the reciprocity of needs) a form of social parasitism which, like so many other forms, may or may not be inevitable (Braudel 1982 [1979], 22).

This shadowy zone of capitalist activity moved westward with the adventurous Europeans who were connecting the "eastern" hemisphere to the "western" by overwater route opened to them by the successful voyage of Columbus. It extended a penumbra towards the "new" continent, dragging values, systems, cultures, and peoples from the old. The Ciboney (Caribs and Arawak) encountered in the new lands were not the Asian peoples the Europeans sought but their descendants who had made an eastward, overland crossing 20,000 years earlier (Watts 1987). These peoples were in a pre-literate state, living in communal horticultural villages, and practicing a remarkable seamanship (Watts 1987). They were engaged in Braudel's "natural" economy characterized by communal provisioning — a habit that greatly disadvantaged them in subsequent negotiations with the invading Europeans. These early Americans were to succumb quickly to the diseases of the Europeans and, through appropriation

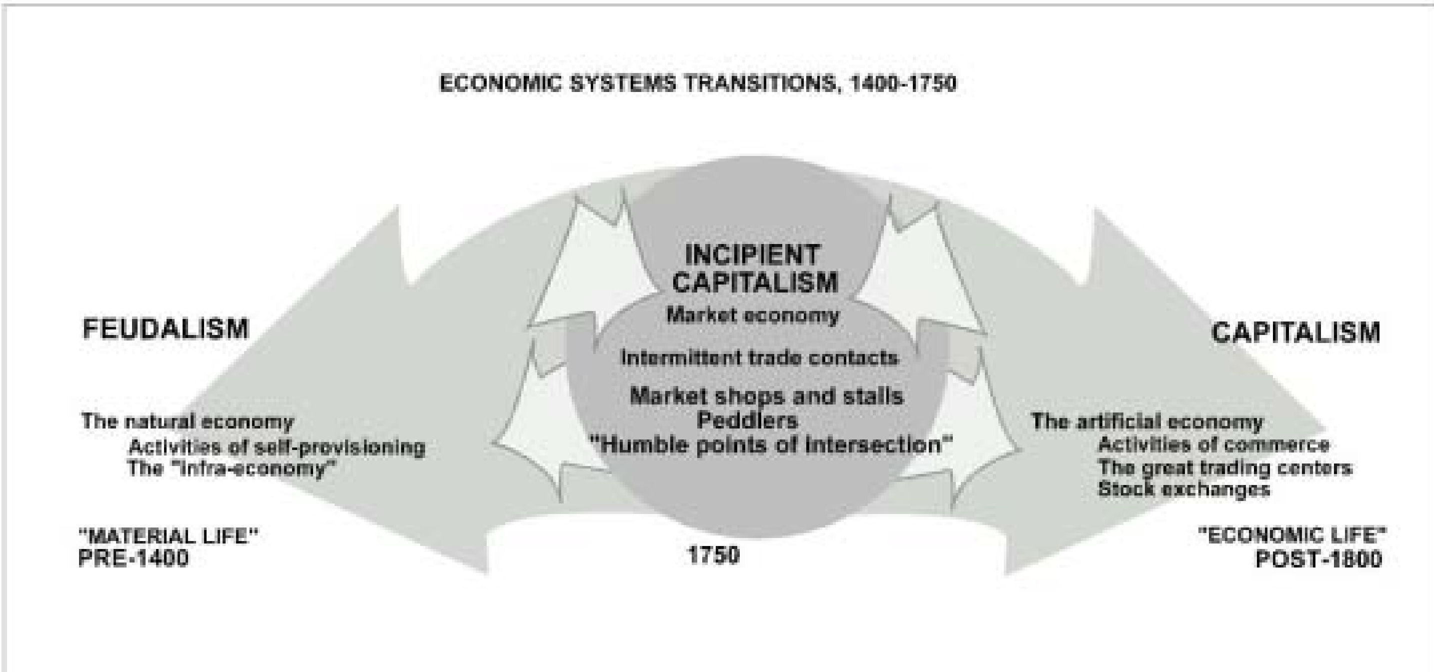


Figure 2.2. Economic Systems Transitions, 1400-1750. This representation of economic history is suggested by Braudel's division of human history into three major periods: material life, the time of self-provisioning; incipient capitalism, a time of intermittent exchange characterized by an increasing dependency on articles not self-provided; and capitalism proper, characterized by universal commercial activity. Ferndnad Braudel, *Civilization and Capitalism, 15th-18th Century*, Vol. 2, *The Wheels of Commerce* (New York, 1984), 21.

made easier by their demise, soon lose control of their mineral and agricultural resources in the great circuits of exchange that arose with the emerging European world-economy.

Mediterranean Origins

At the time Columbus made his return trip to the Americas, the locus of the European economy was the Mediterranean Sea with its littoral Italian and Arab states (Braudel 1992 [1979]. A westward shiftings of power, however, was incipient. Venice was losing her century-old grip on Mediterranean commerce to the enterprising Dutch who had developed seafaring skill and financial innovation adequate to challenge the hegemony of the Italian city-state. The Portuguese, blessed with both Atlantic access and the leadership of Henry the Navigator, had made the bold southward penetrations that would expand their reach to the East and broaden the European world-economy. These eventualities had contrived to motivate the Spanish Crown, ever fearful of the rise of other European powers, to support Columbus in hopes of securing a lucrative trade route to the west. This was a fortuitous commitment. It gave Spain enormous territorial and economic advantage for the next two centuries and it was to imprint an enduring "Spanish" quality on the majority of the peoples now occupying the "new" continent (Braudel 1982 [1979], Terlouw 1992, Winn 1992).

The declining Venetians, were not the first of the Italian states to rise to power in the Mediterranean. They had succeeded the Genoese — "the first to scent an opportunity" (Braudel 1988 [1986], 163). Venetian galleys plied waters mastered earlier by Genoese carracks as they established sea-links with the western edge of the European continent — Southampton, London, and Bruges — in an early stirring of "world" incorporation. This was, however, after the Genoese had seized on sugar as a significant stimulus to trade and had moved a maturing sugar industry from the eastern Mediterranean (where it was brought earlier by Arab traders) to Egypt,

Sicily, southern Spain, Morocco, Madeira, Cape Verde Islands and, finally, the Canaries. By the close of the fifteenth century when Columbus petitioned Ferdinand and Isabella for sponsorship, Genoese finance and entrepreneurship had enabled Europeans to supply a large part of their sugar demand, thus lessening their dependence on Arab traders (Braudel 1992 [1979], Mintz 1985).

The European taste for sugar had been introduced four centuries earlier by Frankish Crusaders returning from their forays to the Middle East (Braudel 1992 [1979], Mintz 1985). During their time among the Arabs, the Crusaders were exposed to many attributes of the "heathen" they did not distain assimilating. In addition to taste for granulated sugar, Europeans adopted the Arab numeric system — a system that facilitated subsequent westward navigations and enabled the trade and finance systems necessary for the establishment of a sugar industry in the distant Americas and the ultimate extensions of European capitalism.

The exotic commodity known as sugar had been introduced to the Mediterranean during the fourth century BC by marauding Arabs who had engaged in their own forays to India. Alexander the Great is credited with bring the sugarcane plant to the Mediterranean in 324 BC (Braudel 1992 [1979], Galloway 1987, Mintz 1985). The Arabs applied innovative irrigation technology to encourage the ever-thirsty sugarcane plant to thrive in the semi-arid, but warm, Mediterranean climate. Sugar and sugar making technology accompanied the spread of Islam and, as Mintz (1985, 25) observed, "Sugar followed the Koran." By the first of the Frankish crusades in 1095, sugar consumption was an essential part of the Arab diet. The Christian knights, however, returned to their homeland bearing only the crystalline product. The plant itself was controlled by the tyranny of latitude and could not grow in the northern climates. Like other tropical products desired by Europeans, sugar had to be secured in acts of exchange

(usually involving silver) and transported the distance. As Braudel observed, it was this complementarity of climates that drove European trade with the eastern Mediterranean and stimulated economic activity of those centuries. Trade in tropical products encouraged the patterns of transport and finance that came to characterize these Old World economies — and, later, those of Brazil, the Caribbean, parts of the Spanish mainland, then, most of the Americas.

After three centuries of "Arab slaughter" (Deerr 1949, 74), the Crusaders not only implanted a demand for sugar in their northern homeland, but their victories in the East loosened Arab hold on the Mediterranean economy. Through a pattern of conquest Braudel characterized as " a harsh but instructive gauge of the economy and civilization established in Europe" (Braudel 1988 [1986], 154), Europeans prepared the way for the rise of their World-economy. In peculiar coincidence, the attire of the contemporary sugarcane-cutter is not unlike that of the marauding Crusaders who first introduced the taste of sugar in Europe (Figure 2.3). Subsequent demand for this product was to stimulate an industry that not only transformed the environs of tropical America, but engaged millions of enslaved Africans and desperate emigrants in its production — many of whose descendents today still hand cut sugarcane wearing metal protection (Wilkinson 1989). Thus we see in the legacy of the Crusaders not only an introduced taste for sugar that transformed the foodways of Europe,[1] but a niche vacated by the Arabs and occupied by the Italians, whose city-states along the Mediterranean littoral were well positioned to enable Europeans to take control of Mediterranean commerce (Wagstaff 1993).

[1] Not a small part of this was substantial changes in consumption habits with spirits becoming an integral part. "Upon all the new settlements the Spaniards make, the first thing they do is build a church, the first thing ye Dutch do upon a new colony is to build them a fort, but the first thing ye English do, be it in the most remote part of ye world, or amongst the most barbarous Indians, is to set up a tavern or drinking house" (Walduck 1710, quoted in Watts 1987, 128).

Figure 2.3. A Modern Cane-Cutter in Protective Armour. Most cane harvest in lesser developed countries is done by cane-cutters who wear protective body armour not unlike that worn by medieval knights. In coincidence, granulated sugar was first introduced to Europeans by Frankish knights returning from crusades to to the eastern Mediterrean. Photo by Brian Smith, *Miami Herald*. Used by permission.

Among these victorious Italians, we see emerge the first of large capitalist families: the Fuggers, Hochstätters, Affaitati, and Welsers (Braudel 1982 [1979]). Among these are counted the first sugar kings, the Cornero family, whose sugar domain in Cypress was wrested from the Arabs in 1479 (Braudel 1982 [1979]). To this lineage of magnates later would be added modern names —Havemeyer, Spreckles, and Fanjul — whose influence within the modern sugar industry is remarkable, given the assumed checks and balances of the contemporary "free market system." But, as we shall see, sugar magnates, then as now, accumulated their wealth from sugar processing and distribution, seldom from field production alone. Even the great Welsers found sugar production in the Canaries unprofitable and by 1520 gave up production, confining themselves to its transport, refining, and trade. And before them, the fifteenth century Genoese

found the plantations of Sicily to be increasingly unprofitable. As they — and the planters of the Americas — were to learn, sure profit lay in the transport, processing, and distribution of the crop where the entrepreneur was less vulnerable to the vagaries of weather, disease, and the difficulties of managing the harvest.

Westward Shiftings

The Mediterranean endured as the economic center of the Western world until the close of the sixteenth century when the Atlantic-facing Portuguese and Dutch successfully challenged its hold on an enlarging European economic sphere. The Portuguese success in navigation gave them first right to direct trade with the East (around Africa) and to the nearby Atlantic islands where they installed tropical agriculture to supply articles imported earlier from the East. The Dutch had developed fast ships (the flyboats) and efficient systems of finance and credit which they honed in extensive grain transfers from the Baltic to western Europe. By the fifteenth century, bulk commodities were moved overwater with relative ease. Grain, cotton textiles, and wood came southward or westward to complement the growing European specialization in monocrops — a specialization that heralded the much contested "division of labor" characteristic of modern capitalism.

Through time European trade networks became increasingly lucrative. Credit and finance systems arose as did systems for storage and dispersal of the large cargoes arriving by ship or overland caravan. These maturing systems of transport and storage were to eventually become large and dependable enough to support the wide and incongruous distribution of today's human population. And here also was to arise all the necessary mechanisms to support a trans-oceanic sugar enterprise — one entirely dependent on matured methods of transportation and finance as well as economies of scale necessary for sugar production and processing.

With increasing sea transport of bulk commodities came an associated rise of warehousing at the seaward entrepôts. Seaboard warehousing caused the inland nodes of trans-shipment to shift from the old locations to new Atlantic-oriented cities at the eastern littoral. Braudel comments on the importance of this shift because with it came the demise of the great exchange fairs of the sixteenth century that first engaged peasantries and noblemen in transactions of "incipient capitalism." As the inland nodes were by-passed, the economy of the natural world, characterized by intimate forms of exchange, gave way to the material economy governed by capitalist exchange that involved transfers of bulk commodities in enormous quantities (Braudel 1984 [1979], Wallerstein 1974, Frank 1978).

With the seaward shift in transport also came an increase in scale of enterprise which was to enlarge beyond the Mediterranean model in which princes or large capitalist families controlled all aspects of a trade. Smaller firms arose and engaged independently in systems of transportation and credit extension, and commission work and brokerage functions — all elements familiar to modern capitalist enterprise.

> It [the North Sea trade] was a system of many parts, created and manipulated by individuals, families, syndicates, and guilds, rather than by kings and princes. That was the critical difference in this emergent capitalism: it operated internationally beyond the control of any one political ruler and without centralized authority of any kind. While it normally served to provide reasonably regular flow of an increasing range of goods to a growing population, it was inherently speculative and opportunistic, adaptable and expandable, for it operated, fundamentally, on the basis of private self-interest and thus it had participants ready to venture on any possibility of a new means to profit (Meinig 1986, 50).

As control shifted westward, so too emerged the participant (and very independent) cities of the Atlantic littoral: Amsterdam, Bordeaux, London, Lisbon, and, (later) on the western margin, Santo Domingo, Havana, Recife, Boston, New York, Baltimore, New Orleans. Before them, in models of elegance and efficiency, the cities of the Mediterranean had formed a

complex commercial society, "a system of points through which goods and messages were exchanged" (Braudel 1995a, 37). The system of points — nodes of commerce — enlarged as more and more people engaged in capitalist exchange, shifting the old feudal economy further and further toward the new material life of capitalism.

But the "system of points" of the European-Mediterranean realm could not expand across the Atlantic until Portuguese successes in navigation had emboldened Europeans to strike out over the great Ocean Sea with some confidence of returning. This had happened with the successful penetration south of Cape Bojador[2] and other advances in navigation that emanated from Henry the Navigator's school in Lisbon (James and Martin 1981). By the close of the fifteenth century the Portuguese — in their thrust southward for an alternate route east — had stumbled upon Atlantic low-latitude islands that could produce many of the same products they trekked eastward to acquire. Here they applied the system of agricultural production now designated "plantation," that the Greeks had first used in the Aegean, and the Arabs and Italians in the Mediterranean. In these East Atlantic islands — Madeira, São Tomé, and the Cape Verde Islands — they installed the old latifundia system[3] and began sugar production to supplement that being purchased in the Mediterranean. By 1485 Portuguese sugar plantations were meeting European demand (Meinig 1986). The Europeans appropriated the lucrative profits of the Mediterranean sugar industry by establishing their own sugar-producing center and, after

[2] For centuries, it was believed by Europeans that waters of the sea boiled south of Cape Bojador (located south of the Canaries off the west coast of Africa). So strong was this belief that Henry the Navigator's most capable captain, Gil Eannes, had to deceive his crew to get them to sail south of this dreaded point for the first time in 1433 (James and Martin 1981, 69).

[3] The Iberians applied the *latifundia* systems as they retook their peninsula from the Arabs in the fifteenth century. As the Arabs were expelled the vast lands were appointed in trust to princes — both secular and clerical — to produce wealth for the Crown; the abandoned Arab slaves, the Fellahin, were assigned with the land as chattel labor in a land-labor association that came to be known as the *encomienda* (Knight 1978).

successfully rounding the Cape of Good Hope, they enlarged their economy through trade routes that engaged the East Indies directly, by-passing the intermediary Arabs of the eastern Mediterranean. And here, after transforming these islands into huge monocrop projects they resolved their labor shortages by forcefully importing black Africans from nearby Senegambia.

The Sugar-Black Slavery Nexus

The Iberian use of slaves in the production of sugar followed an earlier pattern of the Turks who sold war captives for forced labor in their sugarcane fields in Crete, Cyprus, and Morocco (Galloway 1989). The Turks, in turn, had continued the Greek and Roman custom of enslaving war captives (as well as indigenous peoples) as they spread their empire throughout the Mediterranean world (Braudel 1988 [1986]). The Senegambia slave stations of the Portuguese were the first of the notorious "export centers" along the African coast. El Mina in present Ghana soon followed as did Fernando Po, Principé, and São Tomé in the Gulf of Guinea (Figure 2.4). The 50,000 slaves held in São Tomé in 1550 heralded a firmly installed slavery procurement system that was to power the Americas sugar industry for the next four centuries (Dunn 1972). The station at Il Mina also supplied gold. El Mina gold both financed the enlargement of the Portuguese slave trade and, from the earliest imports in 1441, supplied specie to the expanding Portuguese economy until replaced by the enormous exports from Brazil in the following century (Meinig 1986).

The Spanish soon followed the Portuguese into the east Atlantic. In 1480 they established their own sugar plantations in the Canaries where they also enslaved the indigenous islanders (the Guanacos), then imported both willing and unwilling Europeans before resorting to the purchase of black Africans from the Portuguese. By the close of the fifteenth century the Spanish also had lucrative sugar plantations producing for the European market (Deerr 1949, Meinig

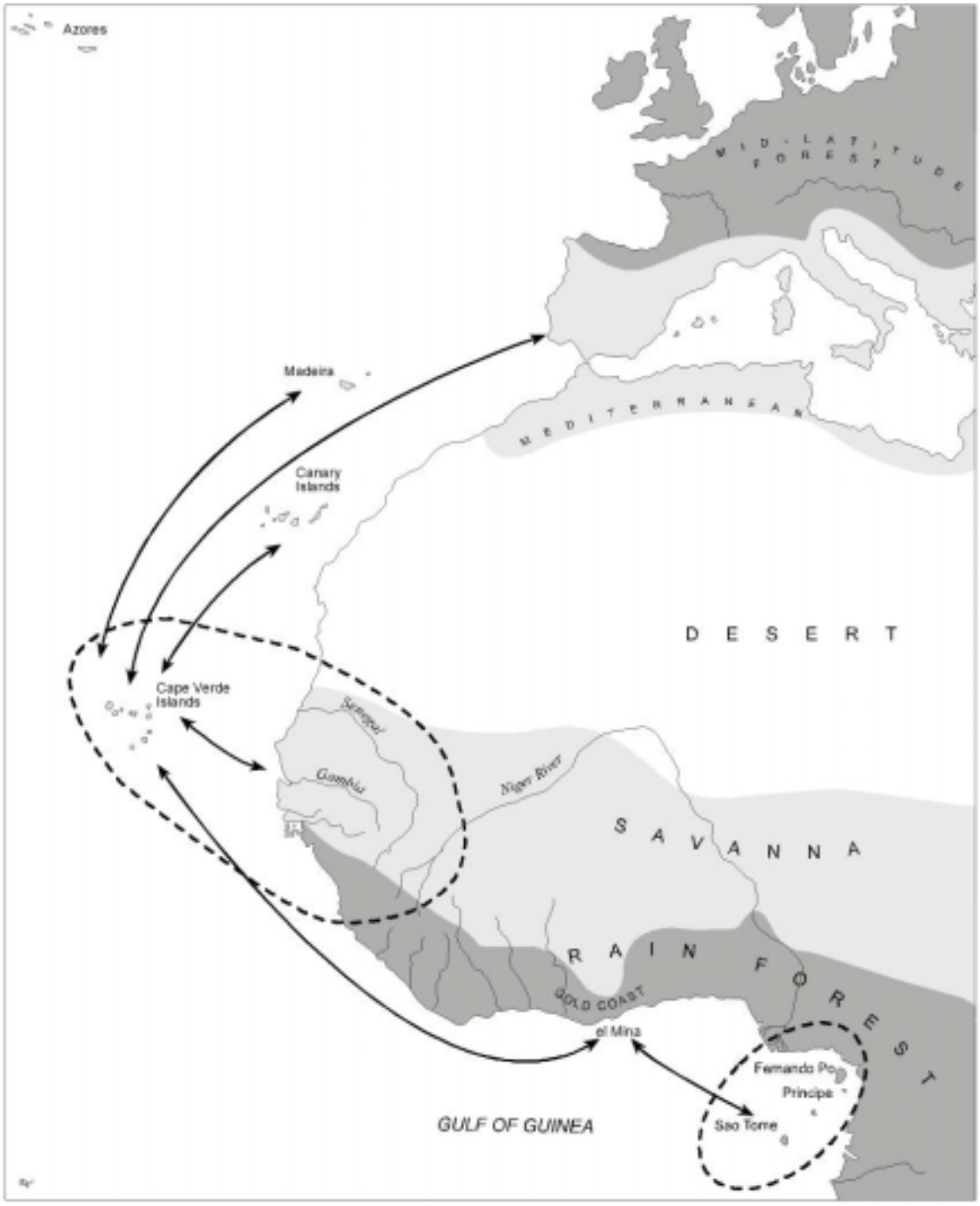


Figure 2.4. Portuguese and Spanish Slave Stations, circa 1525. Redrawn from Donald Meinig, *The Shaping of America*, Vol, I (New Haven, Connecticut, 1986),19.

1987, Braudel 1995a). By 1526, 12 factories operated in the Canaries (Deerr 1949, 115), but these were soon to decline in the face of West Indian and São Tomé competition (and a plague of caterpillars appearing in 1530). Just as output from the east-Atlantic islands began to fall short of European demand, the Iberians were to find unlimited sugar fields in the new world opened to them by the discovery of Columbus. They were quick to extend their sugar plantations westward, first to the Spanish Caribbean, then to Brazil where the success of the industry was to attract other European states as they vied for a greater share of the wealth generated in the Americas.

European Entrepreneurs to the Americas

The Spanish crown began occupation of its claim in the Americas by installing the latifundia system as was done in southern Spain when recovering the peninsula from retreating Arabs. Enormous land grants were made to settlers initially by the *repartimiento* that divided and granted the land. Then, as the old problem of labor reoccurred, the *encomienda* was added. This provision "granted" the indigenous Indians to an estate as servile labor in perpetuity — for the gift of Christianization (Knight 1978). This pattern was to characterize Spanish settlement throughout the Americas. The indigenous Caribbean islanders, however, were quick to succumb to the diseases of the Europeans and those who survived were uncooperative slaves. By 1503, Columbus (then governor of Hispaniola) petitioned the crown for black slaves to relieve the shortage of labor (Watts 1987).

Early interest in plantation production on the islands, however, was soon subordinated to the more lucrative business of gold and silver extraction on the mainland. Once placers were discovered in Mexico, the islands of Hispaniola, as well as Cuba and Jamaica, held little interest for the Spanish and these future sugar colossi lay quietly in ranchlands for another century,

serving as provisioning stations for Spanish galleons. Their sugar industries had to await French and British entrepreneurs whose access to mainland gold and silver was preempted by the Iberians. Gold was, after all, the undisputed greatest treasure of the time. Profit from the reciprocity of commodity trade had yet to dominate the European calculus.

> Again in the sixteenth century, anyone out for American profits made straight for Eldorado. Only when gold and silver proved elusive, or already monopolized by someone else, did venturers content themselves with such activities as sugar-planting, as in northeast Brazil (Hobsbawm 1975, 155).

Portugal reached the Americas only after Columbus had returned triumphant to Spain. In historic irony, the nation that made the greatest contributions to navigation and the subsequent geographic enlargement of the European sphere was not the first to make the Atlantic crossing. Once there, however, the Portuguese quickly installed a lucrative sugar industry in the pattern established earlier in the East Atlantic. Tropical America was the perfect extension of their East-Atlantic industry. The fields of northeast Brazil were rich, flat, well-watered, and had warm, steady temperatures and easy shipping access. By 1526 Brazilian sugar was entering the custom house at Lisbon (Deerr 1949). Production for the year 1560 is estimated at 2,470 tons. By 1660, this had increased to 34,000 tons and, by 1864, Brazil produced 237,898 tons of sugar (Deerr 1949, 113-114). Sugar persisted today as a major agricultural export of Brazil.

Though Portuguese success in sugar production was initially overshadowed by Spanish exports of bullion, in the end, the enterprise of the Portuguese worked a greater transformation on the European world. The great distances over which the product was shipped, the economies of scale involved in its production, and the magnitude of capital necessary to produce successfully all contributed to the expansion of the European capitalist system. The trans-oceanic sugar industry soon manifested all the characteristics of mature capitalism: use of bills of exchange; full engagement of the colonies in a reciprocal trade regulated multilaterally; receipt

of products of the metropoles in exchange for colonial products; and dependency on both sides (Wallerstein 1980b, 185). As with the Mediterranean, trans-Atlantic trade was driven by products of climatic complementarity. Caribbean and Brazilian sugar — and the associated slave trade to supply labor for the plantations — was to dominate the capitalist enterprise of the westward-reaching Europeans for three centuries. In the decades between the initial Spanish claims in the New World and the zenith of Caribbean sugar production at the close of the nineteenth century, subordinate European states were not content to see the Iberians garnering resources of the Americas appropriated through fiat alone. Other European states waited hardly a century before challenging for a share (Watts 1987).

English, French, and Dutch Interlopers

The subordinate European powers, absent their own supply of gold and silver, engaged in a second-best enterprise within the Spanish claim. They appropriated unguarded territory to launch a lucrative sugar industry that moved throughout the Guianas, the Caribbean, and eventually into southern Louisiana.

From 1560 to 1620, Spain and Portugal were united under the same crown making the Portuguese colonies vulnerable to the enemies of Spain (Braudel 1988 [1986]). The Dutch occupied Pernambuco, the principal sugar-producing region, from 1630 to 1654 and contributed significantly to enlarging the sugar industry of northeast Brazil (Deerr 1949, Galloway 1989, Goslinga 1985). Sugar movement to the minor islands began with the ousting of Dutch Jews from (Catholic) Brazil in 1654 (Goslinga 1985). Jews from the Dutch exodus from Brazil were squeezed into ancillary, though not unprofitable, roles of merchant, refiner, and slave provisioner as they moved to the tolerant English (Protestant) islands as they continued their entrepreneurship within “a mobile nation” (Braudel 1986 [1988], 193). The displaced Jewish

planters moved part of their "mobile nation" to Barbados where they transformed that island into the archetype sugar island.

Not only was the climate of Barbados ideal for sugarcane growth, but favorable trade winds provided ready sea lanes, powered the sugar mills, and contributed to the health of planter and slave alike. And the surrounding ocean confined the African slaves, eliminating all possibility of survival should escape be attempted. Small farms of the earlier English settlers were rapidly consolidated into large plantations and the small farmers were squeezed off the island. By 1700 the arable land of Barbados was completely planted to sugarcane and "little" Barbados (the island is but 166 square miles, 21 miles at its maximum length) produced 8,140 tons of sugar (Deerr 1949, 193) (Figure 2.5).

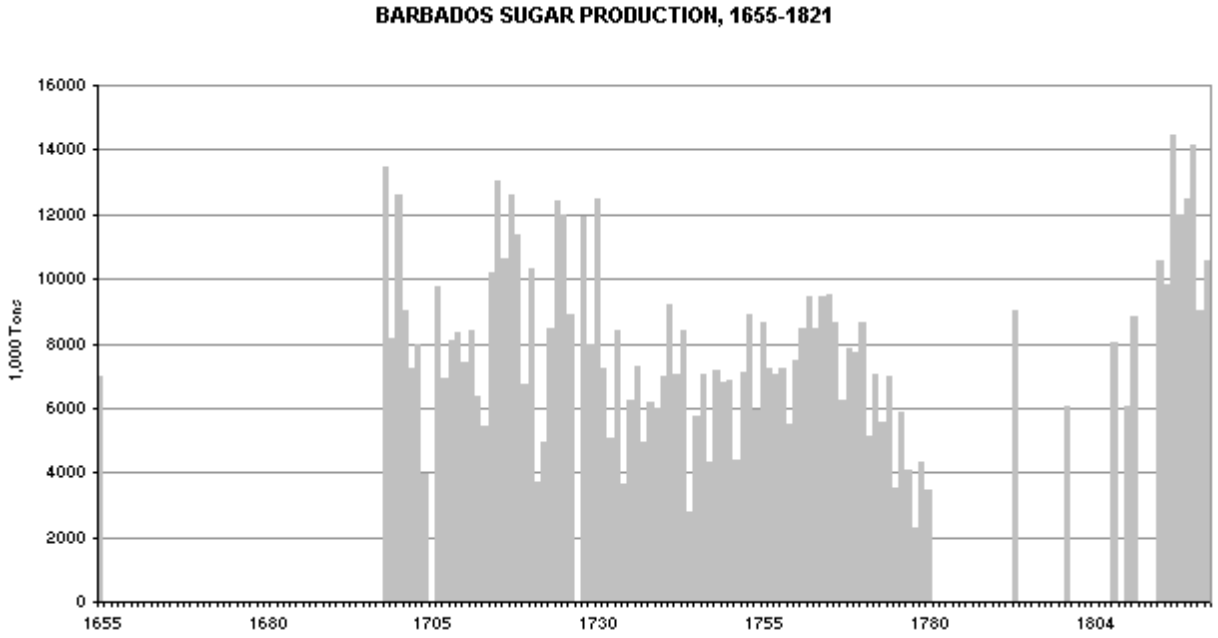


Figure 2.5. Sugar Production of Barbados, 16558-1821. Source: Noel Deerr, *The History of Sugar* (London, 1949), 193.

The Barbados model was moved to the other smaller islands and sugarcane cultivation installed to the exclusion of other productive activity (Galloway 1989, Goslinga 1985). This diminished local provisioning and, in turn, induced imports of foodstuffs, building material, textiles, and various equipment necessary for sugar production. These activities stimulated trade beyond what otherwise may have been the rate of expansion (Sheridan 1974). The enlarging sugar industry — and the associated trade in black slaves — contributed to an expanding network of trade that integrated the European economic realm from Africa to northeast Brazil, and north to Maryland (in addition to its eastward extension to Asia) (Figure 2.6). Tropical America supplied sugar (and molasses and rum), tobacco, rice, tropical fruits, cocoa, coffee, indigo, cotton, raw-hides, and, of course, gold and silver (Meinig 1986). The North American British colony provided all manner of supplies necessary for continued plantation production while the African continent supplied labor. (Wallerstein 1980a, Meinig 1993, Sheridan 1974, Frank 1978). By mid-seventeenth century sugar production had become the leading export crop of the Caribbean and sugar had become the "most highly capitalized plantation industry of the period" (Pares 1970, 24).

> This activity gave employment to ship and seamen, provided raw materials for processing and manufacturing, generated a variety of auxiliary trade from African slaves to New Foundland codfish, provided a field for fortune hunters, yielded revenue to European governments, and gave rise to wealth and income (Sheridan 1974, 11).

The contribution of Caribbean sugar to the Atlantic circuits of trade, however, was not absorbed by an undifferentiated Europe. Competition for this valuable crop heightened ongoing Atlantic as well as on the European continent. England, France, Holland, and minor rivalry among the European states. As old animosities continued, fighting was conducted across the European states also fought over the sugar islands, both to colonize for themselves and to

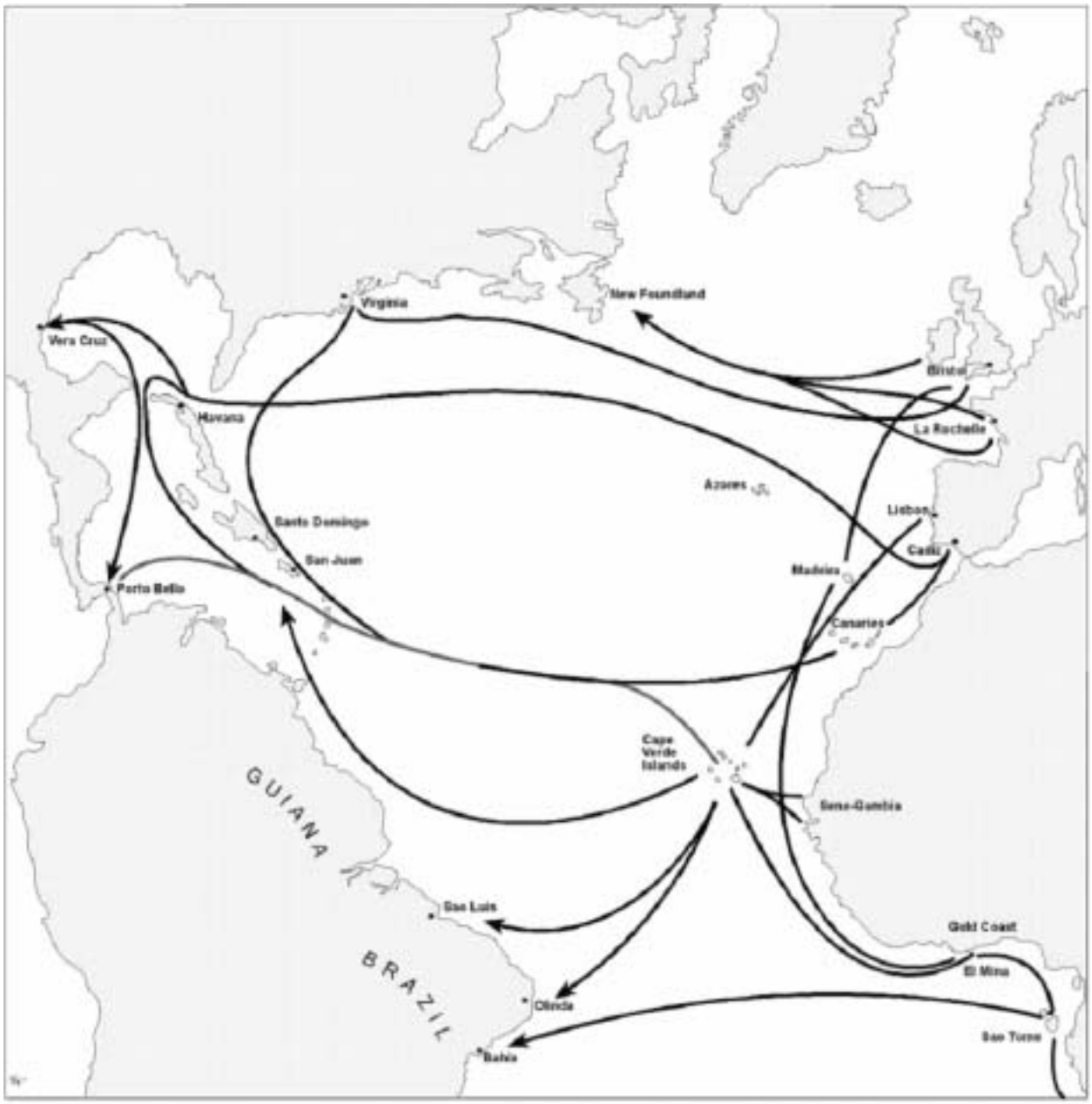


Figure 2.6. Atlantic Circuits of Trade, circa 1630. Redrawn from Donald Meinig, *The Shaping of America*, Vol. I. (New Haven, 1986), 56.

prevent colonization by the competition (Wallerstein 1980a). As sugar islands were seized in battle or by uncontested settlement, European states implanted a sugar industry until every Caribbean island as well as parts of the mainland were enveloped by the plantation sugar industry (Figure 2.7).

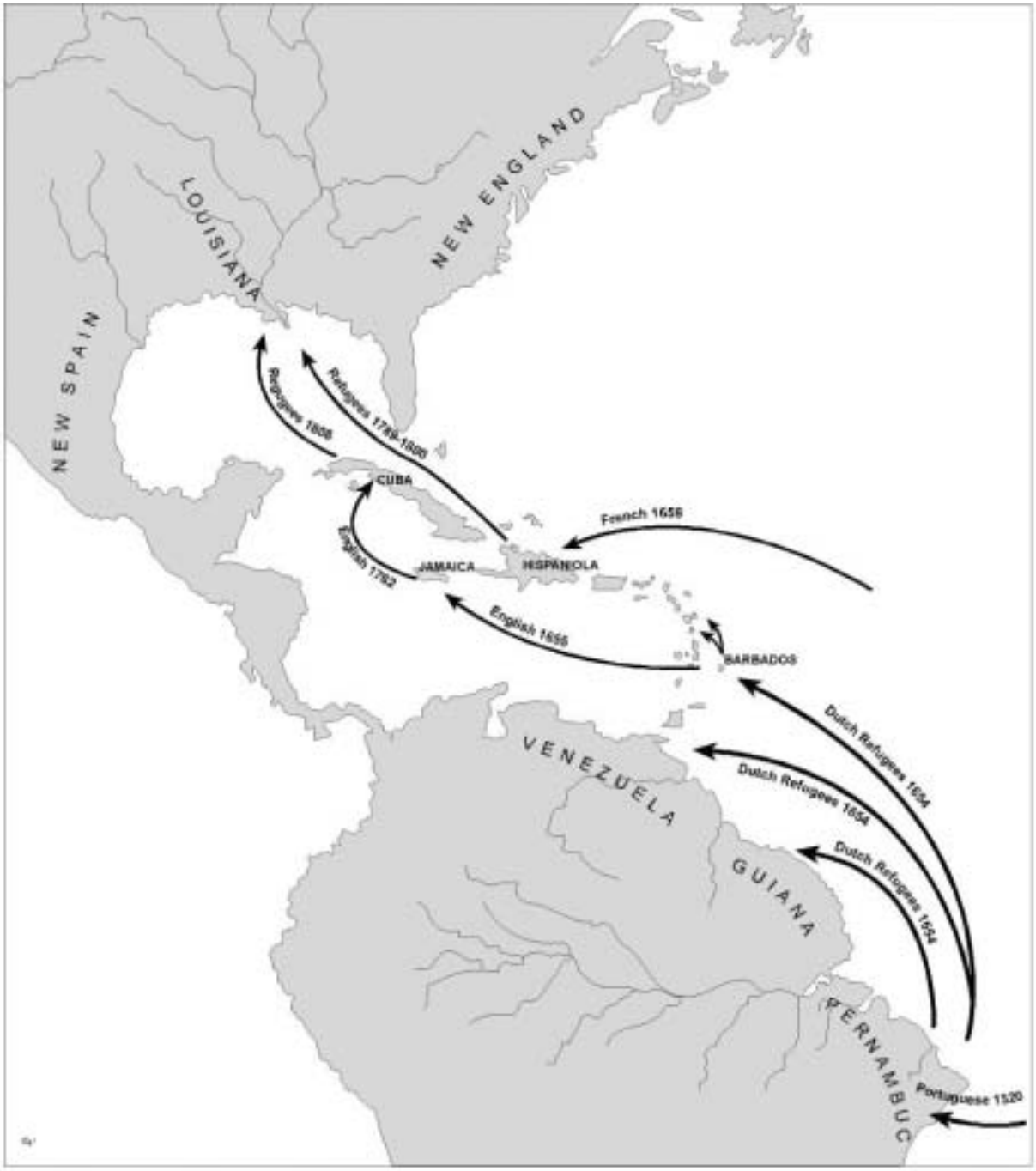


Figure 2.7. Diffusion of Sugarcane in the Americas. Sugar moved relentlessly towards Louisiana by successive colonization, conflict, and treaty-defined exchange of territory among the European powers. The Dutch, who occupied Pernambuco from 1625 to1654, moved sugar manufacturing technology into the Caribbean following their explusion from Brazil in 1654. This stimulus enlivened an industry that the Spanish introduced at their initial occupation but never developed as significant contributor to European sugar supply.

> The plantation was truly an innovation in the Schumpeterian sense. It established new trade routes and shipping lanes, shifted millions of hoe cultivators from one side of the Atlantic to the other, determined the movement of capital, induced the growth of temperate-zone colonies to supply intermediate products, produced a class of nouveaux riche planters and merchants, and became a prize in the contest for power and plenty among the mercantile nations of Europe (Sheridan 1974, 107).

The trans-Atlantic trade had enormous impact in Europe. Merchant capitalists at Nantes, Bordeaux, Lisbon and Liverpool made 15-20 percent and even more on their money and continued their investments in the industries of Europe (Dunn 1972). The fortunes created by the slave-trade gave to the bourgeoisie "that pride which needed liberty and contributed to human emancipation" (Jaurès 1906, 197). In historic irony, it has been observed that the sugar industry and its associated slave trade provided the economic basis for the French Revolution (Beiguelman 1978).

By the close of the eighteenth century Europe was flush with expropriated wealth of the New World. Three centuries of sugar profits had been absorbed by the Europeans. Inca and Brazilian gold, and Potosi and Mexican silver flowed into the coffers of the Iberian crown and across Europe and into the Mediterranean (Figure 2.8). Sugar production and its associated trans-Atlantic movement encouraged other tropical production. Trans-Atlantic population movements accelerated as peoples migrated in search of better opportunity in the promising New World. Northern European entrepreneurs moved into Caribbean production in ever greater numbers. This stimulus is credited with initiating cycles of production that eventually led to the industrial revolution and an associated social mobility unprecedented among Europeans (Braudel 1977, Mintz 1985, Beiguelman 1978, Genovese 1969, 1979).

The plantation enterprise generated adequate wealth for the subordinate European states to challenge the hegemony of the Iberians. The Spanish who "contributed first through their

Figure 2.8. Bullion Exports from exico and Peru, 1550-1880. Redrawn from Fernand Braudel, *Civilization and Capitalism 15th-18th Century*, Vol1 (New York, 1985 [1979]), 422.

appetite for seafaring, conquering and planting" (Meinig 1986, 9), were to forfeit their vast claims in the Americas to France and England. By the onsetting nineteenth century Spain was constrained to her early claims in Mexico and South America. Even her North American colonies of Louisiana and Florida were forfeited to the powerful French and British. Ironically, Spain would see French refugees from a collapsing sugar industry begun in her own lost Hispaniola install a sugar industry in the Louisiana colony she nurtured for half a century. As Spain continued her southward retraction, this lucrative industry was to be enlarged by French refugees and the obstreperous offspring of the British as they continued the plantation system Spain, herself, first installed in the Americas.

The Africans

"It was the shortage of labour [in the New World], combined with the high yield of the mines and sugar plantations which was to allow the slavery of antiquity to be revived in the New World, that huge and traumatic step backwards" (Braudel 1995b [1949], 754). So does Braudel characterize the tragic and immutable link between sugar and slavery that prevailed in Brazil, the Caribbean, and eventually, the southern Louisiana sugar industries. Not only did slaves contribute to the installation and continuance of the industry, trade in slaves became an industry unto itself, generating fortunes for merchants whose maleficent source of wealth, in large part, lost to history.

The end of slavery had to await the abolitionists of the nineteenth century (Davis 1966). Columbus, himself, sent cargoes on Indians to Spain in 1495, 1496, and 1498 to be sold as slaves (Deere 1949). His suggestion to Ferdinand and Isabella that the profit could offset the expenses of his voyages was rejected by Isabella and the Indians were returned to the Caribbean. Hispaniola's Governor Ovando raided nearby Indian communities and enslaved the indigenous Ciboney as labor continued scarce in the new Spanish colony (Watts 1987). When these populations were exhausted, he sent raiders to the Bahamas, then to Florida where one planter, Vasquez de Ayllon, enticed Indians on board his ships, only to be frustrated by the death of many during the return sail to Hispaniola (Deere 1950, 261). Ovando himself made raids to Venezuela and the Central American coasts, but efforts to enslave the New World Indians met with little success (Watts 1987).

Faced with increasing labor demands and diminishing supplies, Hispaniola governor Ovando imported *ladinos* — Iberian Christianized Negroes — to work in the fields and mines of the Spanish islands. By 1510 continued need for labor caused the Spanish to import the *bozales*,

the "Negro not yet Christianized, but untainted by Islam or Judaism" (Meinig 1986, 21). By 1517, hardly two decades after the Europeans had arrived in the Americas, black slaves were imported directly from Africa (Dunn 1972, Watts 1987).

The Portuguese made the Cape Verde Islands their principal slave export center while São Tomé served as the entrepôt for assembling and "seasoning" slaves for the New World "market" (Meinig 1986). Spain secured slaves indirectly from the Portuguese stations off Africa, at the time beyond the (1507) Tordesailles restriction.[4] To oblige the papal prohibition of Spanish activity in Portuguese territory, Spain granted contracts (*asientos*) for the direct transport of slaves from the west-Atlantic slave stations into Spanish America. The first of the coveted *asientos* was given to Portugal, then to the Dutch, and later the English (Dunn 1972). By 1519 the notorious African slave trade system that was to supply labor to the Brazilian and Caribbean sugar industries for three centuries was in operation.

> Thus the system and pattern of the tragic African diaspora were also in place long before the northern Europeans got a firm hold upon any part of America and African slaves and Brazilian sugar had joined Mexican and Peruvian gold and silver as powerful lures to avaricious and nationalistic seafaring predators. It was through their opportunistic forays into this tropical realm that small strands of this African-American connection would become attached to North American shores and introduce one of the most fateful additions to American diversity (Meinig 1986, 24).

As sugar production escalated, black slaves were imported in ever-increasing numbers as the white planter class represented a diminishing percentage of island populations, especially in the French and British colonies (Figures 2.9 and 2.10).

By 1684 when La Salle made his historic descent of the Mississippi into what is now the historic Louisiana sugar area, the African slave trade was entering a third century (Figure 2.11).

[4] The Tordesailles Treaty was a revision of the 1493 papal edict granting to Spain all lands beyond a line 100 leagues west of the Cape Verde Islands and those east of the line to the Portuguese (Meinig 1986).

