Sugar - Source Companion

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Every reference cited in the book, in one place. For each source: what it is, how much of it was read, what it supports, its limits, and its address. “Supports” describes what the source’s own text establishes; “Cited for” records what the book cites the source for where the reading was too limited to restate its contents independently. Quoted passages are the source’s own words.

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Companies, markets and trade (C1 - C132)

C1 - Wilmar International, “Our Sugar Journey” (Annual Report 2024)

Read: Read in full (access deepened after first registration). Supports: Wilmar’s own 2024 account of its sugar business: about 180 Mt world production (85/15 cane/beet, sourced to USDA), over 60 Mt traded, and its milestone timeline (Cosumar, Sucrogen, the Bunge trading book, Proserpine, Shree Renuka, the RaW joint venture with Raizen). Used with company-claim attribution and dated to the report year. Source: https://www.wilmar-international.com/annualreport2024/documents/Our-Sugar-Journey.pdf

C2 - European Commission, MEMO/17/3488, “The end of the sugar production quotas in the EU”

Read: Full page read. Supports: The Commission’s own account of the 1968 Common Market Organisation, the 2006 reform and its EUR 5.4 billion compensation, and the end of the quota system. Source: https://ec.europa.eu/commission/presscorner/detail/en/memo_17_3488

C3 - ICE, Sugar No. 11 Futures contract specifications

Read: Full page read (1 November 2026). Supports: the contract’s standard: 112,000 pounds of raw cane sugar, quoted in cents and hundredths of a cent per pound, a minimum movement of one-hundredth of a cent worth $11.20; March/May/July/October cycle; no daily price limit; physical settlement, FOB the receiver’s vessel at a port in the country of origin; grade based on 96 degrees average polarisation; twenty-nine named deliverable origins on the current specification. In its words: “physical delivery of raw cane sugar, free-on-board the receiver’s vessel to a port within the country of origin”; “Raw centrifugal cane sugar based on 96 degrees average polarization”. Limitations: the deliverable-origin list is as of the current specification, read 1 November 2026; the exchange revises it over time. Source: https://www.ice.com/products/23/Sugar-No-11-Futures/specs

C4 - ICE, White Sugar Futures contract specifications

Read: Full page read (1 November 2026). Supports: the white contract’s terms: 50 tonnes, quoted in dollars and cents per tonne, a ten-cent tick worth $5; five cycles a year (March, May, August, October, December) with fourteen delivery months listed at any time; FOB and stowed; forty-nine deliverable countries of production on the current specification; grade admitting white beet, cane crystal or refined sugar of the current crop, minimum polarisation 99.8 degrees, moisture no higher than 0.06 percent, colour no higher than 45 ICUMSA units; the exchange names its users as the international sugar trade, millers, refiners and end-user manufacturers alongside managed funds and institutional and short-term investors. Source: https://www.ice.com/products/37089080/White-Sugar-Futures

C5 - ICE Insights, “ICE extends White Sugar futures curve”

Read: Full page read. Supports: the white premium as the tradable spread between the raw and white contracts, quoted forward across 14 delivery months, about two and a half years out. Source: https://ice.com/insights/soft-commodities/ice-extends-white-sugar-futures-curve

C6 - ICE, Sugar No. 11 and Sugar No. 16 brochure

Read: Full read (PDF). Supports: the exchange lineage behind New York sugar futures, from the Coffee Exchange of 1882 through the Coffee, Sugar and Cocoa Exchange and the New York Board of Trade to ICE’s 2007 takeover; futures traded since 1914 and options since 1982; Sugar No. 16’s record of trading 35 to 50 percent above No. 11, with the gap at times approaching three to one; the raw-white arbitrage position (long No. 11, short London whites); the destination-refining shift, especially in the Middle East, and the four reasons it persists (raws always cheaper than whites, raws cheaper to transport, local trust in locally refined supply, government favour for local jobs); dollar pricing handing growers a currency exposure. Limitations: an exchange marketing brochure of about 2012; its price relationships are dated and are presented as such where cited. Source: https://www.ice.com/publicdocs/ICE_Sugar_Brochure.pdf

C7 - International Sugar Organization, daily prices page (read 1 November 2026)

Read: Full page read. Supports: the ISO Daily Price is a simple average of the closing quotes of the first three futures positions of the New York No. 11 contract; the White Sugar Price Index is the same average over the first two positions of the London white contract; on days the New York market is closed, an average is calculated under Statistical Rule S-14 of the 1992 International Sugar Agreement; the page showed a level of 18.98 cents per pound on 29 October 2026. Limitations: the S-14 rule applies only to days the New York market is closed; it is not the general construction of the price. Source: https://www.isosugar.org/prices.php

C8 - International Sugar Organization, Sugar Yearbook 2025 description

Read: Search excerpts only; the full text was not read. Cited for: the 2024 daily average of 20.32 cents per pound. Source: https://www.isosugar.org/publication/425/iso-sugar-yearbook-2025

C9 - OECD-FAO Agricultural Outlook 2011, sugar chapter

Read: Search excerpts only; the full text was not read. Source: https://doi.org/10.1787/agr_outlook-2011-14-en

C9b - Financial Post (Reuters wire), “Raw sugar surges to 30-year high on cyclone,” 2 February 2011

Read: Read in full. Supports: the February 2011 price spike and its drivers: Cyclone Yasi, Indian export uncertainty, Brazil’s ethanol diversion. In its words: “ICE March raw sugar soared 1.35 cents or 4 percent to close at 35.31 cents per lb, the strongest settlement for the spot contract since November 1980, after hitting a session peak at 36.08 cents a lb.” Limitations: news report; 36.08 cents was the session peak, 35.31 the settlement. Source: https://financialpost.com/news/raw-sugar-surges-to-30-year-high-on-cyclone/

C10 - BBC News, “Sugar supplies in the bag as panic ends” (2010)

Read: Search excerpts only; the full text was not read. Source: https://www.bbc.com/news/10125768

C11 - “An assessment of the relationship between the high fructose corn syrup and the soft drink markets in the United States” (AgEcon Search)

Read: Search excerpts only; the full text was not read. Source: https://doi.org/10.22004/ag.econ.252739

C12 - Reuters, “Cargill sells stake in Alvean to Copersucar, leaves sugar trading” (2021)

Read: Full page read. Supports: Alvean’s formation in 2014 from Cargill’s and Copersucar’s sugar trading, its scale of about 12 Mt a year, roughly 20 percent of world trade, and Cargill’s 2021 exit from sugar trading in Reuters’ own wording. Source: https://www.reuters.com/article/us-copersucar-m-a-alvean-cargill/cargill-sells-stake-in-alvean-to-copersucar-leaves-sugar-trading-idUSKBN2BM2O0/

C13 - ED&F Man, “Our History” (duplicate registration)

Note: the same source as C50, which holds the fuller account; see C50. Source: https://www.edfman.com/about/our-history/

C14 - Wikipedia, “C Czarnikow” (duplicate registration)

Note: the same source as E43; see E43. Czarnikow’s current operations are covered by its 2024 annual report at C80; only the founding history (1861, Julius Caesar Czarnikow, London colonial broker) rests on this article. Source: https://en.wikipedia.org/wiki/C_Czarnikow

C15 - Report Prime, “Top 10 Refined Sugar Companies”

Read: Search excerpts only; the full text was not read. Source: https://www.reportprime.com/refined-sugar-r6219/company

C16 - Tate & Lyle Sugars, “Our History”

Read: Full page read. Cited for: the British refining dynasty: Henry Tate’s Thames Refinery (1878), Abram Lyle’s Plaistow Wharf (1882) and their 1921 merger, then refining about half the country’s sugar. Source: https://www.tateandlylesugars.com/about-us/our-history

C17 - Tate & Lyle, “Tate & Lyle takes major step to focus business through sale of EU sugar operations” (2010)

Read: Full page read. Supports: the 2010 sale of Tate & Lyle’s EU sugar operations to American Sugar Refining for GBP 211 million. Source: https://www.tateandlyle.com/news/tate-lyle-takes-major-step-focus-business-through-sale-eu-sugar-operations

C18 - ASR Group, “Our History”

Read: Full page read. Cited for: the assembly of ASR Group: Domino in 2001, C&H in 2005, Redpath in 2007 and Tate & Lyle’s European sugars business in 2010. Source: https://asr-group.com/our-history

C19 - United States v. E. C. Knight Co., 156 U.S. 1 (1895), full text via Cornell LII

Read: Search excerpts only; the full text was not read. Cited for: the Sugar Trust’s survival at the Supreme Court in 1895. Source: https://www.law.cornell.edu/supremecourt/text/156/1

C20 - Origins (Ohio State University), “A Sweet Beginning: the U.S. Sugar Monopoly”

Read: Full page read. Supports: the American Sugar Refining Company’s roughly 98 percent of United States refining by 1891 after absorbing four Philadelphia refineries, and the E.C. Knight case. Source: https://origins.osu.edu/milestones/january-2019-us-sugar-monopoly-E.C.Knight-Sherman-Act-Spreckels-court