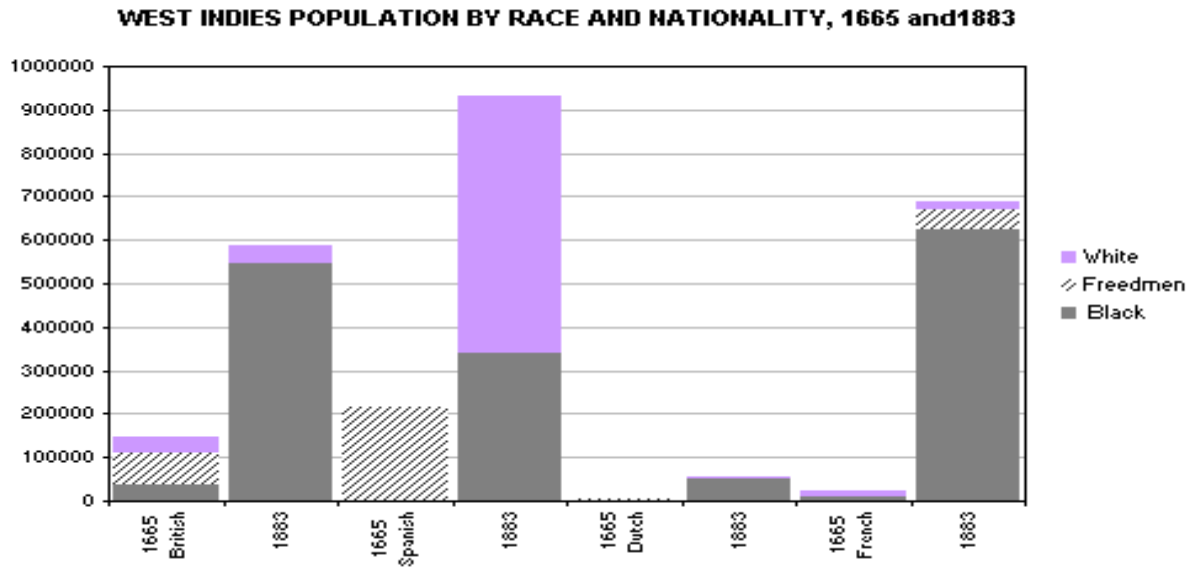


Figure 2.9. West Indies Population by Race and Nationality, 1665 and 1883. Source: David Watts, *The West Indies* (London, 1987), 311-321.

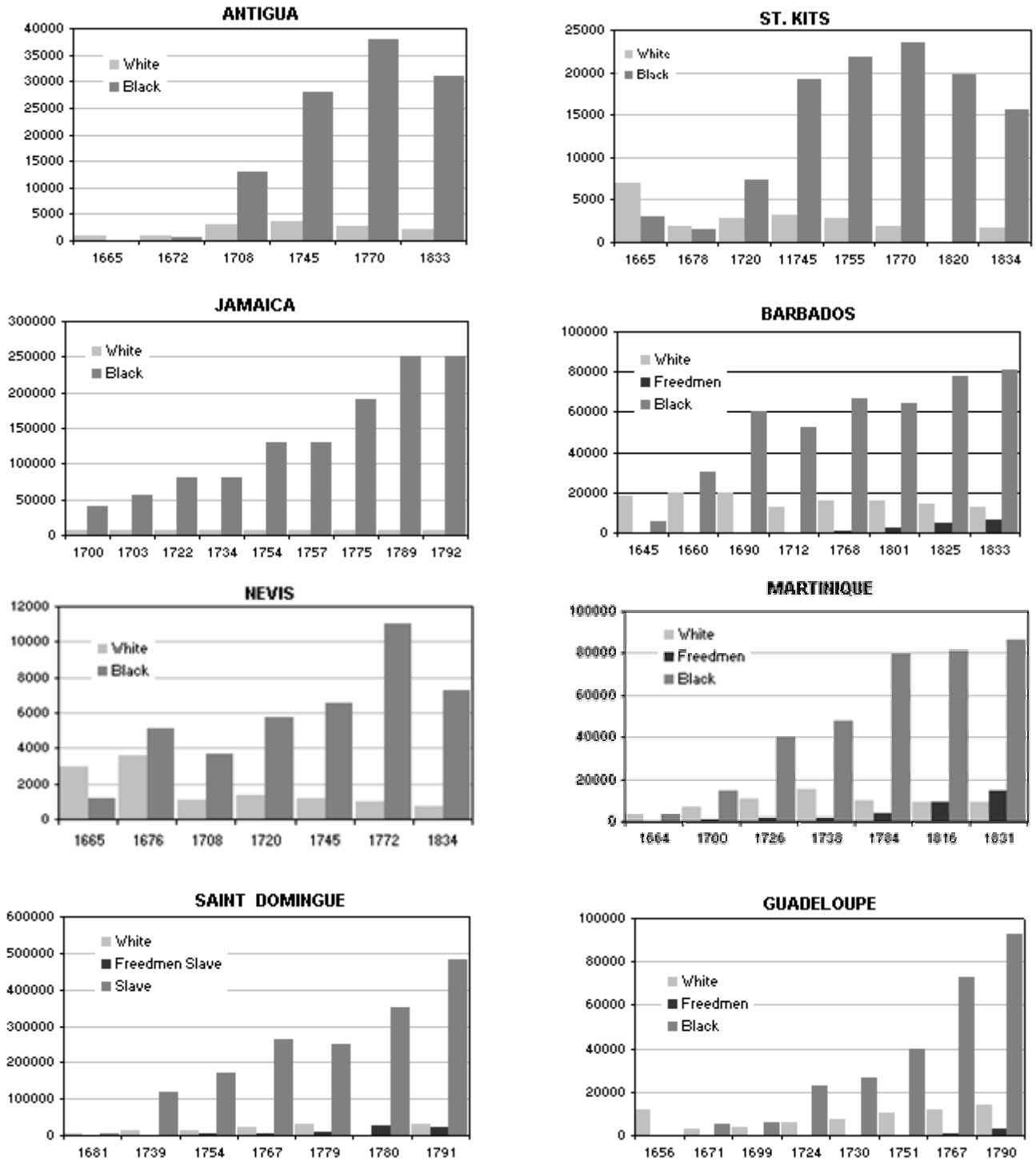


Figure 2.10. Slave, White, and Freedmen Ratios in Selected Sugar Islands, 1665-1890. Source: David Watts, *The West Indies* (London, 1988), 311-321.

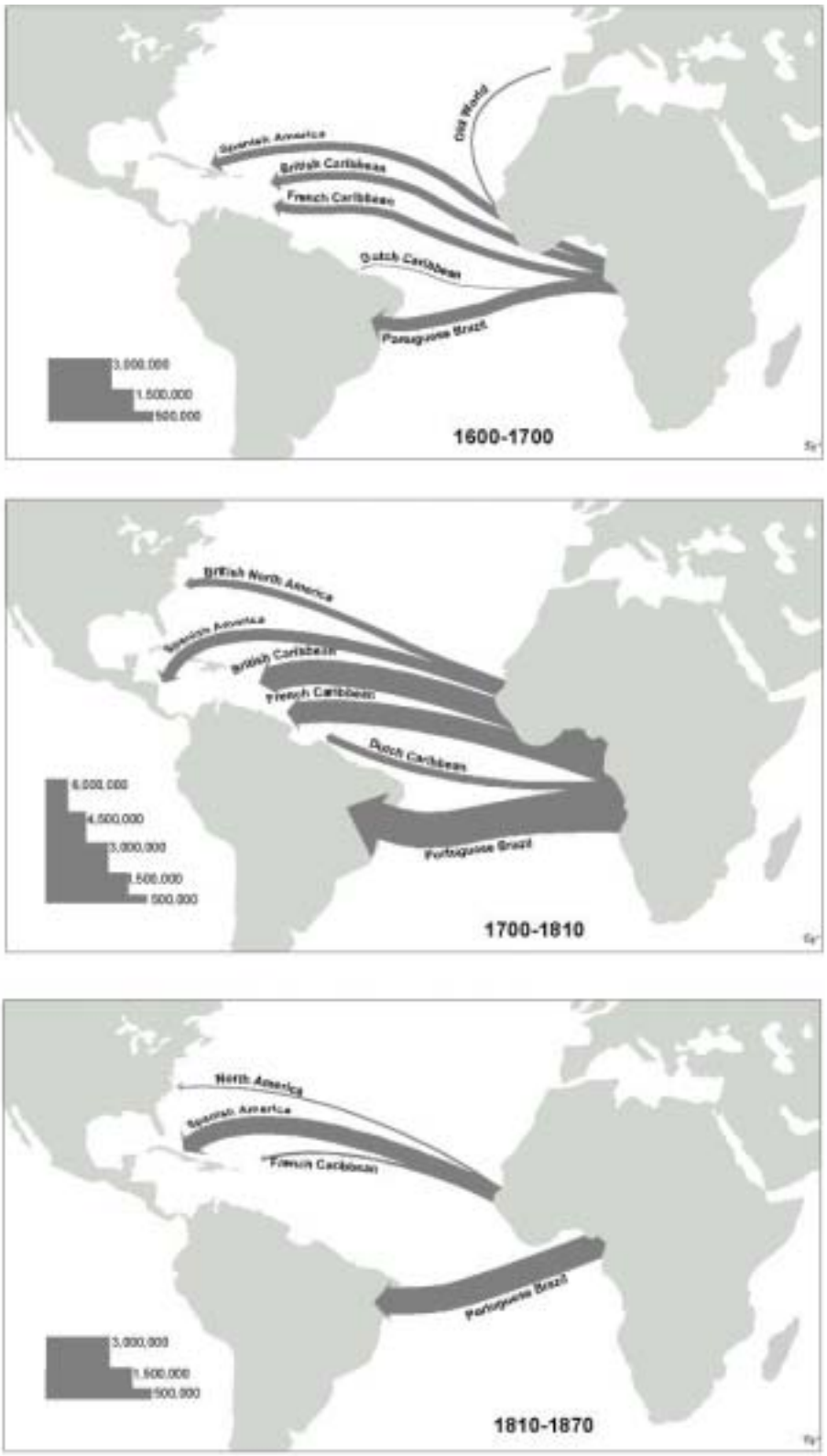


Figure 2.11. Slave Imports into the Americas, 1600-1870. Redrawn from Helmut Blume, *Geography of Sugar Cane* (Berlin, 1985), 170. (Data from Philip Curtin, *The Atlantic Slave Trade: A Census* [Madison, 1969]).

During this time millions of Africans and uncounted indigenous islanders had lost their lives in the service of the sugar industry. Meanwhile the future Louisiana sugar country lay quietly under an ambiguous Spanish claim that was of no immediate consequence to the Houma, Atákapa, and Chitimacha Indians living on lands to be later cleared by black slaves. Like the Ciboney before them, these indigenous peoples were to forfeit land and life as the French appropriated their homeland of millennia to install tropical production for the European market.

CHAPTER THREE

SUGAR AND SUGARCANE

Sugar

The product marketed as "sugar" is a saccharide (a form of carbohydrate) in pure crystalline form. It is variously called granulated sugar, crystalline sugar, or centrifugal sugar (because the crystals are removed from the uncrystallized molasses by centrifugation). Saccharides (sugars) are the simplest carbohydrates synthesized in nature and consist of various arrangements of the atoms carbon, hydrogen, and oxygen. The more common saccharides are sucrose, glucose, fructose, and dextrose. Saccharides are classified according to the number of distinct sugar molecules that form the compound: disaccharides, trisaccharides, etc. (Streitwieser and Heathcock 1981). Common table sugar (sucrose) is a disaccharide composed of the monosaccharides fructose and glucose. Its chemical formula, $C_{12}H_{22}O_{11}$, is represented in Figure 3.1. Because molecules of sucrose in "sugar" are identical, the source of the sugar — sugarcane or sugar beets — is irrelevant to the food industry. As will be discussed in chapter six, it is, however very important to the granulated sugar industry.

Sugarcane has been used as a sweetener for millennia and today refined sugar is used in copious quantities to supplement the natural sugar (fructose) found in fruits and vegetables. Sugar has been isolated from all parts of plants: from the stem of plants such as sugarcane, sorghum, sweet palm, maple, and maize (the source of high-fructose corn syrup [HFCS]); from the roots of the plants such as sugar beet and sweet potato; from any number of fruits such as the fig and the grape ("must"); and even from the flower itself, as the sweet *mahua* of India. Plant exudates are also a source of sugar, the *manna* of biblical fame being the more famous (Deerr 1949, Mathewson 2000).

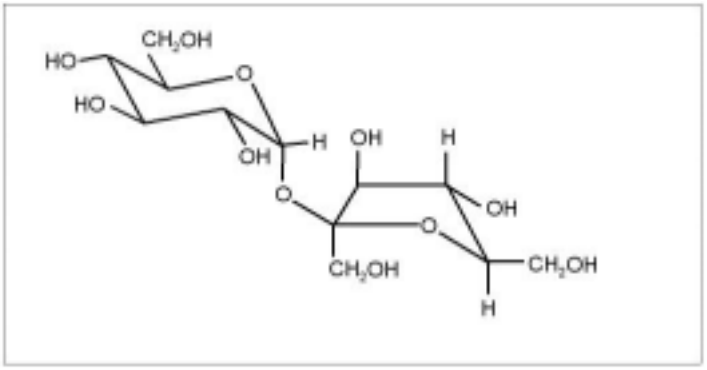


Figure 3.1. Chemical Structure of the Sucrose Molecule. Regardless of its source --either sugar beets or sugarcane -- the molecules of sucrose are identical. Redrawn from Andrew Streitwieser, Jr. and Clayton H. Heathcock, *Introduction to Organic Chemistry* (New York, 1981), 925.

The Sugarcane Plant

Sugarcane, like wheat, rice, corn and other grains, is of the grass family, Gramineae, characterized by segmented stems, blade-like leaves, and reproduction by seed (Barnes 1974). Sugarcane is a tropical plant; it has no adaptation to survive freezing and it is dependent on abundant sunlight for healthy growth. As in all plants, the growth of sugarcane results from the conversion of radiant energy from the sun into plant fibers and sugars (Figure 3.2). Tropical plants, sugarcane has a specific photosynthetic mechanism for fixing carbon into plant sugars. In this adaptation, the first product of photosynthesis is a four-carbon sugar (C_4) (rather than a three-carbon sugar) that is fixed in specialized cells in the conductive tissue (stem) of the plant (Cox and Moore 1985). In sugarcane, the concentration of sugar is exceptionally high, making the plant especially desirable to humans.

The carbon gain per day from photosynthesis varies with latitude as well as cloud cover. Latitude determines the intenseness of solar radiation on a horizontal surface and cloud cover determines the amount of radiation that reaches the surface. Cloud cover, in turn, is affected by

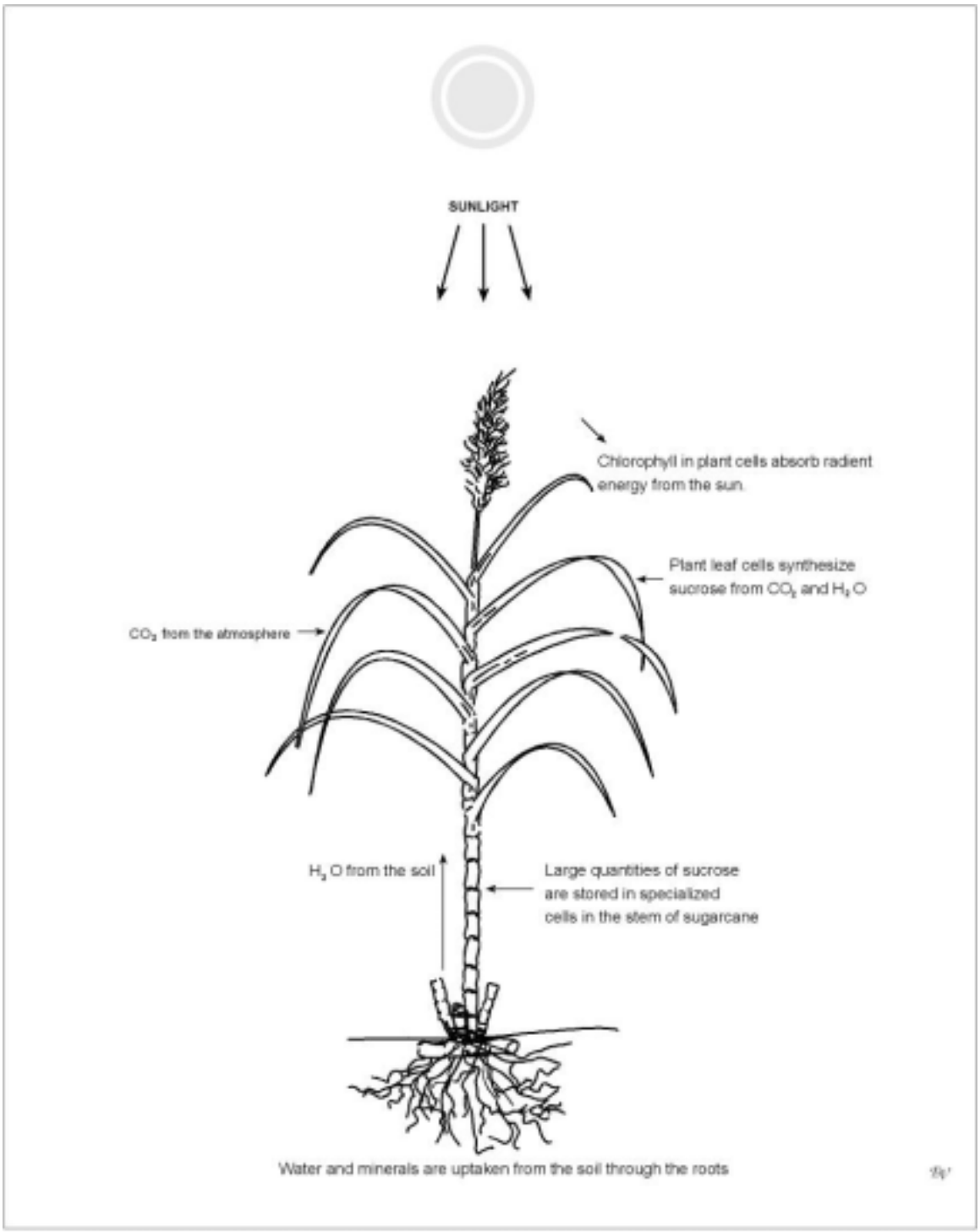


Figure 3.2. Insolation and Photosynthesis. Plants convert solar energy to chemical energy through photosynthesis. The efficiency of each species is determined by its adaptation to the challenges of a particular location, including variety in temperature, soils, and solar radiation.

air currents and the arrangement of continents and oceans. The average solar insolation at any given location is, therefore, a function of latitude and its location relative to continental and ocean configurations. Figure 3.3 identifies areas of the earth's surface that receive the highest solar insolation.

The C_4 plants thrive best under conditions of high solar insolation and high temperature associated with the lower latitudes. Figure 3.4 illustrates the increased efficiencies of C_4 plants at lower latitudes as well as their reduced efficiencies at higher latitudes. The 40th parallel represents the outermost limit of optimum solar radiation for C_4 plants (Cox and Moore 1985). The present global distribution of sugarcane (Figure 3.5) reflects these associations. Because of insolation and temperature requirements, sugarcane cultivation in the Louisiana latitude is at a singular disadvantage.

Like other Gramineae, sugarcane has a wide distribution. Through time the Gramineae became an important food source for humans. Maintaining supplies of this seed continues to engage large segments of the human population. The sugarcane plant itself is of the genus *Saccharum*. Its early domestication is probably due to the ease with which it can be grown and reproduced. The *Saccharum* has five extant species: two wild (*S. spontanium* and *S. robustum*) and three cultivated (*S. officinarum, S. barberi*, and *S. sinense*) (Barnes 1974). More recent plant taxonomy includes two additional species within the genus: *S. bengalenese* and *S. arundinaceum* (McCann 1990). Sugarcane nomenclature is complex (and confusing) due to the long history of domestication in differing parts of the world where various names have been used for the same plant. Table 3.1, aptly titled "Sorting Saccharum Names," lists the stabilized names of extant sugarcane plants and the authorities to which the name is attributed.

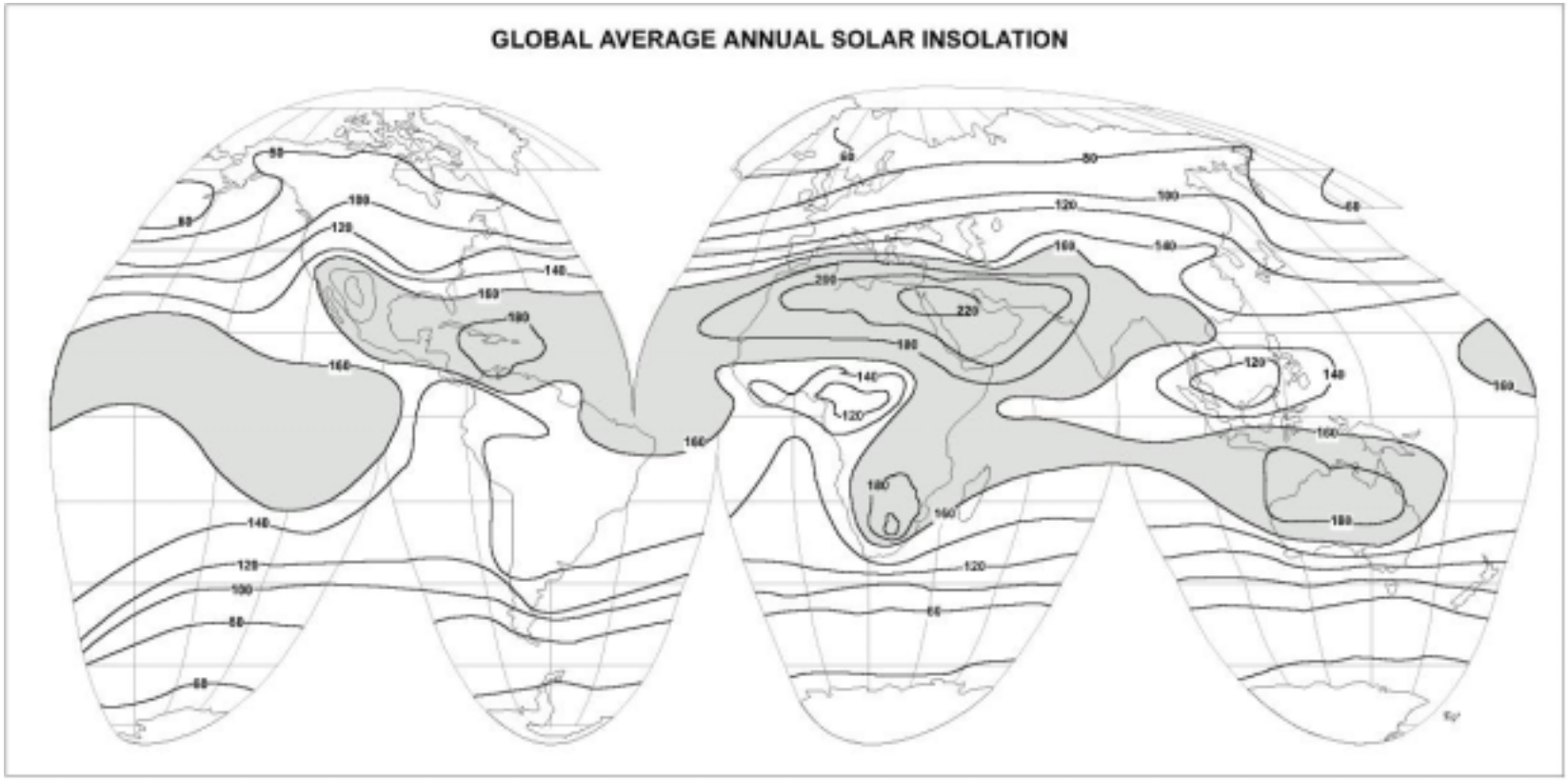


Figure 3.3. Global Average Annual Solar Insolation. The units indicated on the isolines are kilolangleys per year. A langley is a measure of solar radiation equivalent to one calorie per square centimeter of surface. A minimum of 160 kilolangleys per year is necessary for optimum sugarcane maturation. Redrawn from John E. Oliver and John J. Hidore, *Climatology: An Introduction* (London, 1984), 34.

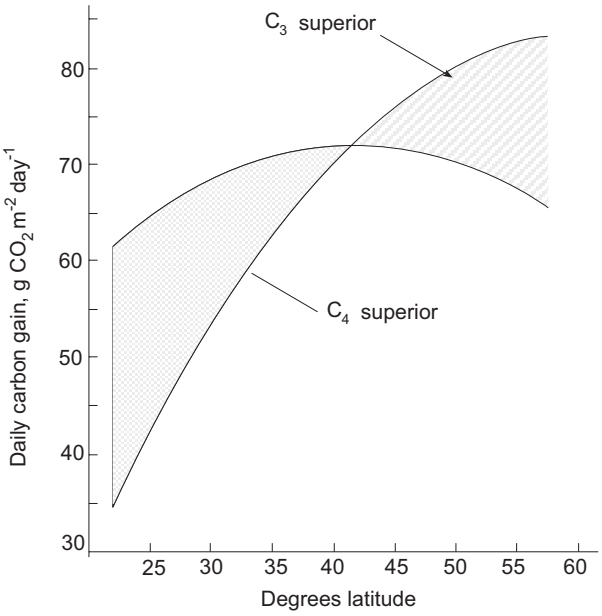


Figure 3.4. Predicted Levels of Photosynthesis for C_3 and C_4 Plants at 40º Latitude. Source: C. Barry Cox and Peter D. Moore, *Biogeography* (London, 1985), 37. Biomass acumulation advantage diminishes with distance from the equator for C_4 plants.

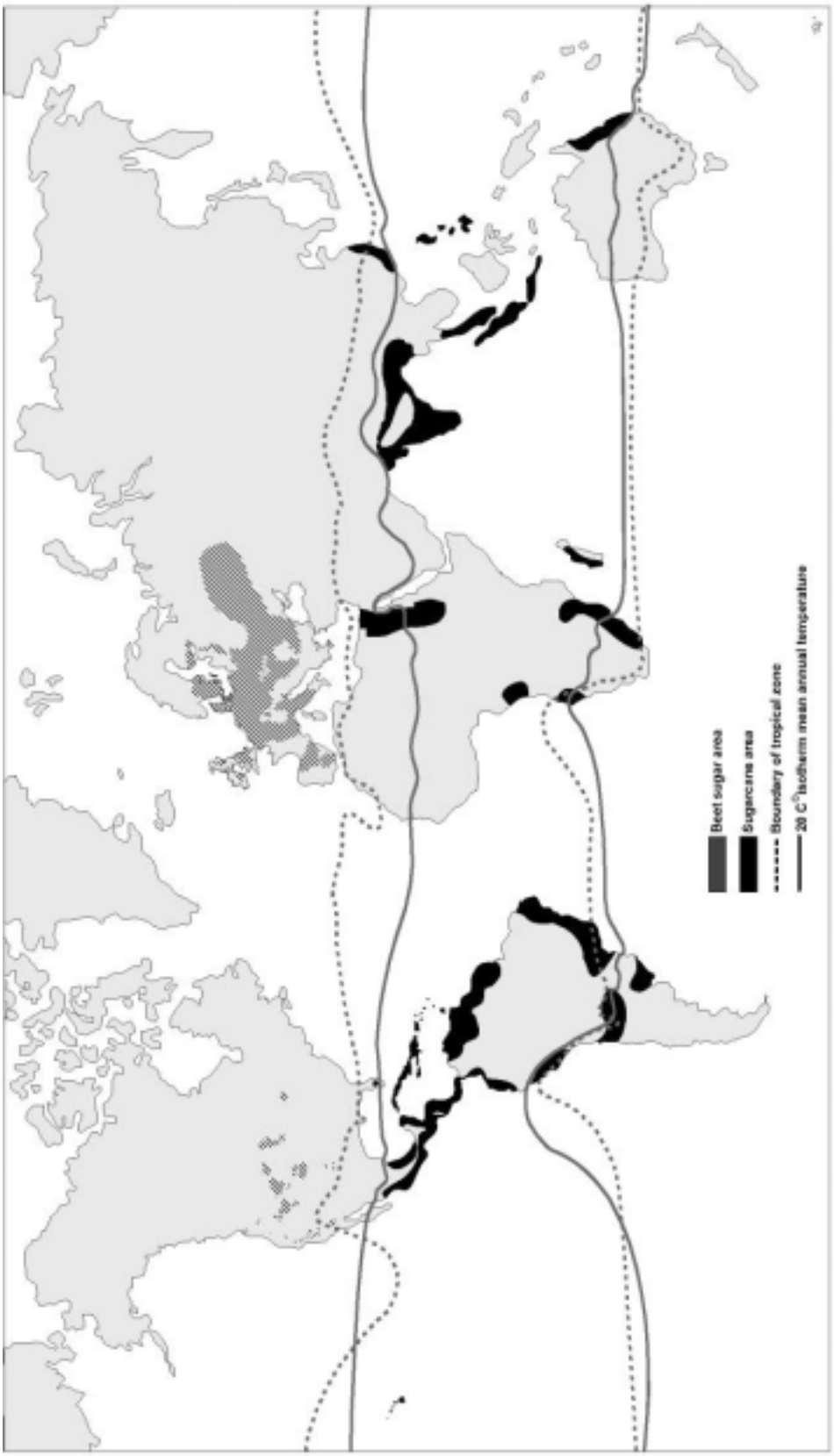


Figure 3.5. Global Distribution of Sugar Beet and Sugarcane Production. Redrawn from Helmut Blume, *Geography of Sugar Cane* (Berlin,1985), 22.

Table 3.1. Sorting Saccharum Names

Saccharum aegyptiacum Willd. ->
Saccharum arenicola Ohwi -> Saccharum spontaneum L. subsp. spontaneum
Saccharum arundinaceum Retz.
Saccharum barberi Jeswiet
Saccharum bengalense Retz.
Saccharatum biflorum Forssk. -> Saccharum spontaneum L. subsp. aegyptiacum (Willd.)Hack.
Saccharum ciliare Andersson -> Saccharum bengalense Retz.
Saccharum edule Hassk. -> Saccharum spontaneum L. var. edulis (Hassk.) K. Schum. & Lauterb.
Saccharatum exaltatum Roxb. -> Saccharum arundinaceum Retz.
Saccharum fallax Balansa
Saccharum fallax Balansa var. aristatum Balansa
Saccharum floridulum Labill. -> Miscanthus floridulus (Labill.) Warb. (GRIN,Wang)
Saccharatum hybridum hort. -> Saccharum officinarum L.
Saccharum japonicum Thunb. (Wang) -> Miscanthus floridulus (Labill.) Warb. (GRIN,Wang)
Saccharum japonicum Thunb. (GRIN) -> Miscanthus sinensis Andersson (GRIN,Wang)
Saccharum munja Roxb. -> Saccharum bengalense Retz.
Saccharum narenga (Nees ex Steud.) Wall. ex Hack. (GRIN)
Saccharum officinale Salisb. -> Saccharum officinarum L.
Saccharum officinarum L.
Saccharum officinarum L. var. violaceum Pers.
Saccharum paniceum Lam. -> Pogonatherum paniceum (Lam.) Hack. <- not yet entered in our own database
Saccharum pophyrocoma (Hance ex Trimen) Bor -> Narenga porphyrocoma (Hance ex Trimen) Bor -> Saccharum narenga (Nees ex Steud.) Wall. ex Hack. (GRIN)
Saccharum robustum E.W. Brandes & Jeswiet ex Grassl
Saccharum rufipilum Steud.
Saccharum sara Roxb. -> Saccharum bengalense Retz.
Saccharum sinense Roxb.
Saccharum spontaneum L.
Saccharum spontaneum L. subsp. aegyptiacum (Willd.) Hack.
Saccharum spontaneum L. subsp. spontaneum
Saccharum spontaneum L. var. arenicola (Ohwi) Ohwi -> Saccharum spontaneum L.subsp. spontaneum
Saccharum spontaneum L. var. edulis (Hassk.) K. Schum. & Lauterb.
Saccharum tinctorium Steud. -> Miscanthus tinctorius (Steud.) Hack.
Saccharatum violaceum Tussac -> Saccharum officinarum L.

Source: Multilingual Multiscript Plant Name Database, 2003.

Batavia, a variety planted in Louisiana in the early nineteenth century, was also called Crystaline, Transparent, Cheribon, and Preanger cane (Deerr 1949). Mutant forms of Batavia were variously called purple, yellow, or striped (as suggested by the stalk or leaf pattern and color). Deerr (1949, 22) comments that at his writing at least 1800 varieties were grown, though he acknowledged that different names probably referred to the same variety. Uba, a sugarcane from Brazil (later called “ribbon” cane) rescued the Louisiana industry from its disastrous

collapse due to mosaic disease in the 1920s. Through his extensive experimentation, Deere found Uba to be originally from Natal Province in South Africa, the name possibly derived from the corruption of "Durban" on a shipping label. He found that Pansahi, Chinea, Agaul, and Merthi of India — all summarily knows as Kavengerie — are also identical to the Uba cane (Deere 1949).

The confusion in early sugarcane nomenclature has been eliminated by a universal adherence to a standardized naming system. New varieties are identified by name of the breeding station and the number of the experimental plant. The variety presently invigorating the Louisiana industry is LCP-85-384. "L" designates the LSU breeding station in Houma, and "CP," that in Canal Pointe, Florida. Other varieties have similarly identifying prefixes: : "BH" indicates Barbados Hybrid, "CH," Cuba Hybrid; "CL," Clewiston, Florida; "POJ," Proefstation Oost Java, "Co" Coimbatore, Madras, etc.

Through time numerous varieties of sugarcane species have been isolated for sugar extraction. Today, hybrids of the species *S. officinarum* are the preferred breeding stock of the commercial sugar industry. On-going hybridization and genetic engineering (in which genetic materials (chromosomes) are manipulated at the cellular level) continue to enlarge the number of varieties available to the sugar industry (Gravois 2001).

Diffusion of Sugarcane

The species, *S. officinarum,* the basis of all industrial cane sugar production today, is also among the oldest cultivars domesticated by humans (Barnes 1974, Blume 1985, Galloway 1987). Confusion in the naming of sugarcane varieties makes tracing sugarcane diffusion a daunting task. American botanist E. W. Brandes, the current authority on the origins and distribution of sugarcane, places the emergence of the *S. officinarum* as a species in New Guinea

about 10,000 years ago (Barnes 1974). Barnes bases this assignment on linguistic as well entomologic evidence in which an obligate association was demonstrated among a parasitic fly, its host beetle, and *S. officinarum*, indicating that the three evolved in close proximity to each other (Brandes and Sartoris 1936).[1] Additional botanic and cytological research confirms that domestication of the species occurred as early 6000 BC (Galloway 1987).

From its origin in New Guinea, the sugarcane plant has experienced a wide dispersion as it accompanied humans in their various migrations. Brandes (in the 1936 publication with Sartoris) identifies three phases in the diffusion of the indigenous Papuan plant: 1) the 8000 BC eastward movement to the Solomon, Hebrides, and New Caledonia islands; 2) the 6000 BC westward movement to Indonesia, the Philippines, and India; and 3) the 800-1000 AD eastward movements to the Marquises, Society Islands, other parts of Oceania, and, finally, the Hawaiian Islands (Figure 3.6). In the latter case, ample linguistic and folkloric evidence confirms the presence of the plant in the islands from the tenth century AD. The 325 BC movement into the Mediterranean region by Alexander the Great, continued a westward diffusion that eventually brought sugarcane to Brazil, the Caribbean, and finally to Louisiana.

Undoubtedly, Arab innovations in irrigation (particularly the quanat system) played a large part in making the arid Mediterranean region suitable for sugarcane growth. Sugar extraction processes spread with the plant as the industry was extended into Egypt, East and North Africa, southern Spain, Cypress, and Sicily where it persisted longest before Spain and Portugal transferred the industry westward into the Atlantic (Galloway 1989, Barnes 1974).

[1] Deere (1949, 21), however, suggests that the wild species, *S. spontanium,* was carried to India and China where the subsequent domestic species, *S. barberi* (after the botanist, C. A. Barber) and *S. sinense* were isolated. Further hybridization then gave rise to *S. officinarum*.

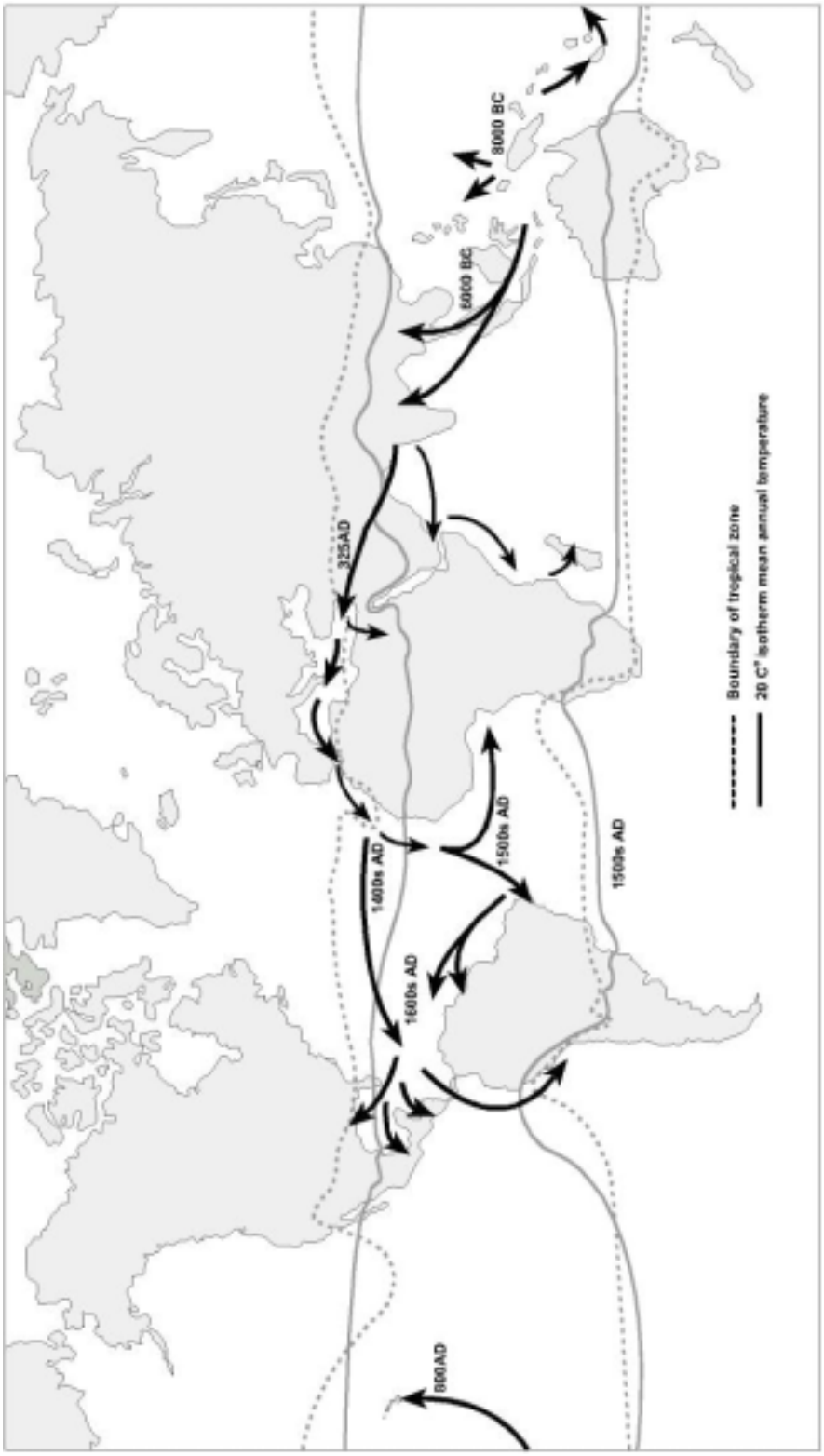


Figure 3.6. Global Diffusion of Sugarcane. Redrawn from Helmut Blume, *Geography of Sugar Cane* (Berlin,1985), 22.

The varieties brought westward in the fourth century BC and subsequently grown in Persia, Arabia, and Egypt formed the basis of the Mediterranean industry until another Indian variety, Puri, was introduced in the fifteenth century. Puri was the stock transferred to Madeira, the Canaries, Cape Verde Islands, São Tomé, and parts of West Africa and, in 1493, by Columbus to the Americas.[2] Puri cane — later called "Creole" cane — was planted throughout Brazil and the Caribbean until the mid-eighteenth century when varieties imported from the Old World began to replace it (Deerr 1949, Galloway 1989).

The continued productivity of the Creole cane after centuries of growth in the Americas was remarkable, given that the warm and humid climate necessary for its growth also encourages competition from pest and disease organisms. Plants of the Gramineae family (wheat, rice, rye) are usually reproduced from the germination of seed. Sugarcane, however, is reproduced vegetatively by placing portions of mature stalk ("sets") into the cultivated ground. The subsequent growth from the sets is, therefore, continued growth of the original plant. With no exogenous genetic contribution (as occurs in the formation of seed from the pollinated flower) the sugarcane plant "weakens" through time, manifesting less resistance to disease and producing less sugar.

By the mid-eighteenth century yields from Creole cane began to drop. Fortunately for the flagging Caribbean industry, Europeans were traveling the world in the "great voyages of discovery." Naturalists onboard the chartered ships collected domesticated cultivars (as well as exotic plants and animals) which they moved about the world in processes that greatly

[2] Because of the wide and early distribution of sugarcane, a pre-Columbian presence in the New World has sometimes been suggested. But, as presented in chapter one, expanding a sugar supply was a significant motivation for colonizing the New World tropics, so a history of early distribution in the favorable American tropics should be of no surprise.

accelerated the diffusion of cultivated plants. The flagging sugarcane industry of the Americas benefited from these relocations. Bougainville brought a resilient and highly productive cultivar from Réunion (Île de Bourbon) to Saint Domingue where it thrived in the Caribbean climate (Galloway 1987). The introduced variety was initially called Otaheite (Tahiti), but later renamed "Bourbon" or "Royal" cane. Captain Bligh brought Otoheite to St. Vincent from where it was moved to Jamaica to become the basis of that enormously productive industry. The Dutch also brought Otaheite (as well as other varieties) to their colonies in St. Eustatius, Curaçao, and Surinam (Deerr 1949). Movements of Otaheite continued throughout the sugar islands, replacing the flagging Creole cane and enabling the Caribbean industry to continue its prodigious output into the twentieth century. Most significance to this discussion, the 1795 de Boré granulation, credited with changing the course of the sugar industry in Louisiana, was from a crop of Otaheite newly brought to Louisiana from Saint Domingue (Blume 1984, Galloway 1987).

Barnes (1974) gives evidence of cane breeding in Mauritius as early as 1780. Later, more significant varietal contributions resulted from the work of John R. Bovell who, in 1888, rediscovered that sugar cane could produce fertile seed. The cane breeding industry Bovell initiated was centered in Barbados, coordinated with Kew Gardens in London, and eventually integrated with stations worldwide (Galloway 1996).

Louisiana sugar planters recognized early the importance of cane breeding to create disease-resistant and productive cultivars. To this end they formed the Louisiana Sugar Planters Association and encouraged the introduction of scientific methodology in both sugarcane cultivation and sugar manufacture (Heitman 1987). Their efforts to modernize were rewarded in 1896 when the LSU Sugar Station was established at Audubon Park in New Orleans to focus on the breeding of sugarcane varieties specific to the Louisiana industry. In 1923 the station was

relocated to Houma where collaboration among the USDA, the American Sugar Cane League, and the LSU Agricultural Center continues today.

Independent as well as collaborative research has characterized the modern sugar industry in the search for new varieties. A 1925 expedition to New Guinea to ascertain the origin of the sugarcane plant was a joint effort of E. W. Brandes of the USDA, C. E. Pemberton of the Philippines, and Dr. Jeswiet of Java — all significant contributors to the modern sugar industry (Deerr 1949). The principal sugarcane breeding stations today are the USDA Sugarcane Station at Canal Point, Florida, and the Indian Sugarcane Breeding Institute at Coimbatore, Madras.[3] These stations serve as major repositories for sugarcane germ plasm as well as centers for crossing, selection and evaluation of new varieties.

Sugarcane Planting and Harvest

Like other grasses, sugarcane will yield flower and seed at maturation. The genetic combinations resulting from seed germination, however, are not always desirable and cannot be reproduced consistently. (Additionally, sugar extraction efficiencies are greater if the sugarcane is harvested before it has "gone to seed.") Instead of planting seed, sugarcane is reproduced from sections of stalk containing nodes (called "sets") (Figure 3.7) that are laid in furrows and covered with soil. Roots and young shoots emerge from the nodes within several weeks. In Louisiana planting usually occurs in late October to allow the tender shoots time to mature

[3] A variety developed at Coimbatore, Co 205, proved to be a remarkable success in North India, particularly in Punjab, where it produced 50 percent greater yield than the indigenous varieties under cultivation. This was followed by other hybrids derived from the three species, *S. officinarum*, *S. barberi*, and *S. spontaneum*. Three of these varieties, Co 285, Co 312, and Co 313, also significantly improved local yields and formed the basis of further breeding work not only in India but also in many sugarcane growing countries. The variety, Co 419, contributed significantly to improved output in Barbados, Jamaica, British Guyana, Sudan, Kenya, Uganda, and Tanzania.

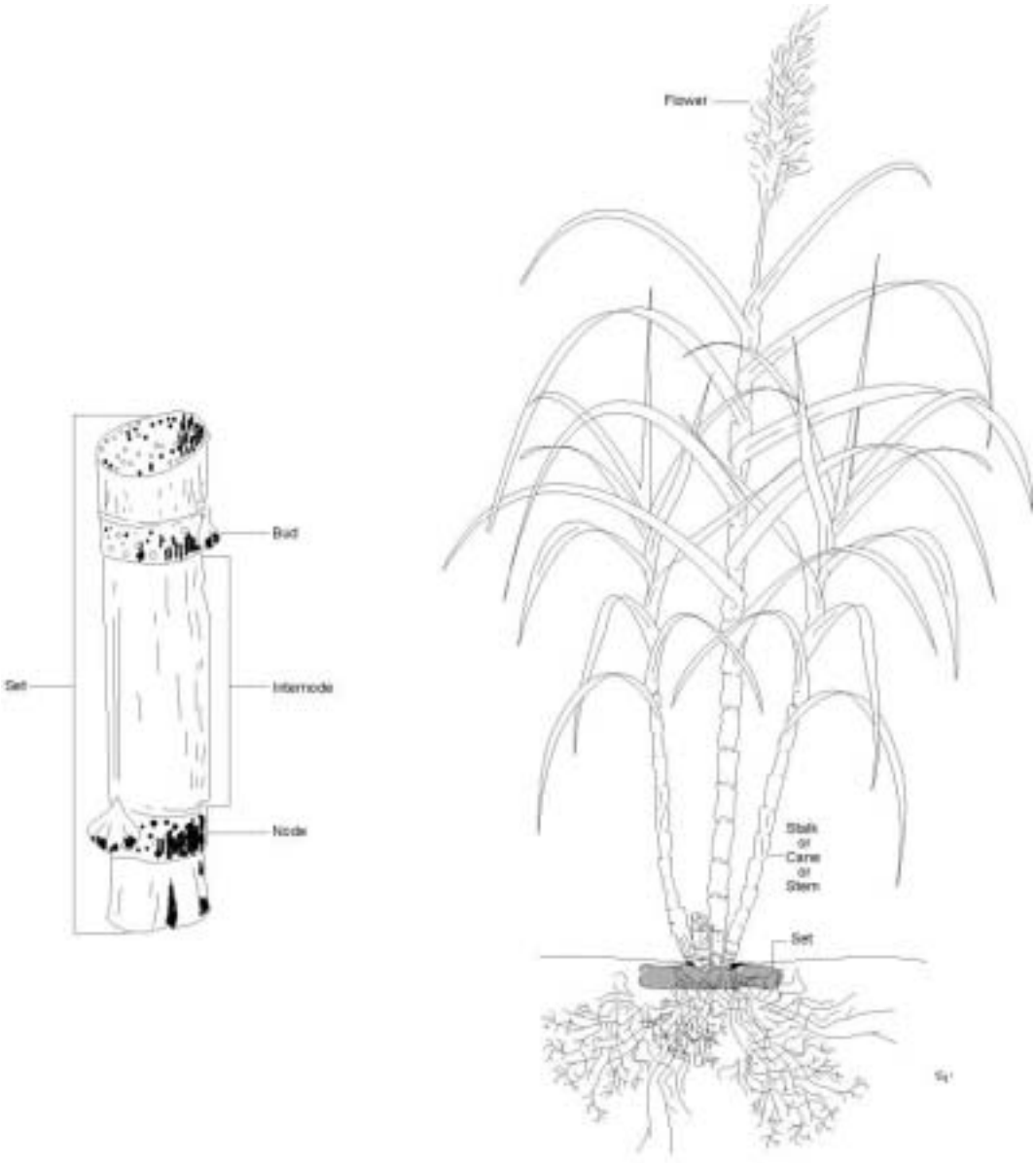


Figure 3.7. orphology of the Sugarplane Plant.

somewhat before a possible frost. At least eight months' growth is necessary for the stalk to accumulate adequate sugar for recovery (Gravois 2001). Figure 3.8 illustrates the wide variety of planting and harvesting seasons found throughout the sugar-producing countries. Those with the longest growing season obviously benefit from the highest sugar yields.

SUGARCANE PLANT AND HARVEST PERIODS IN SELECTED COUNTRIES

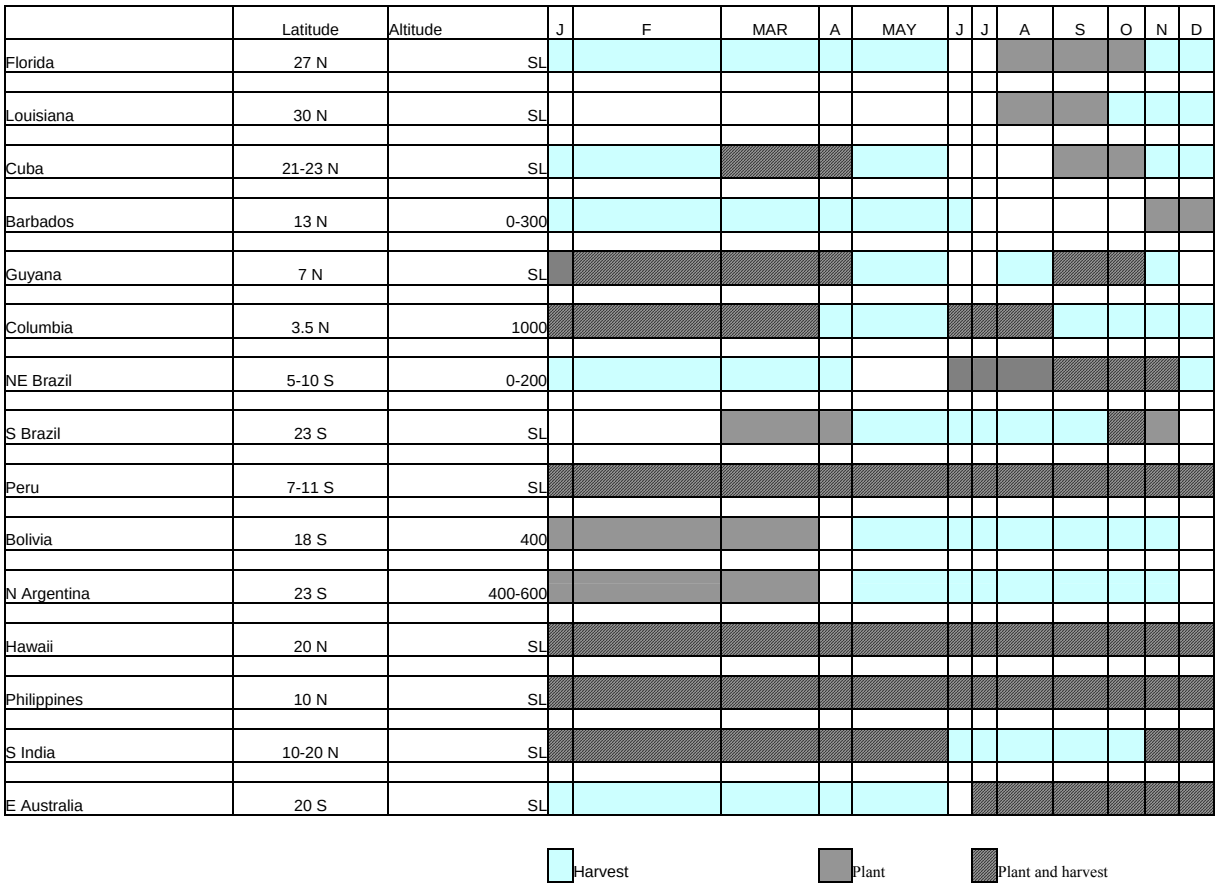


Figure 3.8. Sugarcane Plant and Harvest Period in Selected Countries. Modified after Helmut Blume, *Geography of Sugar Cane* (Berlin, 1985), 68.

Sugarcane harvest involves cutting the emergent stem (or stalk) at the ground. The roots are left in the ground and allowed to regrow or "ratoon." The first crop that emerges from the planted sets is called "plant cane." The subsequent crops are variously termed "first ratoon" (also "first stubble"), "second ratoon" ("second stubble") etc. Sugar concentration drops with successive ratoon crops so after two to three crops (historically) the old roots are excavated and a fresh "plant cane" crop is installed to begin the cycle anew (Figure 3.9). Production efficiencies in ratoon crops have been increased with newer varieties. The variety favored in Louisiana

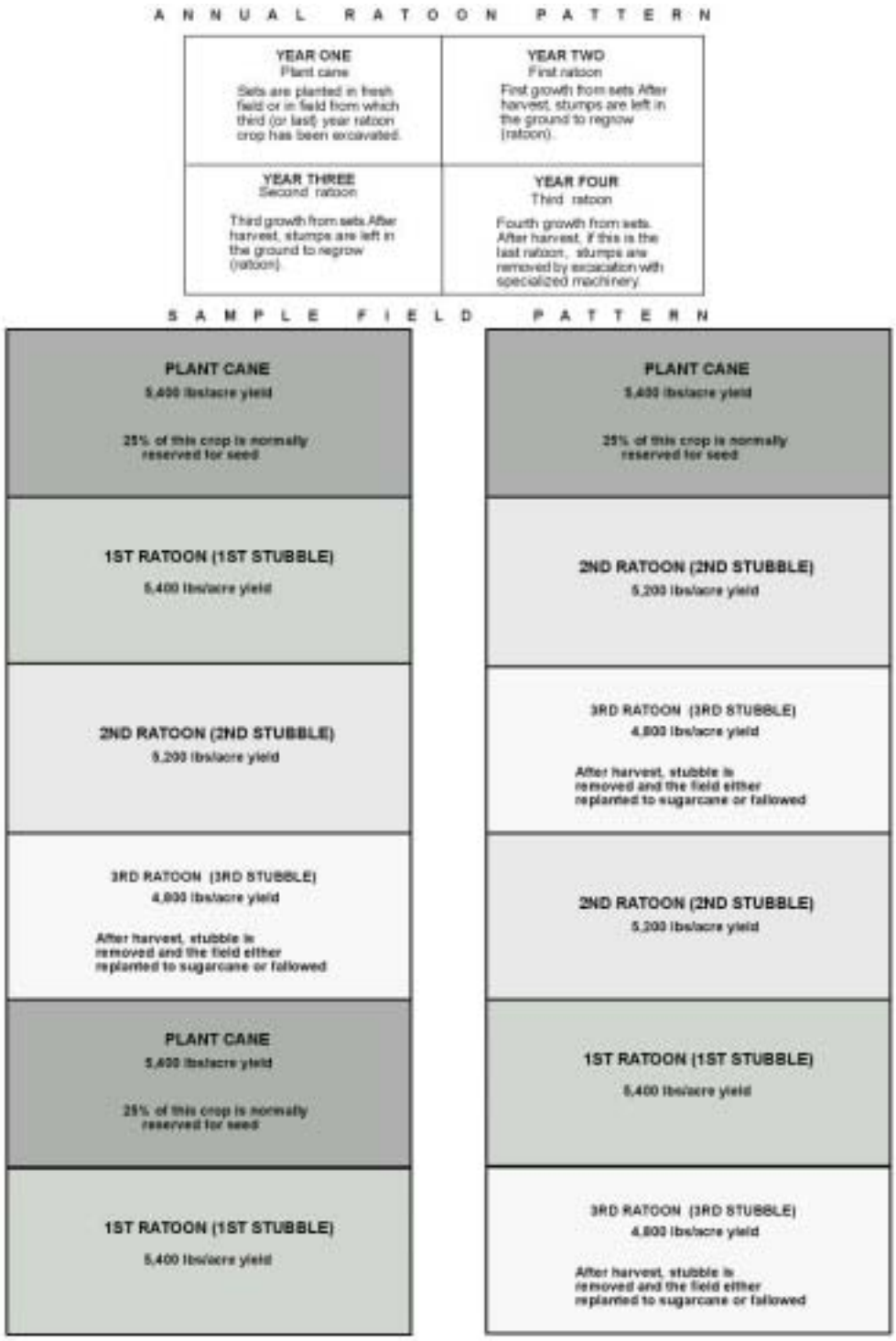


Figure 3.9. Sugarcane Ratoon Cycle. Twenty percent of plant cane is normally reserved for seed. The remainder, along with the stubble crops, is sent to the mill for sugar extraction, hence the designation "sugarcane for sugar" in data sets. In Louisiana, Variety LCP85-384 has enabled a fifth, and sometimes sixth, ratoon of adequate yield. Yields indicated here are for 1997 as quoted in Lonnie Champagen and ichael Salassi (Baton Rouge 1997), 8.

today, LCP 85-384, has produced as many as five ratoon crops of acceptable sugar concentrations (Gravois and Bischoff 2001). This long ratoon cycle is welcomed because it reduces the cost of clearing away an old crop and replanting a fresh field. Additionally, LCP 85-384 has greater cold tolerances and has increased yields as much as 20 percent since its introduction in 1998 (Gravois and Bischoff 2001).

In the subtropics sugarcane harvest ideally occurs before the first frost. When the sugarcane plant is subject to freeze (or harvest) photosynthesis immediately stops and the sucrose begins to change to dextrose and levulose, saccharides that do not readily crystallize by conventional processes. It is therefore important to harvest before a freeze and begin juice reduction (boiling) immediately after the canes are cut. In an earlier era, the planter decided when to begin the harvest, weighing his desire for maximum yield against the possibility of the loss of his entire crop in early freeze. Once cutting began, the "grinding" season was one of frenzied activity in which the cut cane was transported to the mill and juice reduction begun as quickly as possible. Today, harvest begins on a predetermined date for each farmer, set according to a pre-season contract with the mill. The mill's schedule, in turn, is determined (mostly) by its daily grinding capacity and the arrangement and size of the surrounding sugarcane fields. The cut cane is transported by truck (sometimes by rail) to centralized mills where the crop is processed with speed and efficiency unimaginable by earlier planters.

Sugar Manufacture

Granulated (crystalline) sugar has been made by humans for millennia (Galloway 1987, Barnes 1974, Deere 1949). Rudimentary boiling techniques practiced in India eventually led to

the "invention" of crystalline sugar (Deerr 1949). Evidence of earliest sugar manufacture[4] is scanty but, as with diffusion of the plant, linguistic evidence puts the first appearance of crystallization techniques in northern India at about 375 BC (Barnes 1974). Galloway (1989) cites references to "stone honey" that suggest China had crystallization techniques as early as 2000 BC. Brandes (1936) and Galloway (1989) both agree on the fourth century for the arrival of sugar manufacture in Persia.

Unlike mills that process wheat or rice, a sugar "mill" both extracts juice from the canes and manufactures crystalline sugar. A sugarhouse ("boiling house" or "sugar factory") is, therefore, an integral part of a sugar mill. In Louisiana, before rapid transportation was available, each planter had his own mill on site. The urgency to cut and process sugarcane descended on all planters simultaneously and only by coordinating his own cutting and milling could a planter assure success. Once harvest began, the furnaces kept the cauldrons boiling night and day and the sugar-making process was not interrupted lightly (Sitterson 1953a, Prichard 1927). A bottleneck at any point in the production process could have expensive consequences. Labor disruption or mechanical failure of the mill could stop the flow of juice. Fuel shortage could stop the boiling process. Production efficiencies, therefore, required an unusual amount of skill and vigilance on the part of the planter.

Though the modern sugar mill and those of the seventeenth century bear little resemblance, the function of the two facilities differs only in complexity and efficiency. The earliest mills of the Caribbean and Louisiana continued a technology first developed in India and

[4] The process of reducing the cane syrup to the point of crystallization, while referred to as the "manufacture" of sugar is, in fact, only a process of extraction. The sucrose solution is reduced (water is removed) until the sugar assumes its characteristic solid, crystalline form. There is no assemblage of molecules (or product) as is usually indicated by the term "manufacture."

improved by the Arabs. This consisted of wooden rollers in a set of three through which the canes were fed manually (Figure 3.10). For centuries animal or water power turned the mills. Wind was used where favorable air currents prevailed but, for the most part, no significant improvement in the milling process occurred until the nineteenth century when the steam engine introduced dramatic increases in extraction efficiency. Iron and steel casings strengthened the rollers and steel bearings and gears reduced mechanical failures (Fraginals 1976). The modern mill continues the three-roller innovation of the Arabs (Figure 3.11). It is electricity-powered and consists of multiple sets of metal rollers that achieve juice extraction approaching 85 percent efficiency (Reheder 1999) — in marked contrast to the estimated 20 percent efficiency of the older mills (Fraginals 1976).

Figure 3.10. Animal-Powered Three-Roller Sugar Mill. The three-roller mill was an Arab improvement on the Indian vertical, two-roller mill. This innovation was used for centuries in the Mediterranean, the East Atlantic sugar islands, Brazil, and the Caribbean. Source: Noel Deerr, *The History of Sugar* (London, 1949), Plate 27, facing p. 230.

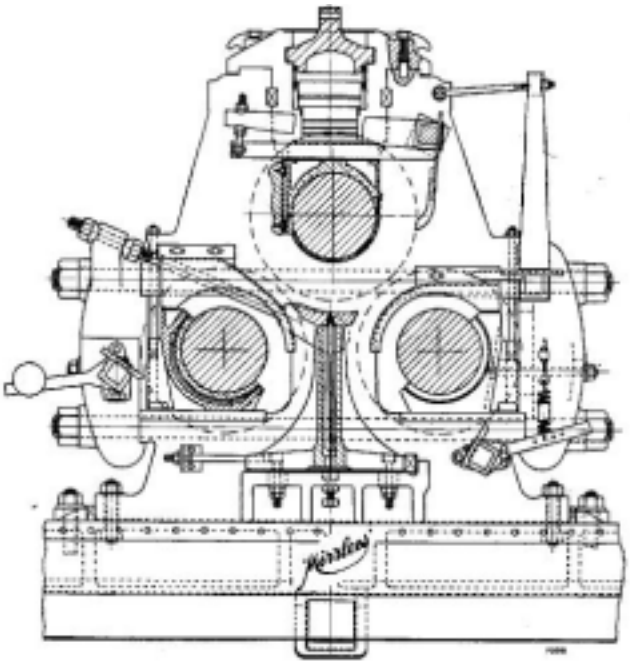


Figure 3.11. Early Twentieth-Century Three-Roller Mill. This diagram of the three roller-mill as produced in the early twentieth century, shows the continuation of Arab technology that introduced a third roller to the earlier Indian two-roller design and thereby achieved greater extraction efficiency. Today's modern mills still use the three-roller arrangement in multiple sets. Source: Noel Deerr, *The History of Sugar*, Vol. 2 (London, 1950), 543.

The early reduction techniques used in the Caribbean as well as Louisiana consisted of a series of open-air kettles in which the syrup was transferred as viscosity increased. In this "Jamaican train," the first kettle, called the *grande*, held 70 to 100 gallons of juice. The second was called the *flambeau*, the third the *sirop*, and the fourth the *teche* or *batterie* (Figure 3.12).[5] The "strike" (*teche*) is the moment crystallization begins. Occasionally, the sugarmaster initiated crystallization by throwing in a handful of sugar to serve as crystal "seed." Once crystallization began, the thickening mass was poured into a wooden trough or "cooler" where it was beaten

[5] The kettle in which De Boré's historic granulation occurred is on permanent display in front of School of Chemical Engineering at Louisiana State University in Baton Rouge.

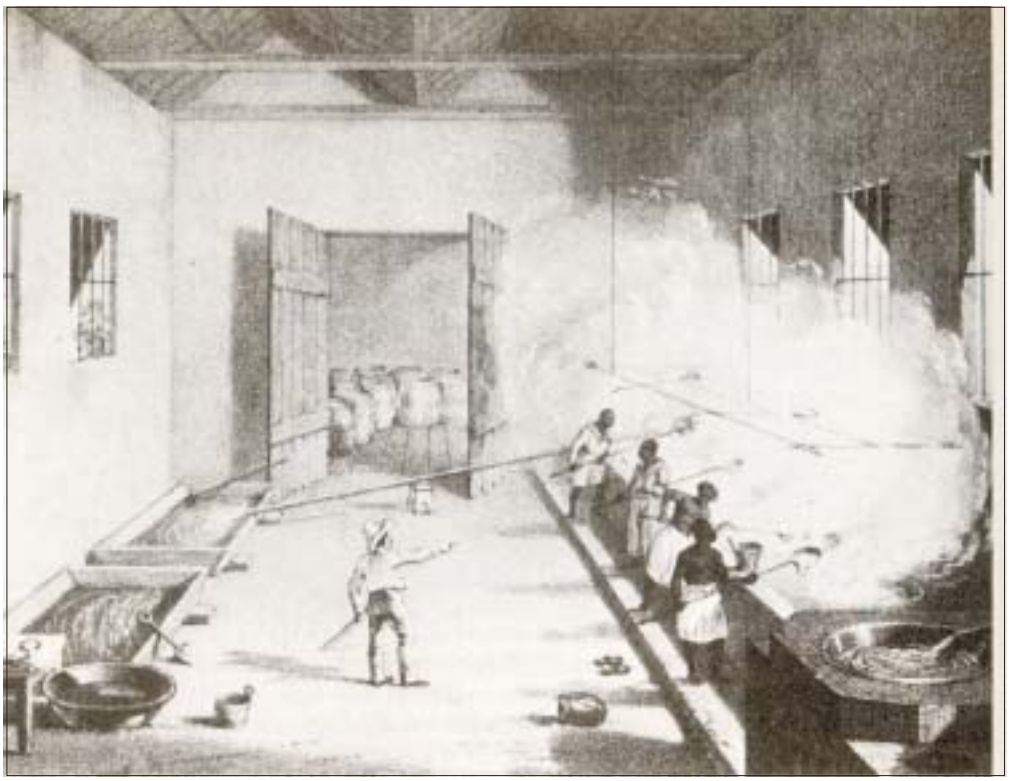


Figure 3.12. Inside an Eighteenth-Century Sugar House. Slaves are ladeling the syrup from right to left in a series of kettles arranged in the "Jamacian train." The *grande* is in the right foreground. The wooden trough for crystallization is in the left background and a ramp for moving the massecuite (mixture of syrup and sugar crystals) is shown connecting it to the *teche, the boiling kettle in which crystallization occurs*. Crystallized raw sugar is shown in the trough in the left foreground. Source: Noel Deerr, *The History of Sugar* (London, 1950), Plate 24, opposite p.451.

with wooden paddles to encourage further crystallization. The thick magma (called "massecuite") was then poured into large casks, positioned in elevated draining rooms, and the uncrystallized syrup caught in cisterns positioned below the casks. Improvements on the Jamaican train continued into the nineteenth century as foundries used available metals to increase the size and efficiency of the train (Deerr 1949, Fraginals 1976) (Figure 3.13).

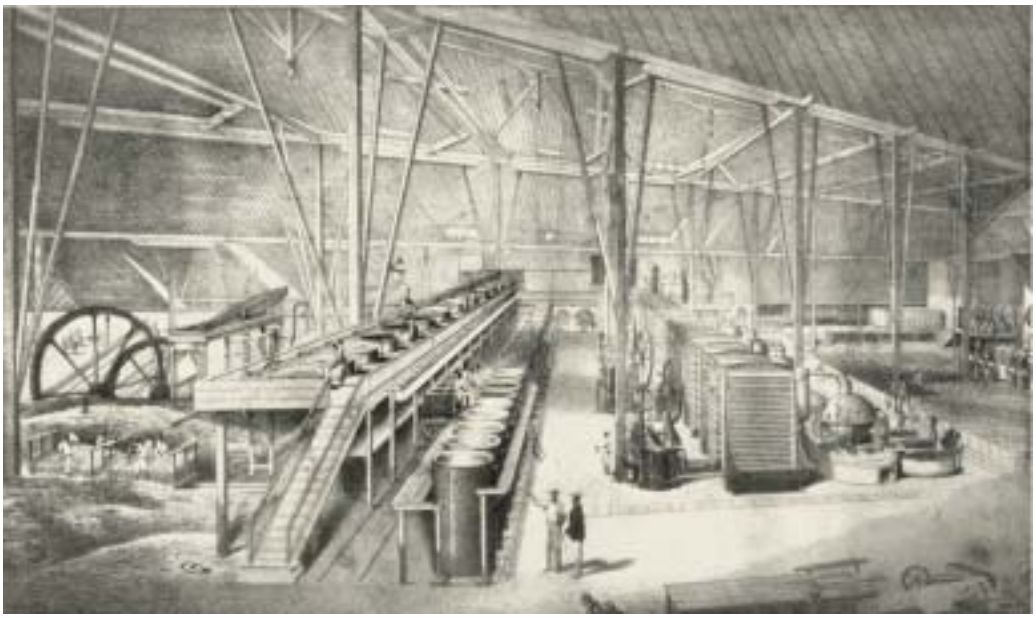


Figure 3.13. Inside a Nineteenth-Century Sugarhouse. The wheels of the mill are seen to the far left. The rows of boiling kettles in the center are an elaboration of the Jamacian train. The filtering cisterns and vacuum pans for final crystallization are to the right. From Geoffrey Fairrie, sugar (Liverpool, 1925), Plate 59, opposite page 158.

In an earlier era, the thickening mass was poured into conical molds (a Venetian innovation) that had a hole at the smaller end for molasses drainage (Figure 3.14). This processes was called "purging" and it preceded "claying," a primitive refining method that produced "clayed" or whitened sugars. After the rise of off-site refining, the resulting raw sugar was transported to a distant location where it was re-melted, further purified, then recrystallized.

The process of removing undesirable products (purification) continued basically unchanged from the early centuries until modern chemical and mechanical introductions of the mid-nineteenth century. As boiling began, flocculants (agents that induce precipitation) were added to bond with impurities and the solid debris was removed with strainers or sieves. The resulting solution was then boiled until crystallization occurred (Fraginals 1976, Deerr 1949).

Figure 3.14. Fifteenth-Century Venetian Draining Cone and Sugar Loaves. The massecuite was placed in a cone-shaped mold and the draining molasses was collected in a vessel positioned below the mold. The resulting sugar "loaves" are shown on the adjacent table. Drawn from a photograph in Fernand Braudel, *Civilization and Capitalism 15th-18th* Century. Vol. 1 (New York, 1992), 225.

In the eighteenth century flocculants were made from strongly alkaline plants such as the jobo, ceiba or almácigo tree (Fraginals 1976). By the late eighteenth century lime was increasingly used as a flocculent for juice purification. Technical improvements in purification and crystallization were slow to come. The introduction of scientific instrumentation began with the Baumé hydrometer (also called the “saccharimeter”) in 1799 (Heitman 1987). This instrument allowed the sugar master to monitor increasing density and better anticipate

crystallization. Subsequent application of modern chemical and mechanical engineering has resulted in the efficient modern mill where sugar recovery rates approach 31 tons per acre, almost 14 percent of the gross weight of the sugarcane (USDA 2001).

Sugar Refining

Earliest refining technology consisted of the claying method in which raw sugar was purified in its draining cone. In the claying process hydrated clay was applied to the top of the cone and within 30 to 40 days the draining water carried away any excess molasses and associated impurities. After drying in the sun, the sugar "loaf" was removed from the mold and cut according to grade, from "white" near the clay-end to "brown" or "muscavado" near the end farthest from the clay. As many as 16 grades were gotten from one loaf (Fraginals 1976, 34). Granulated sugar was manufactured and traded in this characteristic shape until the modern era.

Typical sugar loaves can be seen in the representation of Napoleon in Figure 3.15. The habit of granulated sugar to retain the shape of its draining mold encouraged some of the first applications of the confectionary craft that arose with the availability of "clayed" sugars. The form as well as taste of sugar was prized. Elaborate geometric shapes and images of animals and flowers characterized many gifts of sugar. The record must surely still belong to the king of Portugal who, in 1517, sent to the pope a life-sized sugar effigy, one of each of his twelve cardinals *and* 365 six-feet tall sugar candles (Deerr 1949).

The quality of early manufactured sugar ranged from failed crystallization, yielding only molasses, to pristine white sugar that had been subjected to some form of refining. (As a precursor of rum, however, molasses was never without a market.) By the late seventeenth century a variety of sugars were available in Europe. The most prized was *cassonade*, a "choice, white, dry, fine-grained, violet scented" (Braudel 1982 [1979], 191) sugar from Brazil and

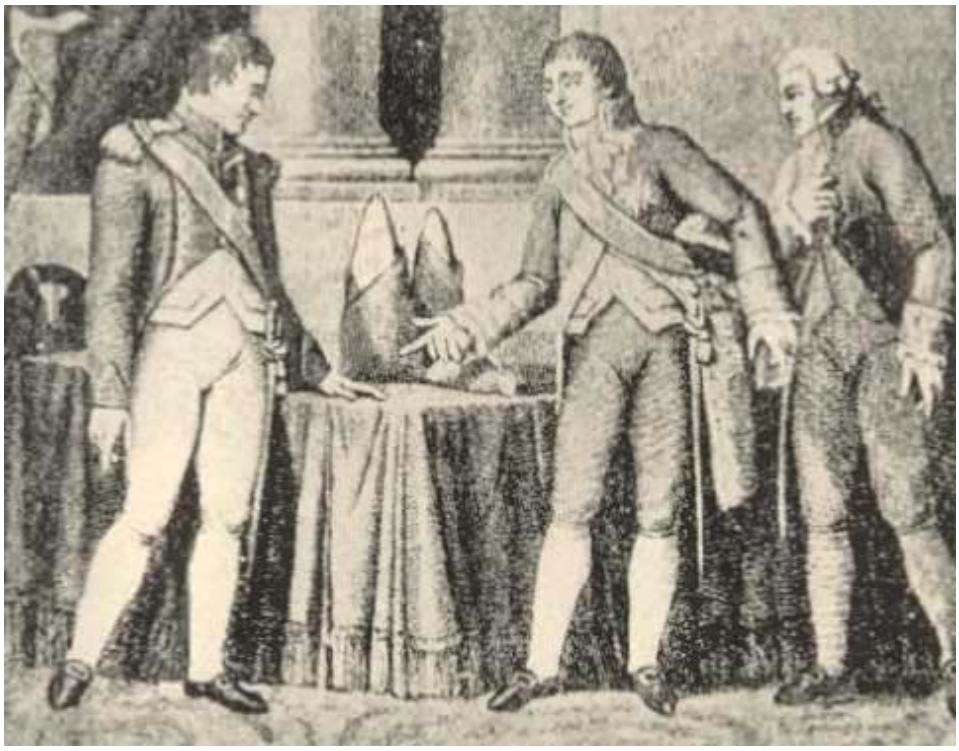


Figure 3.15. Napoleon and Delessert, Sugar loaves can be seen on the table in this photograph of an early nineteenth-century painting of Napoleon and his interior minister. Source: Noel Deerr, *The History of Sugar*, Vol. 2, (London, 1950), Plate 28, facing p. 475.

several of the sugar islands. Next in preference were the sugars from the east Atlantic islands and the Mediterranean: royal sugar, then semi-royal, candy sugar, and finally, Cyprus sugar, a reddish-tinted sugar made in the old Venetian mills of the Cornero family. Sugar from the West Indies fell into four major categories: 1) *muscavado* (raw), 2) *cassonade gris* (also called *sucre passé*), 3) *cassonade blanche* (also called clayed or *sucre terré*), and 4) *sucre raffiné.* The Dutch established a numeric classification of sugar based on color and granulation still in use today. "Twenty-five" indicated a sugar of ideal color and fine granulation while "one" indicated a dark, poorly crystallized sugar. The raw sugar price commonly quoted today on the London and New

York sugar and cocoa exchanges still references this Dutch Standard (DS). DS11 and DS14 are medium-grade sugars commonly marketed today as "raw sugar."

Undoubtedly most of the early whitened sugars were made by claying. At some point the refining process expanded to involve melting of the raw sugar, introduction of more flocculants to remove remaining dissolved impurities, and recrystallization. Early refining techniques were heavily guarded secrets and each "house" was associated with a certain quality of sugar. Various clarifying agents were used in the refining process but the principal agent used for centuries was albumin from egg white or animal blood. Four to five tons of refined sugar required 70-80 egg whites or two gallons of blood to clarify (Deerr 1949). These were added to the melted sugar and the resulting scum continuously scooped off or the solution strained through cloth until it was clear. The variability of success encouraged experimentation with different clarifiers.

Techniques in evidence after 1830 used a German method in which lime was added and carbon dioxide bubbled through the resulting mixture (Fairrie 1925). The liquid was "washed" by percolation through a series of filters made of bone-black (animal charcoal). Upon reduction this clarified syrup yielded fine, white crystals that has come to be the standard for refined sugar.[6] refining techniques became more complex, refining facilities gradually shifted to more convenient locations, usually closer to fuel, refining supplies, and the final market. The Cornero family of the fifteenth century first capitalized on the efficiency of centralized factories for refining raw sugar (Deerr 1949, 451). As the sugar trade spread throughout the Mediterranean, their refineries sprang up in Cyprus, Venice, the Papal States, and Bologna where, as early as

[6] Today's popular "brown" sugar is made from an additional round of syrup thickening in which the syrup is allowed to darken from the heat. The crystals from this process are coated with synthetic levulose. The hydroscopic quality of levulose causes brown sugar to remain moist. Combined with the darkened sugar, it gives a taste much desired for selected dishes.

1470, there was a Society of Sugar Refiners (Deerr 1949). Early sugar refining, however, was a voracious consumer of wood, and the availability of this fuel dictated the location of the early refineries.

The most significant innovations in the sugar industry were those that affected fuel consumption. Until well into the twentieth century, wood was the chief source of fuel, both to boil the syrups and run the mills. The introduction of the steam-power added fuel demands of the mill to those of the boiling house. Brazilian, Caribbean and Louisiana industries emerged during a time when wood was used both as a building material and as fuel and the use of wood in the sugar industry compounded the pressure on wood supplies. The industry not only removed trees to prepare fields for cultivation, but continued the removal in an ever-enlarging periphery to keep the kettles boiling.

Louisiana plantation records provide ample testimony to the planters' concern for fuel and the enormous quantities used in making sugar (Follett 1997). Moody (1974) cites one Louisiana record in which the planter used 940 cords for the boiling house and 450 cords for the steam mill in the production of 5020 hogsheads[7] of sugar (Moody 1976, 47). A crude estimation of the volume of wood yielded by one tree of one foot girth and 30 feet height, allowing an equal volume is branches, is approximately 60 cubic feet. At 128 cubic feet per cord, two trees were needed to make one cord of wood. A planter using 1400 cords of wood in a season to produce 5000 hogsheads of sugar (at the average rate of one cord of wood to produce 3.50 hogsheads would consume 2800 trees — an enormous strain on forest resources.

[7] The hogshead was a West Indies measure of weight equal to 889 kilograms or 7/8 of a ton. It originated as a volumetric measure of the quantity of sugar that could be held in the wooden casks and subsequently varied from 1000 to 1500 pounds (Follett 1997, 397).

The high fuel demand associated with the sugar industry undoubtedly contributed to the exhaustion of the Mediterranean sugar industry by the fifteenth century (as well as the deforestation that transformed that semi-arid environment into the treeless region it is today). Depletion of forest reserves was a limiting factor in continued sugar production in the islands of the East Atlantic (Deerr 1949). The voracious use of wood in the Caribbean spurred the import of foodstuffs and building materials as lands were cleared for the production of sugar at the expense of all other activity.[8]

The separation of sugar manufacture and sugar refining was inevitable in the sugar islands as wood for the furnaces became scarce. Sugar manufacture necessarily occurred near the fields, but raw sugar could be moved a great distance without significant deterioration. The Dutch were first to capture the refining opportunity and by 1580 Dutch refineries in Antwerp processed raw sugar brought from Madeira and the Canaries. By 1640 the Dutch (then in Amsterdam) refined most of the raw sugar brought to Europe from both the English and French colonies (Braudel 1982 [1979]). The English Navigation Acts and the French Exchange later curbed the Dutch refining monopoly but did not destroy the Dutch refining industry. By 1780, only a decade before the dramatic decline of the sugar industry of the Americas, the Dutch operated 170 refineries in Amsterdam ((Braudel 1982 [1979]).

Colbert himself invested in French refineries to encourage French control of their sugar industry. By 1683 France was refining raw sugar from its sugar islands. Refineries sprang up in

[8] The clearing of the land, however, apart from the problematic loss of fuelwood, was otherwise viewed as a benefit though hunting success was diminished by the destruction of wild-life habitat. Antipathy towards naturally vegetated areas was expressed early by the French. Of an abbey in France built in the lowlands of a large parcel granted to the church, Braudel gives us this comment. " . . . a terrible wilderness in the forest of Saint-Gobain, a foetid marsh, a sterile and uncultivated land, the haunt of fever and wild beasts" (Braudel 1988 [1986], 141).

coastal cities from Dunkirk to Marseilles. The most efficient were in Rouen where eight refineries could process 2,250 tons of raw sugar per year (Deerr 1949, 457).. By 1700 the export of refined sugar was the most important revenue source for France. In the 1763 Treaty of Paris, France forfeited all of Louisiana to retain her source of sugar. After the 1791 slave insurrection and collapse of her enormous industry in Saint Domingue, continental French sugar refining diminished dramatically, but French interest in sugar was continued as Napoleon vigorously promoted a beet industry (to the consternation of French farmers) (Figure 3.16) to offset loss of the West Indies supply. This launched the beet sugar industry which spread through Europe and subsequently stimulated the Louisiana cane sugar industry as beet processing technology was applied to sugarcane[9] (Heitman 1987). The beet sugar industry enlarged quickly under Napoleon's policies, was abruptly curtailed with the post-war arrivals of West Indies sugar, but again regained prominence by the 1830s (Heitman 1987, Galloway 1989).

Early sugar refining extended into Germany and was actively promoted through government intervention. In 1676 Leopold I of Hungary embargoed Dutch sugar in an argument still used by advocates a domestic sugar industry today: "this [import of refined sugar] injures the home trade and affords much money to hostile foreigners" (quoted in Deerr 1949, 455). By 1750 Hamburg's 350 refineries processed 49,000 tons of raw sugar from English and French colonies (Deerr 1949, 456). In an "early example of protected state-aided industrialism,"

[9] Heitman (1987) attributes the technique for the extraction of sugar from the sugarbeet to experiments of German chemists in 1747. Fairrie (1925), on the other hand, traces the invention of the process to a French refugee living in Prussia in 1797. In the process, sugar beets are cut into thin slices (cossets) which are immersed in water. The sugar then moves by osmosis into the water. Specific osmotic membranes limit the passage of impurities and the resultant solution is readily crystallized into refined-quality sugar.

Figure 3.16. France's Ambivalence towards Napoleon's Beet Sugar Project. The lack of enthusiasm with which French farmers received the Napoleonic mandate to grow sugar beets is illustrated in this early nineteenth-century cartoon:"Suck, baby, suck. Your father says it's sugar." Source: Jeffrey Fairrie, *Sugar* (Liverpool, 1925), Plate 15, opposite page 24.

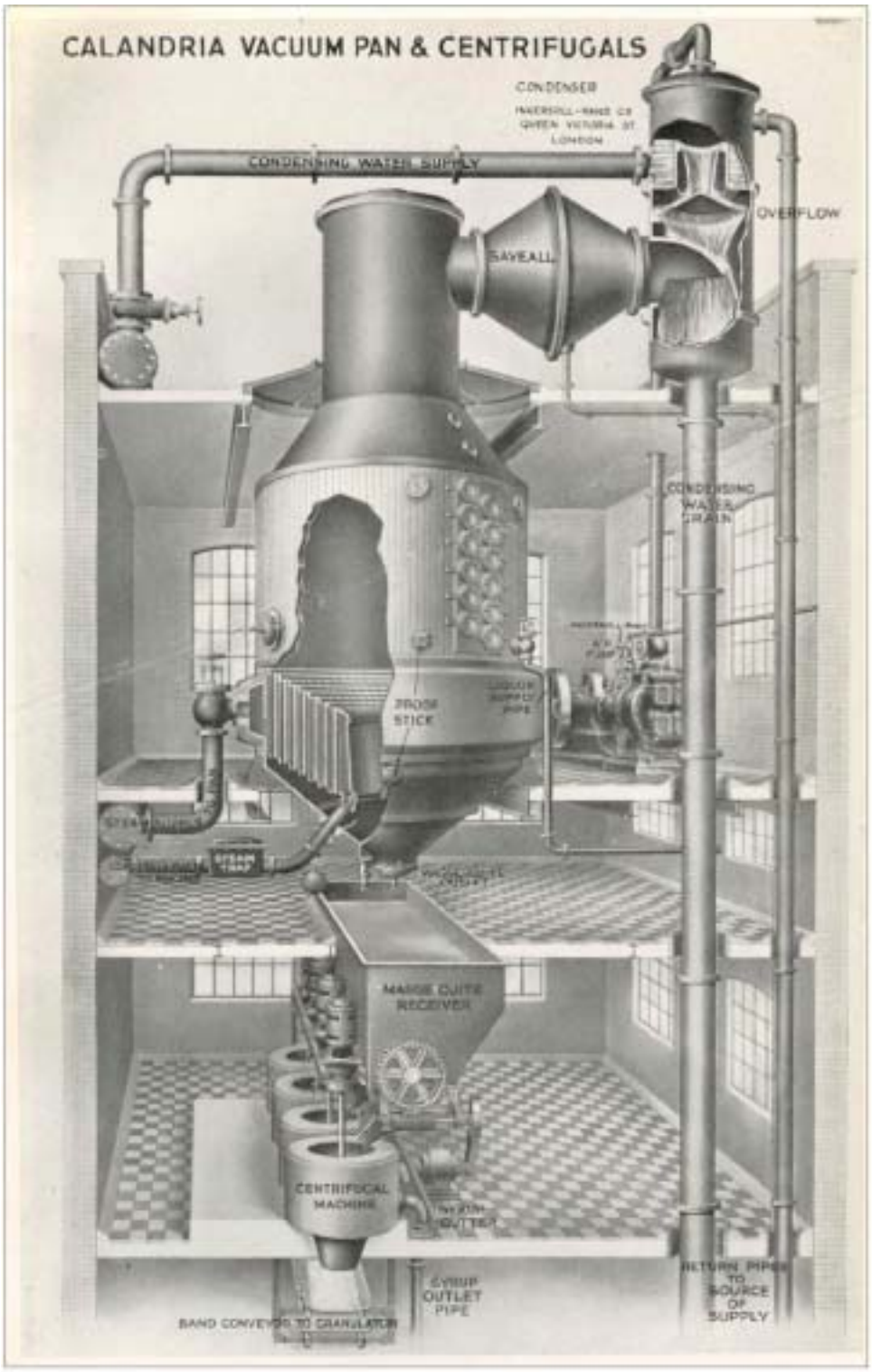
Frederick the Great both controlled and subsidized all sugar refining in Germany (Deerr 1949, 455). German innovation in sugar refining led the industry until well into the twentieth century (Heitman 1987).

England also had early interest in sugar refining. By 1544 it had domestic refineries in London and Liverpool. The numbers increased dramatically as the Navigation Acts halted the import of Dutch refined sugar. A 1753 inventory lists 120 refineries in England: 80 in London, 20 in Bristol, and others in Chester, Liverpool, Lancaster, Whitehaven, Newcastle, Hull, and Southampton, and several in Scotland (Deerr 1949, 458). London refining techniques were improved by German “sugar Bakers” whose skill in purifying the loaves was concealed from the

British refiner owners. As late as 1925, the charcoal filter room of the British refinery was still referred to as the "secret room" (Fairrie 1925, 150). In an early manifestation of the tensions that persist today between sugar production and sugar refining interests, sugar refining was prohibited in the English colonies early in the nineteenth century (Braudel 1992 [1979]). English planters complained bitterly of their disadvantage through transportation losses due to molasses leakage. A keg of raw sugar frequently arrived in England ten pounds short of its disembarkation weight, the molasses having seeped through the cracks of the casks. The ensuing struggle between planters and refiners lasted until 1845 when the tariffs on refined sugar were eliminated (Deerr 1949, 467).

The French, meanwhile, permitted colonial planters to continue local refining. French "clayed" sugars from the West Indies remained popular in France and innovation in refining techniques continued among the West Indies French planters until the collapse of the French industry. This tradition of combined production and refining was transferred with French planters to Louisiana when they relocated following the Saint Domingue revolution of 1791 and accounts for the "plantation sugar" (refined-quality sugar) produced by early Louisiana planters (Deerr 1949).

Refining facilities decreased in number as they increased in size and efficiency. By 1882 British refineries numbered only 34. These received sugar by steamer from English colonies both in the Caribbean and India. As foundries improved the size and precision of machinery, the modern refinery took form (Figure 3.17). Figure 3.18 illustrates the intensive labor involved in transfer of raw sugar prior to the bulk handling and transport of today (Figure 3.19). By 1948 only three refineries remained in England and today, British refining occurs in a single facility controlled by Tate and Lyle, Ltd., an amalgam formed in 1921 from the merger of Abraham Lyle and



3.17. Early Twentieth-Century Refining Machinery. The large circular structure is the Calandria vacuum pan for boiling the syrup. The massecuite (sugar and syrup mixture) receiver and centrifual machines are below. From Geoffrey Fairrie, *Sugar* (Liverpool, 1925), Plate 44, opposite p. 96.

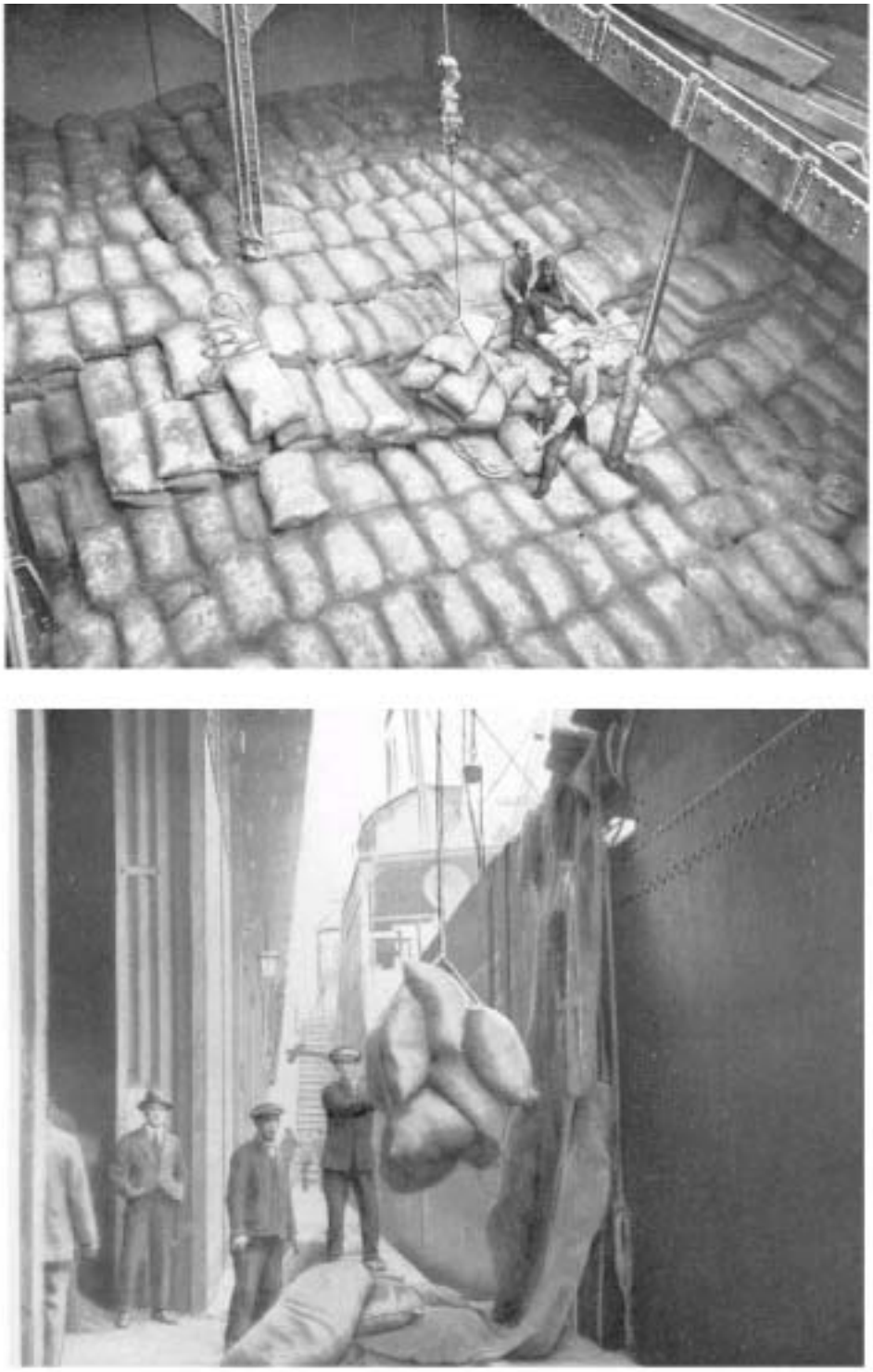


Figure 3.18. Sacks of Raw Sugar Inside a Steamer and at a Liverpool Dock, 1906. By the twentieth-century the cloth sack had replaced the wooden cask for the transport of raw sugar, but the loading and unloading remained labor intensive. Today raw sugar is transported in bulk in specially designed ships. From Geoffrey Fairrie, *Sugar (Liverpool, 1925), Plate 28, opposite p. 58.*

Figure 3.19. Bulk Raw Sugar Storage. This scene is within the St James Sugar Cooperative warehouse in St. James, Louisiana. Photo by John Wozniak, Louisiana State University Cooperative Extension. Used by permission.