C21 - Wilmar International, SGX announcement: “Acquisition of Sucrogen Limited” (5 July 2010)

Read: PDF read in full. Supports: 100 percent of Sucrogen from CSR; seven Queensland mills (2.1 Mt raw sugar a year); three refineries (970,000 MT refined); enterprise value A$1,750 million; Sucrogen the largest Australian raw sugar producer and second-largest global raw-sugar exporter; 171 MW of bagasse cogeneration. Source: http://media.corporate-ir.net/media_files/IROL/16/164878/SGX/2010/Announcement_5Jul2010.pdf

C22 - Al Khaleej Sugar, “Overview”

Read: Full page read (1 November 2026). Supports: producing since July 1995; expanded from 6,000 to 7,000 tonnes a day (record day 7,370 tonnes); a record 1.87 million tonnes in 2017; by its own account about 3 percent of global refined output, exported onward to more than 50 countries; imports raw sugar from Brazil, India, Australia and Thailand; credits the Jebel Ali port’s logistics for its model. Limitations: the company’s own account, presented as such. Source: https://alkhaleejsugar.ae/en/about-us/overview

C23 - Queensland Sugar Limited, Annual Report FY25

Read: Full PDF read (1 November 2026). Supports: QSL’s FY25 account: 96 sugar ships loaded, 95 of them delivered in-full, on-time and in-specification, a 99.0 percent DIFOTIS score; 52 other vessels including 49 molasses cargoes; storage and handling costs of 34.14 Australian dollars per tonne charged to growers’ pool accounts, including payments to Sugar Terminals Limited; the pool Performance Benchmark adjusted for infrastructure, storage and production-risk constraints; the multi-decade STL operating agreement ending 30 June 2026 after a long dispute, including QSL’s own argument that a for-profit owner-operator brought disruption, cost and risk, grower-economic-interest sugar at two-thirds of terminal throughput, and mill-owner voting control of STL; FY25 freight-market commentary (grain competition, Chinese steel exports, coal flows, Cape of Good Hope diversions); 36 raw-sugar cargoes contracted and delivered at 100 percent on-time-in-full. Limitations: the industry marketer’s own account of a contested transition. Source: https://qslmobileapi.blob.core.windows.net/appmedia/pdf/QSL_FY25_AnnualReport_FINAL_WEB.pdf

C23b - Sugar Terminals Limited, “STL completes transition to operating all 6 bulk sugar terminals” (July 2026)

Read: Read in full. Supports: the completion of the terminal operations insourcing. In its words: “STL assuming direct operational responsibility across its six bulk sugar terminals from 1 July 2026… completed on schedule with no impact to sugar receivals or shipping activities. All permanent employees from QSL’s former operations group accepted roles with STL.” Limitations: company announcement; “on schedule, no impact” is STL’s own account, presented as such. Source: https://sugarterminals.com.au/wp-content/uploads/2026/07/021745425.pdf

C24 - International Sugar Organization, MECAS(16)18, “Industrial and direct sugar consumption - an international survey”

Read: Search excerpts only; the full text was not read. Source: https://www.isosugar.org/publication/43/

C25 - Economic Times, “Consumers stay high on sugar-based products” (ISMA study, 2025)

Read: Search excerpts only; the full text was not read. Source: https://economictimes.indiatimes.com/industry/cons-products/fmcg/consumers-stay-high-on-sugar-based-products/articleshow/123907725.cms

C26 - New York Times, “Coke, Pepsi to use more corn syrup” (7 November 1984)

Read: Search excerpts only; the full text was not read. Source: https://www.nytimes.com/1984/11/07/business/coke-pepsi-to-use-more-corn-syrup.html

C27 - UPI, “Drinkin’ corn ’n Coca Cola” (9 February 1984)

Read: Search excerpts only; the full text was not read. Source: https://www.upi.com/Archives/1984/02/09/Drinkin-corn-n-Coca-Cola/4253445150800/

C28 - US Department of Commerce, “Employment Changes in U.S. Food Manufacturing: The Impact of Sugar Prices” (2005)

Read: Full page read. Supports: American sugar prices at two to three times world levels across a quarter-century; more than 10,000 sugar-containing-product jobs lost between 1997 and 2002; about three jobs lost in sugar-using industries for each sugar-growing and processing job. Source: https://www.trade.gov/sites/default/files/2020-12/Employment%20Changes%20in%20U.S.%20Food%20Manufacturing_The%20Impact%20of%20Sugar%20Prices.pdf

C29 - Rogers et al., UK Soft Drinks Industry Levy interrupted time series (PMC7012398)

Read: Search excerpts only; the full text was not read. Cited for: the measured effects of Britain’s 2018 Soft Drinks Industry Levy on sugar sold in soft drinks. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC7012398/

C30 - UK sugar reduction policy outcomes comparison (PMC11132159)

Read: Search excerpts only; the full text was not read. Cited for: the comparison of the levy’s results against the voluntary sugar reduction programme. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC11132159/

C31 - Sudzucker, liquid sweetening solutions product page

Read: Full page read (1 November 2026). Supports: liquid sugar as a ready-to-use industrial input integrated directly into automated production and dosing systems, eliminating the dissolving step, bag emptying and sugar dust; production at Offstein since the 1970s. Limitations: the page does not describe delivery vehicles; an earlier draft's tanker claim was dropped for lack of support. Source: https://www.suedzucker.com/products/liquids/

C32 - Precision Reports, Granulated Sugar Market

Read: Search excerpts only; the full text was not read. Source: https://www.precisionreports.co/market-reports/granulated-sugar-market-610579

C33 - International Sugar Organization, MECAS(26)06, "The molasses market outlook: from residual to primary product"

Read: Search excerpts only; the full text was not read. Cited for: molasses moving "from residual by-product to strategic feedstock," with research pipelines toward sustainable aviation fuel, bio-based chemicals and bioplastics. Source: https://www.isosugar.org/publication/454/

C34 - CIBE-CEFS, "Fact sheet on Molasses" (10 November 2017)

Read: PDF read in full. Supports: "Because of its nature, molasses is expensive to export and is therefore mostly consumed where it is produced"; the EU beet sector's roughly 3 Mt of beet molasses; molasses at 22 percent of European fermentation feedstocks; EU molasses imports (95 percent cane) falling from 1.8 million tonnes in 2007 to 1 million in 2016 (Eurostat); uses in animal feed, food and fermentation. Limitations: a beet growers' lobby document arguing against fermentation-industry scarcity claims; tonnages are Eurostat-sourced, the interpretation is the lobby's. Source: https://cefs.org/wp-content/uploads/2018/02/CIBE-CEFS-Fact-sheet-on-Molasses-10-November-2017.pdf

C35 - MDPI Fermentation, "Processes, Challenges and Optimisation of Rum Production from Molasses" (2021)

Read: Read in full. Supports: a global rum industry worth about 16 billion US dollars, still concentrated in the Caribbean and Asia-Pacific and fed principally on cane molasses; blackstrap as the standard fermentation medium. Source: https://www.mdpi.com/2311-5637/7/1/21

C36 - Rum Wonk, "Modern Rum Trends: Strengthening the Source Material Supply Chain"

Read: Search excerpts only; the full text was not read. Cited for: modern extraction leaving less sugar in molasses, and Caribbean distillers increasingly importing higher-test material. Limitations: the 80-percent-of-production-cost figure is secondhand in the source itself ("heard from well-placed people") and is attributed as such in the book. Source: https://www.rumwonk.com/p/rum-trends-strengthening-the-source-supply-chain

C37 - Forbes, "To Make Better Rum, The Focus Of This Sugar Mill Is Molasses" (2025)

Read: the accessible text was too thin to verify this source. Note: its 80-percent claim is not carried in the book. Source: https://www.forbes.com/sites/tonysachs/2025/03/21/to-make-better-rum-the-focus-of-this-sugar-mill-is-on-molasses/

C38 - Reuters, "Betting on ethanol, Brazilian mills turn sour on sugar" (3 December 2018, via investing.com)

Read: Full page read. Supports: "A shift to ethanol in the 2018-19 season slashed Brazil's sugar output by 9 million tonnes to a 12-year low"; Biosev "installing distillation columns at two plants in the Mato Grosso do Sul cluster to give the mills the option of using 90 percent of their cane for ethanol, up from 50 percent now." Limitations: dated to 2018. Source: https://www.investing.com/news/commodities-news/betting-on-ethanol-brazilian-mills-turn-sour-on-sugar-1707911

C39 - McKay, Sauer, Richardson & Herre, "The Politics of Sugarcane Flexing in Brazil and Beyond" (TNI Think Piece 4, September 2014)

Read: PDF read in full. Supports: "For 2013/14, the flex ratio was 48 per cent sugar and 52 per cent ethanol"; the swing range "60 per cent sugar and 40 per cent ethanol, to a 40-60 split"; "Flexing is made possible by extracting less sucrose from the juice and thereby leaving more available in the molasses"; "Seven milling groups control 55 per cent of Brazil's sugarcane production." Limitations: a 2014 think piece; mid-2010s framing. Source: https://www.tni.org/files/download/flexcrops04.pdf

C40 - UNICA, bioelectricity page (2024 data)

Read: Search excerpts only; the full text was not read. Source: https://unica.com.br/en/the-sector/bioelectricity/

C41 - "Supply of bioelectricity from sugarcane bagasse in Brazil: a space-time analysis" (2024)

Read: Search excerpts only; the full text was not read. Source: https://link.springer.com/article/10.1186/s42834-024-00223-z

C42 - Hindu BusinessLine, "Indian govt gives sugar mills freedom to decide on ethanol production" (2025)

Read: Search excerpts only; the full text was not read. Cited for: India's ethanol blending programme diverting sugar equivalent and altering the world balance. Source: https://www.thehindubusinessline.com/economy/agri-business/indian-govt-gives-sugar-mills-freedom-to-decide-on-ethanol-production/article70000469.ece

C43 - Times of India, "Ethanol push: Government lifts sugar cap" (2025)

Read: Search excerpts only; the full text was not read. Cited for: the lifting of India's sugar cap for ethanol production. Source: https://timesofindia.indiatimes.com/business/india-business/ethanol-push-government-lifts-sugar-cap-industry-hails-jackpot-for-farmers/articleshow/123654475.cms

C44 - Muir (Tereos), "Co-products in the beet sugar industry," ISSCT Proceedings vol. 31 (2023)

Read: Search excerpts only; the full text was not read. Source: https://dochub.sasri.org.za/bitstreams/f680b50d-c034-4af5-8524-b204f86eee91/download

C45 - 7 USC 7272, sugar program loan rates

Read: Search excerpts only; the full text was not read. Cited for: the statutory basis of the American sugar programme and its tariff-rate quota system. Source: https://uscode.house.gov/view.xhtml?edition=prelim&num=0&req=granuleid%3AUSC-prelim-title7-section7272

C46 - EU Publications Office, "Study on the adaptation strategies of the sugar supply chain after the end of the sugar quotas" (2021)

Read: Search excerpts only; the full text was not read. Source: https://op.europa.eu/en/publication-detail/-/publication/26acf487-7f21-11ec-8c40-01aa75ed71a1/language-en

C47 - USDA FAS, "Sugar: World Markets and Trade," December 2025

Read: Full page read. Supports: USDA FAS world production, consumption and trade tables as of December 2025. Limitations: superseded for current numbers by C92 (the May 2026 issue); kept for the December baseline. Source: https://www.fas.usda.gov/sites/default/files/2025-12/sugar.pdf

C48 - Sucden, "Who We Are"

Read: Full page read. Cited for: Sucden's own description of a business of some 5,500 people across more than 25 locations moving over 10 million tonnes of soft commodities a year. Source: https://www.sucden.com/en/about-us/who-we-are/

C49 - Sucden, 2023 Responsibility Report

Read: Search excerpts only; the full text was not read. Source: https://www.sucden.com/wp-content/uploads/2024/05/sucden-2023-responsibility-report-english.pdf

C50 - ED&F Man Commodities, “Our History”

Read: Full page read. Supports: the company’s own history: James Man in 1783, the Royal Navy rum contract held from 1784 to 1970, the move to Mincing Lane in 1810 and the 1869 renaming. Source: https://www.edfman.com/about/our-history/

C51 - Cristal Union, “At a Glance”

Read: Full page read. Cited for: the cooperative’s scale: 9,000 grower-members farming 45 percent of France’s beet area. Source: https://www.cristal-union.fr/en/at-a-glance/

C52 - Wilmar Sugar ANZ / QSL, “Fact Sheet 3: Net Sugar Price”

Read: Full page read. Supports: the cane-price formula driven by CCS and the Net Sugar Price; the ICE No. 11 futures price as approximately 99 percent of the Net Sugar Price (a five-year average for QSL-managed sugar); QSL’s advance payments to growers ahead of sales, charged back to the pool as a marketing cost. Source: https://www.wilmarsugar-anz.com/news/295-fact-sheet-3-net-sugar-price/file

C53 - Sucden, “History”

Read: Search excerpts only; the full text was not read. Cited for: Sucden’s 1952 founding as Sucres et Denrees by Maurice Varsano and Jacques Roboh out of post-war Morocco trading. Source: https://www.sucden.com/en/about-us/history/

C54 - Reuters, “Brazil’s Raizen to buy Louis Dreyfus sugar and ethanol unit Biosev” (8 February 2021)

Read: Full page read. Supports: the Biosev sale terms: R$3.6 billion in cash plus preferred and redeemable shares; a post-deal 35 mills and 105 Mt a year of crushing, about 17 percent of the centre-south 2019/20 crop; combined output of roughly 5 Mt of sugar and 3.84 billion litres of ethanol (2019/20). Source: https://www.reuters.com/article/business/brazils-raizen-to-buy-louis-dreyfus-sugar-and-ethanol-unit-biosev-idUSKBN2A81NA/

C55 - Reuters, “Brazil’s Raizen to buy Louis Dreyfus sugar and ethanol unit Biosev” (2021) (second registration)

Note: the same report as C54, which was read in full and carries the detailed terms; see C54. Source: https://www.reuters.com/article/business/brazils-raizen-to-buy-louis-dreyfus-sugar-and-ethanol-unit-biosev-idUSKBN2A81NA/

C56 - COFCO, COFCO Sugar page

Read: Search excerpts only; the full text was not read. Cited for: COFCO’s own description of handling about 6 million tonnes of raw sugar a year, roughly half of Chinese import volume. Source: https://www.cofco.com/en/BrandProduct/COFCOTunhe/

C57 - Tully Sugar, “Marketing & Export”

Read: Search excerpts only; the full text was not read. Cited for: Queensland’s mill-to-terminal export marketing structure. Source: https://www.tullysugar.com/marketing-export/

C58 - AgWest Farm Credit, “2023 Sugar Beet Industry Perspective”

Read: Search excerpts only; the full text was not read. Source: https://www.agwestfc.com/docs/default-source/business-resources/industry-insights/industry-perspectives/2023_sugar_beet_industry_perspective.pdf

C59 - Tereos, Annual Report 2023/24

Read: Full page read. Supports: Tereos’s own account: 21.1 Mt of cane processed in Brazil in 2023/24 (+22 percent), about 67 percent to sugar (roughly 1.9 Mt), its claim to second-largest Brazilian producer that campaign, and 15,800 grower-members. Source: https://www.tereos.com/app/uploads/2024/06/annual-report-2024.pdf

C60 - FranceAgriMer, monthly market bulletin (premium table)

Read: partly read. Limitations: a column ambiguity in the table meant its indicative numbers were not used. Source: https://www.franceagrimer.fr/sites/default/files/2025-06/nco-suc-2425-bulmensconjoncture-a25m05n612_0.pdf

C61 - Reuters, “Refined sugar prices hit 12-year high on supply concerns” (30 August 2023)

Read: Search excerpts only; the full text was not read. Cited for: London whites at a twelve-year high near 740 dollars a tonne in 2023, the white premium blowing out as refiners bid for raws. Source: https://www.reuters.com/article/markets/commodities/refined-sugar-prices-hit-12-year-high-on-supply-concerns-idUSL1N3AB2CY/

C62 - AP News, “Sugar prices rise worldwide after bad weather tied to El Nino damage crops” (October 2023)

Read: Search excerpts only; the full text was not read. Cited for: the 2023 spike’s drivers: drought fears in India and Thailand, an expected Indian export ban and an El Nino year. Source: https://apnews.com/article/sugar-prices-shortage-el-nino-food-inflation-7c3cc615764b97b7d821fd6b31658f41

C63 - Intercontinental Exchange, FY2024 statistics release

Read: Search excerpts only; the full text was not read. Cited for: record total futures and options average daily volume in 2024, up 24 percent on the year; the release does not break out sugar alone. Source: https://ir.theice.com/press/news-details/2025/Intercontinental-Exchange-Reports-December-Fourth-Quarter-and-Full-Year-2024-Statistics/default.aspx

C64 - Purdue Extension FS-152-W, “Cocoa Processing: Sugar-free Chocolate”

Read: Search excerpts only; the full text was not read. Cited for: sugar’s functional role in chocolate: bulk, viscosity and mouthfeel as much as sweetness. Source: https://extension.purdue.edu/extmedia/FS/FS-152-w.pdf

C65 - “Sugar reduction methods and their application in confections: a review” (PMC8994798)

Read: Search excerpts only; the full text was not read. Cited for: confections running 15 to 50 percent sugar, with 20 to 40 percent removable before texture and sweetness balance fail. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC8994798/

C66 - Sudzucker, sucrose-based excipients page

Read: Full page read (1 November 2026). Supports: pharmacopoeia-grade sucrose as an excipient: filler and binder in tablets and granules, body in powders and lozenges, coating material for pills and pastilles, sweetness and viscosity in syrups and drinkable ampoules, and taste-masking for bitter actives; European Pharmacopoeia monograph coverage. Limitations: a vendor product page; cited for offered product roles, not industry prevalence. Source: https://www.suedzucker.com/products/sucrose-based-excipients/

C67 - Morgan Downey, “Commodities 101: Fermentation Products”