Sons and Henry Tate and Sons.[10] This refinery in Silverton (outside London) processes over one million tons of raw sugar a year (Chalmin 1990).

Sugar refining in the United States emerged in parallel with European refining. At the time the Louisiana industry emerged, North American colonial refineries numbered 17 (Figure 3.20). These refineries received raw sugar from the British sugar colonies and produced both

[10] Tate and Lyle sugar interests are world-wide. It controls not only a large percent of the world's sugar refining, but sugar packaging, distribution, and the manufacture of numerous sugar-containing products. Tate and Lyle describes itself as "World Leaders in Carbohydrate Ingredients." Their products are sold under seven separate brands and include cereal sweeteners, food starches, industrial starches, ethanol, sugars, Sucralose (a sugar substitute), proteins, molasses, animal feed, and bulk storage (Tate and Lyle 2003).

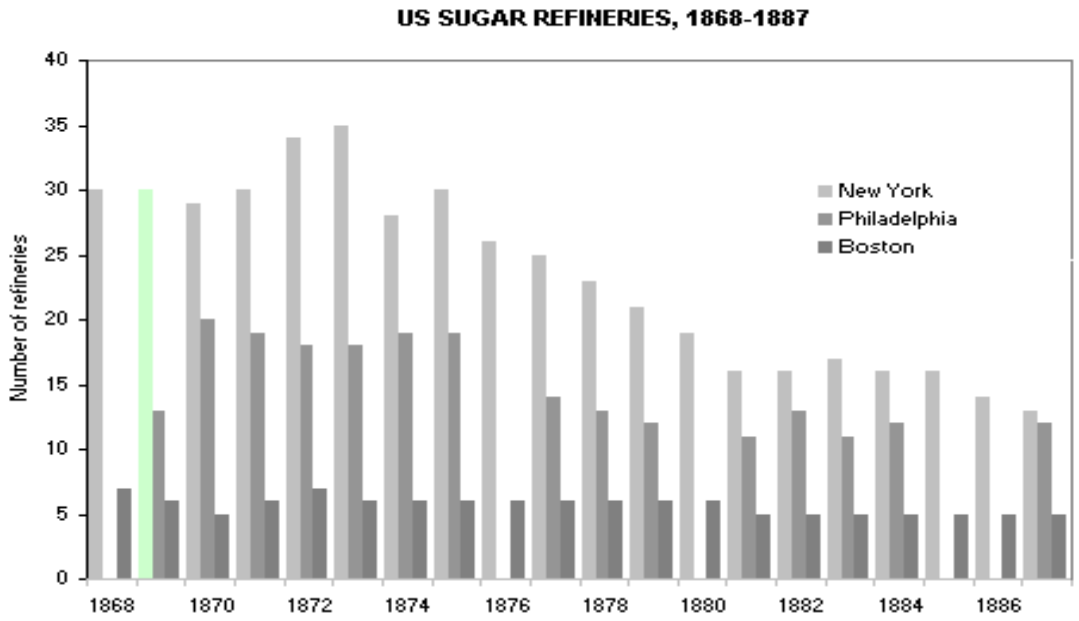


Figure 3.20. U.S. Sugar Refineries, 1868-1887. Source: Alfred Eichner, *The Emergence of Oligopoly* (Baltimore, 1969), 339-342.

refined sugar and rum. After U.S. independence and imposition of the first tariff on sugar in 1789, these New England refiners struggled for access to raw sugar. Duties and quotas continue to limit the entrance of foreign raw sugar into the U.S. Today, the U.S. has eleven cane sugar refineries. As with their English predecessors, American sugar producers and refiners remain at odds. As will be seen in chapter five, domestic producers depend on tariffs to deter the entrance of raw sugar while refiners benefit from foreign raw imports.

Today the production of sugar from sugarcane is an industrial activity conducted separately from farm operations. Once harvested, the sugarcane crop today moves through a complex web of production processes to reach its final products (Figure 3.21). Cane juice, once extracted at the mill, enters a complex production stream that yields refined sugar for human consumption and molasses products for both human consumption and industrial applications.

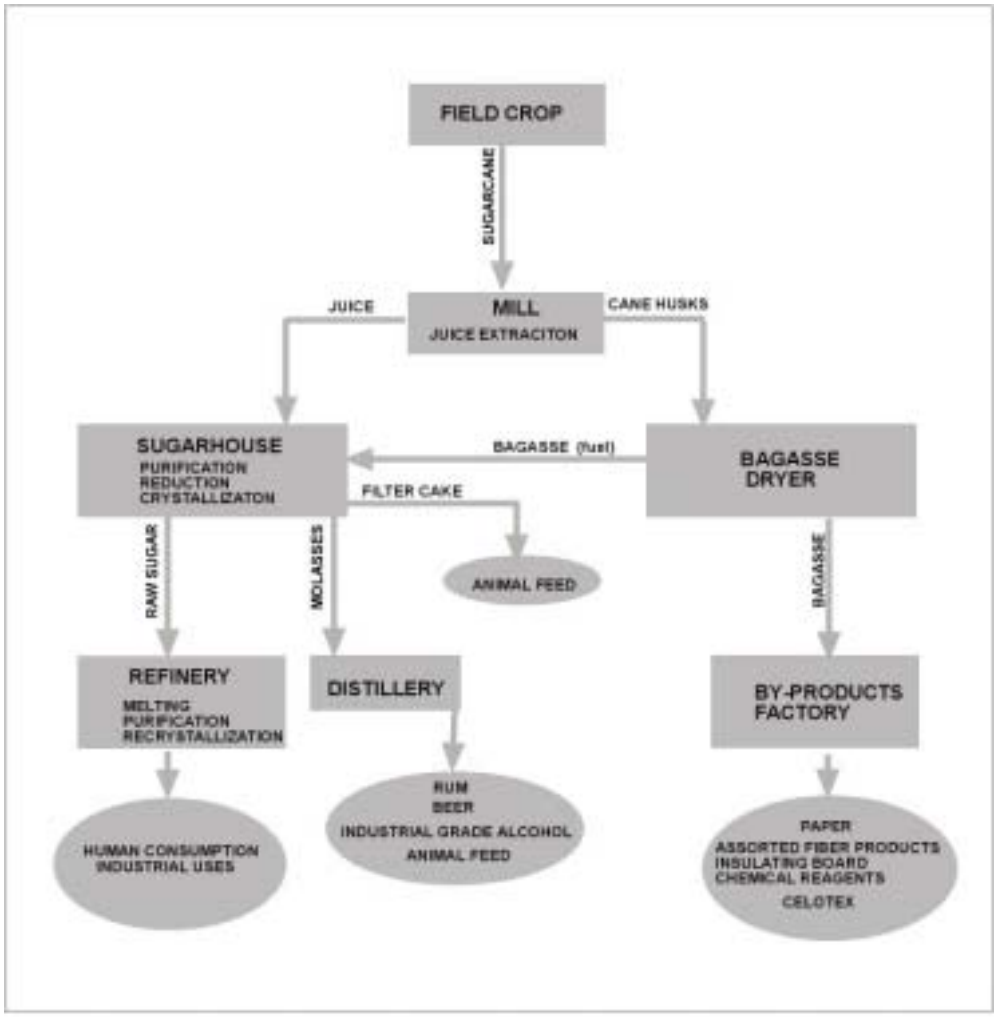


Figure 3.21. Sugarcane Processing and Products.

Cane husks, previously used only for fuel at the mill site, now have a multitude of industrial applications, one of the more important is the manufacture of chemical reagents.

CHAPTER FOUR

SUGAR IN LOUISIANA

French Foundations

Louisiana sugar country today occupies historic lands that were once claimed successively by Spain and France in their contest over North America. For differing reasons, neither nation was able to install a permanent colony on the North American continent (Mitchell 1987, Mitchell and Groves 1987). Spain's vacuous claim to the entirety of the Americas was overwritten in the north by the more enduring settlements of the English. France's presence was the more enduring but, in the end, preoccupation with European squabbles and her Caribbean sugar colonies caused half-hearted colonization to end in forfeiture to the British and Spanish (Harris 1987). France's 250 year presence, however, embedded language, law, and other cultural patterns that persist today at the exits of the two great river systems she tried to hold (Figure 4.1). Louisiana sugarcane fields today, for the most part, remain in the long-lot pattern the French initially installed in their old colony. This relic of early French occupation is clearly visible in a satellite image of the lower Mississippi River and the Lafourche Bayou (Figure 4.2).

French efforts at colonization in the environs of southern Louisiana never matched those in the northern part of the continent, nor in her sugar islands. In 1718, following the founding of New Orleans, the French Crown continued the European pattern of settlement by granting proprietary contracts to individuals in return for occupation of their New World claims. Antoine Crozat was given the Louisiana contract from 1702 to 1717. Large parcels of land were granted to individual settlers and an assortment of plantation industries was attempted: tobacco, indigo, rice, cotton, wheat, and corn as well as animal pelts, tar, pitch, ship masts, pine lumber, sassafras root, and fish drying (Chambers 1925, 144, Goins and Caldwell 1994, 29). The first charter to Antoine Crozat failed to enlarge settlement beyond a small military garrison. A second, given to

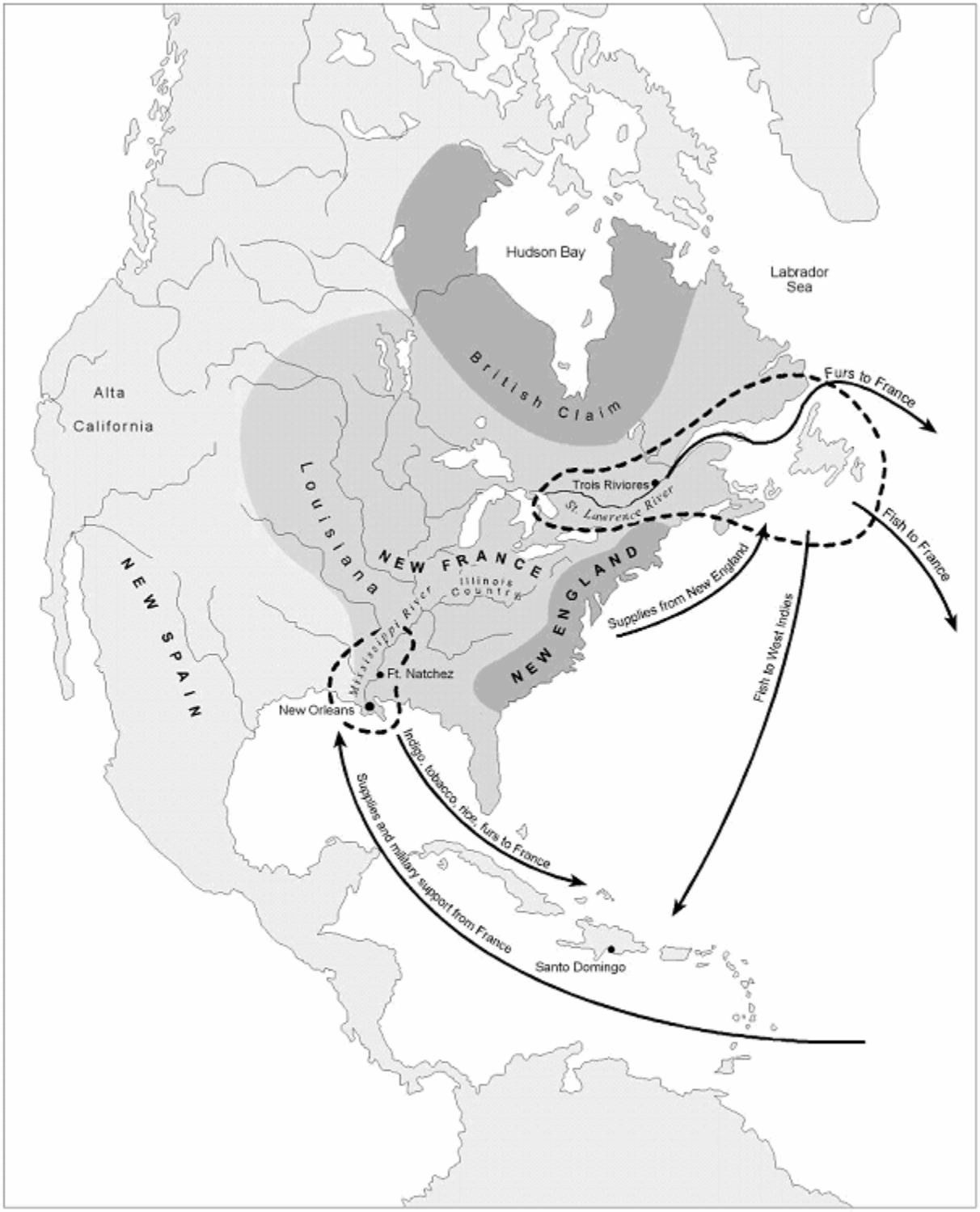


Figure 4.1. France in North America circa 1750. Modified after D.W. Meinig, *The Shaping of America* (New Haven, 1986) and Cole Harris, France in North America in R.D. Mitchell and P.A. Groves, eds., North America, *The Historical Geography of a Changing Continent* (Totowa, New Jersey, 1987), 87.

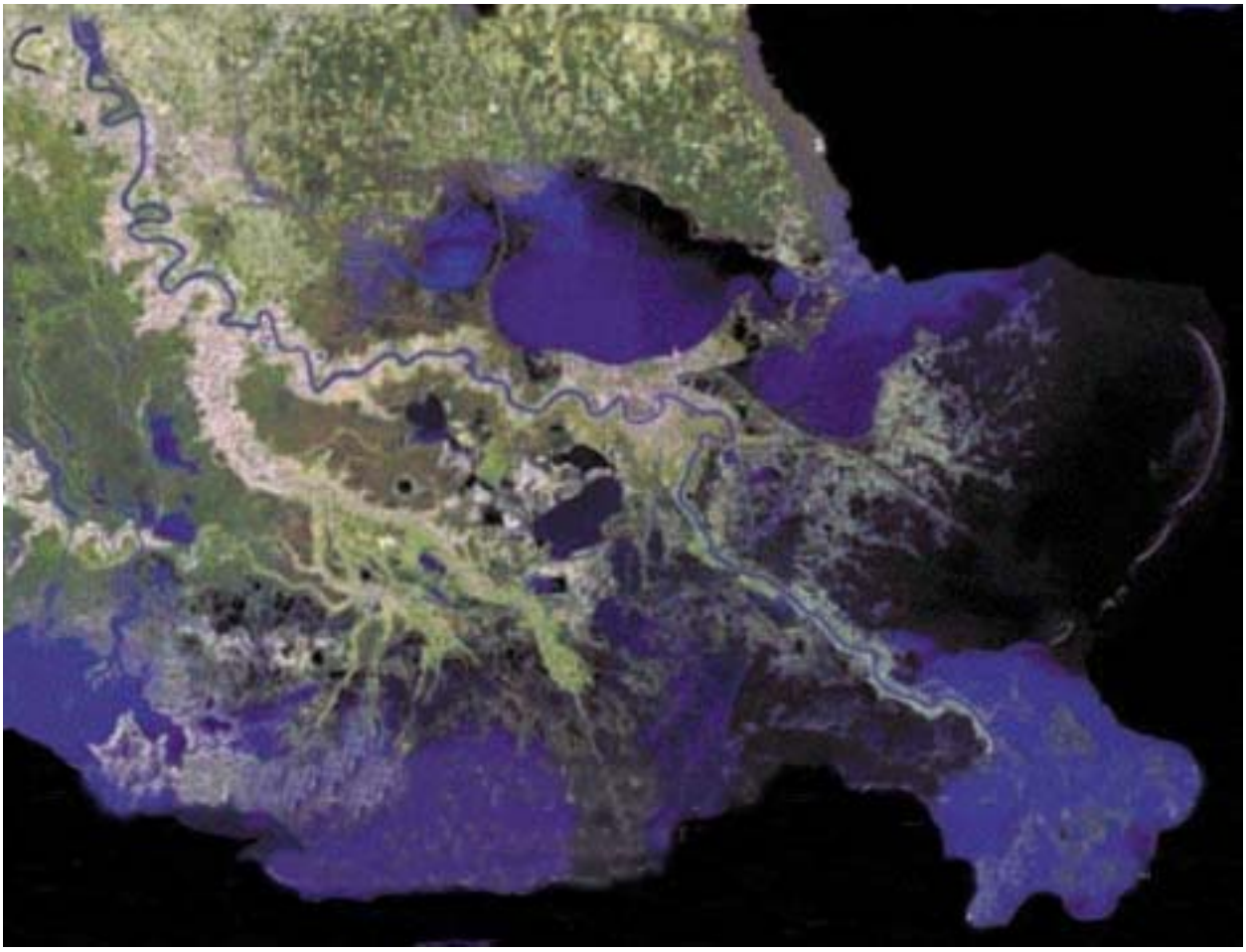


Figure 4.2. Satellite Image of the Lower Mississippi Delta and Bayou Lafourche. This image shows the elevated riparian corridors on which sugarcane is still grown and the long-lot pattern of survey installed by the early French. Source: Louisiana GIS CD: A Digital Map of the State. Louisiana State University and Louisiana Oil Spill Research and Development Program, DeWitt Braud, Director, 2000.

the Scottish entrepreneur, economist, and shyster, John Law faired somewhat better. Law was charged to settle 6000 French in a permanent colony and begin production for the motherland. In efforts to entice settlers to his charter, Law advertised the region (now part of Arkansas) as a land of gold, silver, and unlimited agricultural resources. The Alsace Germans who responded to the ruse were deterred from their return to Europe by generous land grants along the lower Mississippi. From their "German Coast" the industrious Germans installed a vigorous vegetable agriculture that is credited with sustaining the subsequent growth of New Orleans (Meinig 1986).

The early French found life in the southern Louisiana climate a daunting challenge. Failed crops and the failed or late arrival of supplies caused frequent starvation and encouraged the diseases that ravaged old and new settlers alike (DeConde 1967). And, as the Portuguese and Spanish found earlier, labor was in short supply. By 1719 the French Crown began importation of black slaves into Louisiana. The 500 Africans brought from Senegambia became the nucleus of a slave labor force that was to increase to 364,000 by the time of emancipation 150 years later (U.S. Bureau of the Census 2002b) (Figures 4.3, 4.4, and 4.5).

As the French struggled with their lower Mississippi colony , belligerencies on the European continent continued to resonate across the Atlantic. In the 1763 Treaty of Paris, ending the Seven Years War, France ceded all her interests on the North American mainland to the English and Spanish. Québec, Montreal, and Acadia went to England, and the colossal land area known as Louisiana was summarily transferred to Spain. After a 250-year French effort at colonization in North America, French-speakers numbered 70,000 (Meinig 1986). Most lived in Acadia, Cape Breton, and the Illinois country, and along the lower St. Lawrence River (Meinig 1986). A mere four thousand were numbered along the lower Mississippi, half of whom were black slaves (Hall 1992).

Apart from minor shifts in populations, life in New France continued unchanged under Spanish administration. Louisiana — essentially the lower Mississippi delta — was again under active Spanish control and for the next half century Spain administered lands that would eventually support Louisiana's thriving sugar industry — an industry conducted by French refugees from Saint Domingue (Spain's own Hispaniola) as well as English interlopers from the continental East.

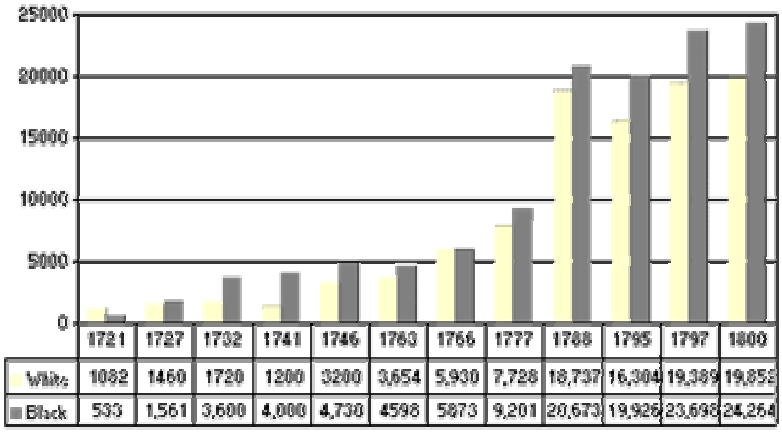
In exchange for her North American claims, France retained Saint Domingue, her lucrative sugar colossus and largest supplier of sugar to the European market. And, of

importance to the future Louisiana sugar industry, France retained the loyalty and cultural orientation of her lower Mississippi colony. French speakers continued to maintain ties with their mother country and, through their European connections, spurred along an incipient Louisiana sugar industry with innovations derived from the simultaneously-arising beet sugar industry in Europe (Heitman 1987).

Spanish Continuity

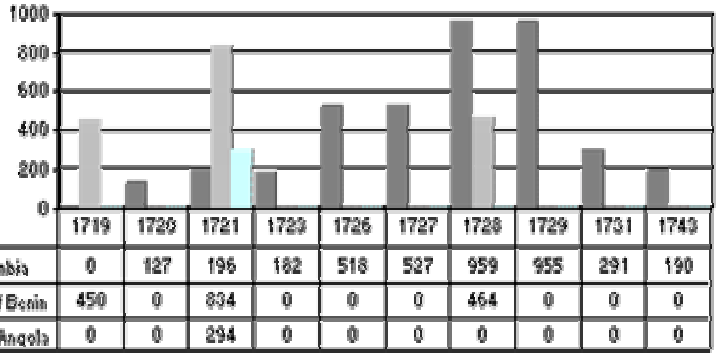
Notice of the 1763 transfer of Louisiana to the Spanish did not reach the French colony for two years (DeConde 1976, Chambers 1925). The first Spanish governor coming to take up his responsibilities had to flee for his life before the disbelieving and belligerent French. It was not until 1769 that Alexander O'Reilly was installed successfully as governor and introduced Spanish instruments of administration. The governing body, the *cabildo* (council of ten), was presided over by a Spanish governor appointed by the king, but each district was supervised by a commandant of French appointees. Business was conducted in French; French law was continued as was the French system of inheritance affecting transfers of title to the huge land grants made earlier by the French. In contrast to the British system of primogeniture in the English colony to the east, properties were passed to children equally or to a surviving wife (Goins and Caldwell 1994).

To encourage growth of her recovered colony, Spain continued the system of land grants it had installed in the Caribbean and the Spanish mainland. River frontage was granted to prospective sellers but, in the French unit of measure, at widths of six to eight arpents (180 feet) and depths to the backswamp. This arrangement gave each lot 1080 to 1400 linear feet of river access and as much as 8000 feet depth (Goins and Caldwell 1994). Further from the prized riverfront, grants were more generous. One Frenchman, Felipe Neri received over a million acres northeast of Fort Miro (present day Monroe) (Goins and Caldwell 1994). Parcels of 200,000



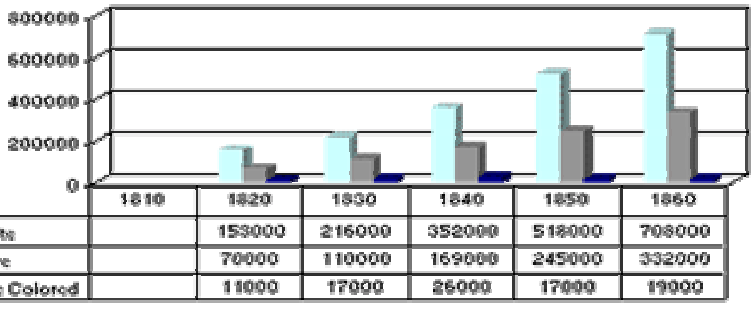
	1721	1727	1732	1741	1746	1763	1766	1777	1788	1795	1797	1800
White	1082	1460	1720	1200	3200	3,654	5,930	7,728	18,737	16,304	19,389	19,852
Black	533	1,561	3,600	4,000	4,730	4598	5873	9,201	20,673	19,926	23,698	24,264

Figure 4.3. Slave and Free Populations of Lower Louisiana During French and Spanish Rule, 1721-1800. Source: Gwendolyn Hall, *Africans in Colonial Louisiana*(Baton Rouge, 1992), 10 and 279.



	1719	1720	1721	1723	1726	1727	1728	1729	1731	1743
Senebambia	0	127	196	162	516	527	959	955	291	190
Bight of Benin	450	0	834	0	0	0	464	0	0	0
Congo/Angola	0	0	294	0	0	0	0	0	0	0

Figure 4.4. Slaves Landed in Louisiana by French Slave Trade: Numbers and Origins. Source: Gwendolyn Hall, *Africans in Colonial Louisiana* (Baton Rouge, 1992), 35.



	1810	1820	1830	1840	1850	1860
White		153000	216000	352000	518000	708000
Slave		70000	110000	169000	245000	332000
Free Colored		11000	17000	26000	17000	19000

Figure 4.5. Slave and Free Populations of Lower Louisiana, 1820-1860. Source: U.S. Bureau of the Census, *Historical Statistics of the United States*, 2000.

acres were more common in the southwestern Louisiana where the Spanish understood ranching's need for greater.

Within only six years of Spanish reoccupation, the (lower) Louisiana population increased from 4000 to 13,500, mostly from immigration of the discontented Acadians who, after 1763, found the English spilling over their homeland of centuries (Goins and Caldwell 1994). With natural increase and a generous immigration policy, the population of the Spanish colony at the turn of the century was 36,500 (Goins and Caldwell 1994). Immigrants to the Spanish colony were welcomed from Germany, France, England, and Spain's own Canary Islands (Din 1988). Even U.S. citizens were enticed with offers of citizenship, free land, and unrestricted access to the Mississippi (DeConde 1976) — not an insignificant consideration for agriculturalists producing within the Mississippi watershed, well west of the Appalachian divide.

With rapid and indiscriminate immigration, Louisiana became a cosmopolitan colony, a microcosm of the fluid Caribbean society in which culture, race, and national interest melded into an eclectic society. As with North American English subjects before, distance from the controlling state contributed to an independent and unbridled spirit.

> That "whole," meaning the non-Anglo-American population, was in fact hard to define internally, for in addition to the great variety that had accumulated during the century of French and Spanish rule, there was a continual drifting in along all the tropical sealanes: French, Spanish, Portuguese, Italians, and a wide sprinkling of others; white and black and all shades in between; seamen, fishermen, trappers, smugglers, pirates, traders, artisans, farmers; having in common only a niche somewhere in the watery labyrinth of the Delta or the downriver suburbs of New Orleans, a convergence toward a common Creole tongue, and a strong sense of distinction from the Americans, who regarded them all with a degree of disdain (Meinig 1993, 19).

The diversity of this population would be compounded by more infusions from the south as the slave insurrections in Saint Domingue drove French sugar planters to seek more secure environs in another "French" colony where they continued the industry so successful in Saint Domingue (Brasseaux and Conrad 1992).

Spanish tolerance for the new republic sharing her eastern border was less generous than her immigration policy. Spain intermittently retracted U.S. rights to the Port of New Orleans, disrupting market access for the enlarging production of the U.S. frontier. This honed U.S. schemes to secure a more permanent access to the Gulf. In the 1796 Pinckney Treaty, the U.S. (again) secured unrestricted use of the lower Mississippi and the port of New Orleans for a period of thirty-years. In less than a decade, however, Spain had ceded control of the port and all of Louisiana back to France.[1] This, however, was to be of little long-term consequence to the United States for, within two years, the United States itself had acquired not only the desired access, but the entirety of the Mississippi watershed (Blum et al 1963).

Incorporation of Louisiana into the United States

Through the purchase of Louisiana the U.S. gained control of the mouth of the Mississippi as well as a population of colonists "not particularly pious nor besieged by intimations of immortality" (Fiehrer 1989, 421). Meinig (1993, 15) elaborates further:

> Louisiana was an imperial colony of alien people — this all American leaders recognized, though they differed as to how comfortable they were with that fact and what means should be taken to "Americanize" this sudden addition. Jefferson, and apparently most others, assumed some combination of pressured acculturation and dilution of numbers as appropriate and essential to the task. Louisianans, in the eyes of these Americans, were a people speaking a foreign tongue and steeped in foreign ways, exhibiting unusual and even questionable values and behavior (festivals and frolics on Sundays!), used to authoritarian government, unlettered in representative institutions, following strange legal customs and laws.

Easterners did not take warmly to the incorporation of this arena of ruffians into the civility of America. Sentiments expressed eight years later in the deliberations for the admission

[1] In the secret 1802 arrangement, France reacquired her old colony in a continental-sized land swap in which Spain's Queen Maria Luisa "negotiating for her dull husband" (DeConde 1976, 58) was promised Tuscany as a token kingdom for her daughter to rule and, it can be assumed of the clever queen, to put the powerful Napoleon between the advancing American nation and her Mexican silver mines.

of Louisiana to statehood confirm the enduring resentment. The prospective citizens were characterized as "Anglo-Hispanic-Gallo-Americans who bask on the sands at the mouth of the Mississippi" (Josiah Quincy Adams of Massachusetts, quoted in Meinig 1993, 17). Antipathies ran both ways. The incipient Louisiana sugar industry did not look kindly upon U.S. control, especially the (1804) restriction on the import of "fresh" slaves from Africa. The resentment was more keenly felt since similar restriction was not applied in the nation itself until 1808.

The value of Louisiana to the new nation was evident in both the unorthodoxy of its acquisition and the circumstances of its admission to statehood. Jefferson agreed to the purchase without consultation with Congress. Congress granted statehood in spite of the requirements of the Northwest Ordinance that a state have a population of 60,000 free whites before admission. In 1812 Louisiana had only 34,311 free whites (Meinig 1993), nearly half short the Ordinance requirement. Counted in the total population — and demonstrating the eclectic nature of the colony— were 7585 free colored (Hall 1992) among whom were Andrew Dunford, a successful black planter and slave-owner, and Norbert Rilleaux, the (black) inventor of the vacuum-pan evaporation process, an innovation that was to revolutionize the sugar industry worldwide (and later deter mechanization in the Louisiana industry because planters deemed the aptitude of their Negro slaves inadequate to warrant investment in sophisticated machinery [Heitman 1987]).

In the decision to allow premature statehood and the assimilation of the Louisiana population into the United States, we see an early U.S. recognition of the advantage of access to the Gulf of Mexico. As Meinig (1993, 24) observed, the Louisiana territory gave the United States its first permanent access to the "American Mediterranean" and a new perspective from which to view other occupants of the Gulf littoral (Healy 1988). Cuba, Puerto Rico and the Yucatan — colonies tethered tentatively to the disintegrating Spanish empire — were fields of tropical crops potentially within the United States. Early nineteenth-century maneuverings to

include Cuba, Florida, and part of Mexico in a "could have been" nation would have secured for the United States not only a sugar source, but a plethora of tropical resources complementary to those available in the more northern latitudes of the United States (Meinig 1993, 24).

In incorporating Louisiana into the union, the United States secured access to the Gulf and, of great significance, it also acquired an emerging sugar industry with its promise of a domestic sugar supply. Notions of self-sufficiency in sugar were much in evidence as European hostilities continued into the century. As will be discussed in chapter five, geopolitical events of the time benefited the emerging Louisiana industry. Tariffs imposed following the War of 1812 instituted protection for domestic sugar that greatly encouraged the Louisiana industry. And they introduced an ever-enlarging argument over the role of the U.S. government in trade policy — arguments that were to culminate in the hostilities of the Civil War and, even today, reoccur with intensity when U.S. agricultural trade polity is reviewed.

The Louisiana Sugar Industry

Historians (Chambers 1925, Gayarre 1965 [1882], Sitterson 1953a, Deere 1949) recount early attempts to cultivate sugarcane in French and Spanish Louisiana. In 1726 the Jesuits[2] — ever following the French flag — planted an unsuccessful crop from "seed" (stalk segments) received from their brothers in Saint Domingue. Other planters attempted sugar manufacture, but with little success. The cultivar used— Caribbean Creole cane — was at the time "failing" (producing less sugar and succumbing to disease) even though growing conditions in the Caribbean were optimum. It is not surprising that cultivation in the more challenging Louisiana environment met with little success. Sugar was not to emerge as a successful industry in southern

[2] The Jesuits had intermittent and minor success with sugarcane cultivation in Louisiana up to their ousting by the Spanish from all the empire in 1767. The Jesuits were among the larger slave holders in the New World and among the more successful sugar producers in the French sugar islands. In the city of Santo Domingo alone, they had over 2000 slaves (Deere 1949).

Louisiana until 1795 when Jean Etienne de Boré, an innovative and persistent entrepreneur and active citizen[3] received a new cultivar from Saint Domingue where it had recently been brought from Réunion. His crop yielded the first sugar of commercial importance and is attributed with launching the modern Louisiana industry (Goins and Caldwell 1994, Chambers 1925, Gayarre 1965 [1882]).

Other names are customarily included in the list of early and successful sugar planters: Claude Joseph Du Breuil de Villars (of Dijon, France, owner of the huge Faubourg Marigny plantation south of the city of New Orleans); Chevalier de Mazan, Deheran (whose fine quality sugar had "run out of the caske" in route to France) (Deere 1949, 248); Antoine Mendéz (a Spaniard who gave up sugar and sold his plantation to de Boré); and Antoine Morin, refugee from Saint Domingo, distinguished alumnus of École de Paris, chemist and botanist, who laid out de Boré's plantation in the French Caribbean pattern and, ladle in hand, supervised the crystallization of de Boré's first kettle of sugar (Chambers 1925, Gayarre 1965 [1882], Sitterson 1953a, Deere 1949).

De Boré's 1795 sugar granulation demonstrated the possibilities of a successful industry in Louisiana. It required a cash outlay of $4,000 and the labor of 40 slaves (valued at $1200 each), but it returned a profit of $5,000 (Sitterson 1953a) — an earning considered acceptable for a start-up sugar plantation. De Boré's success was soon repeated by other planters who were encouraged by Spain's liberal commercial policies permitting indiscriminate export of sugar from the port of New Orleans. Spain's tolerance enabled the infant industry to take such hold that by the turn of the century, sugar had largely replaced cotton and indigo, both succumbing to price depression and disease. By 1801, 75 plantations along the Mississippi produced five

[3] In 1802, as Mayor of New Orleans, De Boré officiated at the ceremony transferring Louisiana from the Spanish back to the French.

million pounds of raw sugar (Sitterson 1953a). Prospective planters continued to enlarge the sugar region and with the transfer of Louisiana to the United States, American Citizens added to the influx.. As preferred sites along the Mississippi were soon bought up, the small farmers — mostly the Acadian *petit habitants* — were forced westward in a repetition of the displacements in Barbados and other Caribbean islands a century and a half earlier.

The emerging Louisiana industry benefited from a fraternity with the Cuban industry only a few hundred miles south. During a brief occupation of Cuba in 1763, Britain installed a vigorous sugar industry that persisted when the colony was returned to Spain[4] (Figure 4.6). The Cuba and "northern" Spanish Louisiana industries freely exchanged information, machinery, technology, and camaraderie in an arrangement that was to endure for 150 years until political eventualities — hardly imagined at the time — put a strange and incongruous divide between these geographically close sugar colonies.

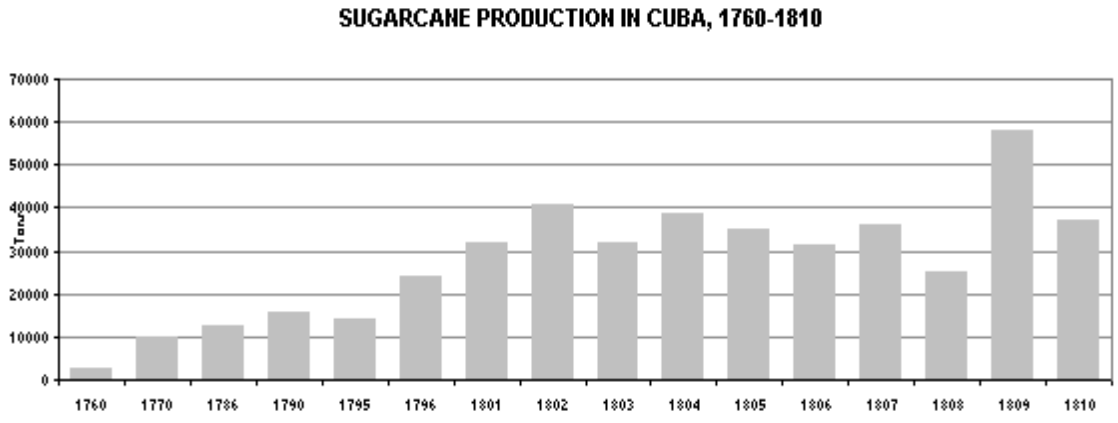


Figure 4.6. Sugarcane Production in Cuba, 1760-1810. Source: Noel Deerr, *The History of Sugar* (London, 1949), 131.

[4] Britain occupied Cuba in 1762, making a bid to out-produce the French on nearby Saint Domingue. It returned the colony to Spain by provisions of the Treaty of Paris, but the sugar industry Britain installed was to continue its growth and, through infusion of international capital — especially American — Cuba became the single greatest producer of sugar for export the world was to know (Blume 1985).

The early Louisiana industry was further enlarged by the 1791 slave revolt in Saint Domingue and the subsequent exodus of whites from the island. Between 1790 and 1804, 45,000 whites abandoned Saint Domingue to its 450,000 blacks (Fiehrer 1989). While some returned to France or emigrated to northeast U.S. cities, the majority moved to Cuba, Jamaica, or Louisiana where they continued sugar production. By 1803, 27,000 French from Saint Domingue were recorded in Oriente, Cuba (Lachance 1988). As hostilities between Spain and France increased, these French again emigrated, many to Louisiana. New Orleans recorded the entrance of 9059 French from Cuba in 1809 alone (Lachance 1988). Among these were 500 sugar planters whose 3000 slaves were authorized by Governor Claiborne to enter in spite of the U.S. prohibition against foreign slave imports into the territory (Lachance 1988). This infusion of experienced planters and their entourages of sugar makers, physicians, coopers, and slaves had a mixed reception. While they were welcomed by some, others resented the threats to peace introduced by an invasion of the "forces of Bonaparte" (Lachance 1988, 121).[5]

The revolts on Saint Domingue not only infused the Louisiana industry with experienced planters, the consequent collapse of the largest source of sugar at the time (Figure 4.7) increased the potential market of the nascent Louisiana industry. Its prospects were further encouraged by intensifying tensions between the U.S. and Britain that threatened Jamaican supply — at the same time demand was increasing in both the States and Europe. To these inducements were added the growing isolationist posture of the U.S. and an associated concern for a domestic sugar supply (Meinig 1996). These events all coalesced to encourage prospective planters and consolidate a viable Louisiana sugar industry (Figure 4.8).

[5] The enduring loyalty of these immigrants is seen in the name given to one of their settlements. Napoleonville, in Lafourche Parish, persists not only as the heart of sugar production in Louisiana, but as a reminder of geopolitical events that moved a group of French refugee sugar planters to Louisiana 200 years ago (Hawkins 2000).

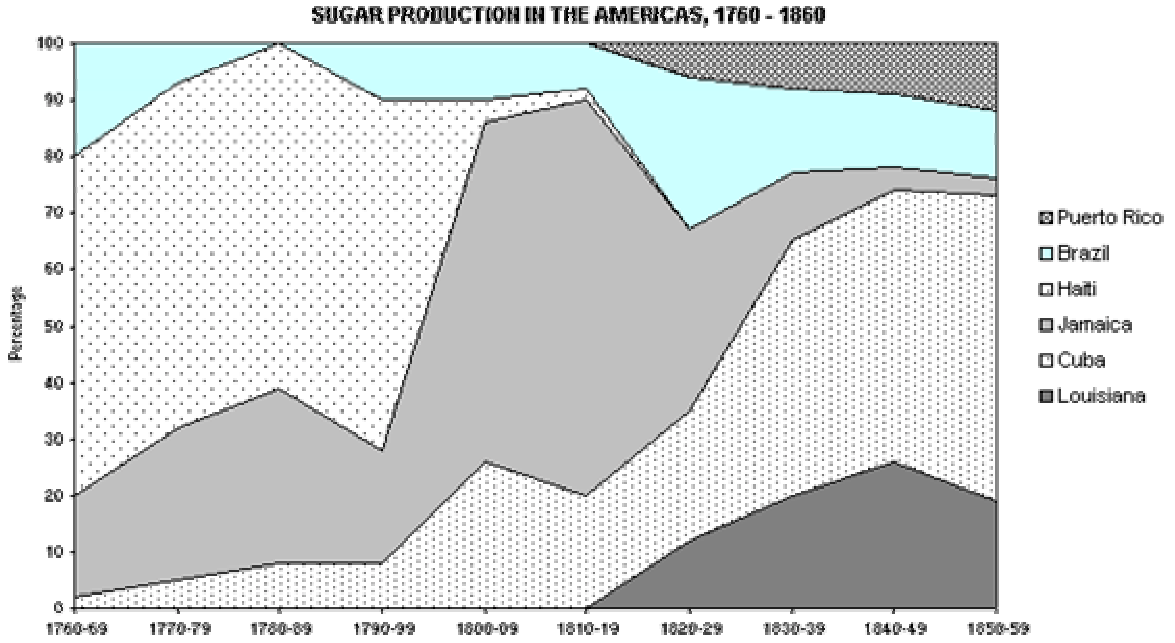


Figure 4.7. Sugar Production in the Americas, 1760-1860. Source: Richard J. Follett, The Sugar Masters: Slavery, Economic Development, and Modernization on Louisiana Sugar Plantations, 1820-1860 (Ph.D. dissertation, 1997), 99.

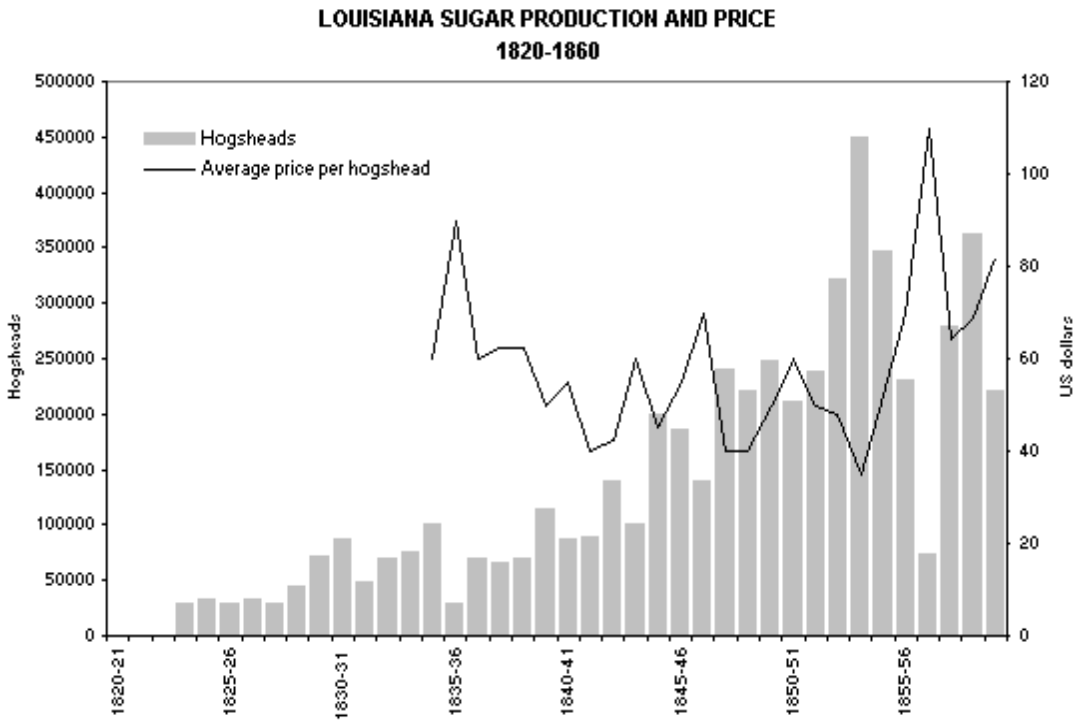


Figure 4.8. Louisiana Sugar Production and Price, 1820-1860. Source: Cecil Gray, *History of Agriculture in the Southern United States to 1860 (New York, 1941),* Table 45.

As suitable sites along the Mississippi were taken, prospective planters moved to the next high ground, filling the available parcels along the Lafourche and Teche Bayous before moving westward (bypassing the unsuitable hardpan prairie) until obvious precipitation limits halted the expansion along the Brazos and Colorado Rivers in Texas.[6] This remarkable growth of the sugar industry contributed to settlement expansion in the state (Figure 4.9) and continued until onset of the Civil War with a final expansion encouraged by the 1846 appearance of *DeBow's Review* and its numerous essays on prospects and methods of sugar production (Sitterson 1953a).