Read: Full page read (1 November 2026). Supports: five bulk fermentation products sharing the corn/sugar feedstock stream and their organisms (citric acid from Aspergillus niger; lysine and monosodium glutamate from Corynebacterium glutamicum; xanthan gum from Xanthomonas campestris; vitamin C); practitioner estimates that China makes about 62 percent of combined world output across these markets, with citric acid at roughly 3 million tonnes a year clustered in Shandong, more than 60 percent of world lysine, the largest share of a 350,000-to-450,000-tonne xanthan market, and overwhelming vitamin C production, with firms such as Fufeng and Meihua running several products off the same corn stream; the absence of any futures market in these products, leaving assessed prices and annual contracts; the Whitacre/ADM lysine case history; and the Animal Science Products v. Hebei Welcome vitamin C case (US Supreme Court, 2018, unanimous) on how American courts treat a foreign government’s reading of its own law. Limitations: a practitioner’s survey; its market shares are indicative estimates, not a verified industry census, and the manuscript attributes them as such. Source: https://commodities101.morgandowney.com/commodities/fermentation-products

C67b - US Department of Justice press release, “Archer Daniels Midland Co. to Plead Guilty and Pay $100 Million for Role in Two International Price-Fixing Conspiracies” (15 October 1996)

Read: Read in full. Supports: the ADM fine and its record status. In its words: “agreed to plead guilty and pay a $100 million criminal fine - the largest criminal antitrust fine ever - for its role in two international conspiracies to fix prices to eliminate competition and allocate sales in the lysine and citric acid markets worldwide.” Limitations: a contemporaneous government release; the market-size figures (600 million and 1.2 billion dollars) are as stated there. Source: https://www.justice.gov/archive/atr/public/press_releases/1996/0988.htm

C68 - “Comprehensive assessment of the l-lysine production process from fermentation of sugarcane molasses” (Process Biochemistry)

Read: Search excerpts only; the full text was not read. Cited for: a modelled molasses-to-lysine process achieving 0.31 grams of lysine per gram of glucose at a 26.5 percent return on investment. Source: https://link.springer.com/article/10.1007/s00449-017-1766-2

C69 - “Assessing the Potential for Industrial Chemicals Production from the Sugarcane Industry” (Informit abstract)

Read: Abstract only; the full text was not read. Source: http://search.informit.com.au/documentSummary;dn=797007693746606;res=IELENG

C70 - S&P Global CEH, High-Intensity Sweeteners abstract (2025)

Read: Abstract only; the full report was not read. Cited for: the current market positions of the intense sweeteners: cyclamate still highest-volume globally, saccharin and aspartame flat or declining in several regions, acesulfame-K, sucralose and stevia growing, sucralose fastest. Source: https://www.spglobal.com/content/dam/spglobal/ci/en/documents/products/pdf/CI_0325_Global_CEH_Sweeteners_High_Intensity_Abstract.pdf

C71 - Meticulous Research, High-Intensity Sweeteners Market press release

Read: Search excerpts only; the full text was not read. Source: https://www.meticulousresearch.com/pressrelease/486/high-intensity-sweeteners-market-2034

C72 - Nordzucker, 2025/26 results and key figures

Read: Full page read. Supports: Nordzucker’s 2025/26 results: revenue of EUR 2.34 billion against EUR 2.77 billion the prior year, EBIT of -226 million including roughly -160 million non-recurring in Europe, a net loss of EUR 171.7 million; 2.8 Mt of beet sugar plus 0.6 Mt of cane via Mackay Sugar. Source: https://www.nordzucker.com/en/the-sugar-company/company-profile/key-figures-2

C73 - Cosun Beet Company, “About Us”

Read: Search excerpts only; the full text was not read. Source: https://www.cosunbeetcompany.com/about-us/

C74 - AGRANA, sugar segment reporting page

Read: Search excerpts only; the full text was not read. Source: https://reports.agrana.com/en/business-areas-segments-key-topics/acs-sugar-segment

C75 - Sugar Asia, “Japan’s sugar refiners: consolidation and future growth”

Read: Full page read (access deepened after first registration). Cited for: Japan’s refining system: about a million tonnes of raws a year into eleven refineries, the state buying and reselling at a higher stable price, and consolidation into two majors. Source: https://sugar-asia.com/japans-sugar-refiners-consolidation-future-growth/

C76 - USDA FAS GAIN, “Sugar Annual - Indonesia” (ID2026-0014, April 2026)

Read: Full page read. Supports: Indonesia’s refining system: about 37 of 43 state mills over a century old; a five-year average recovery of 7.1 percent (2025/26); eleven refineries with 5.02 MMT installed capacity running at about 70 percent in 2025/26 against 78.8 percent the prior year, throughput set by raw-sugar import permits. Source: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Sugar+Annual_Jakarta_Indonesia_ID2026-0014.pdf

C77 - Swedish sugar industry silo history paper (SASRI dochub)

Read: Full PDF read (1 November 2026). Supports: concrete silo designs traced to Great Western Sugar in the United States in 1930; engineer Nils Weibull credited with the first steel silo for bulk handling in 1933; a 10,000-tonne raw-sugar silo at Malmo harbour in 1957, “after the international breakthrough of bulk handling of cane raw sugar”; the first two 20,000-tonne granulated-sugar silos in 1956; a 30,000-tonne conversion the largest by 1961. Source: https://dochub.sasri.org.za/bitstreams/1544bd91-e8a2-4ed3-9c1b-aa69346abe1f/download

C78 - sugarindustry.info, “The right approach how to design the conditioning system of a sugar silo”

Read: Abstract-level page read (1 November 2026); the full PDF sits behind a download and was not read. Cited for, from the abstract: raw sugar’s residual moisture leads to agglomeration; conditioning parameters (time, air quantity, humidity and temperature) set against silo type, residual water content, crystal size, feed rate and environment; manual clearing of caked silos endangers staff. Source: https://sugarindustry.info/paper/18649/

C79 - TSSCT, “Back to basics: your guide to sugar refining excellence” (E. M. I. Sarir)

Read: Search excerpts only; the full text was not read. Cited for: white recovery from raws running 95 to 98 percent depending on raw quality and design, molasses the main loss. Source: https://tssct.org/wp-content/uploads/2019/08/0900-0920-E.-M.-I.-Sarir-1.pdf

C80 - Czarnikow Group Limited, Annual Report and Accounts 2024

Read: Full page read. Supports: the book’s Czarnikow account verified at the report: 2024 revenue of US$5,141m against net revenue of about US$97m, 423 people in 13 offices, US$1.58bn of group credit facilities; the Brazil desk’s US$270m in credit lines from 18 local banks financing one million tonnes of local origination within 3.8 Mt of agriproducts, not sugar alone; a principally fee-based pricing model hedged through derivatives and back-to-back agreements. Source: https://www.czarnikow.com/wp-content/uploads/2025/04/CZ-Annual-Report-2024.pdf

C81 - KCaFTA Market Brief No. 7: ROK Refined Sugar

Read: Search excerpts only; the full text was not read. Cited for: South Korea’s three domestic refiners and their 2022 market shares: CJ CheilJedang 47 percent, Samyang 32 percent, TS DaehanJedang 21 percent. Source: https://xudzhtdbklatztyoqeut.supabase.co/storage/v1/object/public/kcafta.market.02/file1/1/ROK%20Market%20Brief%20No.7.pdf

C82 - Mubasher, “Savola starts expanding Jeddah sugar refinery” (2014)

Read: Search excerpts only; the full text was not read. Cited for: the 2014 expansion of the Jeddah refinery toward 1.7 million tonnes. Source: https://english.mubasher.info/news/2622801/Savola-starts-expanding-Jeddah-sugar-refinery/

C83 - The Business Year, interview with United Sugar Company’s general manager (2019)

Read: Search excerpts only; the full text was not read. Cited for: United Sugar Company’s roughly 1.2 to 1.3 million tonnes of capacity at Jeddah. Source: https://thebusinessyear.com/interview/sweet-success-saudi-arabia-2019/

C84 - USDA FAS GAIN, “Food Processing Ingredients - Saudi Arabia” (2018)

Read: Search excerpts only; the full text was not read. Source: https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Food+Processing+Ingredients_Riyadh_Saudi+Arabia_3-29-2018.pdf

C85 - Bahrain Ministry of Industry and Commerce, Bahrain Sugar Refinery announcement

Read: Search excerpts only; the full text was not read. Source: http://www.moic.gov.bh/en/node/3266

C86 - Oman Sugar Refinery Company, “The Refinery”

Read: Search excerpts only; the full text was not read. Cited for: about a million tonnes of capacity at Sohar Port with half a million tonnes of bulk raw storage. Source: https://omansugarrefinery.com/refinery

C87 - Canal Sugar Company

Read: Search excerpts only; the full text was not read. Cited for: the West Minya project’s presentation as the world’s largest beet sugar plant at up to 750,000 tonnes a year, a billion-dollar build with Al Khaleej participation. Source: https://canalsugar.com/

C88 - Al Khaleej Sugar, “International Projects”

Read: Search excerpts only; the full text was not read. Source: https://alkhaleejsugar.ae/en/international-projects/projects

C89 - European Commission DG AGRI, Sugar Dashboard

Read: Search excerpts only; the full text was not read. Source: https://agriculture.ec.europa.eu/system/files/2024-01/sugar-dashboard_en.pdf

C90 - USDA FAS GAIN, “Sugar Annual - European Union” (E42024-0010)

Read: Search excerpts only; the full text was not read. Cited for: post-quota EU prices falling toward world levels after 2017. Source: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Sugar+Annual_Brussels+USEU_European+Union_E42024-0010.pdf

C91 - Tate & Lyle Sugars, “Our Locations”

Read: Search excerpts only; the full text was not read. Cited for: Thames Refinery still running at 1.2 million tonnes a year under ASR Group. Source: https://www.tateandlylesugars.com/about-us/our-locations

C92 - USDA FAS, “Sugar: World Markets and Trade,” May 2026

Read: Full page read. Supports: the May 2026 issue’s 2026/27 forecasts and 2025/26 revisions; the current-numbers anchor for world supply and demand figures, including the forecast Brazilian cane mix moving to 52 percent ethanol after the August 2025 blend rise. Source: https://apps.fas.usda.gov/psdonline/circulars/sugar.pdf (release page: https://www.fas.usda.gov/data/sugar-world-markets-and-trade-05282026)

C93 - CIA, “The World Sugar Market: Situation in 1974 and Outlook for 1975” (declassified)

Read: Full page read. Supports: the contemporary American intelligence assessment recording the free-market price running from 15 cents a pound in January 1974 to 34 cents by September 1974. Source: https://www.cia.gov/readingroom/docs/CIA-RDP86T00608R000500200007-9.pdf

C94 - UPI, “Pepsi, Coke turn to corn syrup” (6 November 1984)

Read: Full page read. Supports: Pepsi moving to 100 percent HFCS in brand Pepsi and Pepsi Free (from approval levels of 50 percent in April 1983 and 80 percent in fountain syrup in September 1983); Coke at 100 percent in bottles and cans, with fountain syrup at 100 percent from May 1984. Source: https://www.upi.com/Archives/1984/11/06/Pepsi-Coke-turn-to-corn-syrup/2049468565200/

C95 - Amalgamated Sugar, company site

Read: Full page read. Supports: by its own account a cooperative of more than 700 grower-members and the country’s second-largest beet-sugar manufacturer. Source: https://www.amalgamatedsugar.com/

C96 - Western Sugar Cooperative, company site

Read: Full page read. Supports: a growers’ cooperative of more than 700 growers and shareholders. Source: https://www.westernsugar.com/

C97 - Michigan Sugar, “About Us”

Read: Full page read. Supports: the third-largest US beet processor, about 1.3 billion pounds a year, the Pioneer brand, founded 1906. Limitations: the page does not state cooperative status. Source: https://www.michigansugar.com/about-us/

C98 - UNICA statistical note on 2024 bioelectricity, from CCEE data (Portuguese)

Read: Full page read. Supports: “Em 2024, a geracao de energia eletrica para a rede foi de 632.145 GWh” (generation for the grid, not consumption); the generation table: hydro 417,063 GWh, wind 103,283, gas thermal 28,780, biomass thermal 28,260, with sugarcane bagasse and straw at 21,218 GWh, 75 percent of the biomass total. Source: https://unicadata.com.br/arquivos/pdfs/2025/03/14d900986abb3b7537a661e79675dcd7.pdf

C99 - Jensen & Morin, “Energy and the environment in beet sugar production” (ESST Proceedings, Reims 2015)

Read: Full page read. Supports: “over the last 50 years, from using 250-300 kWh fuel per tonne of beet to 170 kWh for a good factory excluding pulp drying” (kilowatt-hours of fuel, thermal, over roughly 1965-2015); drum drying of pulp at about 98 kWh per tonne of beet; best-practice designs aiming at 140 to 150 including drying. Source: http://enerdry.eu/wp-content/uploads/2015/12/jensen-AS-ESST-reprint.pdf

C100 - NDSU Extension AS1365, “Feeding Sugarbeet Byproducts to Cattle” (2023)

Read: Full page read. Supports: “The cossettes are conveyed to a pulp press, which squeezes some of the water from the pulp to facilitate transportation”; pulp marketed as dry shreds or pellets goes to a pulp dryer. Source: https://www.ndsu.edu/agriculture/extension/publications/feeding-sugarbeet-byproducts-cattle

C101 - Sudzucker, pressed sugar beet pulp product page

Read: Full page read. Supports: pressed pulp at “min. 24 % - typically 29 % dry matter content”; “Used in direct feeding - fresh or ensiled”; “Fresh pressed beet pulp should be fed within 2 days”; uses including biogas generation. Limitations: a producer product page. Source: https://www.suedzucker.com/product/pressed-sugar-beet-pulp/

C102 - Sudzucker, sugar beet pulp pellets product page

Read: Full page read. Supports: “the desugared and pressed beet pulp is dried and processed into pellets … Can be stored under appropriate storage conditions.” Limitations: a producer product page. Source: https://www.suedzucker.com/product/sugar-beet-pulp-pellets/

C103 - AGRANA press release, Kaposvar biogas plant (15 November 2007)

Read: Full page read. Supports: “The feedstock consists of the spent beet pulp produced during sugar beet processing, as well as of beet syrup”; the by-products supplying a large portion of the plant’s energy needs. Limitations: a company press release. Source: https://www.agrana.com/news/pr-421-agrana-opens-first-of-its-kind-biogas-plant-in-kaposv-r-hungary

C104 - British Sugar case study, “Anaerobic Digestion at Bury St Edmunds” (27 November 2017)

Read: Full page read. Supports: “designed to take approximately 97,500 tonnes of pressed sugar beet pulp per year,” some fed directly during the campaign and some stored as bales; generating up to 5 megawatts of electricity with heat recovery. Limitations: a company case study. Source: https://www.britishsugar.co.uk/sustainability/case-studies/2017-11-27-anaerobic-digestion-at-bury-st-edmunds

C105 - TotalEnergies press release, Cristal Union pulp-for-biomethane agreement (29 February 2024)

Read: Full page read. Supports: a fifteen-year supply agreement; pulp as “over half of the anaerobic digestion unit’s feedstock” at a Normandy biomethane unit then being built. Limitations: a company press release. Source: https://totalenergies.com/newsroom/totalenergies-joins-forces-cristal-union-produce-biogas-sugar-beet-pulp/?lang=eng

C106 - USDA FAS GAIN, “France’s Sugar Beet Crop Devastated by Disease - Sugar Industry’s Viability Threatened” (11 August 2020)

Read: Full page read. Supports: the American agricultural service’s account of the 2020 French virus yellows crisis after the neonicotinoid seed-treatment ban, a mild spring, aphid infestation and compounding drought. Source: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=France%27s+Sugar+Beet+Crop+Devastated+by+Disease+-+Sugar+Industry%27s+Viability+Threatened_Paris_France_08-11-2020

C107 - Reuters, “France to ease pesticide ban for sugar beet to curb crop losses” (6 August 2020)

Read: Full page read. Supports: France moving to “exempt sugar beet for up to three years from a general ban on neonicotinoids”; “the jaundice virus transmitted by aphids has developed massively.” Source: https://www.reuters.com/article/world/france-to-ease-pesticide-ban-for-sugar-beet-to-curb-crop-losses-idUSKCN2521ON/

C108 - “Fertirrigation with sugarcane vinasse: Foreseeing potential impacts” (Journal of Environmental Science and Health Part A, 2017)

Read: Full page read (abstract and article text on the page). Supports: vinasse is “the main wastewater from ethanol production” and fertirrigation its primary destination in Brazil, with applied K2O determined weekly against the crop’s extraction of about 185 kilograms of K2O per hectare. Source: https://www.tandfonline.com/doi/full/10.1080/10934529.2017.1338892

C109 - CETESB technical norm P4.231, “Vinhaca - criterios e procedimentos para aplicacao no solo agricola”

Read: Full page read. Supports: vinasse soil application in Sao Paulo state is regulated by this norm, with application dose tied to soil and crop criteria. Source: https://cetesb.sp.gov.br/ntc-p4-231_vinhaca_-criterios-e-procedimentos-para-aplicacao-no-solo-agricola-3a-ed-2a-versao/

C110 - US FDA, “High-Intensity Sweeteners” page

Read: Full page read. Supports: “Six high-intensity sweeteners are FDA-approved as food additives in the United States: saccharin, aspartame, acesulfame potassium (Ace-K), sucralose, neotame, and advantame”; cyclamate “currently prohibited.” Source: https://www.fda.gov/food/food-additives-petitions/high-intensity-sweeteners

C111 - Wikipedia, “Saccharin”

Read: Full page read. Supports: “Saccharin was produced first in 1879, by Constantin Fahlberg … working on coal tar derivatives in Ira Remsen’s laboratory at Johns Hopkins”; the failed 1977 FDA ban attempt and the warning label dropped in 2000 after the rat-specific mechanism was established. Limitations: a tertiary source; its primary references are listed on the page and load-bearing claims were checked against them. Source: https://en.wikipedia.org/wiki/Saccharin