[6] Though sugar production in Texas never challenged that of Louisiana, the processing facilities established in Sugarland, Texas, now owned by Imperial Sugar, are the largest in the United States. Through a series of vertical integrations, Imperial Sugar is now the largest U.S. domestic processing, refining, and retailer (Imperial Sugar 2002). Even some Louisiana sugarcane makes the rail trip to Imperial's processing facilities in Sugarland, its reputation for better sugar recovery being judged an acceptable offset to the expense of transport (Constant 2002).

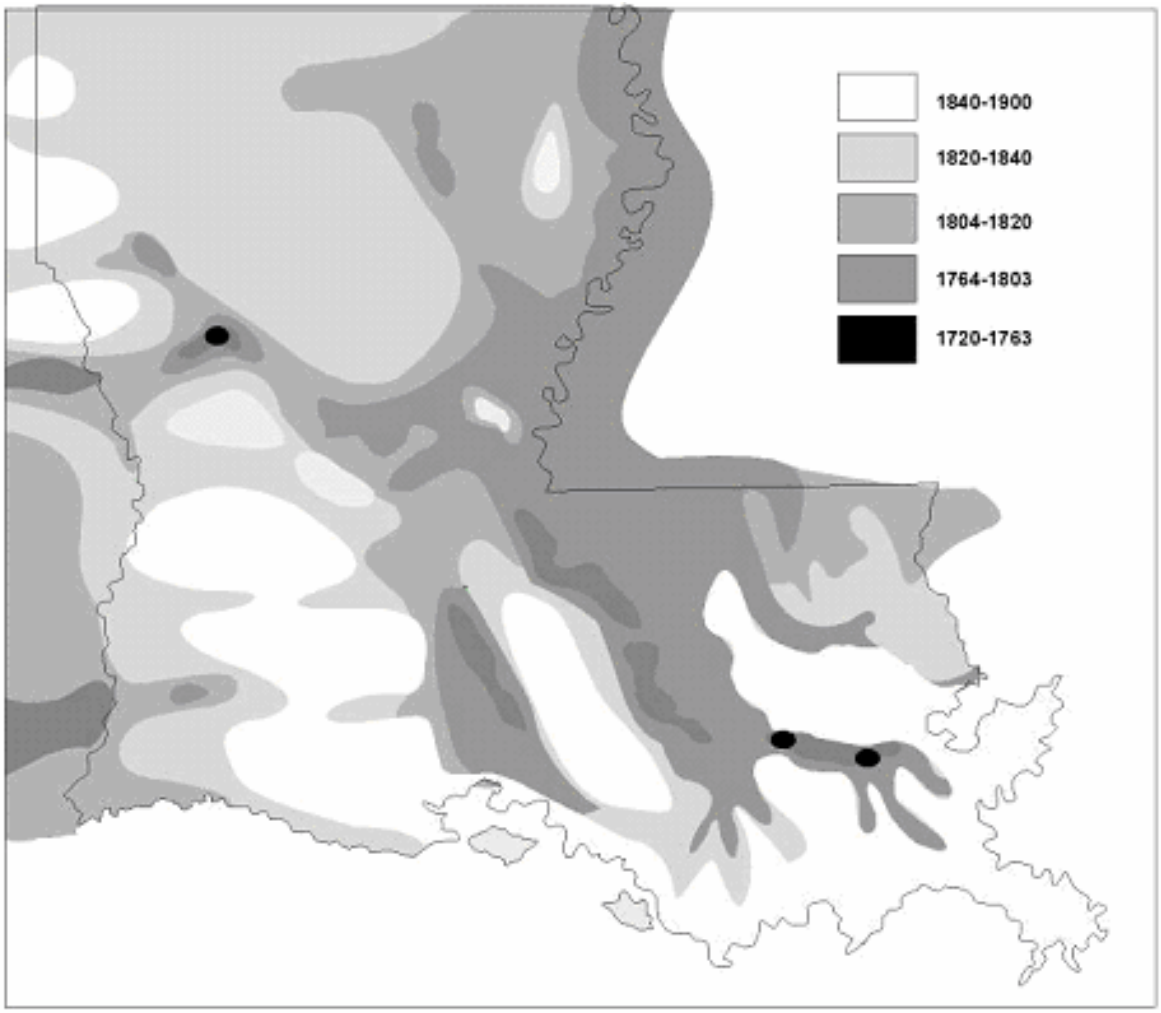


Figure 4.9. Progress of Settlement in Lower Louisiana, 1720-1900. Modified after Milton B. Newton, Jr., *Atlas of Louisiana* (Baton Rouge, 1972), 66.

Louisiana Sugar Planters

The residents of the Caribbean littoral to whom the Americans objected were not all ruffians. Some were among the most innovative and wealthy people of the time (Heitman 1987, Follett 1997). Early sugar production engaged an elite of substantial financial resources, keen intelligence, and good management skills. Not only did a sugar planter need ready and adequate resources to buy land for a plantation, but he had to manage a large labor force, operate a factory, understand plant adaptation and disease, and know the domestic and international sugar markets

(Sitterson 1953a). Start-up costs were enormous and the slave-based production system required significant capital outlays for labor. Immigrating planters either brought their own slaves or imported them from the east. With the cost of "good field hands" at $600 in the early decades and escalating to $1500 by the mid-nineteenth century (Sitterson 1953a), "labor" was a substantial part of a planter's capital expense. In addition to these labor costs, a planter had to install cooperages for making hogsheads, a mill and sugarhouse, storage areas and, most important, secure large forest reserves for fuelwood. This assemblage was not affordable by many (Table 4.1).

The Louisiana climate introduced an urgency into the sugar harvest not experienced in the tropics. In marked contrast to the Caribbean, frost can freeze the canes, spoil the sugar, and render a crop worthless. Harvest time ("grinding") was, therefore, the most critical phase of the early Louisiana sugar enterprise. Once cutting began and the cauldrons fired, the crop was moved quickly to the mill, the cane "ground" and the juice immediately sent to kettles that boiled continuously until the crop was in. This activity required adequate and ready labor as well as skillful coordination.

Securing adequate slaves was problematic for Louisiana planters especially once the United States had jurisdiction in the territory. A simultaneously westward-moving cotton frontier

Table 4.1. Capital Required for a 50-slave Plantation, 1830.

Item	Unit cost	Total cost
1250 acres suitable land @	$20	$25,000
50 Negroes (working hands) at	$600	30000
30 pair work oxen	40	1200
40 horses and mules	50	2000
25 cows	15	375
10 carts	60	600
25 ploughs	7	175
24 trace chains	75c	18
10 ox chains at	3	30
5 plow chains	3	15
1 timber wheel and chain	100	100

50 hoes		37
36 axes	1.5	54
15 collars and hames	2	30
16 ox yokes	4.5	41
40 spades		30
Blacksmith shop and tools		150
Dwelling house Negro cabins stables and corn mill		6075
30000 pickets for fencing		2100
24 cane knives & 12 scythes		40
60 arpents sugar cane for plants		3000
Grinding house (and outlet)		10000
Mill put up ready for grinding		2000
Clothing, feeding, and doctor's bills for 50 Negroes @ $50		2500
Overseer board & washing		1000
Cooper		375
Sugar maker		502
12 hoe harrows at	5	60
5 harrows at	8	40
Am't capital invested		$87,704

Source: Vernon Alton Moody, *Slavery on Louisiana Sugar Plantations* (New York, 1976), 99.

compounded the demand for slaves and an 1804 restriction on the import of foreign slaves limited the sources. An intranational slave trade emerged as cotton and rice planters to the east sold surplus slaves to the west (Bancroft 1959) (Figure 4.10). By mid-century, black slaves represented a large part of the population throughout the plantation South, a proportion still evident in the percentage of blacks in Louisiana today (U.S. Census 2000b) (Figures 4.11).

Figure 4.10. U.S. Slave Populations by State, 1820. Source: U.S. Bureau of the Census, *Historical Statistics of the United States*, 2001.

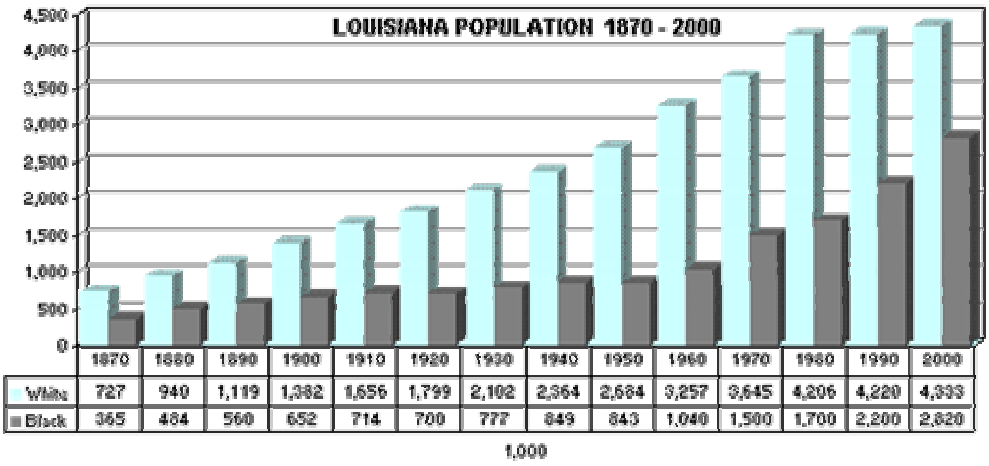


Figure 4.11. Louisiana Population, 1870-2000. Source: US. Bureau of the Census, Historical Statistics of the United States, 2002b; 1971-2000: US. Bureau of the Census, Statistical Abstract of the United States, 2001.

A large slave force characterized the most successful sugar enterprises as did economies of scale in planting and manufacture. Small quantities of granulated sugar could satisfy a private demand, but production of a volume that would generate a profit after transport, insurance, and marketing costs required large operations. Given these requirements, the size of some of these early plantations was enormous — in the thousands of acres — certainly in violation of the Jeffersonian ideal of modest land holdings (Blum et al, 1963). They were purchased at astonishing prices and had equally astonishing appreciations. In one example, the Brown

plantation above New Orleans was bought in 1806 for $16,000 and only one year later a purchase offer of $40,000 for the same parcel was declined as inadequate (Sitterson 1953a, 23).

Heitman (1987) attributes the success of the early Louisiana sugar planters to their connections with France from where they transferred innovations in beet sugar manufacturing. Heitman speculates further that their progressiveness was due to extreme wealth, resources that enabled them to travel at will and bring European know-how and equipment back to their plantations. The French planter "was not tied to the soil in the same way as the small grower; rather he was a proto-capitalist with an international vision, only one generation from the likes of an Andrew Carnegie" (Heitman 1987, 25). Frederick Law Olmsted (1968 [1856], 670) characterized successful sugar planters as "among the most intelligent, enterprising, and wealthy men of business in the United States."

By the 1820s the sugar industry in southern Louisiana was no longer a tentative extension of that in the Caribbean. It was growing dramatically, responding to a favorable U.S. tariff regime and the high price of sugar stimulated by the collapse of the Saint Domingue industry. The Louisiana sugar industry began crafting a unique region, outwardly-oriented as it both exported its product to distant markets and imported industrial skill, equipment, and finance (Heitman 1987). The young industry drew in prospective planters and settlers from the eastern United States and abroad, forging an anomalous unit of dissimilar cultural and political spheres as French and English, black and white, slave and free, Catholic and Protestant, and Whig and Democrat were integrated in the service of the industry.

The Louisiana Sugarcane Environment

The physiography of southern Louisiana determined the quick installation of the sugar industry. A fortuitous configuration of the lower Mississippi river system provided both the arable land for cultivation and the waterways that moved the heavy casks to market. The soils of

the natural levees were ideal for sugarcane cultivation. They are well-draining and extend an adequate distance to the backswamp where the fine clays, prone to water-logging, marked the extent of the cultivable strip. The historic sugar area (and in large measure the contemporary) lies entirely on these natural levees within the 120-mile wide Mississippi floodplain

and 4.13).

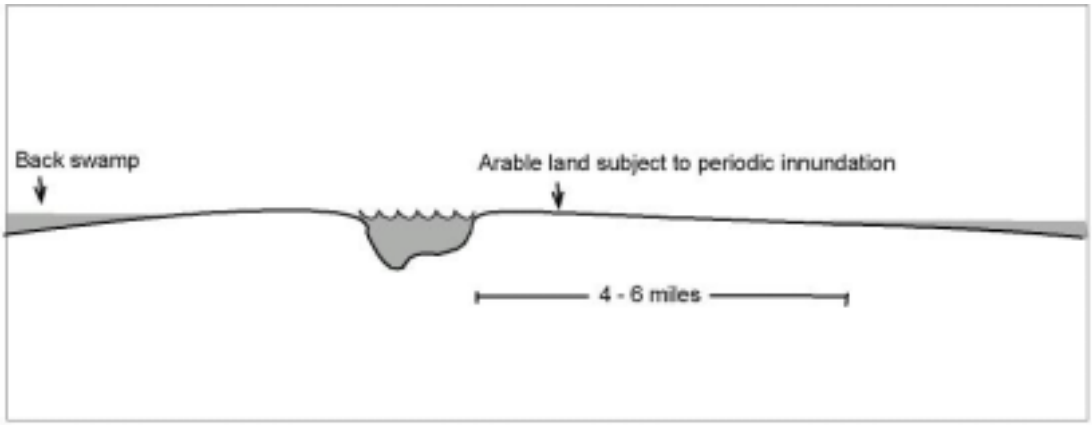


Figure 4.12. Natural Levee and Backswamp Formation. The natural levee is formed by alluvial deposits of a river during floodstage. At flood, the river overflows its banks, extending its water to the next confining rise which may be a natural geologic feature such as a bluff, or a previous levee constructued by the same river at an earlier geologic time. Arable land is restricted to the higher margin adjacent to the watercourse.

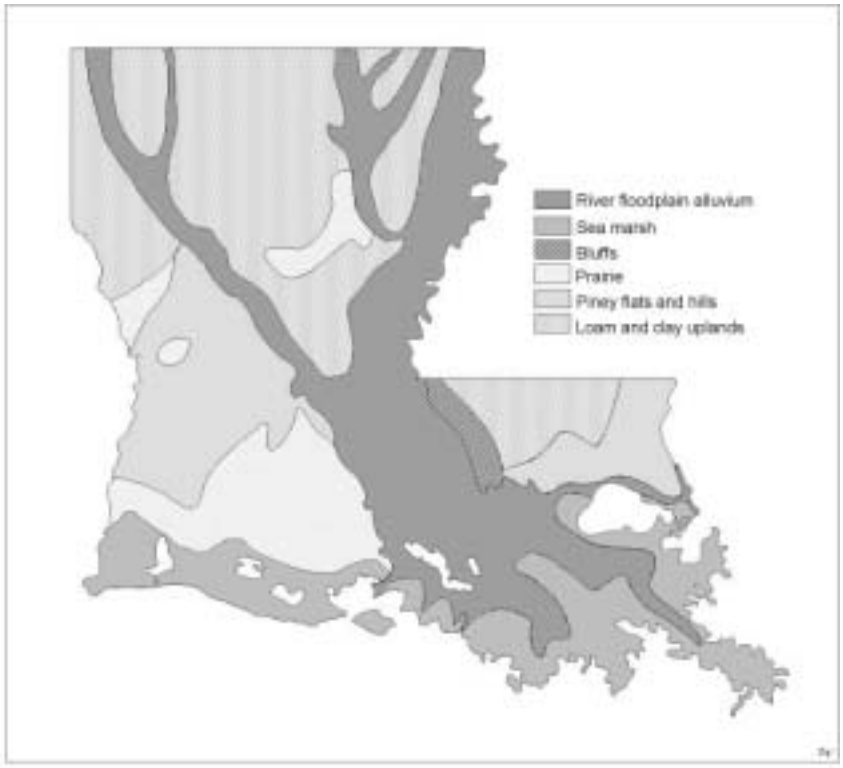


Figure 4.13. Soil and Vegetation Regions of Louisiana. odified after Fred Kniffen and Sam B. illiard, *Louisiana: Its land and People* (Baton Rouge, 1988), 72 and 79.

As in the historic Mediterranean, waterways offered a path of least resistance to the movement of heavy commodities. With a single cask weighing approximately 1000 pounds, transport in a pre-mechanized era would limit inland expansion of the industry.[7] The Mississippi carried sugar (as well as cotton and other goods) out of the port of New Orleans and around the eastern seaboard to northeast manufacturing centers (Figure 4.14). Sugar also flowed down the Lafourche and Teche Bayous and into the Gulf of Mexico for a longer trip to New Orleans.

[7] The importance of transport in the movement of bulk commodities is illustrated in the simultaneously exploding Cuban sugar industry. Though Cuba's climate is more favorable for sugar cultivation, the industry did not take-off until railroads were available to move the cane from field to mill and, most important, from factory to the distant ports. Unlike Louisiana, where a ready water transport system accelerated its emergence, long overland transport deterred Cuba's industry until a comprehensive railway system serviced the inland provinces (Zanetti and Garcia 1998).

These routes established a linear, southward-moving pattern that oriented the region outward (Goins and Caldwell 1994). Inter-river transport had to await the Barataria and Lafourche Canals and the twentieth century road system with its ferries and bridges (Becnel 1989). New Orleans itself remained oriented seaward until the steam-powered riverboat could buck the current and enable reciprocative exchanges with the hinterland (Rolston and Stanton 1999).

These early waterways, however, no longer serve as transport routes. They were gradually severed from the Mississippi as this region responded to geologic changes that gradually cut off the distributary flows of the lower Mississippi.[8] Bayou Manchac was cut off in 1826, Bayou Plaquemine in 1870 and, after a century of sugar culture along its banks, Bayou Lafourche was cut off in 1902 (Kniffen and Hilliard 1988).[9] Fortunately for the sugar planters, land transport emerged simultaneously with the demise of the river systems. Today sugar moves out of the region primarily by truck or rail (Hilliard 1979).

In the past, the rivers afforded terror as well as transport for the early planters. The early levees were vulnerable to crevasses (breaks) at floodstage and the escaping waters could ruin a season's crop and wipe out an entire plantation. Levee maintenance was, therefore, a high priority. As early as 1727, the French Crown required that levees be constructed and maintained

[8] The sediment loads that accumulate at the continental margins are enormous and they induce relatively rapid geologic change. The annual load deposited by the Mississippi is 256 billion kilograms. In comparison, that of the Amazon is 1438 billion kilograms and that of the St. Lawrence is 17 billion kilograms (Skinner and Porter 1992).

[9] Bayou Plaquemine resisted severance from the Mississippi the longest. An innovative lock, completed in 1907, operated for half a century to lift boats and barges up to the Mississippi for a shorter trip to New Orleans.

Figure 4.14. New Orleans Overwater Trade Routes, circa 1820. Adapted from Donald Meinig, *The Shaping of America*, Vol. I (New Haven, 1986), 73.

by all riparian property holders (Cruse 1953). After the Louisiana Purchase the American policy allowed the parish judge (who executed regulations made by the police jury) to collect funds for levee construction from affected landowners. After statehood (1812) the General Assembly maintained the levees through a special tax levied in proportion to assessed value of property with additional tax on land subject to inundation (Cruse 1953). An act passed in 1818 required all planters to provide the labor of their slaves twelve days a year for levee and road maintenance. This policy of local management continued until 1850 when the state legislature

introduced a separate fund for state levee maintenance, thereby relieving the planters from direct involvement in levee maintenance (Cruse 1953). Today all farm area in the Mississippi floodplain is protected from catastrophic flood by the system of locks and spillways installed and maintained by the Army Corps of Engineers.[10]

The waterways that enabled early installation of a sugar industry were fortuitously located in the warmest part of the state where frosts are least frequent and growing season is longest. Though infrequent, severe frosts do occur in Louisiana. Its location on the southeast side of a large continental mass exposes Louisiana to both marine and continental climatic patterns. In summer, north-eastward moving air carries warmth and humidity from the Gulf creating ideal conditions for sugarcane growth. In winter, however, descending polar fronts expose the region to low temperatures that can destroy a sugarcane crop. Past meteorological records testify to the potency of this threat. In 1895, 24 inches of snow was recorded in Rayne. In 1899, a particularly cold year, Clinton recorded 0^0 Fahrenheit while Minden, in the northeast corner of the state, recorded an astonishing -16^0 Fahrenheit (Kniffen and Hilliard 1988). With the ratooning (regrowth) habit of sugarcane, such an exceptionally hard freeze can destroy not only the current crop, but those of future years that would have resulted from the regrowth of the canes.

In his broad overview of the Mediterranean, Braudel (1995a [1949], 168) defines the Mediterranean region by distribution of its vegetation: "The first olive tree on the way south marks the beginning of the Mediterranean region and the first compact palm grove the end." The early Louisiana planters received no similar biogeographic signals from the distribution of the dominant vegetation in Louisiana. The butterie, or bottomland cypress and hardwood forests,

[10] The Mississippi River and Tributaries Project confines the Mississippi River to its present channel and (theoretically) prevents catastrophic flooding by relieving pressure on the levees at extreme flood stage. Four spillways are part of the Project: the Birds Foot (in New Madrid, Missouri), the Morganza, the Atchafalaya, and the Bonnet Carre, located north of New Orleans.

were continuous from the lower coastal marsh to the more northerly reaches of the Red and Mississippi Rivers. Their convenient supply of fuel (of which huge amounts were needed) encouraged a northward extension into the Red River corridor as lower levee sites were filled (Hilliard 1979). The planters were to learn from bitter experience the narrow tolerances of their tropical plant. Successive crop failures due to the erratic freezes caused a retraction of the sugarcane region southward below the 250 frost-free day isoline. This conformation is readily seen in a comparison of maps of the growing seasons of Louisiana and the present sugarcane area. (Figure 4.15 and 4.16). Figure 4.17 illustrates the critical margin in winter temperatures that separate northern from southern Louisiana.

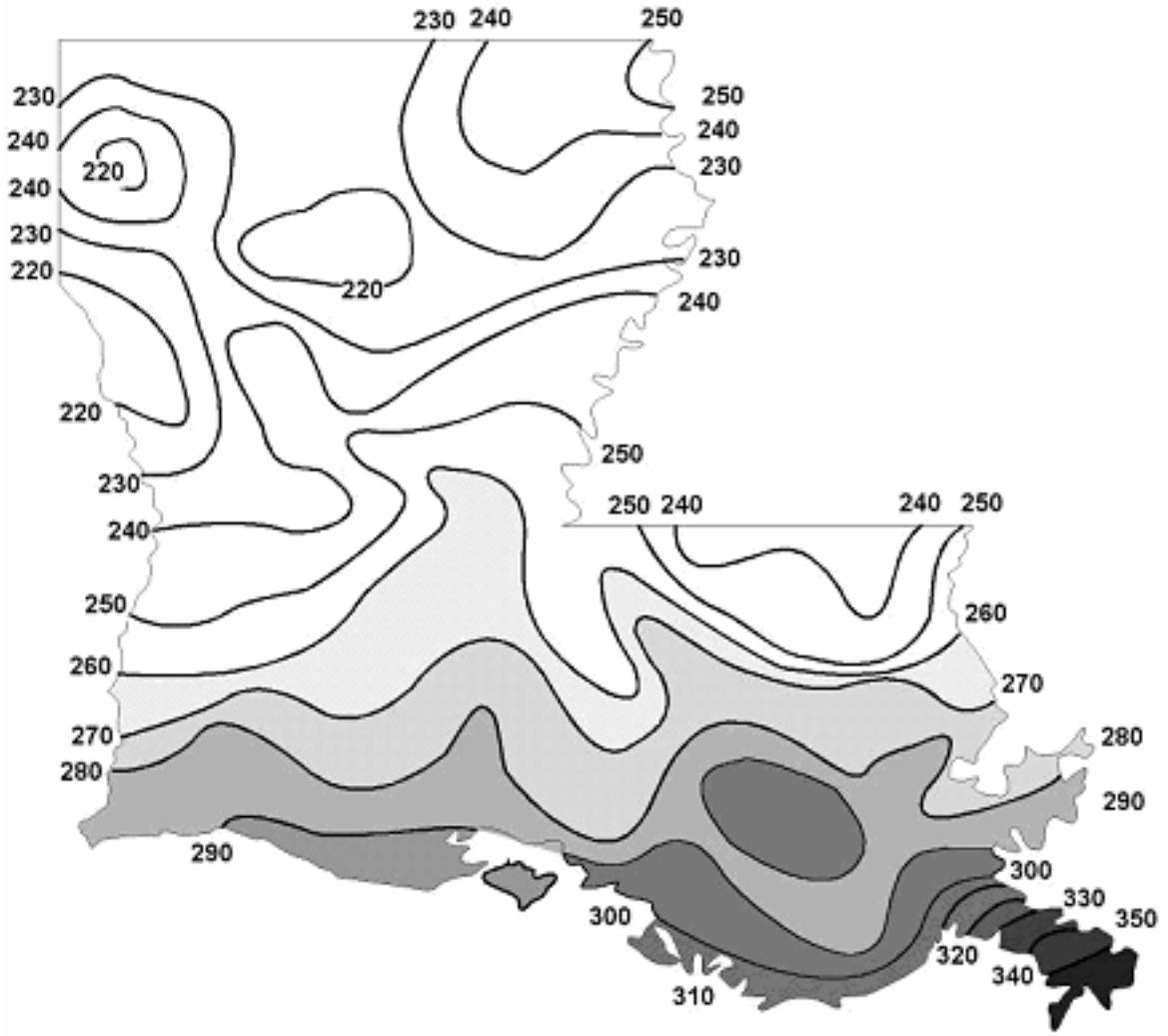


Figure 4.15. Louisiana Frost-Free Days. Source: Fred Kniffen and Sam Hilliard, *Louisiana*, (Baton Rouge, 1988), 22.

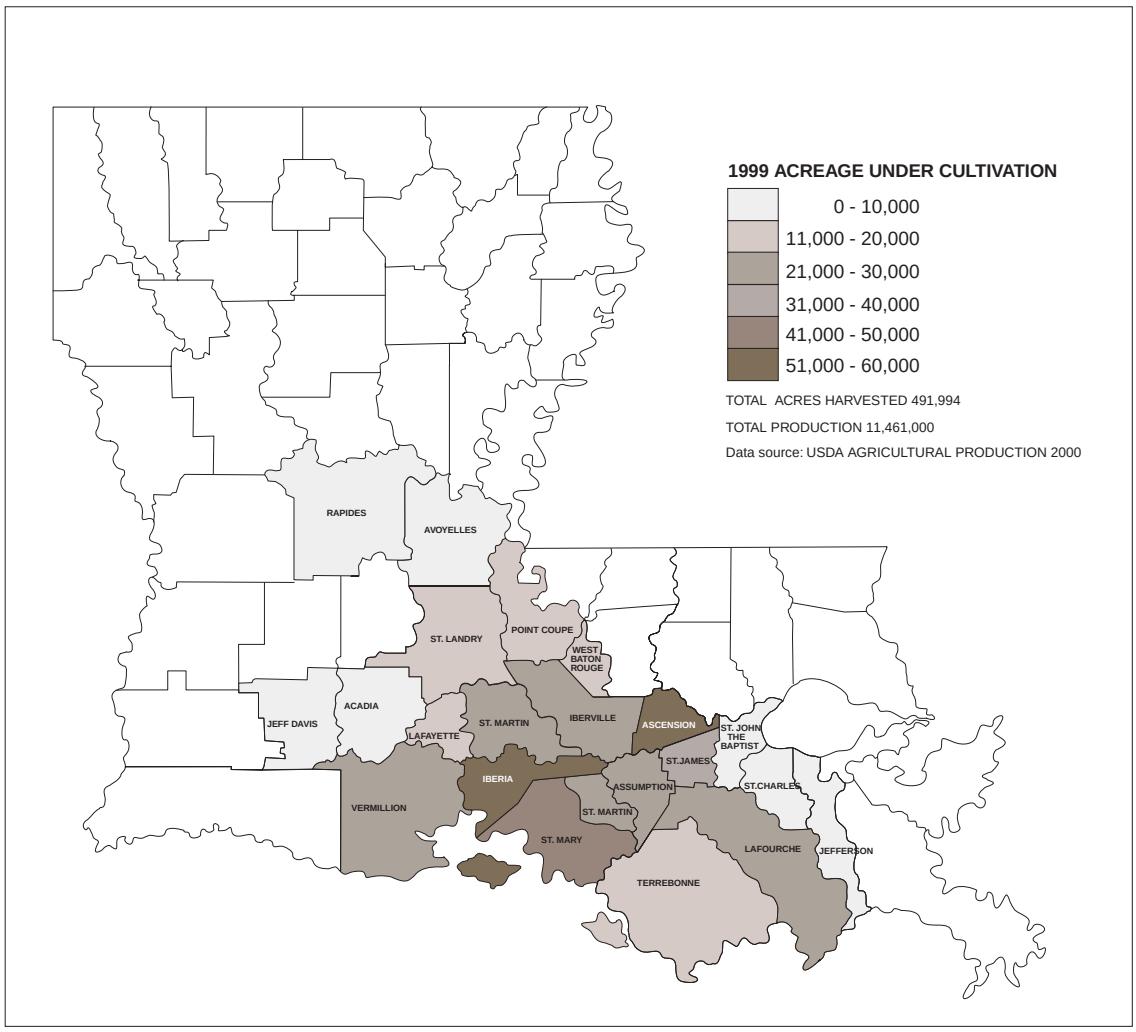


Figure 4.16. Louisiana Sugarcane Producing Parishes,. Source: USDA, Agricultural Production by State and County, 1999.

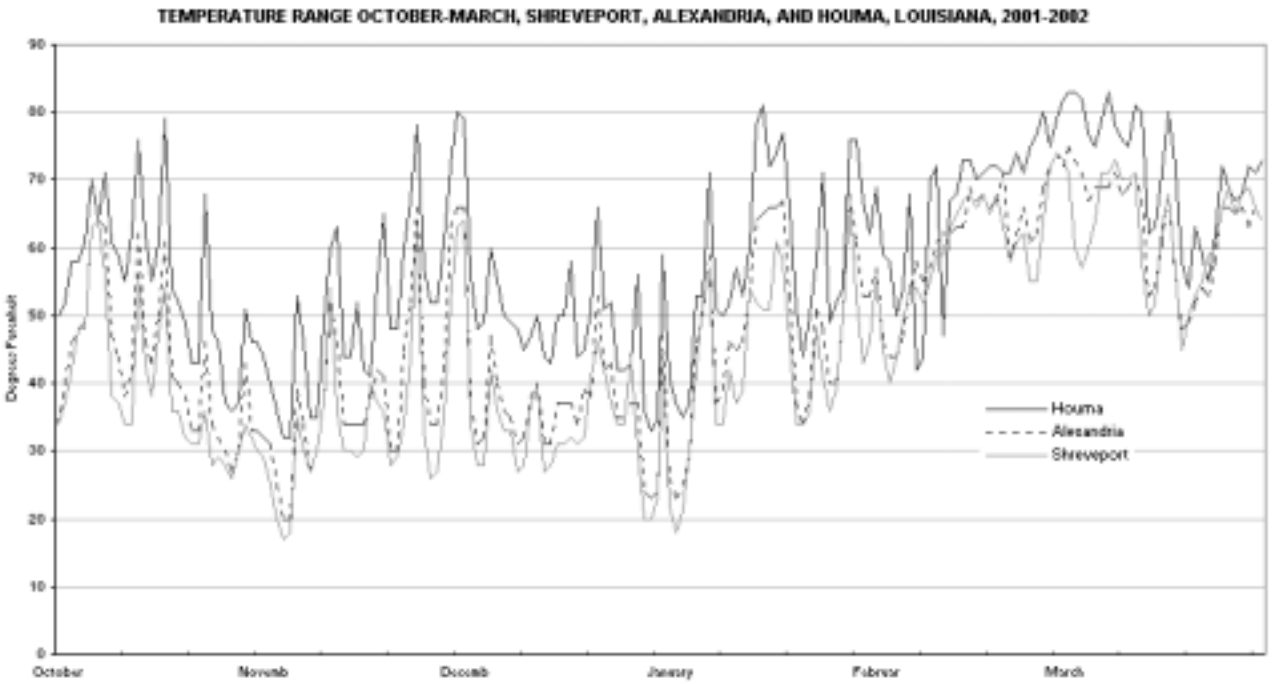


Figure 4.17. Temperature Range October-March, Shreveport, Alexandria, and Houma, 001-2002. Source: NOAA, 2003.

Because Louisiana is subject to freezing temperatures, sugarcane must be harvested before it has reached optimum maturity. The untimely interruption of the growth cycle caused Louisiana sugarcane yields to be among the lowest of any sugar producing region (Table 4.2) though recent varietal improvements have made significant improvements (Gravois 2001, Buzzanell 1996). Sugarcane grown in the tropics, especially if combined with optimum insolation, has yields significantly higher than those in Louisiana as evidenced by the production potential of Hawaii compared to that of Louisiana (Figure 4.18). Because of these disadvantages, profit in the Louisiana industry is dependent on the breeding of fast-maturing varieties as well as continued improvement in extraction efficiency of the mills (Heagler 1991, Champagen and Salassi 1997. U.S. Sugarcane Acreage and Yield, and Sugar Recovery Rate, 1995-2000. Source: USDA, *Sugar and Sweetener Situation and Outlook*, 2001. (Note: the recovery rate indicates the percentage of total sugarcane weight that is recovered as sugar.)

Table 4.2. Sugar Production Efficiency of Selected Countries.

Rank	Country or region	Sugar content	Cane yield	Sugar yield
1	Ethiopia	1	1	1
2	USA, Hawaii	3	1	1
3	Swaziland	2	2	1
4	Australia, Queensland	1	3	2
5	Peru	3	1	2
6	Sambia	2	2	2
7	Bolivia	1	3	3
8	Malawi	2	3	2
9	Argentina, Jujuy	2	3	3
10	Columbia	3	2	3
11	Taiwan	3	3	3
12	Indonesia	3	3	3
13	Mauritius	3	4	3
14	Nigeria	2	4	4
15	Reunion	2	4	4
16	Tanzania	3	3	4
17	Rep. of South Africa	3	3	4
18	USA, Florida	4	4	3
19	Sudan	3	4	4
20	Japan, Nansei Islands	3	4	4
21	Japan, Ryukyu Islands	3	4	4
22	Fiji	1	5	4
23	Philippines	3	4	5
24	Guadeloupe	5	4	4
25	Guyana	5	3	3
26	Cuba	3	5	4
27	Argentina, Tucuman	3	5	5
28	Ivory Coast	4	4	5
29	Trinidad	4	4	5
30	Zaire	4	4	5
31	Bolivia, Santa Cruz	4	5	5
32	Brazil, Campos	4	5	5
33	USA, Louisiana	5	4	5

Source: Helmut Blume, *The Geography of Sugarcane* (Berlin, 1985), 90. Note: Blume grouped producing countries in groups of 1-5, with 1 indicating highest production efficiency and 5, the lowest.

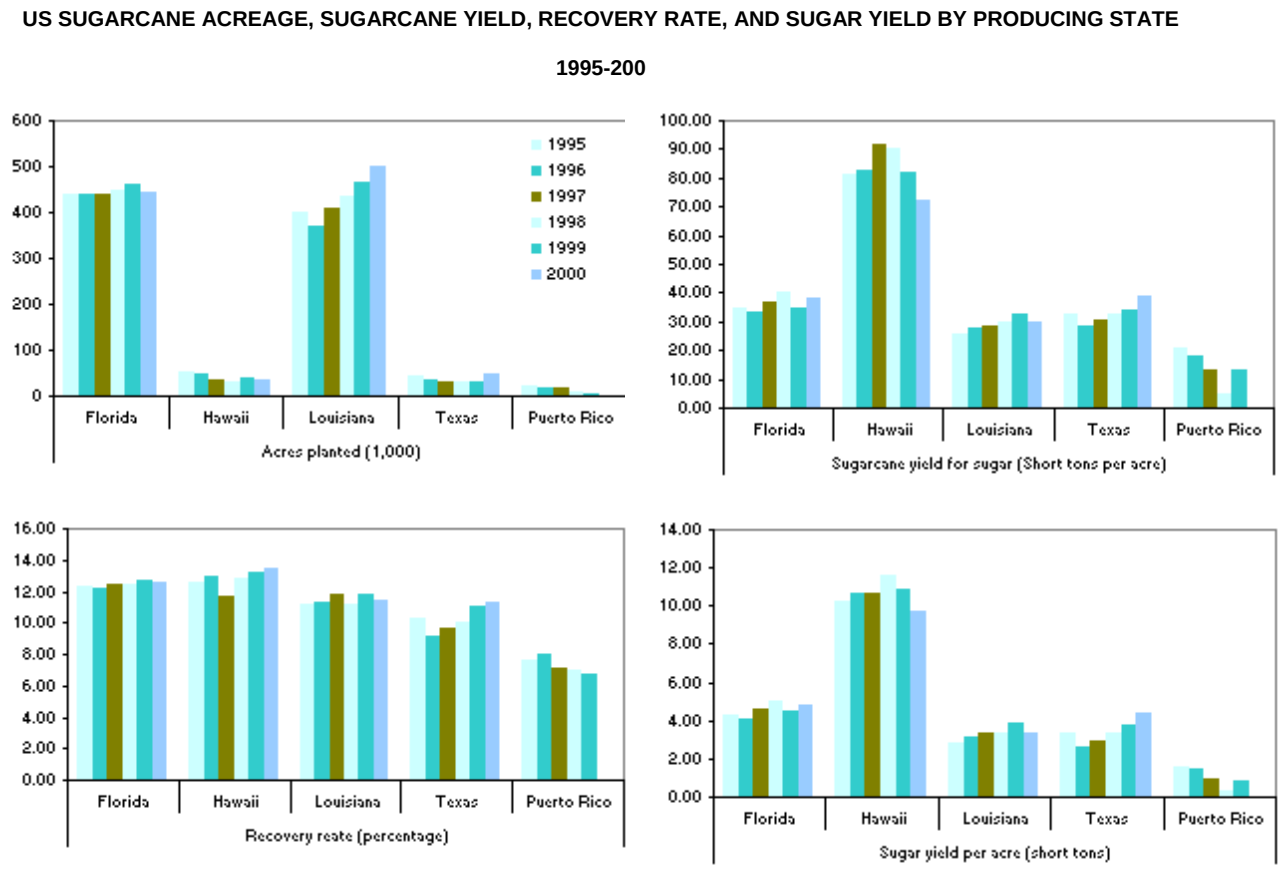


Figure 4.18. U.S. sugarcane Acreage and Yield, and Sugar Recovery Rate, 1995-2000. Source: USDA, *Sugar and Sweetener Situation and Outlook,* 2001. (Note: the recovery rate indicates the percentage of total sugarcane weight that is recovered as sugar.)

Sugar in the Louisiana Economy

Since its initial emergence sugar has been a significant contributor to the Louisiana economy. Other crops — especially cotton, rice, and more lately, soybeans — have become increasingly important, but sugarcane has continued its major contribution. (Figure 4.19). The area planted to sugarcane has remained remarkably constant since the last available sites along the levees were filled in the 1800s though mill arrangements have changed dramatically. The number of Louisiana sugarcane farms has stabilized at about 700 since a spate of consolidations in the 1970s (Reheder 1999) though they are now on the increase as producers of the traditional

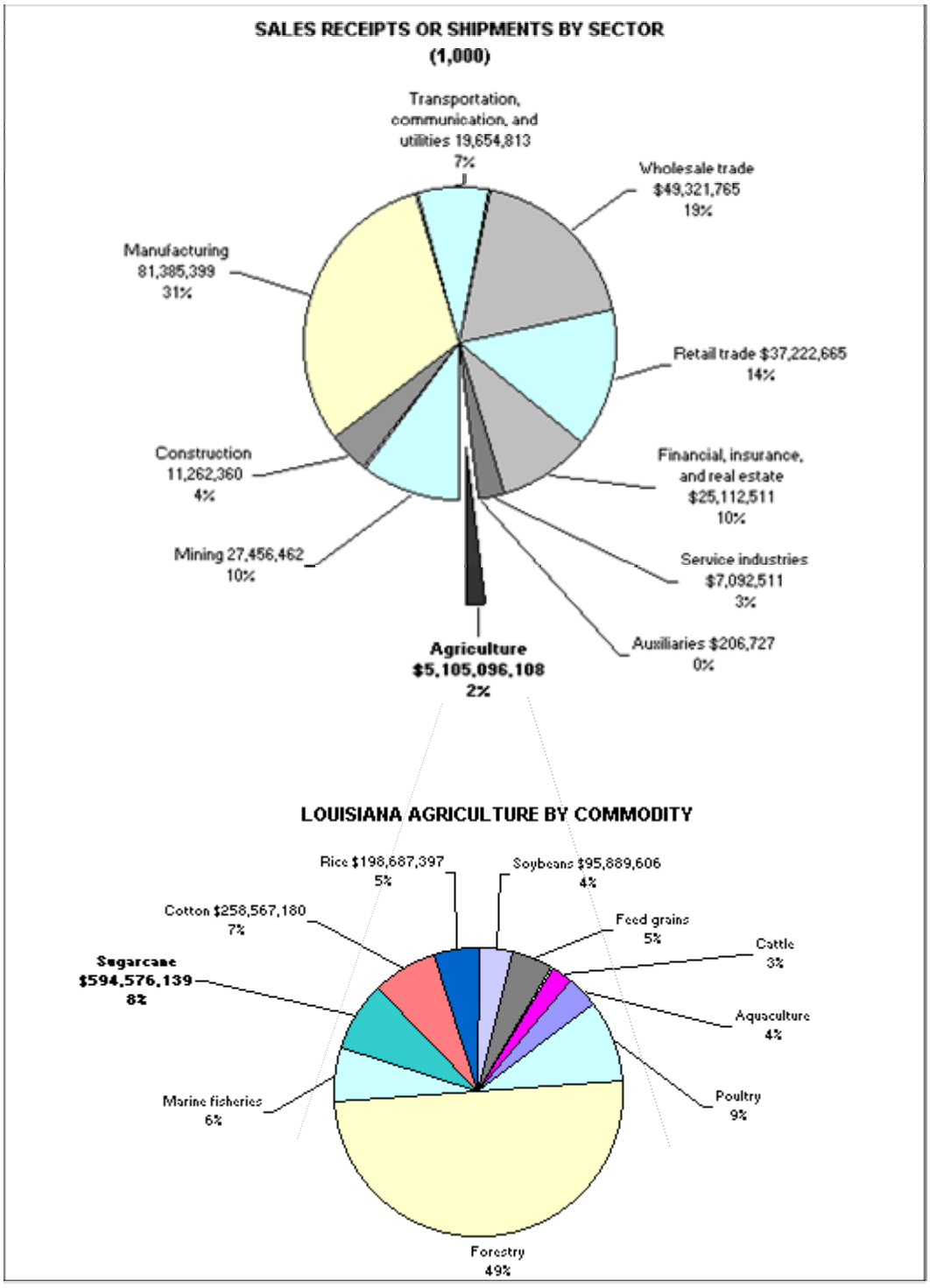


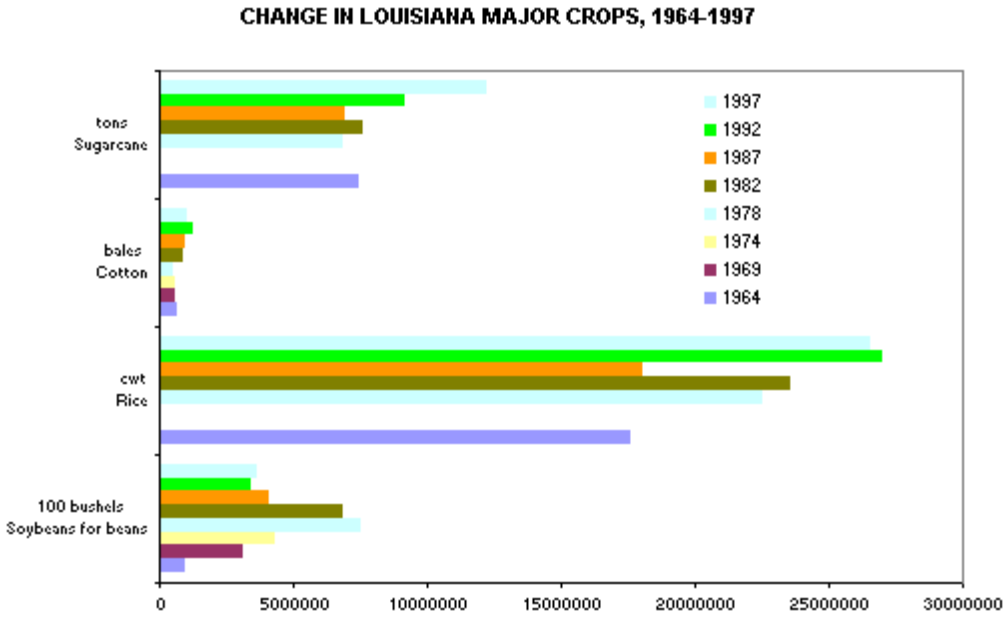
Figure 4.19. Sugar in the Louisiana Economy, 2000. Source: USDA, NASS, 2000 and *Louisiana Summary*, 2000.

commodities (wheat and rice) turn to sugar for its better price (Constant 2002). The size of Louisiana sugarcane farms has increased, but not as dramatically as has the size of other farms in Louisiana (Figure 4.20). Louisiana sugarcane farms are relatively small compared to those of Florida where similar production is achieved on only 250 farms (USDAb). Unlike Louisiana, most of the Florida units are operated by industry producers (entities that own the land as well as the processing facilities) (USDA 2000a). Louisiana has one producing unit of enormous size, the Prudential enterprise in Terrebonne Parish, a result of consolidations of South Coast and Southdown Plantations and numerous smaller plantations into an 80,000-acre farm (Rehder 1999, 186). This large-scale operation, however, is the anomaly and most production in Louisiana is on smaller units, operated by tenants (USDA 2000) (Figures 4.21 and 4.22).

Sugar manufacturing units (mills) in Louisiana continue to decline in number from 1536 in the pre-Civil War era (Rehder 1999) to 18 today, six of which are sugar cooperatives (Figure 4.23) Increasing capital requirements for installation or modernization of a sugar mill[11] has driven the consolidation of milling function into single units that operate as independent industries, completely dissociated from field production. Figure 4.24 illustrates the change in landscape during the tenure of sugarcane cultivation in southern Louisiana.

In contrast to the early industry in which all aspects of sugar production were conducted under one ownership, sugarcane farmers today increasingly hire-out various functions of sugarcane production. Most farmers continue to hire-out aerial application of pesticides and others also hire-out harvest or both harvest and transport to the mill (Constant 2002). These arrangements eliminate the need for the farmer to own and maintain expensive equipment,

[11] A proposed new mill to service the westward-moving industry was estimated to cost between $66 million and $130 million (*Advocate* 2000). The Lake Charles project is on hold due to non-receipt of expected federal funds. The railroad system to service the mill, however, was built at state expense and portions of it are now in use by western growers (Constant 2002).



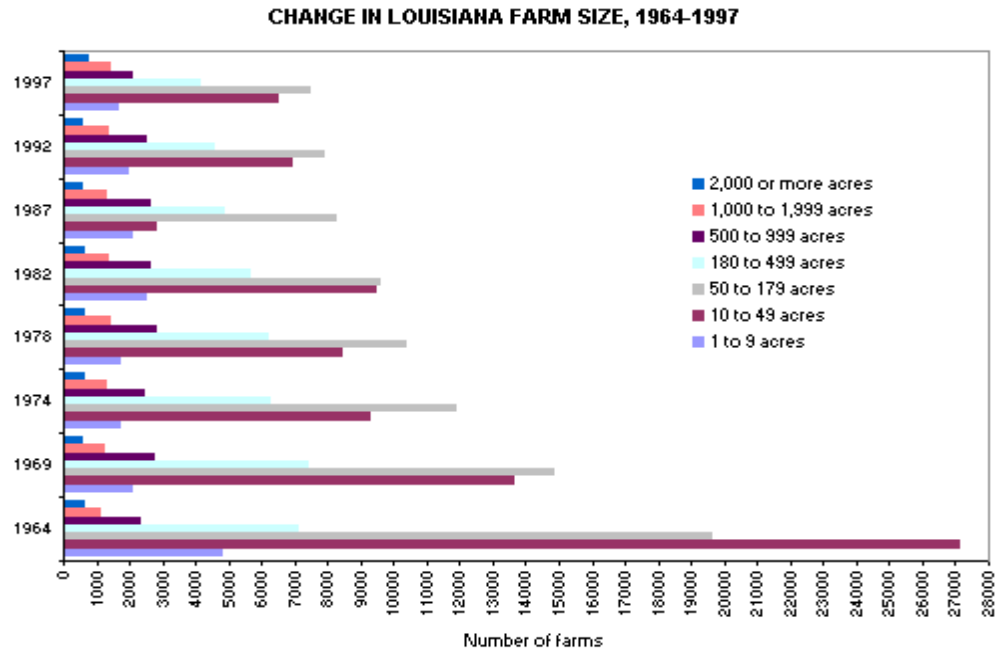


Figure 4.20. Change in Louisiana Farm Size and Major Crops, 1964-1997. Source: 1997 Census of Agriculture, State Data, USDA, National Agricultural Statistics Service.

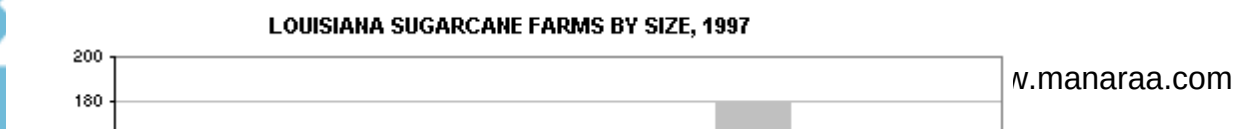


Figure 4.21. Louisiana Sugarcane Farms by Size, 1997. Source: USDA, 1997 Census of Agriculture.

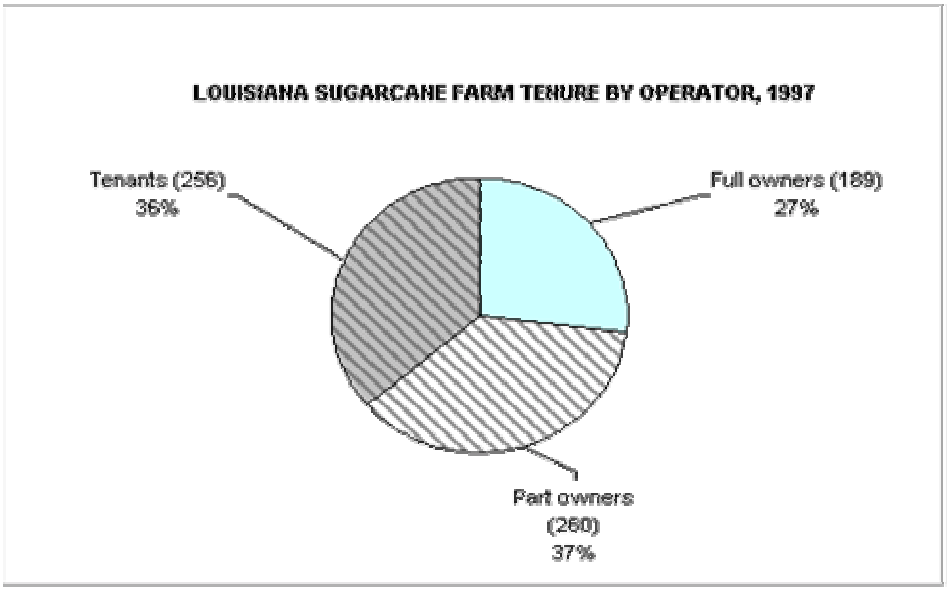


Figure 4.22. Louisiana Sugarcane Farm Tenure by Operator, 1997. Source: USDA, 1997 Census of Agriculture.

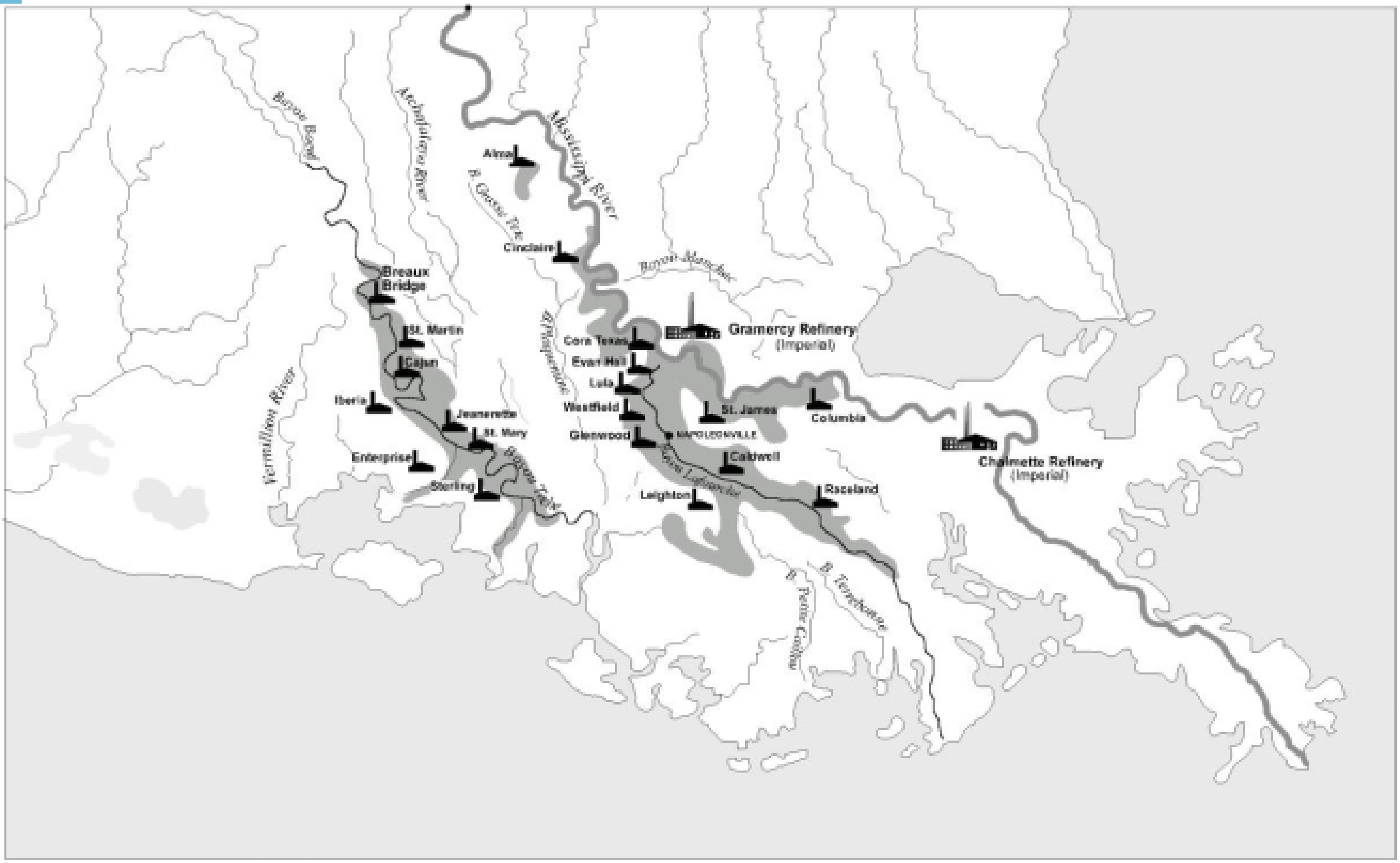


Figure 4.23. Louisiana Sugar Houses and Refineries. Modified after Louisiana Cooperative Extension Service, *Sugar Houses in Louisiana* (Baton Rouge, 1990), Publication No.1616.

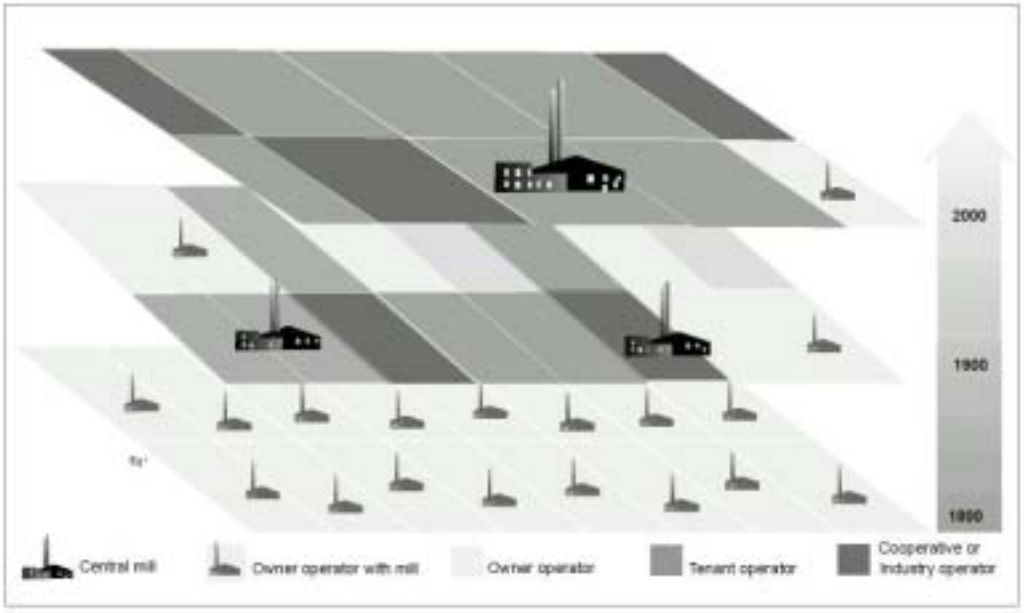


Figure 4.24. Changing Field Patterns in the Louisiana Sugar Country, 1800-2000. In the early Louisiana sugar industry all aspects of sugarcane cultivation and sugar manufacture were carried out in self-contained units under one operator. Today's industry involves both the agricultural sector (with 704 operators) and a manufacturing sector that both produces and refines sugar. The lone owner-operator is the Pateau Enterprise Factory in Iberia Parish.

especially as the cost of these increases; a modern billet harvester (Figure 4.26) costs upwards of $200,000 (Hoy 2001).

As the U.S. agriculture sector is increasingly dominated by agribusinesses, Louisiana sugarcane planters continue to operate as tenants and small producers (Champagen and Salassi 1997). Louisiana sugarcane planters presently own 30 percent of the current sugarcane acreage and rent the remaining 70 percent. Their “after-mill proceeds” are shared with the landowner according to pre-harvest arrangements in which the owner receives either 20 percent of the farmer’s profit from sale of the recovered sugar or 12.2 percent of gross production. For the majority of Louisiana sugarcane farmers today, sugarcane production is not a lucrative enterprise (Shuker, Heagler and Chapman 1986). A 1925 characterization of the Louisiana sugar planter is still relevant for these farmers:

Figure 4.25. Sugarcane Billet arvester. Photo by Douglas Durand, Jr., Louisiana State University Agricultural Extension Service. Used by permission.

The reports available seem to justify the conclusion that success in sugar planting was dependent on so many circumstances that opening a plantation was a speculative undertaking. A man intending to operate on the scale something above the average purchased a plantation for $150,000 or $200,000. He paid what he could and usually gave security for the payment of the balance in six annual installments, with high interest from date of purchase. If good crops were made for the next five or six years he might hope to pay out. Usually he did not. Poor crops resulting from sickness, crevasses, frosts or wet or dry weather frequently sent the planter to seek financial aid in New Orleans. He had to have money to meet his notes and to pay current expenses. If there were three or four poor crops in succession he was ruined. More often, however, planters found themselves able to pay just enough of their debts each year to leave a hope of paying out in the future. Thus they struggled on, men of ability, handling great sums of money, managing great interests, ever hoping for Fortune's smile but ever on the verge of ruin (Quoted in Moody 1976, 105).

CHAPTER FIVE

MECHANISMS OF CONTINUANCE

Louisiana Sugar and the Tariff

Upon being accused of bribing senators to pass a tariff favorable to refined sugar H. O. Havemeyer, chief engineer of the twentieth century U.S. sugar refining monopoly, is reported to have responded "Sugar is a gift of the tariff" (Quoted in Eichner 1969, 289). His comment has much truth. A tariff of some level has restricted foreign sugar for the duration of the nation. Sugar was among the articles listed in the tariff of 1789, designed to raise revenues for the new government. This tax for revenue was continued for two decades after which it was continued, not for revenue generation, but to enable a growing domestic sugar industry. The protected environment U.S. sugar has since enjoyed, however, is in jeopardy as the U.S. enters an era in which geopolitical considerations influence foreign trade policy (Bhagwati 1991).

The shift from a tax for revenue to one for protection has its genesis in the early decades of the nineteenth century. Britain's continued presence in disputed western lands and its continued disruption of U.S. trade with the West Indies had incited the War of 1812. Louisiana entered the Union the same year and the new state was to find war events fortuitous for its nascent sugar industry. The pre-war revenue tariff of 2.5 cents a pound for raw sugar and 5.0 cents a pound for molasses was doubled to provide additional revenues for the war effort. This discouraged the entrance of foreign sugar, assuring the U.S. market for Louisiana producers.

With the end of the war, Louisiana planters took precautions against a reversion to the post-war tariff rate. In an early demonstration of organized lobbying, the newly established Louisiana Planters' Association sent a delegation of its most prominent members to Washington to petition for the maintenance of the high War of 1812 wartime tariff (Tregle 1942). The

arguments used by the planters to protect their young industry are, ironically, the same used today by those arguing for the elimination of the current U.S. sugar program:

> Most compelling was the dependence on the whims of foreign governments for the export of this necessary commodity, and the loss of specie as vast sums were spent to purchase sugar, rum and molasses to supply the growing U.S. demand. Additionally, the planter, in performing such patriotic duty had to face peculiar circumstances not attendant upon the cultivation of other crops. Extensive capital was necessary to purchase the vast lands, slaves, and costly machines and buildings required for entrance in to the industry. And, the cane was ever at the mercies of a climate not native to the crop (Tregle 1942, 28).

The vicissitudes of climate were identified as particularly challenging for the Louisiana planters. Early Louisiana frosts curtailed the maturation of the cane threatening the current as well as subsequent years' crops, and the not-infrequent hurricanes flattened their canes making them unharvestable. To this was added infestations of worms and the immanent threat of total devastation from levee breaks. All were used to enlist sympathies for the planters (Conrad and Lucas 1995).

The War of 1812 as well as subsequent eagerness of the United States to avoid further entanglement with European powers left a generalized sentiment of protectionism throughout the U.S. that was to mature into a national policy of protectionism (Blum et al 1963, 186). In the post-war tariff debates, the sugar duty was held at three cents per pound (Tregle 1942). This protective tariff was justified on the grounds that, with discouraged foreign imports, Louisiana planters would soon supply the entire nation with sugar. It is notable that the bill was supported by John C. Calhoun and William Lowndes of South Carolina — men from the state that later initiated hostilities of the Civil War because of their strong disagreement over the right of the national government to impose tariffs for any purpose save revenue-generation (Blum et al 1963). This support was tendered, however, as Tregle (1942) observed, before it became

apparent to the South that an early zeal supporting home industries would be disadvantageous, depriving it of cotton revenues otherwise realized in trade with Great Britain.

In the decades leading to the Civil War, the tariff issue continued to solidify the South against the North. It also exposed an incongruous position held by of the Louisiana sugar planters and their representatives. These justified protection for their industry, deeming a tariff necessary to keep out West Indies sugar so their (disadvantaged) industry could grow. At the same time, in solidarity with the rest of the slave-South, they opposed protection for northern manufacturing on grounds that it disadvantaged southern cotton. This inconsistent stance, favoring a peculiar tariff and slavery simultaneously, was to characterize sugar planters politics for decades, creating strange and shifting alliances until the Civil War removed the issue of slavery (Tregle 1942).

Louisiana itself was a microcosm of the national divergence over the tariff. Within the state were advocates of both positions, the agricultural cotton section, wanting free trade, and a "manufacturing" sugar section, wanting protection from West Indies sugar. Louisiana representatives presented a divided force in Washington. Representation split its allegiance in an effort to support both cotton and sugar. While some of the Louisiana representatives voted for the tariff in the contentious 1828 vote,[1] those from the cotton districts opposed it (Tregle 1942). Tensions within the state intensified with the collapse of cotton prices in the 1830s[2] and cotton

[1] The sharpening divergence over issues of protectionism and free trade caused Southerners to refer to the tariff of 1828 as "tariff of abominations" which they believed to be both discriminatory and unconstitutional. They argued that the federal government had authority to levy tariffs for the sole purpose of revenue generation, not trade intervention, arguments that escalated into the nullification crisis (which Jackson adroitly pacified) and ultimately the Civil War (Blum et al 1963).

[2] Cotton prices had been on the decline since the second decade of the century. By 1830 cotton prices had fallen from 25.4 cents per pound in 1816 to 8.4 cents per pound (Tregle 1942).

planters blamed the "nabob" sugar planters for weakening the southern cotton industry through their alignment with the protectionist North. In the 1928 tariff debates, the sugar planters presented their usual arguments and added yet another in their defense of their tariff: removal of the protective tariff would expose Louisiana sugar planters to West Indies competition forcing them to take up cotton and further depress the falling cotton prices (!) (Tregle 1942). Instead, the cotton planters took up sugar. The 1829 crop value for sugar was $6,069,585 while that for cotton was $2,044,620 (Tregle 1942, 53). This conversion enlarged the sugar planter population and swung the entire state into the pro-tariff (though anti-slavery) Whig camp of the Northeast for the duration of the Whig interlude in U.S. politics.[3]

The divided sentiments between Louisiana sugar and cotton planters were manifested in the mixed support for Andrew Jackson. By the 1830s, it might be assumed that as a "southern" agriculturist, the Louisiana sugar planter would support the party of the "Savior of New Orleans." Instead, the Louisiana sugar planters supported the National Republicans (Whigs), the "detested capitalists" whose vision included a protectionist policy to keep out foreign manufacture, and whose banking and commerce policy, arguably, favored the North at the expense of the South (Tregle 1942, Woodward 1971). This anomalous alliance stemmed primarily from the confidence that the Whigs would extend their protectionist logic to include Louisiana sugar whose market lay entirely within the U.S. The sugar planters' need for a

[3] Following the demise of the Federalists in the 1820s, the Republicans divided into the National Republicans and the Democrats. The National Republicans continued (in part) the legacy of the Federalists with commitment to a strong, national government as defended by Henry Clay and Daniel Webster. The Democrats defended state-rights and the rule of the common man as personified by Andrew Jackson. Jackson's strong personality and "monarchial" stance caused the National Republicans to rename themselves "Whigs" to contrast to his "Tory" behavior. The National Republicans identified themselves as "Whigs" from the 1828 election of Jackson until 1852 when the name "Whig" fell out of use and "Republican" identified the party (Blum et al 1963).

peculiar tariff overrode concerns that the Whig North might succeed in curtailing the states rights that enabled them to secure the slave labor necessary for continued sugar production (Tregle 1942).

Through time defenders of a domestic sugar industry refined their argument for the tariff. To the earlier arguments for independence of the West Indies supply and the vicissitudes of nature were added arguments that the sugar country's consumption of goods from other states, as it engaged solely in sugar production, contributed generously to intrastate commerce; that this commerce offset the effects of the sugar tariff on non-sugar producing states; and that continued protection was necessary because of the many obstacles to sugar production (great expense, great risk, and small profits, etc.) (Tregle 1942).

As the nation approached the decade of the Civil War, debate over the sugar tariff intensified. Comments made in 1844 aptly summed the sentiments of the other southern states for a sugar tariff that put their brother slave-holder agriculturists in the camp of the Northerners:

> Now no article can be permanently produced, so as to be sold in any country for any length of time, below the actual cost of such article in the country. Thus, if we take the case of sugar produced from the cane, which is a tropical plant, the cost of producing it in a climate where there is at least some winter and frost, situated nearly seven degrees north of the tropic, season and the laws of nature forbid that any duty, however high, or any competition, however great, can bring down the cost of production to the cost of producing the same article in a tropical climate. Thus, ever since the acquisition of Louisiana, sugar has been subjected to a duty nearly always equal and for many years higher, than the present rate; and the relative difference between the price of the foreign and domestic article, and of the cost of production, is nearly one half the price; and nothing but the duty can occasion the difference of price (quoted in Tregle 1942, 139).

This assessment of Louisiana sugar was made by the U.S. Secretary of Agriculture, Robert Walker (of Mississippi) on the occasion of the debates on the 1844 tariff. The sugar issue was again before the Congress, driven by the intensifying debates between the industrial North and the agricultural South. Disagreement over the tariff and its variously interpreted impact on

the manufacturing and agricultural sectors continued to separate the northern and southern states, constructing an immutable sectionalism that was to culminate in the hostilities of the Civil War (Tregle 1942, Woodward 1971).

Following the end of the Civil War and the elimination of slavery, political cohesion among the sugar planters was not as solid as might be expected. Many planters believed the Democratic party, which favored protectionism, was the more useful advocate of optimum terms for sugar. On the other hand, some surviving sugar planters joined the Republican party in the belief that demonstrating cooperation with the federal government would benefit the recovering state and secure aid for its sugar industry, especially for rebuilding of the war-torn Mississippi levees (Alexander 1961, Sitterson 1953a).

By 1880 Republicans (then in control of Congress) passed the McKinley Tariff, putting sugar on the free list. This was a great disappointment to sugar planters who had supported the Democrat candidate, Grover Cleveland, in hopes that Democratic policies would dominate and their much-desired sugar duties would continue. Cleveland, though a Democrat, was firmly anti-tariff and remained unyielding in his resistance to sugar duties. To soften Congress' sweep of protective policies, however, he allowed a bounty on domestic sugar. The bounty lasted until 1894 when, much to the dismay and anger of the Louisiana sugar planters it was removed. The planters felt betrayed by the national (Democratic) party and resolved to switch allegiance to the Republican party (Key 1943).

To add to the cumulative inconsistencies of the time, not all the planters shifted their allegiance. Some of the sugar planters found the anti-Negro issue the more pressing and continued support for the Democratic party (Tregle 1942). By the turn of the century, the tariff persisted as a primary concern of Louisiana sugar planters though a decade of treasury surpluses

(1890-1900) made preserving the tariff especially difficult. To face this new challenge, the newly formed Louisiana Sugar Planters' Association sent special delegates to Washington to lobby for Louisiana sugar interests (Heitman 1987). In a 1904 defense of the Louisiana sugar industry, W. C. Stubbs offered a summary of sugar tariff history which (with appropriate additions) is still apropos:

> I have already alluded to the tariff and its influence on the sugar industry. The first duty levied on sugar was in 1789 which was augmented in 1790, 1797, and 1800. These duties were imposed at a time when there were no lands within the United States which grew sugar cane and no sugar was grown. In the War of 1812 the duty was 5 cents per pound, but was reduced to 3 cents in 1816. They were levied for revenue only, and the tariff of 1816 continued until the compromise Act of 1832. Since that time sugar has been the political football of each political party, and has been subjected to frequent and severe tariff changes. Since establishment of the U. S. in 1789, the tariff has been changed twenty times, fluctuating between 3.4 of a cent in 1861 and 5 cents in 1812 (W. C. Stubbs quoted in Taggart 1933, 50).

The complicated alliances of the earlier sugar planters' representatives continue today. In the vote for the 1996 Farm Bill (and again in 2002), representatives from the cotton and sugar districts voted differently for the new farm policy which was aimed at tariff reduction and subsidy withdrawals (USDA 1996). In obvious inconsistency, Senator Breaux of Louisiana spoke out against trade interruptions caused by domestic protection while, simultaneously, insisting that protection for sugar be continued (Congressional Record 2002).

The United States Sugar Program

Though tariffs have protected the U.S. sugar industry since the nation began, direct government intervention in domestic sugar production did not begin until the depression years of the 1930s. The genesis of this intervention, however, lay in events of the turn of the century that saw the rise of large U.S. corporations and subsequent government action to curb the first monopolies (Eichner 1969). During this "Age of Corporate Growth" not only did U.S.

corporations increase in size, but government intervention in the U.S. economy increased significantly, justified in the 1930s by the dramatic and severe economic downturn.

> Thus, extensions of the powers of the Federal government over matters of economic concern before 1929 were intended in part to prohibit certain evils which had appeared as corollaries of a free competitive system; New Deal legislation, on the other hand, was based in part upon the assumption that the balance-wheel of the capitalistic system in America, competitive enterprise for profit, had failed to maintain equilibrium in that system, and that, in consequence, the government had to assume the positive responsibility of obtaining 'this better planned society we are entering upon now (Dalton 1937, 3).

The agricultural sector of the New Deal era was greatly depressed because of production surpluses that accompanied the post-war recovery (Cochrane 1993). In response, the federal government attempted to increase prices by regulating supply both through production and import controls. Like the producers of other U.S. farm crops, U.S. domestic sugar producers were also in dire straits. While not formally classified as part of the more important farm sector (Sugar was viewed as a luxury and taxed accordingly as was liquor and tobacco), sugar was also given special attention by Congress. With the passing of the Jones-Costigan Act of 1934 (more commonly called the U.S. Sugar Program), the federal government began an unprecedented intrusion into the operation of the U.S. sugar industry. Sugar production was designated an essential agricultural commodity (so it could be included in agricultural legislation), annual production and reserve optimums were established, and authority for quota enforcement put in place. Counter-cyclical (subsidy) payments were permitted to aid producers when their crops could not be sold to meet production costs. The government also considered agricultural workers in the legislation by tying producer-benefits to payment of a minimum wage (Johnson 1974).

The Jones-Costigan Act attempted to address the (divergent) interests of sugar refiners as well as sugar producers in the same bill. Tariffs were increased to discourage the entrance of foreign sugar. The restriction extended even to sugar from the U.S. territories of Hawaii, Puerto

Rico, the Philippines, and Virgin Islands — a clear indication that mainland refiners had influenced the legislation.[4] The subsequent restriction on foreign raw sugar imports had a dramatic impact on domestic refineries. Their post-war imports of 700,000 tons (which had increased from a pre-war low of 20,000 tons) fell to 77,000 tons (Johnson 1974, 30). Not only were refiners and producers set at odds, so were mainland and offshore refiners as refining interests in the U.S. territories no longer had access to the U.S. market. These restrictions contribute to an ever-increasing control of the U.S. market by the mainland refiners (Johnson 1974).

The 1934 act, though intended as an emergency measure to stabilize the flagging sugar industry — like other emergency farm legislation of the time — has been renewed before each expiration, except for a brief discontinuance from 1974 to 1981. This interruption, tied to the aftermath of the cessation of Cuban supply following the 1954 U.S. trade embargo, caused dramatic price volatility in the world market (Figures 5.1 and 5.2). Stung with the sudden loss of a large source of sugar, the United States again encouraged sugar self-sufficiency through policies reminiscent of those following the War of 1812. Generous federal assistance was justified and a surge of growth ensued (Cochrane 1993).

[4] Johnson (1993)points out that this unconstitutional trade restriction went unchallenged even after Hawaii was admitted to statehood in 1950. The lone dissenting voice during the hearings was that of the Hershey corporation who had extensive production and refining operations in Cuba. Aggressive United States investment in the Cuban industry had caused Cuba's refined export to the United States to increase from 25,000 tons in 1925 to 303,000 tons by 1930 (Johnson 1993, 29).

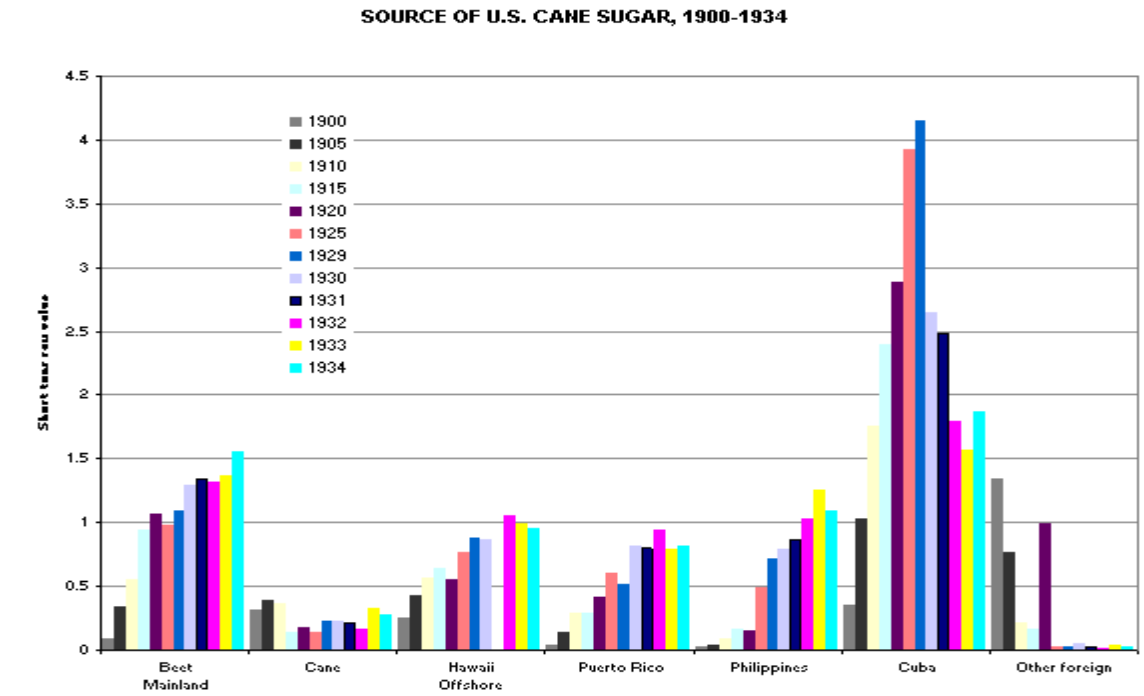


Figure 5.1. Source of U.S. Cane Sugar, 1900-1934. Source: Vladimir Timoshenko and Boris Swerling, *The World's Sugar* (Stanford, 1957), 157.

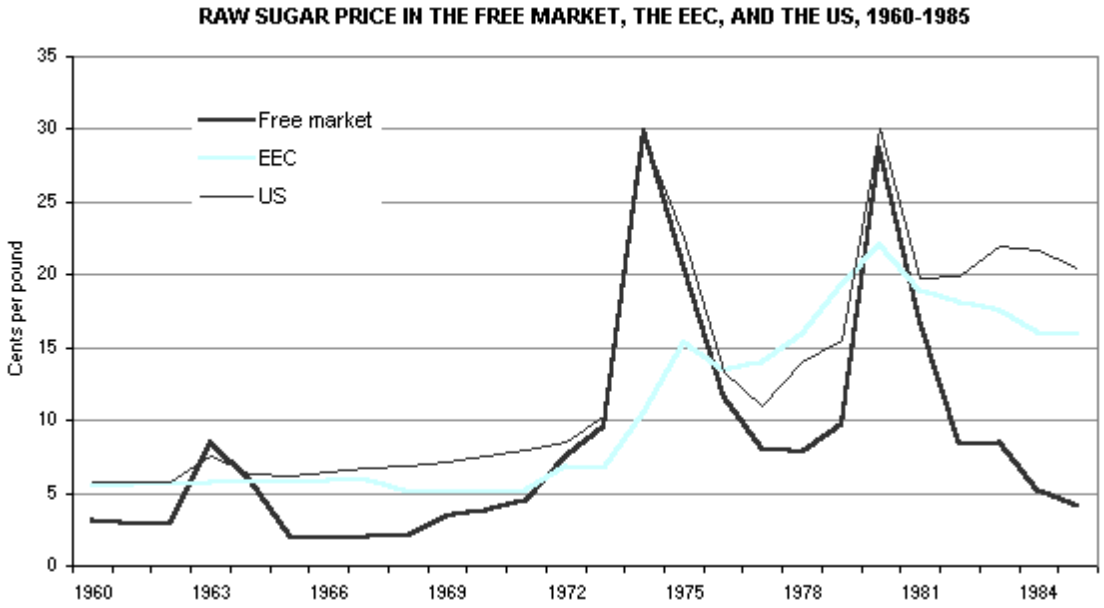


Figure 5.2. Raw Sugar Price in the Free market, the EEC, and the U.S., 1960-1985. Source: Alfred Eichner, *The Emergence of Oligopoly* (Baltimore, 1969), 38.

In the intervening years, between the emergency legislation of the 1930s and the generous policies of 1960s, the U.S. farming sector saw dramatic transformations. The small farm had given way to large agricultural enterprises much different in operation and profit-structure from the entities the depression-era legislation was designed to help. The sugar subsidy of the 1960s, therefore, benefited both the new large agricultural corporations as well as the small farmers. This liberality roused public objection to the generous sugar program and, in 1974, after 40 years of continuance, the program was abruptly allowed to lapse. United States production and refining interests were suddenly thrust into the world market. This "unilateral disarmament" of the United States — in the face of persistent government intervention by most other producing countries — created a dramatic price instability of the late 1970s. By 1981 the price of sugar had fallen from 29.5 cents per pound to 4.0 cents per pound and U.S. producers were in certain danger of collapse (Johnson 1974) . Distressed producers were rescued by the 1981 Omnibus Farm Bill (The Agriculture and Food Act) that, once again, insulated the U.S. sugar industry from the world market. As illustrated in Figure 5.3, U.S. sugar production and trade continues isolated from the world market save for limited imports mandated by World Trade Organization agreements.

The 1981 Omnibus Farm Bill[5] introduced mechanisms of price support and supply control that remain in effect today. Domestic production is controlled through acreage allotments for both sugarcane and sugar beets (except for mill allotments in Louisiana discussed below). Shortfalls in demand are met by controlled imports. Total supply is allocated among four domestic areas and 40 foreign countries (Cuba's allotment has since been divided among the eligible Caribbean countries). Select producer-countries are permitted free or low-tariff rates on

[5] Since 1977 sugar as well as all agricultural legislation had been collected into an instrument called the "Omnibus Farm Bill" renewed every five years.

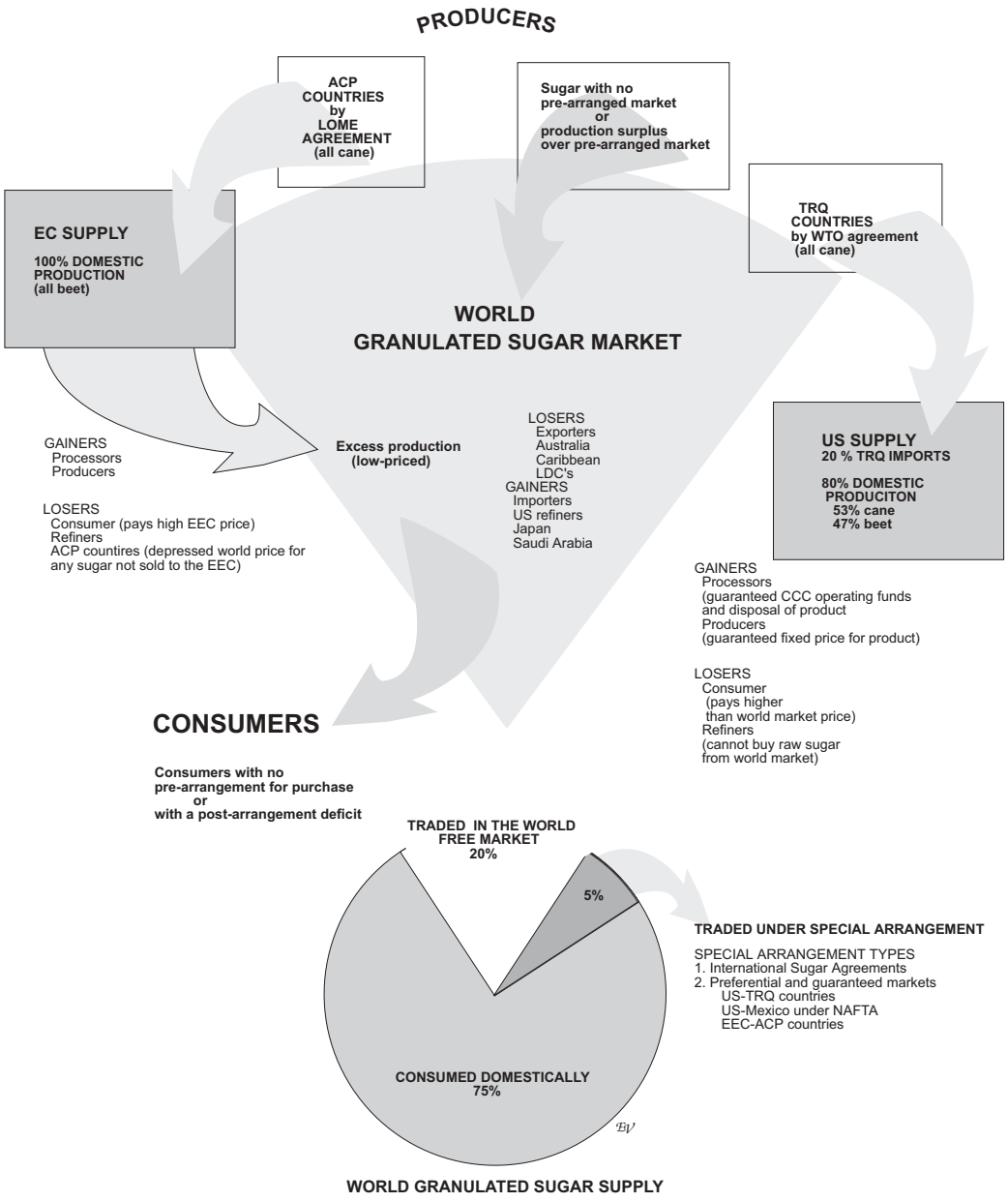


Figure 5.3. World Granulated Sugar Supply and Trade and the U.S. and E.U. Markets. Because the U.S. and E.C. tariffs bar imports (except the minimum by WTO or Lome agreement), most tropical cane producers have no access to the these large markets.

an allotted quota (TRQ). Beyond these amounts, any exports are subject to regular duty (currently 15.36 cents per pound). The selected countries and their current quota are listed in Figure 5.4. As part of the 1994 Uruguay Round of the General Agreement on Tariffs and Trade (GATT), the U.S. agreed to maintain its TRQ imports at a minimum of 1.256 million tons of raw sugar per year ((Schumacher 2001). This commitment became enforceable in 1995 under dispute settlement mechanisms instituted with the World Trade Organization (WTO) (Jurenas 2000). The amount of this import allotment is derived from historic domestic shortfalls and historic trade and aid commitments (Haley and Suarez 2000).

Supply control is further exercised through domestic production allotment. The USDA calculates the desired domestic production annually by subtracting the coming year's demand (estimated consumption plus desired year-end stocks) from current inventory. The TRQ minimum import is a consideration in the calculation of supply. The allotments are made, however, to favor domestic producers and minimize the import of foreign sugar. If projected imports are estimated to be greater than 1.532 million tons (an amount derived from the TRQ plus an arbitrary margin), the USDA suspends allotments and producers are free to produce at will — effectively making imports of more than 1.532 unnecessary. Granulated sugar supply is allocated between cane and beet sugar producers according to past performance. Beet sugar allotment is based on the previous two-year production history while cane sugar allotment is based on past marketing history, past processing levels (sugar extraction rates) and current in-ground crop of each state.[6]

[6] The 2002 Farm Bill has introduced a provision for mid-season reallotment, which poses some planning difficulty for the sugarcane farmer whose harvest schedule spreads over a 4-5-year period.

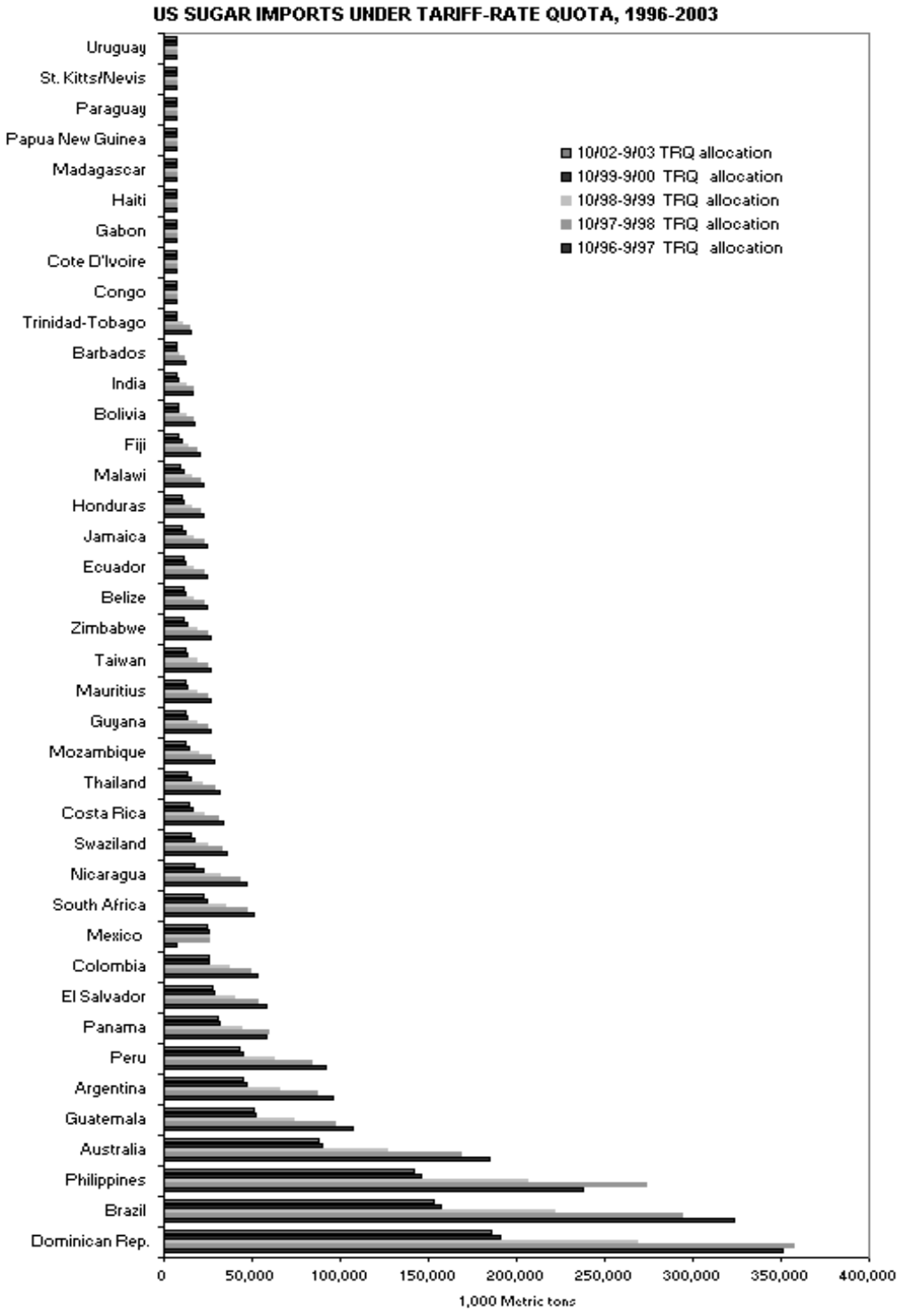


Figure 5.4. U.S. Sugar Imports Under Tariff-Rate Quotas, 1996-2003. Source: United States Trade Representative, *USTR Announcements for Allocation of the Raw Cane Sugar, Refined Sugar, and Sugar-Containing Products Tariff-Rate Quotas* (Washington, D. C., Office of the US Trade Representative, 2002)..

Figure 5.5 illustrates the USDA formula for estimation of domestic granulated sugar demand and the associated allotment of production quotas for cane and beet sugar and for mainland and offshore cane producers. In Louisiana, sugar volume (not acreage) is allotted to the individual farmer. In year 2000, the Louisiana allotment was 1.8 million tons (USDA 2001). This was apportioned by the mills, with each farmer's allotment based on his recent production history.