C112 - Wikipedia, “Sodium cyclamate”

Read: Full page read. Supports: “Cyclamate was discovered in 1937 at the University of Illinois by graduate student Michael Sveda”; the 1969 rat study on the 10:1 cyclamate-saccharin mix, GRAS removal in October 1969 and the full US ban in October 1970; “the European Union considers it safe.” Limitations: a tertiary source; its primary references are listed on the page. Source: https://en.wikipedia.org/wiki/Sodium_cyclamate

C113 - Kochergin, Johnson, Morrow & Peacock (Amalgamated Research LLC), “Molasses Desugarization in the US Beet Sugar Industry - Recent Update”

Read: PDF read in full. Supports: molasses desugarization history and mechanics in the US beet industry: “the first industrial-scale batch system in the U.S.,” a single column with 22 cubic metres of resin, installed in 1973 at the Utah-Idaho Sugar factory in Moses Lake, Washington; the first commercial US simulated-moving-bed MDS unit in 1988 at the Amalgamated Sugar factory in Twin Falls, Idaho; Finnsugar’s sequential SMB process introduced in 1989. Limitations: a vendor paper from Amalgamated Research. Both 1973 and 1988 firsts are United States firsts; SMB technology itself is older. The 75-to-80-percent figures are Z-factors - a composite of extract purity and separator recovery quoted at 60 percent extract-molasses purity - not simple recovery rates; the “up to eight times” loading figure is the vendor’s claim relative to the 1988 baseline. Source: https://arifractal.net/wp-content/uploads/2019/06/Molasses-Desugarization-in-the-US-Beet-Sugar-Industry-Recent-Update.pdf

C114 - US FDA, “FDA Issues Draft Guidance Regarding the Declaration of Allulose on the Nutrition Facts Label” (17 April 2019)

Read: Full page read. Supports: the FDA’s 2019 draft guidance exercising “enforcement discretion regarding the requirement that … allulose be included” in the Total and Added Sugars lines, and counting allulose at 0.4 calories per gram. Source: https://www.fda.gov/food/hfp-constituent-updates/fda-issues-draft-guidance-regarding-declaration-allulose-nutrition-facts-label

C116 - Raizen, Earnings Release Q3 of the 2024/25 crop year (17 February 2025)

Read: Read in full. Supports: E2G (second-generation ethanol) output and plant statuses: 49.7 thousand cubic metres produced year-to-date April-December 2024/25 against 25.2 the prior year (+97.2 percent); Costa Pinto closed as a production unit from 1 April 2025 for conversion to research; plants 3-4 commissioning and 5-6 under construction; E2G capex of R$1,458.7

million year-to-date. Limitations: company-reported; the E2G output is company-wide across Costa Pinto and Bonfim, so Bonfim alone ran below its 82-million-litre nameplate. Source: https://api.mziq.com/mzfilemanager/v2/d/c016735f-1711-48ce-919f-a8c701b83c19/292a65a2-5ec3-bbdb-1ffd-36ff5fb25c07?origin=2

C117 - MegaWhat/UOL, “Raizen planeja 20 usinas de etanol de segunda geracao ate 2030” (31 August 2023)

Read: Search excerpts only; the full text was not read. Cited for: Raizen’s expansion plan of 20 second-generation ethanol plants by 2030 (about R$24-25 billion), the Bonfim inauguration in October 2023 with 82 million litres a year per plant, and the first five plants’ fifteen-year output (4.3 billion litres) pre-sold, 3.3 billion litres to Shell. Limitations: plan announcements, not delivery. Source: https://megawhat.uol.com.br/combustiveis/biocombustiveis/raizen-planeja-20-usinas-de-etanol-de-segunda-geracao-ate-2030/

C118 - Valor International, “After setbacks, GranBio redesigns project in Alagoas” (28 January 2025)

Read: Search excerpts only; the full text was not read. Cited for: BioFlex’s status per the trade press and the Exygen redesign. Limitations: trade press. Source: https://valorinternational.globo.com/agribusiness/news/2025/01/28/after-setbacks-granbio-redesigns-project-in-alagoas.ghtml

C119 - GranBio Investimentos S.A., audited financial statements, June 2025

Read: Search excerpts only; the full text was not read. Cited for: the company’s self-description of BioFlex I as still “the largest second-generation ethanol production plant in operation in the world”; a US Department of Energy grant of up to US$100 million via AVAPCO; the Itau exposure settled in September 2023. Limitations: self-reported, and it contradicts C118 on whether BioFlex I is operating - the conflict is unresolved and both are cited. Source: https://www.granbio.com/documents/5/Financial_Statements_Granbio_2025.06.pdf

C120 - Verbio ad-hoc announcement, “VERBIO acquires cellulose ethanol plant from DuPont in Nevada/Iowa, USA” (8 November 2018)

Read: Read in full. Supports: the DuPont Nevada plant’s fate: about 115,000 cubic metres a year of ethanol capacity from 300,000 tonnes of straw, converted to straw biomethane with 25-35 million dollars of additional investment. Limitations: the buyer’s announcement. Source: https://www.verbio.de/en/investor-relations/ad-hoc-announcements/article/verbio-acquires-cellulose-ethanol-plant-from-dupont-in-nevada-iowa-usa/

C121 - Biofuels International, “World’s ‘first’ commercial second-generation bioethanol facility ‘shuts down’” (2017)

Read: Search excerpts only; the full text was not read. Cited for: the Crescentino plant (a EUR 250 million build, 40,000 tonnes a year from about 270,000 tonnes of biomass) shutting in 2017 after the Mossi Ghisolfi concordato preventivo, its assets later passing to Versalis/Eni. Limitations: trade press. Source: https://biofuels-news.com/news/worlds-first-commercial-second-generation-bioethanol-facility-shuts-down/

C122 - Bomgardner, C&EN, “POET-DSM to pause cellulosic ethanol production” (2019, via EPA HERO record)

Read: Search excerpts only; the full text was not read. Cited for: POET-DSM’s Project Liberty (Emmetsburg, Iowa; 25 million gallons a year; corn cobs and stover) paused in November 2019 and converted to research and development, the company blaming the EPA’s Renewable Fuel Standard waiver programme. Limitations: the policy-cause claim is the company’s. Source: https://hero.epa.gov/reference/10285668/

C123 - Raizen, 2024/25 crop-year balance presentation (August 2024)

Read: Search excerpts only; the full text was not read. Cited for: E2G output of 16.2 million litres in 2023/24 (over 100 percent growth) and a reported E2G contribution margin of 14 percent. Limitations: a company presentation. Source: https://static.poder360.com.br/2024/08/balanco-raizen-14-ago-2024.pdf

C124 - Czarnikow, “Stakeholders” page

Read: Full page read. Supports: the ownership record: CZ owned 42.5 percent by Macquarie Group, 42.5 percent by Associated British Foods and 15 percent by an employee benefit trust; Czarnikow Group Limited 100 percent owned by C. Czarnikow Limited. Source: https://www.czarnikow.com/stakeholders/

C125 - Effingham Local History Group, “Lives - Julius Caesar Czarnikow” (researched by C. J. Hogger and S. Morris)

Read: Full page read. Supports: an independent local-history verification of Czarnikow’s German origin: he “came to Britain from Germany in the 1850s and built up one of the world’s greatest sugar brokerage companies”; died 1909, interred at St Lawrence, Effingham. Source: https://elhg.org.uk/discovery/lives/lives-czarnikow-family/

History and political economy (E1 - E52)

C126 - USDA Foreign Agricultural Service, "Sugar Annual - New Delhi" (GAIN report IN2026-0024, April 2026)

Read: Read in full (report body and tables). Supports: India 2025/26 season facts: cane FRP of INR 3,550 per tonne, up 4 percent; State Advised Prices in Uttar Pradesh, Uttarakhand, Haryana and Punjab set above the FRP and untied to recovery; the sugar minimum sale price unchanged since 2019 at INR 31,000 per tonne; cane dues of 8.87 billion dollars, 80 percent disbursed, 1.79 billion outstanding, with Karnataka at 530 million and Maharashtra at 330 million; 541 mills operating against 493 the previous season (table: 358/493/541 mills and 28/30/33.6 million tonnes produced October-March of 2023/24-2025/26, recovery 10.0/8.3/9.2 percent); ISMA's 2 April 2026 estimate of 27.2 million tonnes, 12 percent below its initial 31-million-tonne forecast, after excessive rain in Maharashtra, Uttar Pradesh and Karnataka; 465 of 541 mills closed by the first week of March 2026. Limitations: an attache report citing industry sources for arrears and mill-status figures; the season was still open at writing. Source: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Sugar+Annual_New+Delhi_India_IN2026-0024.pdf

C127 - USDA Foreign Agricultural Service, "Sugar Annual - Brasilia" (GAIN report BR2026-0020, April 2026)