Price supports are the other component of the 1981 Farm Bill designed to assist the domestic sugar industry. In this system, sugar processors (mills) take out loans at favorable rates from the Commodity Credit Corporation (CCC). This cash is used for prompt payment to farmers upon extraction of sugar from their sugarcane (sugarcane farmers cannot participate directly in the CCC loan program because their crop cannot be stored). The mill is required to pay 18 cents per pound for raw sugar extracted from sugarcane and 22.9 cents per pound for sugar extracted from beets (2002 rates). The anticipated sugar itself is the collateral for the loan. Repayment of the loan by the processor is contingent upon a complex caveat. If the TRQ, set in June of the harvest year, is *below* 1.532 million tons, the loan amount plus interest must be repaid. This assumes the U.S. domestic supply, as estimated by the USDA, will be somewhat short, therefore prices should remain high enough for the processor to meet his operating cost and repay his note to the CCC. If the TRQ is set *above* 1.532 million tons, the loan becomes a "non-recourse" loan, meaning that the processor has the option of forfeiting his sugar to the CCC in lieu of a cash repayment. This scenario assumes the domestic supply will be generous and the price may fall below that which would cover the processor's costs (Figure 5.6).

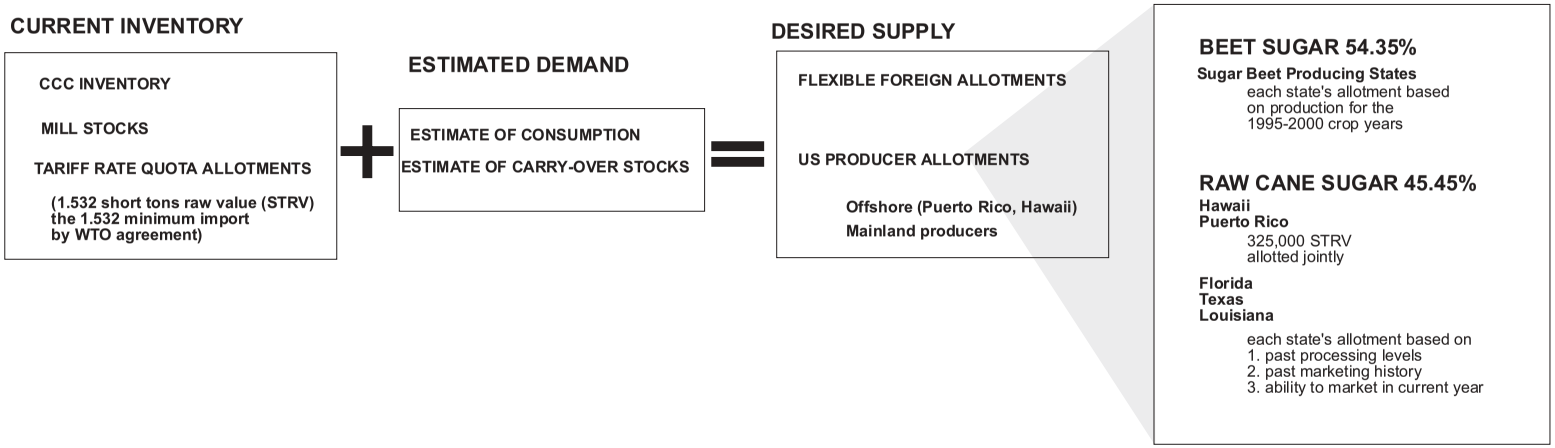


Figure 5.5. USDA Calculation of U.S. Granulated Sugar Demand and Supply. U.S. sugar suppy is regulated by the USDA whose annual allotment to producers is based on estimates of current stocks and projected demand.

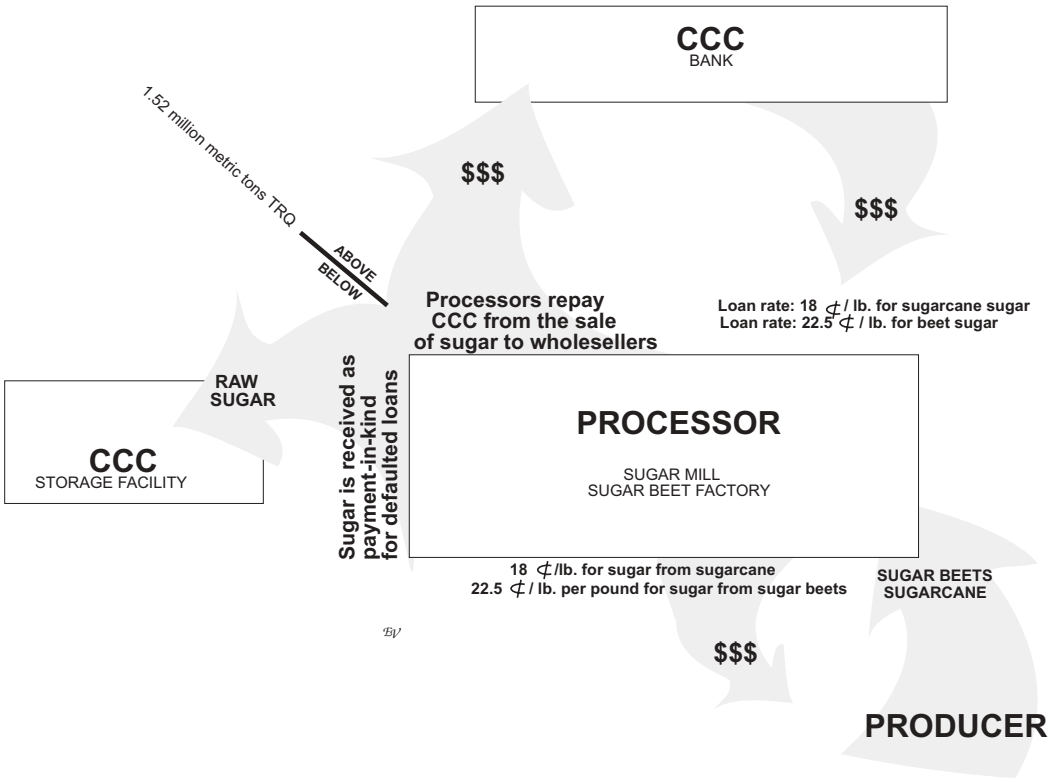


Figure 5.6. Price Support for Granulated Sugar under the U.S. Sugar Program. In this scheme the beneficiary is the processor. (In some cases, if the processor also owns or rents the land, the processor is called "an industry producer." The individudual farmer or producer benefits from the program in that the entire crop is guaranteed a market at a fixed price (In 2002, the CCC loan rate was18 cents for sugarcane sugar and 22.9 cents for sugar beet sugar).

In this scheme, the processor (the mill) has opportunity for profit in the margin between its operating costs and the price of sugar it can get from domestic refiners. The producer's profit lies in his operation efficiencies alone. His benefit from a guaranteed market at a price which is known before each harvest season (18 cents per pound in 2002) (2000b) is not insignificant especially in the climate of the 1996 Farm Bill that has reduced price support for the other

traditional program crops.[7] The sugar price support program, however, is the only mechanism presently legislated to assist sugarcane producers. Contrary to popular belief, the sugar farmer has not been the recipient of counter-cyclical (subsidy) payments since 1974.

An analysis of the federal budget summary for the period 2002-2011 shows the sugar program to be among the least expensive of the federal agricultural programs and the one most severely impacted by revisions introduced in the 1996 Farm Bill (Figure 5.7). Additionally, sugar has not burdened the CCC with excessive storage as have the program crops. The first sugar acquired by the CCC was in 1986 (U.S. Congress 1995). A second acquisition in 2000 was for 132,000 tons received by the CCC (in lieu of $54 million in processor debt, as provided by the non-recourse loan provision of the U.S. sugar program (USDA 2001). The difference between the cost to the federal government of the program crops and the sugar program is particularly egregious for the year 2000.[8]

[7] The program corps include food grains (rice and wheat), feed grains (corn, sorghum, and barley), cotton, and soybeans. These crops were grown by most producers when the depression-era farm support program was initially installed. These can be stored in bulk to be released during production shortfalls or periods of higher than expected demand. The continuation of support for the program commodities in spite of economic recovery encourages the popular notion that the program crops represent the largest part of U.S. agricultural production. To the contrary, the 1995 program share of total agricultural production was less than 20 percent (USDA 2000a).

[8] Direct subsidy payments to individual farmers are now part of the public record. In 1997, the U.S. Supreme Court ruled that these transactions involve public funds given to private enterprise (not private citizens), and the USDA has been forced to open its records for public examination. Subsidy payments to all U.S. farmers for the period 1996-2000 have been compiled into a database by the Environmental Working Group and are available at their website.

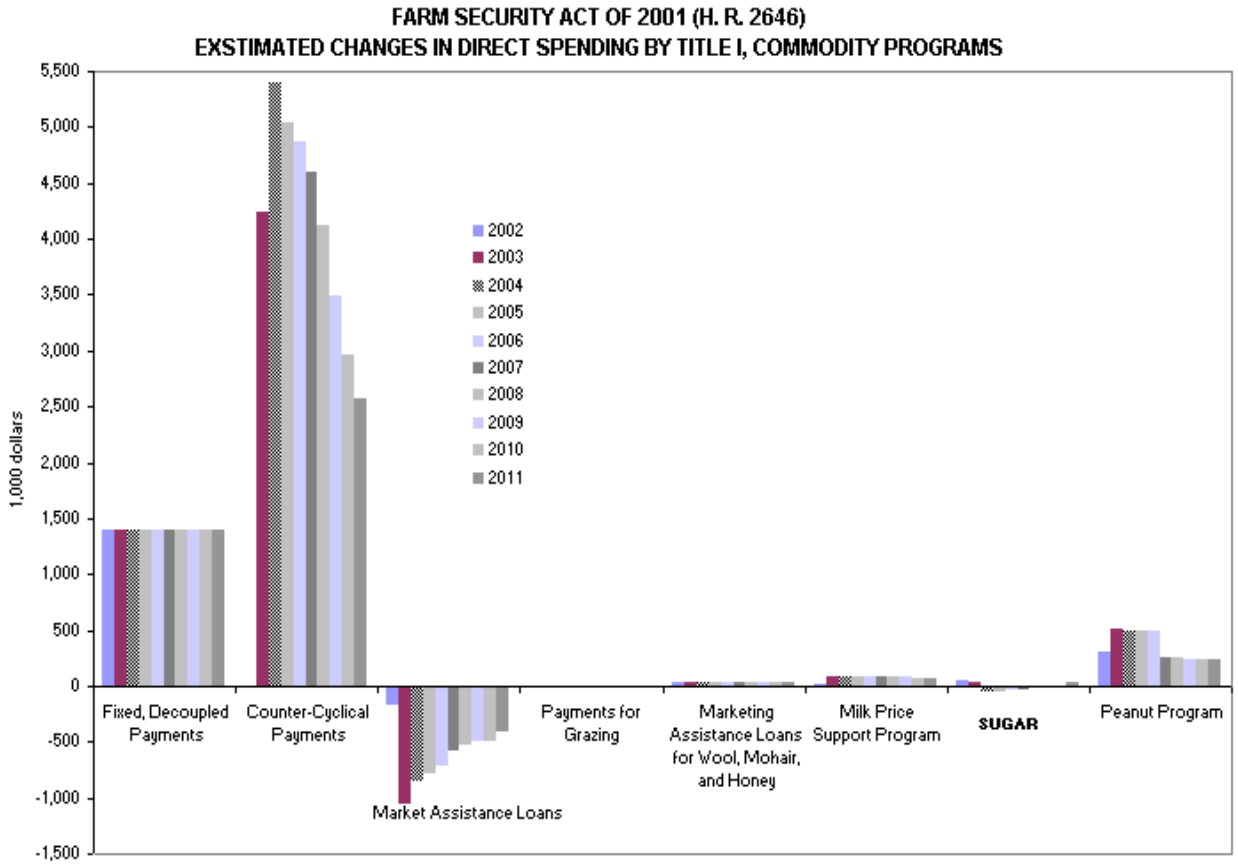


Figure 5.7. Estimated Changes in Direct Spending for Commodity Programs, 2002-2011. Source: CBO 2002

In an emergency measure, Congress approved $98 million to offset the effects of the 1996 Farm Bill (Environmental Working Group 2002), compound the funds already extended in direct government payments to the agricultural sector (Figure 5.8) Nebraska farmers received the greatest amount of these emergency funds — $252 million — while Louisiana farmers received $75 million which went to rice, wheat, corn, cotton, and soybean farmers (Table 5.1).

Figure 5.8. Direct Government Payments to the Agricultural Sector, 1980-2006. Source: USDA, Econimic Research Service, *USDA Agricultural Baseline Projections to 2010,* 2001.

Table 5.1. USDA Subsidy Payments to Louisiana Farmers, 1996-2000.

Subsidy category	Type	1996	1997	1998	1999	2000	Total
Subtotal, Farming	payments	165,980,613	136,958,669	242,421,460	343,343,517	422,855,243	1,311,559,665
Subsidies	recipients	25,079	25,216	25,172	26,377	27,408	35,310
Subtotal, Conservation	payments	8,912,924	9,004,130	10,342,535	10,607,049	11,883,306	50,749,953
Programs	recipients	3,903	3,476	3,098	2,966	3,128	7,508
Subtotal, Disaster	payments	1,541,273	53,078	73,949	65,013,757	17,931,489	84,613,392
Payments	recipients	769	117	70	9,916	6,087	11,655
Total USDA subsidies	payments	176,434,811	146,015,878	252,838,125	418,964,324	452,669,801	1,446,923,011
	recipients	27,614	27,165	26,751	32,087	31,957	42,551

Source: Environmental Working Group 2002, complied from USDA data, various years.

The 704 Louisiana sugarcane farmers were not among these 31,957 recipients. Sugarcane growers, however, are faced with escalating production costs as are the producers of the traditional program crops (Figure 5.9). As production costs continue to climb, it can be assumed that the smaller farmers will be the first squeezed out of sugarcane production as sugarcane farm size in Louisiana responds to the production efficiencies associated with economies of scale now overtaking the U.S. agricultural sector (Figure 5.10).

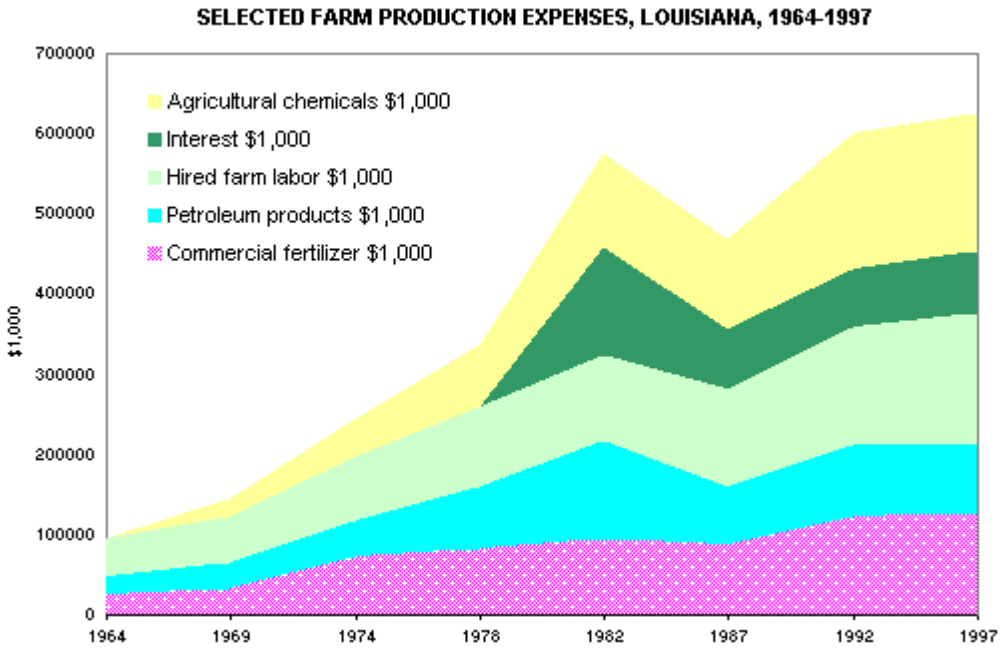


Figure 5.9. Selected Farm Production Expenses, Louisiana, 1964-1997. Source: 1997 Census of Agriculture, State Data, USDA, National Agricultural Statistics Service.

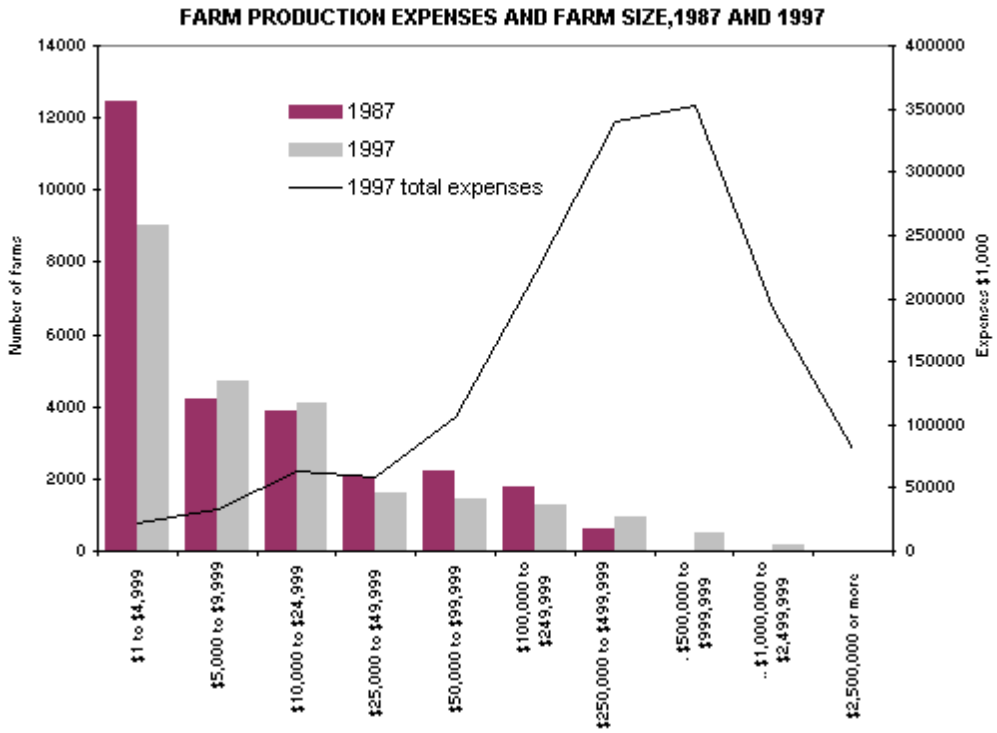


Figure 5.10. Farm Production Expenses and Farm Size, 1987 and 1997. Source: 1997 Census of Agriculture, State Data, USDA, National Agricultural Statistics Service.

The Refining Juggernaut

The U.S. sugar industry is actually two disparate industries. Sugarcane cultivation (and arguably raw sugar manufacture) is an agricultural enterprise while sugar refining is an industrial enterprise that transforms a raw product into a food additive having a wide variety of applications. Raw sugar is a product not unlike other "raw materials" that is moved off-site to enter a manufacturing and marketing stream.

The refining industry, like other major industries, experienced consolidation early in the twentieth century (Eichner 1969, May 1989). It has subsequently undergone extensive vertical

integrations that now put sugar refiners in control of the U.S. granulated sugar retail market although recent improvements in raw sugar manufacture herald a change in this arrangement.[9]

Consolidation within the U.S. refining industry began at the close of the nineteenth century when, in imitation of Standard Oil's monopoly, the major refiners united in an agreement to withhold supply to force upward the price of refined sugar. In 1881 three large refining companies, Havemeyer and Elder, Matthiessen and Weichers, and the Brooklyn Sugar Refining Company began a simultaneous withholding of sugar from the U.S. market. By 1887 the three had coerced other east coast refiners to join in an association known as the Sugar Refineries Company. Through an intense price war, these were able to collapse other refiners who refused to join in the monopoly. In 1890 the United States Supreme Court invalidated the association but, like Standard Oil before, the Sugar Refiners Company reorganized as a holding company under New Jersey corporate statutes. The American Sugar Refining Company or the "Sugar Trust," as the company became known, aggressively moved against their remaining east-coast opponent, James and William Arbuckle who owned competitive northeast refineries and an innovative packaging system coveted by the Trust. By withholding raw sugar from the Arbuckle packaging industry, the Sugar Trust forced the Arbuckles to join their association. In a foreshadowing of the integrations common today, this union added to the Trust not only the Arbuckle refineries but their packaging patent and their lucrative coffee import business as well.

The monopolistic coercion of the Trust continued until the remaining principal opponent, the California refineries of Claus Spreckles,[10] eventually capitulated, but only after a protracted

[9] Application of refining techniques in the manufacturing facility now enable the on-site production of refined-quality sugar. In 1987, Glenwood Mill in Louisiana began producing refined sugar directly and markets the product under the trade name "Cajun Crystals" (Gravois 2001).

price war that drove the refined and raw price differential to within 0.34 cents (Eichner 1969).[11] By the close of the twentieth century the American Sugar Refining Company controlled 90 percent of the U.S. refined sugar industry (Eichner 1969). In historic irony, the great New York refineries of the Sugar Trust were subsequently bought by the British conglomerate, Tate and Lyle and, in 2002, again sold to Imperial Sugar of Sugarland, Texas, now making a bid to control the U.S. sugar industry.

As the U.S. sugar industry continued into the twenty-first century a series of vertical integrations resulted in control of the United States sugar industry by only a few very large sugar processors. Through consecutive mergers, Imperial Sugar has moved to its dominant position in the Unites States sugar industry. Its control of the U.S. market as well as the control of Tate and Lyle of world markets follows Eichner's logic of consolidation.

> The sugar refining industry was consolidated for one reason alone: so that those who had survived the Golden Age of Competition would no longer be completely at the mercy of impersonal market forces. All other considerations, including possible economies of scale and windfall profits, were secondary (Eichner 1969, 119).

Eichner's four-stage model for the evolution of the American economy equally describes the changes in the American sugar industry: 1) 1600s to 1840, a period of "imperfect competition" dominated by artisans and small-scale manufacturing; 2) 1843-1895, the "golden age of competition" characterized by increased scale and standards of manufacturing; 3) 1890s-1950s, the "corporate revolution" marked by the emergence of the monopoly and oligopoly; and

---

[10] Claus Spreckles developed a western sugar industry by stimulating the California sugar beet industry and importing Hawaiian raw sugar for refining in his Crockett refinery. The Spreckles company, California and Hawaii Sugar, controlled 30 percent of Hawaii sugar production by 1890 (Eichner 1969).

[11] The price differential between raw and refined sugar has moved significantly through time from 10 cents per pound in 1830, twice the price of raw sugar (Eichner 1969, 30), to 5.00 cents per pound before 1850 to 2.07 cents per pound by 1876 (Eichner 1969, 48).

4) the post World War II decades of increasing corporation size, the "era of the conglomerate" (Eichner 1969, 11).[12]

The present structures of the global sugar market present a great risk to the future of Louisiana production. Should the U. S. withdraw price support from its sugar industry, causing it to engage with the world market, multinational sugar enterprises will certainly favor lower-cost tropical cane sugar over that produced in Louisiana and, absent their secure U.S. market, Louisiana producers can hardly be expected to survive.

The Costs of the Controlled Sugar Trade

The costs of the sugar program are diffuse and extremely difficult to quantify. They are disputed by proponents and opponents alike (Ortega 1996; Champagne and Salassi 1997; International Trade Commission 2000; Peterson 1996; USDA 2000b; Zepp 1977; Moyer and Josling 1990). Contrary to arguments to the contrary, the "costs" to the federal government are relatively small compared to other program crops in which tax dollars are used to make deficiency payments directly to farmers. The U.S. sugar program operates at "no-net-cost" to the federal government though it can be argued that the federal government incurs substantial cost through the administration of the non-recourse loan program, the CCC storage of excess stocks, and the expense of marketing surplus sugar (Peterson 1996, Johnson 1993).

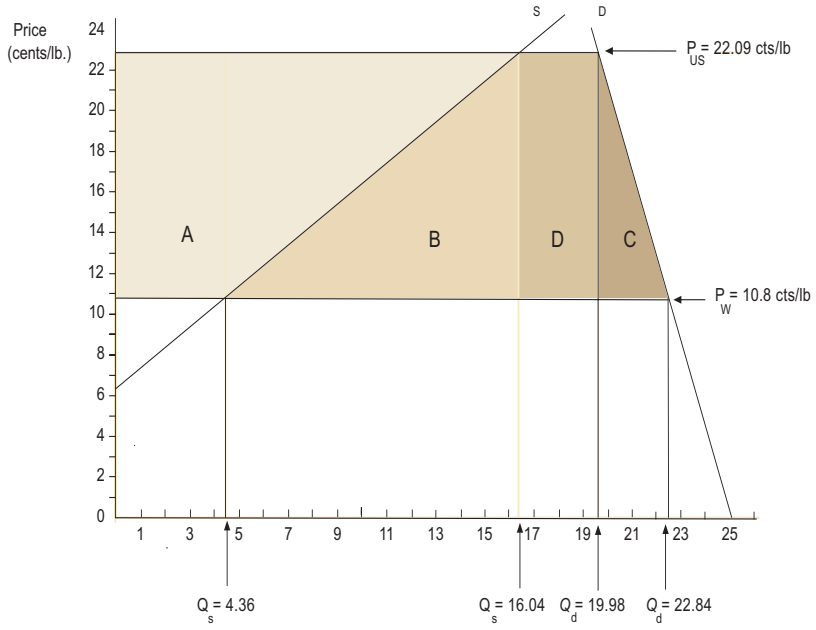
The cost of the sugar program to the consumer is equally hard to quantify though it cane be argued the price of sugar and sugar-containing products is higher in the U.S. than it would be if refiners and food processors had access to foreign sugar. Estimates of this cost ranges between

[12] Eichner maintains that monopoly emerged at the close of the nineteenth century because the U.S. stock market had matured sufficiently to capitalize the mergers as well as production efficiencies: "The reorganization of production and new management techniques made it possible for the megacorp to expand to any size it might wish without suffering diseconomies of scale and this, in turn, reinforced the megacorp's already considerable market power" (Eichner 1969, 2).

$200 million and $3 billion (Marks and Markus 1993, GAO 2000, USDA 2000b, Monahan 1992, Haley, Vivien and Sigura 1993). The cost to the U.S. consumer lays, at any given time, between the U.S. wholesale price of raw sugar and the world price. In one model (Figure 5.11), economists determined that the cost to U.S. consumer was $2-4 billion (Morke and Tarr 1981). These calculations were based on a difference of 11 cents per pound between U.S. price and world price — a not unrealistic situation, though not a common one either. In the model, gains to domestic producers are $1.2 billion because producers receive a higher price for their sugar than they would have in the world market. Gains to foreign producers are also considered in this scenario because they receive a higher price for sugar in the U.S. than they would in the world sugar market.

Scrutiny of this model exposes some of its difficulties. First, the "free" market price of sugar used as the baseline of the calculation is "a mythological figure," an "average of all the special arrangements of prices obtained from average of prices received from all preferential arrangements of the world market" (Johnson 1993, 23). The "mythological" nature of price is underscored in one year's survey. Within the same year, raw sugar was exchanged between various countries at prices that ranged from $200 per ton (Japan and Australia) to $55 per ton (South Africa and Namibia) (Johnson 1993). Hence, arguments based on an average world price make little contribution to resolution of the dilemma of price instability.

The long-term cost of the program can be argued to be significant to the U.S. producers because it masks production inefficiencies of the U.S. industry. As long as price support enables U.S. farmers to meet production costs, appropriate adjustments to other crops or land use are not made, and they become more vulnerable to painful adjustment in the eventuality of sugar trade liberalization by the U.S. Additionally, U.S. resources are used to produce a product at greater



5.11 Estimated Costs of Restricted Imports under the U.S. Sugar Program. At world price of approximately 11 cents per pound, nearly 23 million pounds of sugar would have been consumed in the United States, much of it imported. By restricting imports to approximately 4 million pounds, the US price was increased to 22 cents per pound. The excess cost to consumers, A + B + C + C (because of the imposed constraints) was an estimated $2.4 billion. The Gain to domestic producers was trapezoid A, just under $1.2 billion. Rectangle C, $440 million, was the approximate gain to those foreign producers who obtained quota allotments. Triangles B and C represent the estimated deadweight loss of $820 million. Source: Georgetown Economic Services using data from GAO analysis of USDA data and elasticity estimates derived from Morris E. Morke and David G. Tarr, *Effects of Restrictions on United States Imports: Five Case Studies and Theory,* US Federal Trade Commission Staff Report, June 1981; and F. M. Schener, "The United States Sugar program" John F. Kennedy School of Government Case Study, Harvard University, 1992.

cost than its value on the international market — an inconsistency that has been remedied by off-shore production or increased foreign imports in many other sectors

Arguments against sugar price controls expand to include issues of developing countries (Jabara and Valdes 1993, Illeyne 1997). The world granulated sugar market is a residuals market in which surplus sugar from producing countries is sold. Only 25 percent of cane sugar is sold

outside the producing countries but this trade represents significant income for those countries (Illeyne 1993). It has been argued that the preferential price TRQ-countries receive does not offset their overall losses as they sell their remaining sugar into a world market depressed by the U.S. and E.U. protectionist policies (Scherer 1992). It is further argued that the high cost of the U.S. granulated sugar industry is responsible for stimulating the creation of artificial sweeteners that further reduce the relatively flat demand for granulated cane sugar (Sturgis et al 1990). (Figure 5.12).

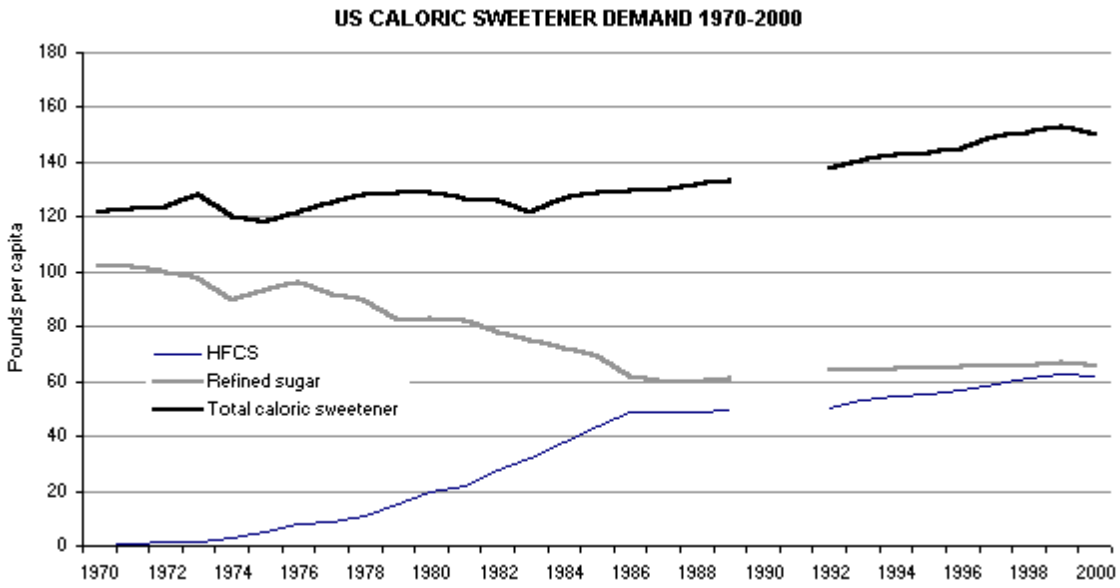


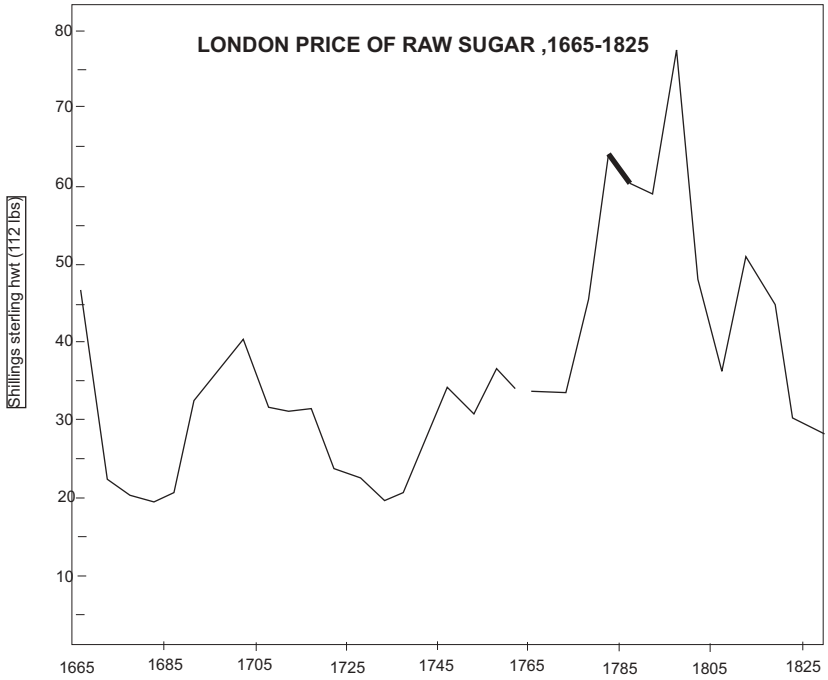
Figure 5.12. U.S. Caloric Sweetener Demand, 1970-2000. Source: USDA, Sweetener Market Data, 2000. (High Fructose Corn Syrup) (HFCS).

Price Stabilization and Global Cooperation

Price volatility has characterized the sugar industry since its emergence in the seventeenth century (Figure 5.13). The causes vary from political events to weather-related crop failures. Political eventualities can have enormous effect as demonstrated in the launch of the beet sugar industry (Napoleon's) Continental blockade and the collapse of the European industry during World War I . Because of the difficulty in managing sugar's long harvest cycle, political and economic efforts to control the volatility of sugar prices contribute to its intensity (Johnson 1993). Weather disruptions affect harvest several years distant from the one affected by adverse weather. A common response to subsequent high prices from one weather-induced seasonal shortfall, however, is increased production that, in turn, (in subsequent years) gluts the market, depresses prices, and causes acreage to be taken out of production until the next cycle of crop failure restarts the cycle (Johnson 1993). The intensity of price volatility is further compounded by protective policies that deter contraction following price drops as producers — insulated from price effects that would otherwise cause them to reduce production — actually increase production to make up for profit losses (Johnson 1993, Scherer 1992).

The first effort at international coordination of sugar supply was prompted by the entrance of beet production at the close of the nineteenth century (International Sugar Organization 1980). This temperate climate crop greatly expanded the potential supply of granulated sugar and introduced an annual crop rotation into the multi-annual pattern of tropical sugarcane. By the close of the nineteenth century, European beet sugar production threatened to overtake the traditional cane sugar industries (Figure 5.14).

The 1902 Brussels Convention produced the first international agreement in which the major producers of sugar beets and sugarcane formed the International Sugar Organization (ISO) to control the production of (excess) granulated sugar, then being overtaken by beet sugar



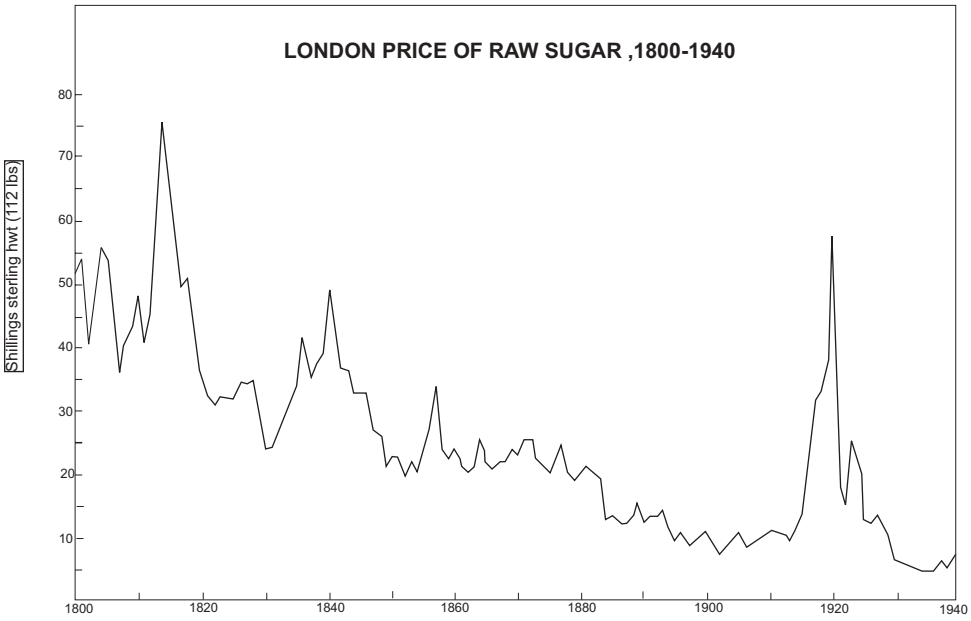


Figure 5.13. London Price of Raw Sugar, 1665-1825 and 1800-1940. Source: Noel Deerr, *The History of Sugar* (London 1950), 528-532.

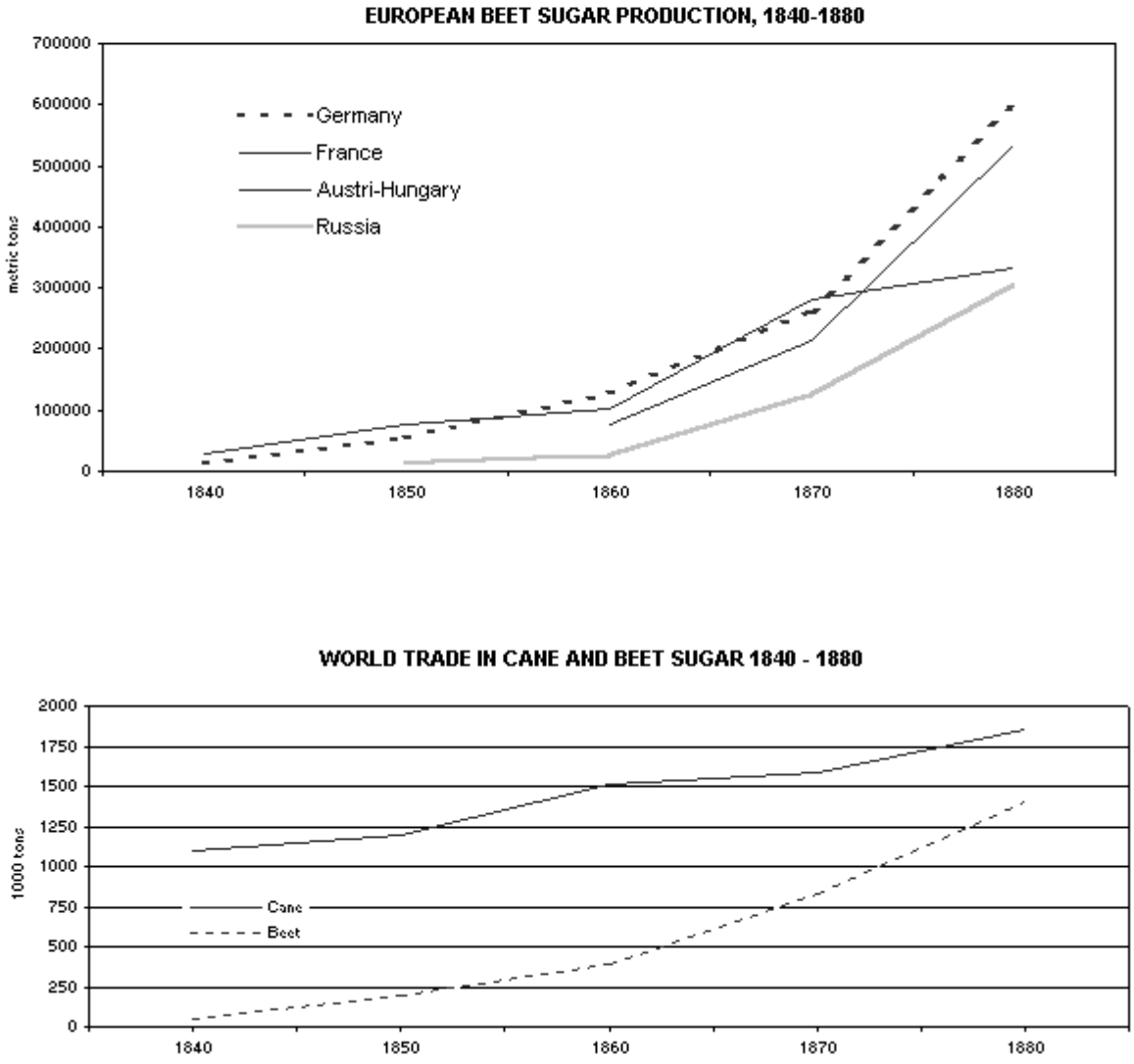


Figure 5.14. European Beet Sugar Production and World Trade in Cane and Beet Sugar 1840-1880. Source: George Abbott, *Sugar* (London, 1990), 140 and 142.

producers (Abbott 1990). The variable compliance of member states became moot as World War I ensued and the European beet industry collapsed. Post-war recovery of the beet industry again drove prices down, and sugar-producing countries again attempted production coordination through the 1931 International Sugar Agreement. In a pattern that still foils

stabilization efforts today, non-signature countries took advantage of the reduced supply to increase their own production. While 7.2 million tons were voluntarily withheld by participants, non-participants increased production by 5.2 million tons (Abbott 1990, 183). Germany, Hungary, Poland, Czechoslovakia, and Yugoslavia reduced beet production, and Cuba, Java, and Peru reduced cane production. Japan, however, increased beet production and Brazil and the Dominican Republic (mostly American-driven enterprise) made huge increases in cane production. This reestablished sugarcane as the principal source of granulated sugar, reducing the trend towards the dominance of beet sugar (Abbott 1990).

In 1937 a third International Sugar Agreement was attempted. This time the U.S. (at the time increasing its imports) agreed to participate by importing a percentage of its annual demand from selected producing countries. This gave birth to the TRQ list that today still regulates the entrance of foreign sugar into the U.S. Reasons for the subsequent failure of the 1937 International Sugar Agreement are suggested by the language summoned as its authority. Ideals of reasonableness and fairness were to govern production. Profit was to be determined "by a reasonable price not to exceed the cost of production including a reasonable profit of efficient producers" (quoted in Abbott 1990, 183).

Subsequent agreements followed in 1953, 1958, 1968, and 1977.[13] The 1977 agreement gave birth to the current International Sugar Agreement. Through this agreement, the ISO sets annual global quotas based on estimates of the net import requirements of the free market and the expected surplus production of member *and* non-member states. The desired full coordination of world sugar supply is, therefore, hamstrung by the non participant countries.

[13] The International Sugar Agreement has been renewed annually since 1977. It hosts a web-site through which buyers and sellers are easily put in contact. The International Sugar Organization also serves as a valuable forum for data comparison in which other sugar analysts such as F. O. Licht, Czarnikow, Man, and Tate and Lyle imput sugar statistics.

The idealized mechanism for relating supply and price is illustrated in Figure 5.15. In this scheme the ISA attempts to regulate sugar supply by associating the quotas assigned to various (participant) producing countries with the moving world price of sugar. Falling prices trigger tightening quotas to arrest price fall. Rising prices trigger loosening quotas to release pressure on the upward trending price.

The ISO uses three criteria to determine optimum sugar volume: 1) past performance of the granulated sugar industry, 2) projected production for the current crop year, and 3) the interest of developing nations. This last criteria is not only difficult to specify but contentious as well. Persistent volatility in the world sugar price does not suggest a large success of the ISA. The agreement, however, represents a reasonable mechanism for coordinating an industry with far-flung producers and consumers who are otherwise independent in economic and trade policy. And, it represents a regulatory environment the U.S. and Louisiana producers of granulated sugar may soon enter.

The long-term effectiveness of the ISO is compounded by short-term planning policies of the lesser-developed countries for whom sugar is a lucrative cash crop and often their principal source of foreign exchange. Many of these countries have few competitive alternatives to sugar, given their tropical climates, the historically established trade relations, and uncompetitive alternative production technology (Jabara and Valdes). Consequently, in efforts to offset losses, they increase production in a climate of falling prices, only to compound the market disorder. Their predicament is further compounded by the increased use of HFCS and the continued introductions of synthetic sweeteners — mostly engineered in the U.S. in response to the high cost of granulated sugar (McCann 1990).

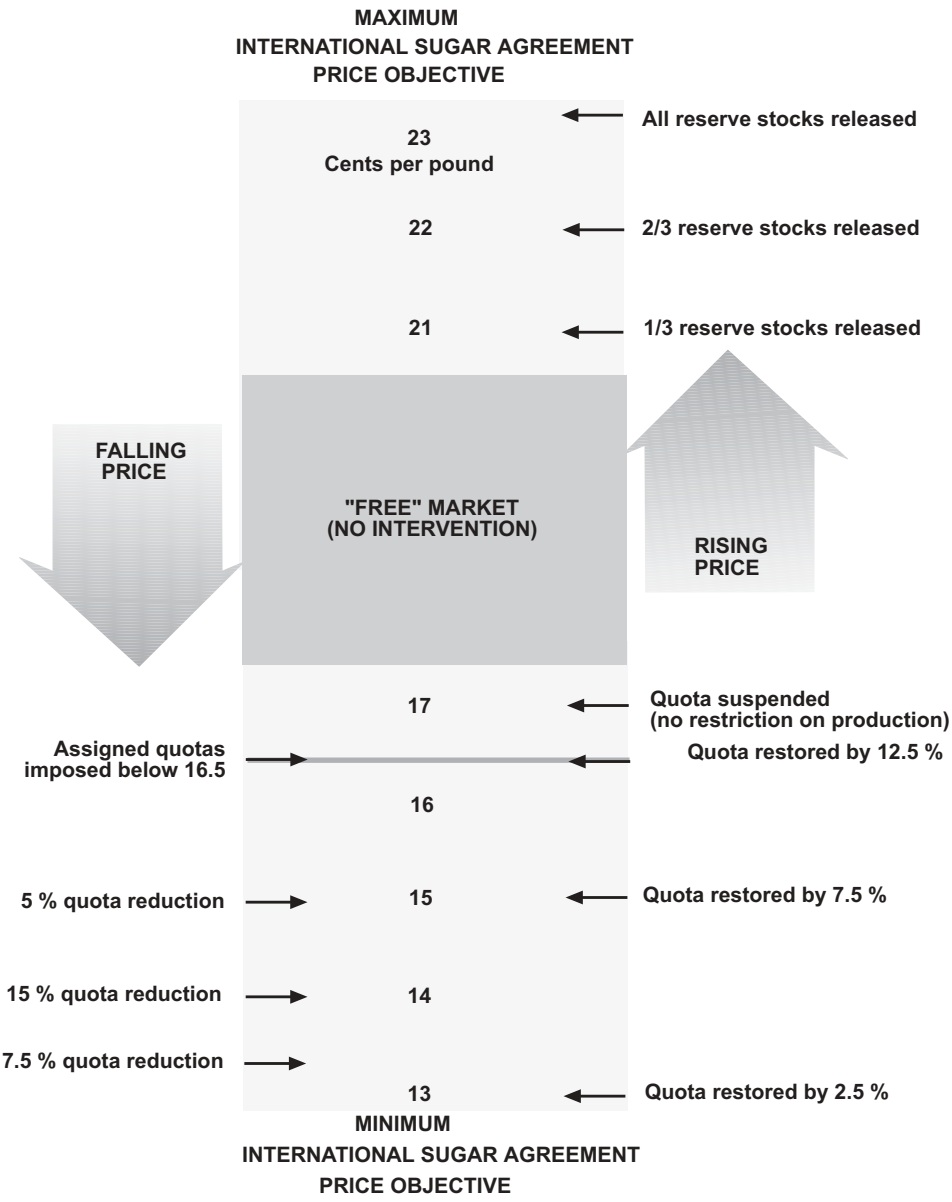


Figure 5.15. A theoretical Mechanism for Stabalizing World Raw Sugar Price and Supply. This schematic illustrates the association of price movement and raw sugar supply.The International Sugar Organization attempts to regulate sugar supply by associating quotas assigned to the various producing countries (exclusive of the United States and the E.U.) with the moving world price of sugar. Falling prices trigger tightening quota levels to arrest price fall. Rising prices trigger loosening quotas to release pressure on the upward trending price. The schematic is adapted from George Abbott, *Sugar* (London, 1990), 191.

The European Union Effect

While the U.S. sugar policy is held partly responsible for global price distortion (because such a large market is withheld), the effect of the E.U. policy is generally agreed to have the greatest distorting effect. The E.U., now a large producer of granulated sugar, sells its surplus sugar on the world market at depressed prices. This is argued to contribute significantly to the volatility of world raw sugar prices (Johnson 1993). On the other hand, it is argued that careful monitoring of the volume and timing of E.U. exports functions as a market stabilizer (Harris and Tangerman 1993).

The EEC controls sugar production by quota allocation through the Common Agricultural Policy (CAP). Individual countries are allocated a production share and each, in turn, allocates production quotas to individual sugar beet producers.[14] Unlike the U.S. policy that attempts to operate in isolation from the world sugar market, the EEC policy releases excess sugar into the world marked. As world price moves below a CAP-determined threshold price, E.U. imports are subject to levies. As the world price moves above the threshold price, support mechanisms for E.U. producers are activated. It is argued by proponents of the E.U. program that the world price of sugar is stabilized by this system because the E.U. can infuse the world supply at any point the price movement is deemed unfavorable (Borrell and Duncan 1993). Opponents, however, argue that the price of sugar is destabilized by E.U. policy because it encourages excess production and, as in the U.S., the supported domestic price prevents contraction adjustments during times of low prices.

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[14] Like the U.S. preferential arrangements with TRQ countries, the EC allows favorable entrance of cane sugar from selected former colonies under the Lomé Protocol. This arrangement accommodates the old British Commonwealth Sugar Agreement and all earlier preferential arrangements of former European states and their former colonies, most of whom are members of the Caribbean and Pacific alliance (ACP).

The most remarkable aspect of the E.U. sugar situation is its production potential. Since the sugar beet industry began at the beginning of the nineteenth century, the European states have demonstrated remarkable ability to supply themselves with sugar. Table 5.2 illustrates the history of European achievement of self-sufficiency in sugar that began as early as 1960.

Table 5.2. E. C. Sugar Production, Imports, and Self-Sufficiency, 1968-1990.

(Million metric tons)	Total Production	Total Consumption	Total Imports	Total Exports	Net Exports	Self-Sufficiency Ratio
1968/69	6.187	6.306	0.067	0.615	0.548	108.1
1969/7O	7.435	6.41	0.065	0.562	0.497	116
1970/71	7.055	6.75	0.063	0.776	0.713	104.5
197l/72	8.081	6.325	0.046	1.348	1.302	127.7
1972/73	7.65	6.541	0.046	1.147	1.101	116.9
EC-9						
1973/l4	9.516	10.414	1.418	0.979	-0.439	91.4
1974/74	8.57	90561	1.718	0.097	-1.621	89.6
1975/76	9.703	9.535	1.429	1.405	-0.024	101.8
1976177	10.003	9.036	1.444	1.666	0.222	110.7
1977/78	11.536	9.481	1.338	3.434	2.096	121.7
1978/79	11.774	9.544	1.266	3.231	1.965	123.4
1979/80	12.289	9.414	1.33	3.767	2.437	130.5
1980/81	12.088	9.246	1.162	4.592	3.43	130.7
EC-10						
1981/82	15.028	9.597	1.372	5.183	3.811	156.6
1982/83	13.924	9.474	1.333	5.207	3.874	147.1
1983/84	11.003	9.314	1.389	4.062	2.673	118.1
1984/85	12.5	9.555	1.368	3.832	2.464	130.8
1985/86	12.72	9.391	1.316	4.204	2.888	135.5
EC-12						
1986/87	14.096	10.907	1.562	4.506	2.944	129.2
1987/88	13.212	10.847	1.613	4.281	2.668	121.8
1988/89	13.915	10.885	1.561	4.749	3.188	127.8
1989/90	14.272	11.271	1.615	4.838	3.223	126.6

Source: Simon A Harris and Stefan Tangermann, "A Review of the EC Sugar Regime in *The Economics and Politics of World Sugar Policies"* (Ann Arbor, 1993),113. Note: At 100 percent self-sufficiency, production equals demand. Below 100 percent implies imports and number above 100 percent reflects the percentage of total production that is exported.

By 1980 the E.U. was self-sufficient in sugar and produced a 30 percent surplus. This surplus, however, is not welcomed by sugarcane growers of the tropics who depend on the world market to dispose of any sugar not previously sold through the usual special arrangements. The short time the E.U. took to reach sugar self-sufficiency provides an example of how quickly the U.S. could reach this early eighteenth-century goal by converting to beet sugar (with its added bonus of possible annual acreage adjustment). And, it suggests an historic irony. In the past, the European quest for tropical sugar drove world trade and contributed significantly to enlarging the European world-economy. Today the European states themselves are among the largest producers and exporters of sugar in the world (Figures 5.16 and 5.17).

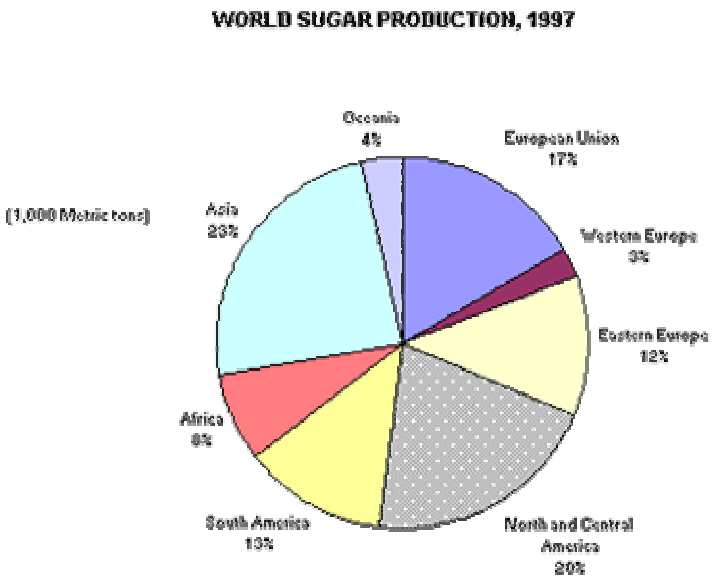

Figure 5.16. World Granulated Sugar Production by Region, 1997. Source: F. O. Licht 2000.

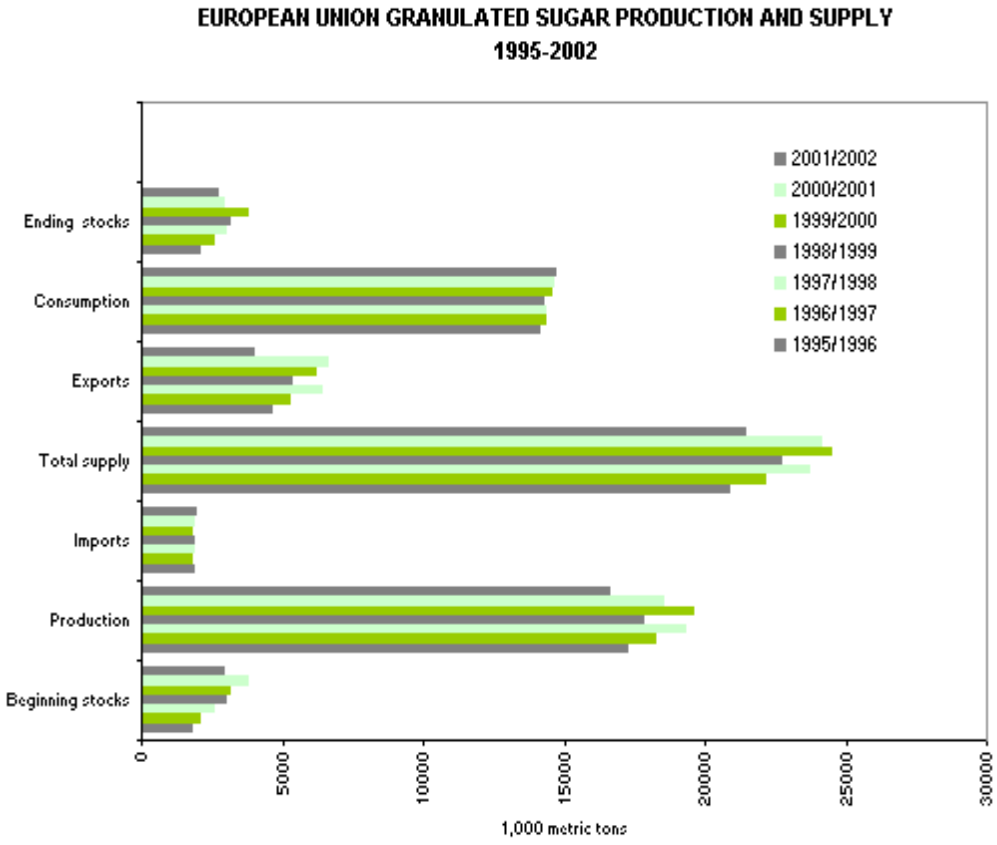

Figure 5.17. European Union Granulated Sugar Production, Distribution, and Supply, 1995-2002. Source: USDA, Foreign Agricultural Service, 2001.

CHAPTER SIX

AN UNCERTAIN FUTURE

The future of the Louisiana sugarcane industry is tied to the future of the granulated sugar industry in the US as well as the larger sweetener industry. Both the sugarcane and sugar beet industries now produce for a merged granulated-sugar market that is part of the larger sweetener market. The era of granulated sugar may be yielding to an era of alternative sweeteners. The conversion to synthetic sweeteners is attributed not only to the high price of U.S. granulated sugar that stimulated the search for alternatives, but to the growing concerns about the health effects of caloric sweeteners (Pearson 2003). Beet sugar overtook cane sugar at the beginning of the twentieth century and provided a perfect substitution because the sugar from each source is identical. Alternative sweeteners, however, substitutes well for granulated sugar in many applications. Synthetic sweeteners, therefore, present significant challenges for both the sugar beet and sugarcane industries. The share of granulated sugar of the US market has declined from 72 percent in 1975 to 40 percent in 1988 (Pearson 1993)..

Alternative caloric sweeteners such as HFCS,[1] glucose, and dextrose have been widely used in processed foods since their availability in the 1950s. More recently, synthetic, non-caloric sweeteners are increasingly used as their end-use characteristics are improved. Figure 6.1 shows the deliveries of granulated sugar for human consumption and the flat growth for the past decade in U.S. demand in all products except bakery goods where substitution for granulated sugar has meet with little success in producing an acceptable final product.

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[1] HFCS are made from isomerization (rearrangement of atoms within a molecule) of dextrose. Dextrose is a simple saccharide, easily extracted from corn, but not easily crystallized.

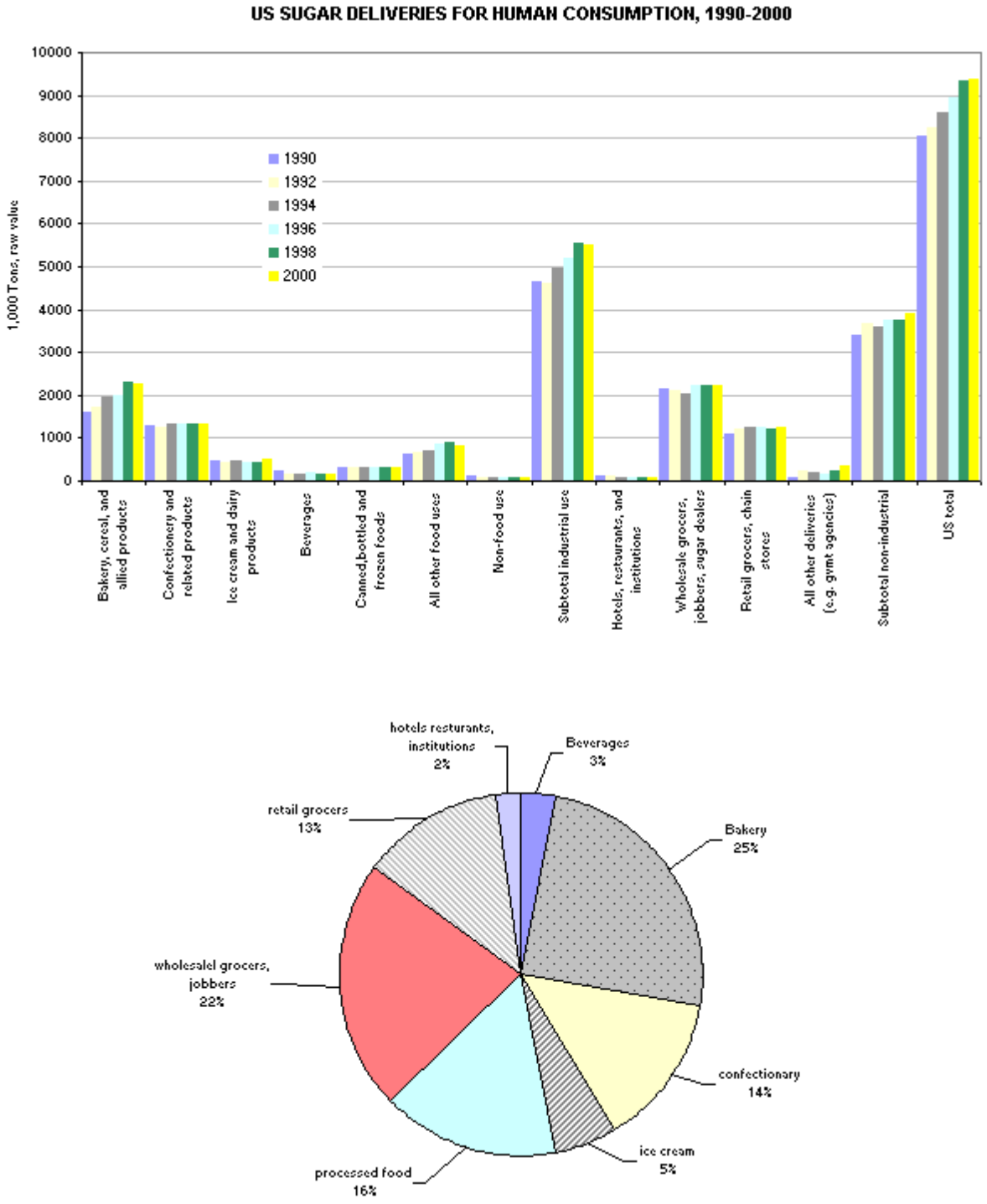

Figure 6.1. U.S. Sugar Deliveries for Human Consumption, 1990-2000. Source: USDA, Sweetener Market Data, Farm Service Agency, 2001.

Saccharin, the oldest of the synthetic alternatives was synthesized in 1879 at Johns Hopkins University and has been marketed in the US under the brand name *Sweet'n Low* for over half a century(McCann 1990). Aspartame, also invented by U.S. scientists, is marketed under the brand names *Equal*, *Twinsweet*, *Nutra-Sweet*, and *Canderal.* The most recent alternative sweetener, Sucralose, was synthesized by Tate and Lyle and has been marketed in the U.S. since 1999 under the brand name *Splenda* (McCann 1990). Sucralose is a granular product, not unlike granulated sugar, and because of its growing acceptance, Sucralose presents a formable challenge to other sweeteners (Copple 2001).

The greatest threat to U.S. sugar producers is the loss of price support as the U.S. seeks a more favorable bargaining position in the WTO by bringing its domestic production in line with WTO objectives. Within the last decade U.S. agricultural exports have declined 20 percent from the high of $57.3 billion in 1997 (Galvin 2001). This decline has prompted the Foreign Agricultural Service and USDA to structure an agenda focused on recouping and gaining on the earlier volume (Schumacher 1998). Increased access to foreign markets is a stated goal for U.S. trade: "The new farm bill recognizes how critically important trade is to our producers. Forty percent of US commodities go into the export market, and in order to sustain profitability for our producers this market must be expanded" (Farm Security Association 2002, 11).

At the 2000 Geneva negotiations of the WTO the U.S. identified the high tariff structure of foreign markets as the greatest impediment to increased U.S. agricultural export and identified four areas for trade improvement: 1) the elimination of export subsidies; 2) the reduction and strict limitation of domestic supports; 3) further opening of global markets by the lowering of tariffs and increasing quotas; and 4) limitation of the use of agricultural

monopolies that control imports and exports (WTO 2000). This language is remarkably descriptive of the current U.S. sugar policy. Its use as an argument for improved access for U.S. agricultural products to world markets not only underscores the inconsistency of the present U.S. sugar policy, but the future uncertainty of granulated sugar in the U.S.

Compounding the insecurity introduced by U.S. efforts to bring its domestic policy in line with its foreign policy is the uncertainty introduced by the 1994 North American Trade Agreement (NAFTA). In an analysis of the impact of Mexican sugar eligible to enter the US under terms of the NAFTA, one USDA economist offers this sobering observation: "Sugar pricing in the United States becomes a direct function of Mexican export potential. The larger is the potential, the lower is the U.S. price, with a lower constraint being the world price" (Haley 2002, 17). After 2008 sugar will have free and unrestricted access into both countries, presenting a significant challenge to continuance of U.S. price supports. Figure 6.2 outlines the schedule of reciprocal tariff reductions agreed to by the US and Mexico.

Mexican exports are projected to accelerate from 4.506 million tons in 2002 to 5,171 in 2008 (Haley 2002). This projection does not include the anticipated move of American sugar interests into Mexico to capitalize on the trade opportunity. Nor does it include the unpredictable effects of free trade in High Fructose Corn Syrup (HFCS) (Haley 2002). The conspicuous absence of HFCS from Mexican imports in Figure 6.3 is being addressed with additional side-letters (Haley 2002) and contributes to the complex future of the U.S. sweetener industry. Regardless of the outcome in HFCS agreement, increased use of sugar substitutes in the U.S., combined with the uncertainty of Mexican cane sugar production contributes to an uncertain future for the U.S. sugarcane industry.

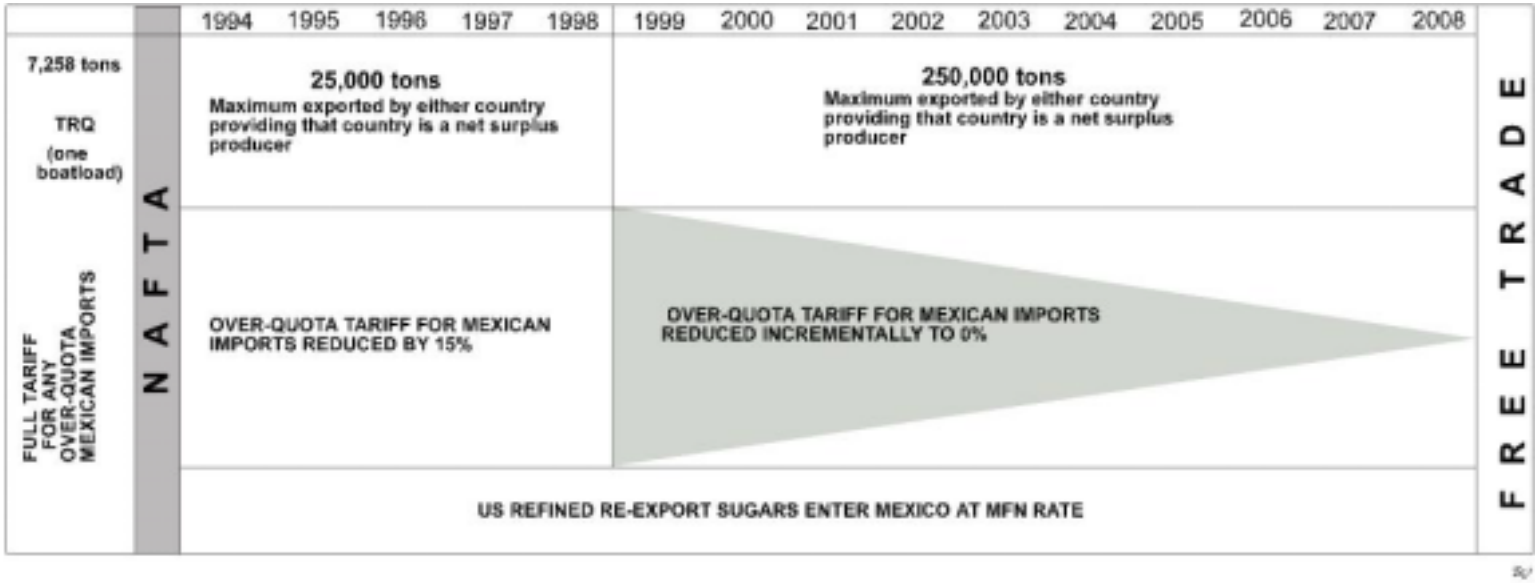

Figure 6.2 U.S. Sugar Trade with Mexico, 1994-2008. Source: Stephen Haley, "Conceptual Overview of the U.S. Baseline" (USDA, *Sugar and Sweetener Situation and Outlook*, 2000).

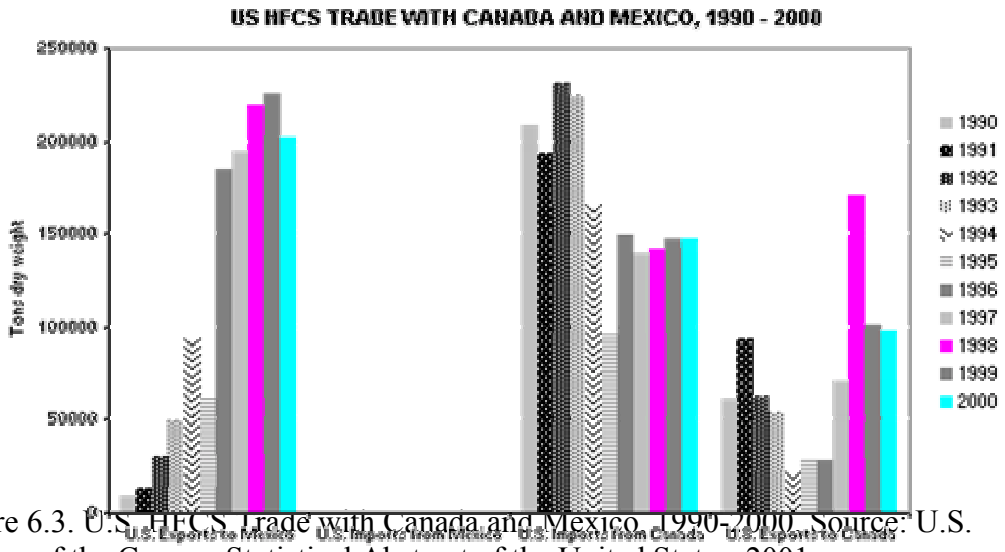

Figure 6.3. U.S. HFCS Trade with Canada and Mexico, 1990-2000. Source: U.S. Bureau of the Census, Statistical Abstract of the United States, 2001.

Cuba, of, course is the wildcard. Future resolution of the political difficulties barring Cuban imports will certainly impact domestic sugar production. Any increases in production in Louisiana (outside limited acreage increase) must come from varietal improvements as well as technical improvements in sugar recovery. A glance at the productive potential manifested by Cuba in the past (Figure 6.4) suggests a near and abundant source of cane sugar that may again be the major U.S. supplier in the not-too-distant future. This threat, combined with the potential to expand beet sugar production and the wide distribution of corn acreage in the United States (Figure 6.5) contributes to an uncertain future for the Louisiana sugar industry.

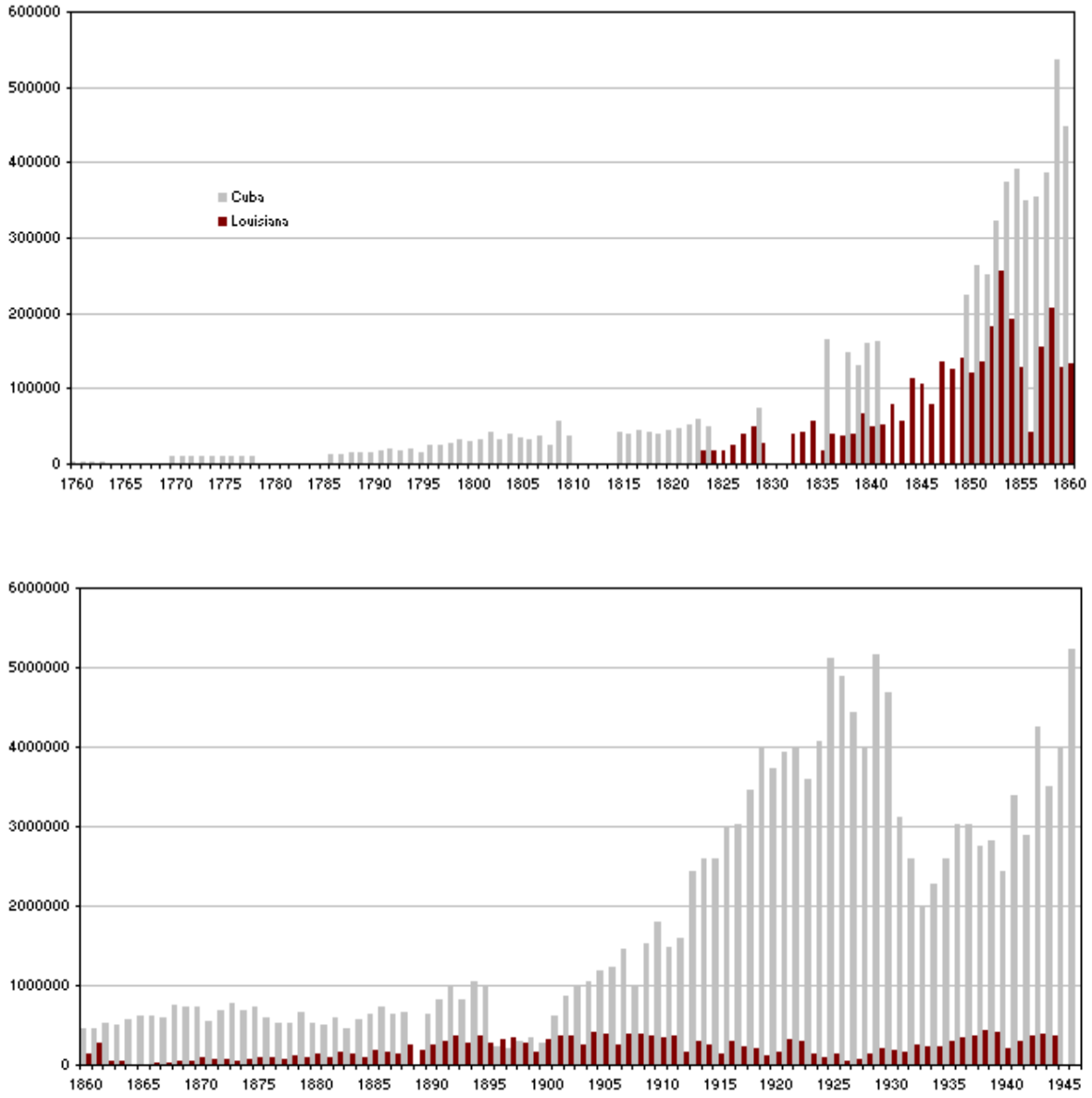

Figure 6.4. Cuba and Louisiana Sugarcane Production, 1760-1945. Source: Noel Deerr, The *History of Sugar* (London, 1950), 450.

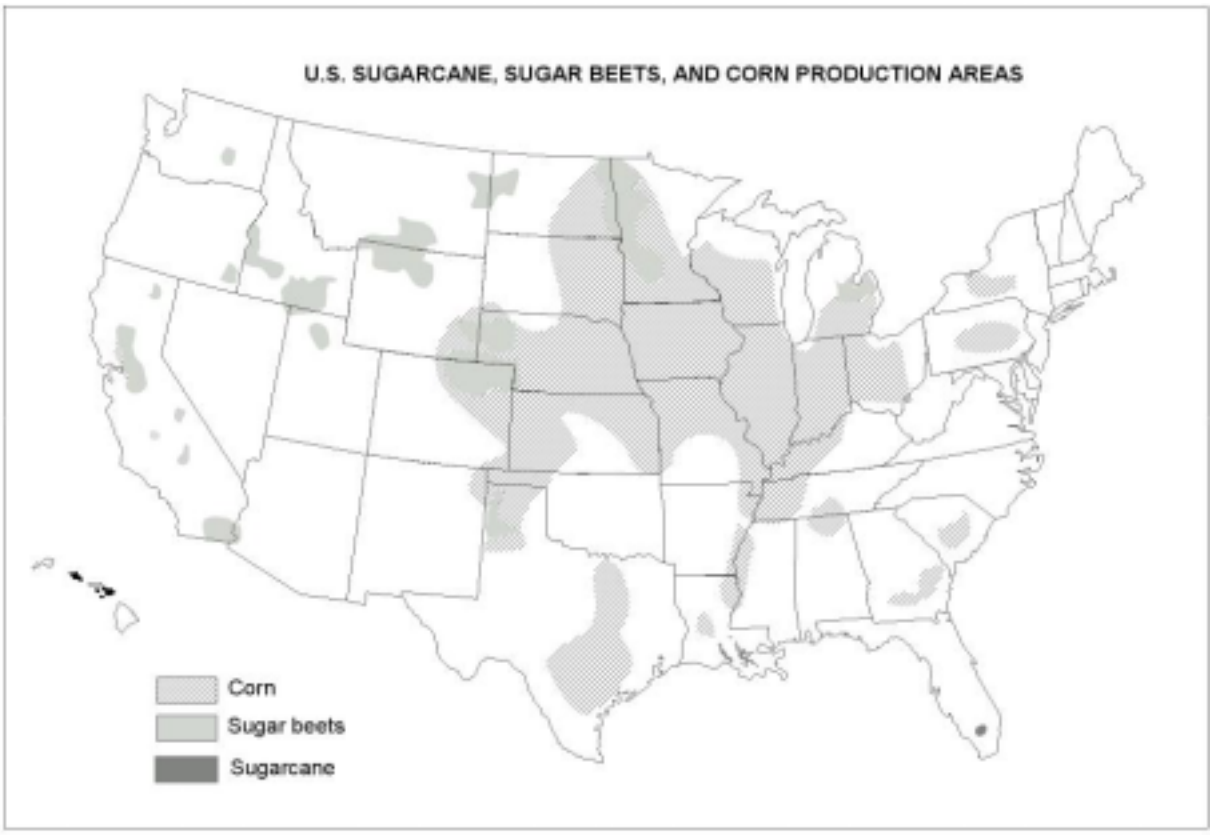

Figure 6.5. U.S. Sugarcane, Sugar Beets, and Corn Production Areas. Source: USDA, 1997 Census of Agriculture.

CHAPTER SEVEN

CONCLUSION

The history of sugar is a long and checkered one. Once a coveted tropical luxury, sugar has become a readily available staple produced in both temperate and tropical climates and from sugarcane as well as sugar beets. Sugar witnessed the age of exploration and discovery — watershed events that closed a divide between the previously self-contained eastern and western continents and brought dissimilar cultures together with large consequences for both. It was responsible for the forced migration of millions of black Africans to the Americas where their assimilation into the European-dominated culture continues to be problematic. Sugar participated in the expansion of the European world-economy and the subsequent globalization processes — all driven by production efficiencies — that now connect producers and consumers without the constraints of distance. Cane sugar's importance continues to diminish as beet sugar and alternative sweetener competition increases. Continued production of a tropical crop in subtropical Louisiana is , therefore, uncertain.

Price supports are the industry's underpinning, but, ironically, the policy that supports sugarcane production also contributes to excessive stocks that, in turn, encourage support withdrawal. This was heralded by the 1996 Farm Bill as the U.S. government began a revision of agricultural policy — four decades old — to bring U.S. farm production in line with world demand and supply. The resulting fall in U.S. commodity prices has many farmers reconsidering the choice of unconstrained discretion in which they enjoyed "freedom to farm" at the expense of long-term security.

The continued use of agricultural lands in southern Louisiana for the cultivation of sugarcane underscores tensions between individual freedoms and the common good now on the ascendant as world resources are stressed to support the enlarging human population. Agricultural lands are presently perceived (and in large measure regulated) as private property over which the individual has sole right to exercise personal discretion (Johnston 1987, Trosper 1998). These notions continue an era the "free period of development of law," a regime in which persons are left to arrange their affairs as they deem fit with minimal regulatory interference (Emel and Brooks 1988, 242).

Modern agriculture, however, necessarily engages the surrounding environment. Imputs such as fertilizers, pesticides and herbicides cannot be contained within a private property. Extensive drainage, irrigation and — most important — the removal of resources from the land all affect the commons. The intensifying farm crisis may speed an era in which freedom to farm is curtailed by coordinated supply despite the curb on farmer discretion. Codification of production standards and enforced quotas — as is being encouraged for sugar by the International Sugar Organization and for general agriculture by the World Trade Organization — is forcing the hand of the U.S. as it struggles to maintain a large share of global agricultural trade.

Sugar production in Louisiana may experience these changes sooner that agriculture in other parts of the nation. As in the 1974 precedent, Congress could legislate a new sugar policy for immediate implementation, not softened by incremental adjustments as in the 1996 Farm Bill revising support for the traditional program crops. Increased U.S. concern for its share of the world market, the impending free entrance of Mexican sugar, and the declining

share of granulated sugar of sweetener demand, all contrive to diminish congressional support for a continued domestic supply of cane sugar.

The public focus on curbing U.S. farm aid, especially as alternative demands on the federal budget escalate, has drawn attention to the sugar program. The prospect of program revisions are exacerbated by inaccurate popular notions of excessive cost of the sugar program to the government and are, in turn, fueled by the rhetoric of anti-sugar coalitions. This research has proved these notions of excessive cost to be unfounded. Unlike the producers of the traditional program crops, sugar farmers do not receive subsidy payments. They benefit from the "no-net-cost" price support program but they do not have opportunity for excessive profits. The "cost" is distributed to the consumer and, though argued to be excessive, reflects the relatively higher cost of all goods and services available in the United States.

Opportunity for profit lies beyond the producer, within the processing and marketing stream where granulated sugar merges with HFCS and the synthetic sweeteners. Within these various manufacturing and distribution channels are found numerous participants and opportunities for excessive profit. Refiners, agents of international commercial shipping, brokers, financiers, commodity consultants, retailers, autonomous agencies subsidized by various governments, and various independent operators all have the opportunity for excessive profit. At the interface of these various entities one enters Braudel's "shadowy zone" of capitalist enterprise in which opportunities for excessive profit are difficult to identify and more difficult to curb.

Increasing economies of scale as well as vertical integrations within the sugar industry contribute to a growing pattern of wealth concentration among the elite who are positioned to

use political power to their advantage. Agricultural policies put in place in 1934 to remedy instabilities of the depression era have led to a forging of close ties between federal bureaucracies and local elites (Sheiber 1978, 448). Sugar interests, like other special interests, uses political access to its benefit as evidenced in the 2002 legislation in which sugar, once again, escaped revisionist legislation. Political influence through selected lobbying, however, has become the norm in American politics. The "iron triangle" of sugar interests — the U.S. House Agricultural Committee, the CCC , and lobbyists is roundly criticized by anti-saccharites (Peterson 1994). But wheat, peanuts, dairy or any other program sector could be substituted for sugar to underscore what, arguably, is a general system of interest groups that circumvents the spirit of the democratic process (Browne 1992).

Agricultural production, once viewed as a common good, is now practiced for profit as any other capitalist enterprise.[2] Capitalism has caused use of the land to shift from a zone of self-provisioning into one dominated by wealth accumulation and characterized by Braudel (1982 [1979], 22) as "not the true market economy, but indeed often its exact opposite." Additionally, the capitalist imperative precludes long-term sustainable use of natural resources and contributes to social unrest as more and more people are separated from the land with no other means of livelihood.

In the larger world, unemployment and associated poverty have contributed to destabilized societies in which people engage in desperate action because they have no means of livelihood. The U.S. agribusiness model now exported to the lesser developed countries, contributes to this tragic situation. While production on a large scale is thought to be an

[2] This contrasts markedly to an earlier era before notions of profit maximization was the prevailing economic paradigm. "In Sicily [in the seventeenth century] if a vendor asked a price for an agricultural product a single gram over the fixed tariff, he could be sent straight to the galleys!" (as occurred in Palermo in 1611) (Braudel 1982 [1979], 30).

appropriate solution to food shortages, in actuality, it contributes to the displacement of small agriculturists, depriving then of a means of livelihood. Malnutrition and social discontent increase because people are thrown into a cash economy with no means of securing cash. This loss of employment opportunity has been characterized as the creation of GATT refugees in a scenario that does not bode well for the world's future:

> The application of GATT will also cause a great tragedy in the Third World. Modern economists believe that an efficient agriculture is one that produces the maximum amount of food for the minimum cost, using the least number of people. It is estimated that in the world there are still 3.1 billion people who live from the land. If GATT manages to impose worldwide the sort of productivity achieved by the intensive agriculture of nations such as Australia, then it is easy to calculate that about two billion of these people will become redundant. Some of these GATT refugees will move to urban slums. But a large number of them will be forced into mass migration. . . . We will have profoundly and tragically destabilized the world's population (Goldsmith 1994, 39)

In many lesser-developed countries, there are few alternatives to sugarcane cultivation, and any displaced labor and capital has significant repercussions. Louisiana farmers, however, do have alternatives and could benefit from the release of resources now tied to sugar production. Louisiana's sub-tropical climate and rich soils could support alternative crops, as they have in the past when travelers to the region were awed by the diversity of fruits and vegetable that grew in abundance (Martin 1975 [1829]). A map of the value of agricultural products of the U.S. underscores the opportunity lost to Louisiana agriculture. Counties in California and Florida, climates similar to Louisiana have agricultural sales values ten times that of Louisiana (Figure 7.1). The enormous mid-south market now receiving a large portion of its horticultural produce from California and Florida could be a ready market for increased Louisiana production.

A more varied, smaller agricultural enterprise in southern Louisiana, enhanced by the research now devoted to sugarcane, could produce a model of subtropical, small-scale

agriculture whose export to agriculturalists of the developing world would have greater long-term benefit than the agribusiness model now exported by the U.S. Increased employment associated with smaller scale agriculture could improve the unemployment in Louisiana's rural parishes and reverse a depressive pattern that puts Louisiana among the poorest states in the nation. The potential benefit of a reorientation to smaller-sale agriculture can be seen every Saturday morning in Baton Rouge at the Red Stick Farmers Market where both community spirit and small-farmer pride and success are in evidence. Redirection of current USDA and LSU sugarcane research towards support of small farming would be a more equitable and reasonable use of public funds, especially in the face of the uncertainties facing the cane sugar industry.

Much has changed in the two centuries since sugar was introduced in southern Louisiana, but much is remarkably the same. The landscape speaks its history clearly, in the remarkable constancy of sugarcane planting, in the persistent relics of the old industry found throughout the sugar country, and in the lives of the contemporary population, many of whom are descendents of African slaves whose labor initially installed the industry. The present Louisiana industry, however, faces great uncertainty. Its long history not withstanding, geopolitical and economic eventualities may cause the promising industry introduced into southern Louisiana 200 years ago to finally go the way of indigo, tobacco, and cotton, the other crops attempted by the French at the mouth of the Mississippi in their unsuccessful bid for an American empire.

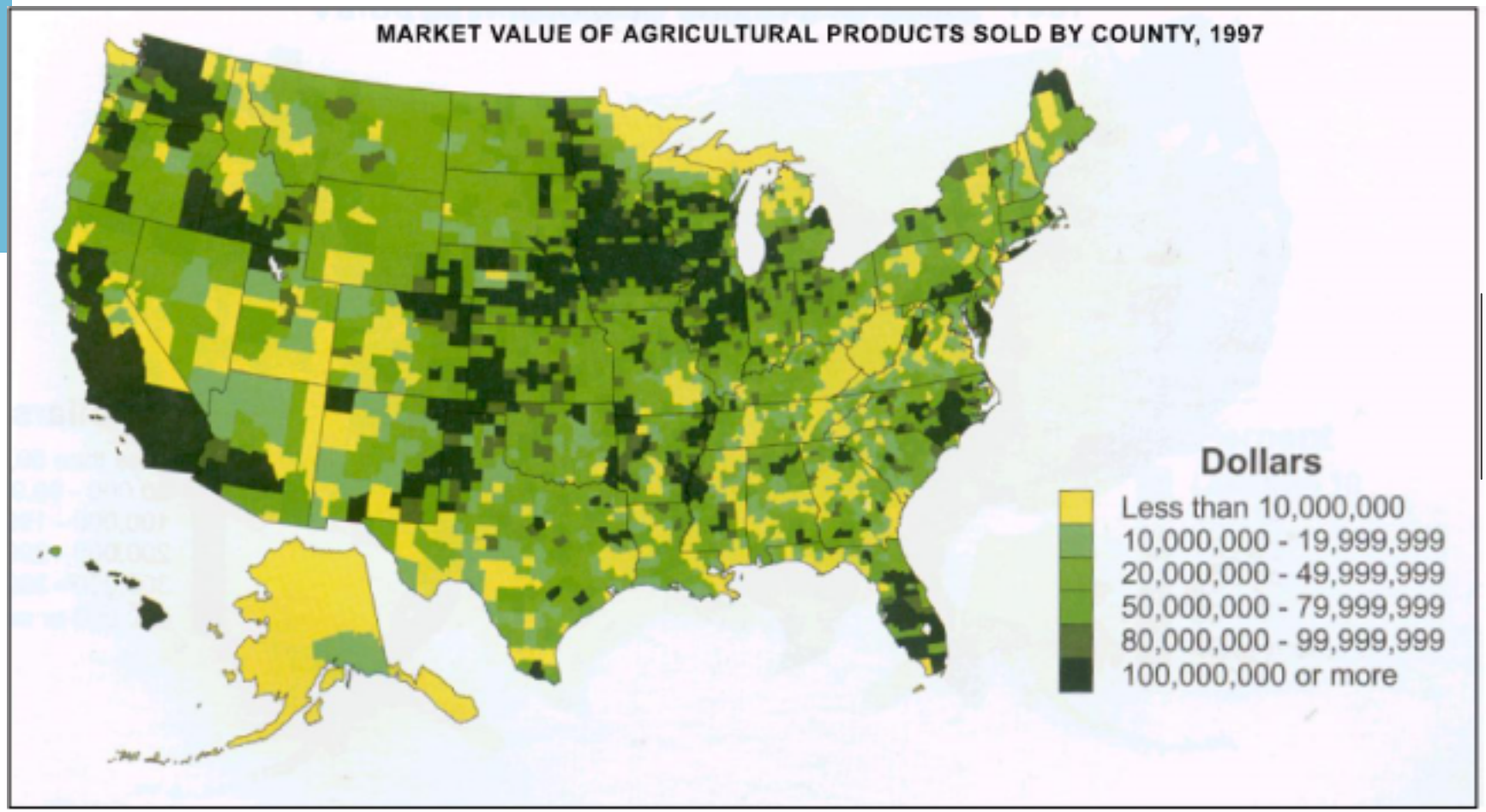

Figure 7.1. Market Value of Agricultural Products Sold by County, 1997. Source: USDA, 1997. *Census of Agriculture, Agricultural Atlas of the United States*, Vol 2, Subject Series, Part 1 (Washington D. C., 1999), 29.

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VITA

Elizabeth Vaughan came to the study of geography from a long and circuitous journey through academia in which she focused on studies in biology and anthropology. Her geography interests are eclectic. Her first love is physical geography with emphasis on human alteration of ecosystems and the consequence to their animal occupants. Her most recent course of study at Louisiana State University took her into the realm of historical and economic geography with investigations into the reasons behind deleterious agricultural and industrial practices. During her introduction to geography at San Francisco State, she became interested in water resources as critical losses of this uncelebrated element of ecosystem functioning continue to accelerate habitat destruction. Research for her master's degree led her to India where she studied the social and environmental effects of a series of large dams on the Narmada River in western India.

Elizabeth was born in southwestern Louisiana, graduated from Holy Angels Academy in Jonesboro, Arkansas, after which she continued to slowly advance her education while fulfilling her responsibilities to work and family. Her associations with the various colleges mark her movement around the United States: Marillac College, St. Louis, Missouri; Arkansas State University, Jonesboro, Arkansas; University of Southwestern Louisiana, Lafayette, Louisiana; and, in California, University of California, Berkeley; College of San Mateo, San Mateo; Foothill College, Los Altos; California State University Hayward; San Francisco State University, San Francisco; Canada College, Redwood City; and finally LSU where she returned to a familiar culture, family, and friends to complete her doctoral studies which she hopes to apply in encouraging in others a responsible stewardship of the land and a life-long love of learning.