Read: Read in full (report body and tables). Supports: Brazil facts: the MY2026/27 export forecast of 33.6 million tonnes raw value (about 29.5 raw and 4.1 refined); the production-mix shift toward ethanol linked to domestic gasoline prices; the 8 April 2026 announcement of studies to raise the gasoline ethanol blend from 30 to 32 percent; the Consecana-SP cane-pricing model in place since 1999, run by Unica and Orplana on a total-recoverable-sugar basis, with Cepea's average Sao Paulo cane price of BRL 1.0816 per kilogram of TRS, about BRL 149 per tonne, through March 2026; the Unica-Orplana memorandum of 3 April 2026 to review the model after years of frozen price circulars; the EU-Mercosur agreement of 17 January 2026 granting 180,000 tonnes of duty-free raw cane sugar for refining, with Brazil's share reserved for North-Northeast producers; Brazil as the second-largest recipient of the US sugar tariff-rate quota at about 14 percent, consistently filled. Limitations: Post forecasts are estimates, not outturns; policy items (blend study, MoU) are announcements. Source: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Sugar+Annual_Brasilia_Brazil_BR2026-0020.pdf

C128 - "Analise do escoamento ferroviario de acucar com destino ao Porto de Santos" (ENEGEP 2025 conference proceedings; DOI 10.14488/enegep2025_tn_st_425_2083_51117)

Read: Abstract and extended excerpted passages read via a search index; the full text was not retrievable. Cited for: Santos handling approximately 67 percent of Brazilian sugar exports; over 90 percent of production concentrated in the centre-south at an average distance over 500 kilometres from the port; the 2024 modal split of sugar arriving at Santos (road 47 percent; rail operators VLI 29, Rumo 13, MRS 11 percent); eleven road-rail sugar terminals in Sao Paulo and Minas Gerais moving over 12 million tonnes a year; four discharge terminals at the port with 18 million tonnes of combined annual capacity. Limitations: Portuguese-language conference paper citing ANTT (2025) and Port of Santos operational data; its abstract also states that only about 25 percent of volume moves by rail, which conflicts with its own 2024 modal split, so that figure was not used. Source: https://doi.org/10.14488/enegep2025_tn_st_425_2083_51117

C129 - CARE Ratings, "Tamilnadu Newsprint & Papers Limited" rating rationale (January 2025)

Read: Sections read in full (company profile, operations, raw-material sourcing, capex; the ratings PDF's analytical sections). Supports: TNPL facts for FY24: paper capacity of 4.4 lakh (440,000) tonnes per annum; Unit-I pulping of 1,580 tonnes per day including 550 tpd chemical bagasse pulping, 730 tpd hardwood and 300 tpd deinking; 2 lakh (200,000) tonnes per annum of paperboard with utilisation up from 84 percent in FY23 to 98 percent in FY24; bagasse sourced from local sugar mills on a barter basis in exchange for steam and coal, with shortfalls met by open-market purchases; bagasse at roughly 50-60 percent of the printing-and-writing raw-material mix against about 30 percent wood pulp; captive power of 103.62 MW at Unit I plus 35.50 MW of wind farms; Unit I self-sufficient in pulp and power. Limitations: a credit-rating rationale reporting company figures; capacities are nameplate. Source: https://www.careratings.com/upload/CompanyFiles/PR/202501120108_Tamilnadu_Newsprint_&_Papers_Limited.pdf

C130 - EFSA Panel on Nutrition, Novel Foods and Food Allergens, "Safety of D-allulose as a novel food pursuant to Regulation (EU) 2015/2283" (EFSA Journal, June 2025)

Read: Abstract, background, identity, production-process and assessment sections read in full. Supports: D-allulose is an epimer of D-fructose differing at the C-3 hydroxyl; produced by enzymatic conversion of D-fructose with D-psicose 3-epimerase, with the applicant's fructose input made by hydrolysing sucrose and enzymatically converting the remaining glucose; the application (Petiva Europe SA, 4 August 2018) proposed use as a sugar substitute in cereals, confectionery, soft drinks and similar foods; the Panel concluded in June 2025 that safety "cannot be established" because the applicant did not supply requested data on identity, production process, uses, genotoxicity and human data; D-allulose accordingly remained an unauthorised novel food in the EU as of that opinion. Limitations: a verdict on one applicant's dossier, not a finding of harm; other applications may follow. Source: https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2025.9468

C131 - Colchero, Popkin, Rivera & Ng, "Purchases of sugar sweetened beverages in Mexico one year after implementation of an excise tax" (BMJ, 2016)

Read: Abstract level - the full abstract via the journal's indexed record; the publisher page blocks automated access. Supports: Mexico's 2014 one-peso-per-litre excise tax; household purchases of taxed drinks fell about 6 percent in 2014 against the pre-tax trend, deepening to 12 percent by December; the decline was largest in low-income households (9 percent average, 17 percent by December); untaxed-drink purchases rose 4 percent, driven by bottled plain water. Limitations: one year of post-tax household purchase data from an unbalanced panel; purchases, not consumption or health outcomes. Quote: "purchases of taxed beverages decreased by an average of 6%… and decreased at an increasing rate up to a 12% decline by December 2014." Corroboration (search-highlight level): the tax rate of 1 peso per litre is documented in PAHO's account of the 2013 reform ("Taxes on Sugar-sweetened Beverages as a Public Health Strategy: The Experience of Mexico", paho.org) and in the team's 2017 follow-up study (PMC5525113), which also reports the reduction persisting in year two. Source: https://doi.org/10.1136/bmj.h6704

C132 - Wang & Balagtas (Purdue University), "How GLP-1 Medications Are Changing the Caloric and Nutritional Content of Household Grocery Purchases" (working paper, October 2026)

Read: Abstract and introduction read (50-page PDF); the full text was not read. Supports: GLP-1 adoption cuts household grocery calories by 5.1 percent in the adoption half-year before the effect fades; grocery spending falls 7.1 percent; purchases of sugar and added sugar are not significantly reduced; weight-loss-indicated users cut calories by 7.9 percent while diabetes-indicated users show no significant reduction. Limitations: a working paper; household grocery purchases, not total consumption. Source: https://xuejian-wang-ron.github.io/assets/pdf/Wang_JMP.pdf ### E1 - "Sugar plantations in the Caribbean" (Wikipedia) Read: Read (revision of 28 October 2026; cites Ponting, Draper, Palsson 2021, Knight, Tomich, Roberts, Petley). Supports: the plantation complex of the Caribbean, including the mid-seventeenth-century codification of racial caste law in the British islands and the demographic makeup of the field gangs. Limitations: a tertiary source; its named references are listed on the page. Source: https://en.wikipedia.org/wiki/Sugar_plantations_in_the_Caribbean

E2 - European Commission memo, "The end of the sugar production quotas in the EU" (29 September 2017)

Read: Read. Supports: the official record of the 1968 Common Market Organisation (quotas plus a support price above world level), its 2006 reform at a cost of 5.4 billion euros and its abolition on 30 September 2017. Source: https://ec.europa.eu/commission/presscorner/detail/en/memo_17_3488

E3 - Sweetener Users Association, "A History of the U.S. Sugar Program" (2019)

Read: Read. Supports: the American policy timeline: sugar taxed for revenue from 1789 with repeals and restorations, and the Jones-Costigan Act of 1934 building the quota system carried through successive farm bills. Limitations: an industry-advocacy source with an anti-program slant; its timeline facts were cross-checked against USDA ERS material. Source:

https://sweetenerusers.org/wp-content/uploads/2019/03/Sugar-History-2019.pdf

E4 - Origins (Ohio State University), “A Sweet Beginning: the U.S. Sugar Monopoly” (19 January 2019)

Read: Read. Supports: the Sugar Trust, the E.C. Knight case, the Sherman Act and Spreckels. Source: https://origins.osu.edu/milestones/january-2019-us-sugar-monopoly-E.C.Knight-Sherman-Act-Spreckels-court

E5 - Michael Taylor, “The West India Interest and Colonial Slavery in Parliament, 1823-33” (History of Parliament / IHR)

Read: Read. Supports: the West India interest’s parliamentary organisation and lobbying in the decade of emancipation. Source: https://www.historyofparliament.com/wp-content/uploads/2020/10/m.taylor-west-india-interest-and-colonial-slavery-in-parliament-1823-33-ppp-ihr-3-nov.pdf

E6 - Tate & Lyle, company history page

Read: Read. Supports: the corporate self-history behind the figure of 74 British refineries as late as 1878 and the following century’s consolidation toward duopoly. Limitations: a corporate self-history. Source: https://www.tateandlyle.com/about-us/company-history

E7 - “Coffee, Sugar and Cocoa Exchange” (Wikipedia)

Read: Read. Supports: the exchange lineage: the 1882 Coffee Exchange, the New York Board of Trade, futures trading in sugar from 1914, options from 1982 and the ICE takeover in 2007. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/Coffee%2C_Sugar_and_Cocoa_Exchange

E8 - UK National Archives, “The 1833 Abolition of Slavery Act and compensation claims”

Read: Read. Supports: the official record of the 1833 Act and the compensation machinery, including annuities paid for more than 800,000 emancipated people. Source: https://www.nationalarchives.gov.uk/explore-the-collection/explore-by-time-period/georgians/1833-abolition-of-slavery-act-and-compensation-claims/

E10 - “Sugar industry in Cuba” (Wikipedia)

Read: Read. Supports: the Cuban industry’s nineteenth-century rise, the 1919-20 “Dance of the Millions” boom and collapse, and the long arc toward the present. Limitations: a tertiary source; its “leading producer 1895” claim is flagged on the page as needing a citation. Source: https://en.wikipedia.org/wiki/Sugar_industry_in_Cuba

E11 - Jorge F. Perez-Lopez, “The Cuban Sugar Industry 1959-2019: From Front Runner to Back of the Pack” (ASCE proceedings, 2019)

Read: Read. Supports: the post-1959 history of the Cuban industry: centralisation into centrales, state management and decline. Limitations: a specialist academic paper published in an exile-community scholarly venue; its perspective is noted. Source: https://www.ascecubadatabase.org/wp-content/uploads/2020/01/v29-asce_2019_30perezlopez.pdf

E12 - National Museum of Australia, “Islander labourers”

Read: Read. Supports: the official account of South Sea Islander labour in Queensland cane fields: over 62,000 taken between 1863 and 1904, many recruited by deception, and the deportations under the 1901 Pacific Island Labourers Act. Source: https://www.nma.gov.au/defining-moments/resources/islander-labourers

E13 - Tegegn & Dhont, “The downhill journey of the Java sugar economy in the Netherlands Indies” (Cogent Arts & Humanities, 2023)

Read: Read in full. Supports: a recent peer-reviewed synthesis of the Java sugar economy’s rise and collapse, leaning on Van Zanden, Bosma, Knight and Fryer. Source: https://www.tandfonline.com/doi/full/10.1080/23311983.2023.2220213

E14 - “Brazilian sugar cycle” (Wikipedia)

Read: Read (revision of 23 September 2026; cites Schwartz, Furtado, Freyre). Supports: the sixteenth- and seventeenth-century northeastern sugar cycle and its eclipse. Limitations: a tertiary source; its named references are listed on the page. Source: https://en.wikipedia.org/wiki/Brazilian_sugar_cycle

E15 - “Atlantic slave trade” (Wikipedia)

Read: Read (cites Eltis, Manning, Morgan, Solow, Moya Pons, Thornton). Supports: the trade’s scale and mechanics, including the demographic evidence that deaths exceeded births on the sugar islands through most of the slavery era. Limitations: a tertiary source; its named references are listed on the page. Source: https://en.wikipedia.org/wiki/Atlantic_slave_trade

E16 - UCL Centre for the Study of the Legacies of British Slavery, “Legacies of British Slave-Ownership” project page

Read: Read. Supports: the project that has spent fifteen years tracing the Slave Compensation Commission’s records - more than 40,000 owners named - into banking, insurance, railways and industrial ventures. Source: https://www.ucl.ac.uk/social-historical-sciences/history/research/research-projects-and-centres/centre-study-legacies-british-slavery-cslbs/cslbs-projects-and-partners/legacies-british-slave-ownership

E17 - “Indian indenture system” (Wikipedia)

Read: Read (revision of 19 October 2026; cites Tinker, Bahadur). Supports: the indenture system built from India, China and the Pacific after emancipation. Limitations: a tertiary source; its named references are listed on the page. Source: https://en.wikipedia.org/wiki/Indian_indenture_system

E18 - LSU Libraries, “Sugar at LSU: a Chronology” (special collections exhibit)

Read: Read. Supports: Louisiana’s antebellum sugar economy: planters’ banks and factor credit from the 1820s, steam-powered mills and tariff lobbying from the same decade. Source: https://lib.lsu.edu/sites/all/files/sc/exhibits/e-exhibits/sugar/contents.html

E19 - Michael Dudzik, “The origins of the French beet sugar industry (1806-1815)” (Charles University, Prague)

Read: Read. Supports: the Napoleonic origins of the French beet industry. Source: http://www.elektropolis.cz/wp-content/uploads/2022/06/HS_062_Dudzik.pdf

E20 - “Economic history of Mauritius” (Wikipedia)

Read: Read. Supports: the island sugar economy within the Commonwealth preference and the post-1968 diversification into textiles, tourism and finance. Limitations: a tertiary source that mixes eras; some statistics are dated (CIA Factbook vintage) and used with date labels. Source: https://en.wikipedia.org/wiki/Economic_history_of_Mauritius

E21 - “Sugar Act” (Wikipedia)

Read: Read (revision of 24 October 2026). Supports: the 1764 Sugar Act: the halved but enforced duty and its place among the grievances on the road to the American Revolution. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/Sugar_Act

E22 - Smithsonian NMAH, “Rum” (On the Water online exhibit)

Read: Read. Supports: rum’s place in the Atlantic trades. Source: https://americanhistory.si.edu/explore/exhibitions/on-the-water/online/living-atlantic-world/new-tastes-new-trades/rum

E23 - “Navigation Acts” (Wikipedia)

Read: Read. Supports: sugar as an enumerated commodity from 1660, systematically enforced only from 1696. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/Navigation_Acts

E24 - Bank of England Staff Working Paper 1006, “The collection of slavery compensation, 1835-43” (25 November 2022)

Read: Read. Supports: the payout’s mechanics: compensation for more than 800,000 emancipated people, paid partly in 3.5 percent government annuities, collected for absentee owners through a small ring of London banks and merchant houses and converted to cash almost at once. Source: https://www.bankofengland.co.uk/working-paper/2022/the-collection-of-slavery-compensation-1835-43

E25 - “International Sugar Agreement” (Wikipedia)

Read: Read (revision of 22 July 2026; treaty texts via AustLII). Supports: the cartel chronology: the 1931 Chadbourne Plan, the 1937 London agreement creating the International Sugar Council, the 1968 UNCTAD agreement creating the International Sugar Organization. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/International_Sugar_Agreement

E26 - FAO, Thailand country study (1997)

Read: Read. Supports: Thailand’s structure: around 107,000 smallholders growing for contract mills that own no cane, under state milling licenses and production quotas. Limitations: a 1997-vintage study; its figures need date labels. Source: https://www.fao.org/4/x0513e/x0513e24.htm

E27 - Das & Mookherjee, “Ownership Form and Contractual Inefficiency” (ISID Discussion Paper 04-06, 2004)

Read: Read. Supports: the economics of mill ownership and grower contracts in the Indian industry. Source: http://www.isid.ac.in/~planning/workingpapers/dp04-06.pdf

E28 - Moynagh, “Brown or white? A history of the Fiji sugar industry 1873-1973” (ANU PhD thesis, 1978)

Read: Abstract only; the 47 MB full text has not been read. Cited for: Fiji’s cane fields built on Indian girmit from 1879 under CSR, and the 1973 handover after the Denning arbitration. Limitations: only the abstract is verified. Source: https://openresearch-repository.anu.edu.au/items/f99c6689-0f87-4802-836b-6ca7eedac10b

E29 - Smithsonian NMAH, “Rum” (same exhibit page as E22)

Read: Read. Supports: identical to E22 - this is the same page, listed twice in the records. Source: https://americanhistory.si.edu/explore/exhibitions/on-the-water/online/living-atlantic-world/new-tastes-new-trades/rum

E30 - Frank Taussig, analysis of refined sugar and the Sugar Trust (Library of Economics and Liberty)

Read: Read. Supports: Taussig’s argument that the tariff’s differential between raw and refined sugar sheltered refining margins - “the mother of trusts” in Havemeyer’s own phrase - and the price wars against Spreckels (1889-92) and Arbuckle (1897). Source: https://www.econlib.org/book-chapters/chapter-part-ii-chapter-viii-refined-sugar-and-the-sugar-trust/

E31 - “Capitalism and Slavery” (Wikipedia)

Read: Read. Supports: the Williams-thesis debate: slavery’s profits granted a large role in Atlantic commerce while their share of industrial investment is disputed. Limitations: a tertiary source summarising the scholarly debate. Source: https://en.wikipedia.org/wiki/Capitalism_and_Slavery

E32 - Royal Historical Society panel on Capitalism and Slavery (2023)

Read: Read. Supports: the current state of the Williams-thesis reassessment among historians. Source: https://royalhistsoc.org/eric-williams-capitalism-and-slavery/

E33 - Commonwealth Sugar Agreement to Lome transition study (Intereconomics, via EconStor)

Read: Read. Supports: the preference ladder’s chronology: the Commonwealth Sugar Agreement 1950-74, the 1975 Lome Convention’s Sugar Protocol (about 1.28 million tonnes a year for ACP exporters, Mauritius holding 487,200), and the 2001 Everything But Arms initiative. Source: https://www.econstor.eu/bitstream/10419/140214/1/v24-i06-a07-BF02924737.pdf

E34 - Queensland cane railways, industry account (zelmeroz.com)

Read: Read. Supports: the scale benchmark for cane railways: more than 3,500 kilometres of 610-millimetre narrow gauge hauling over 24 million tonnes of cane a year, field-to-mill within about 24 hours, transport at roughly 30 to 40 percent of milling cost. Limitations: an industry historian’s account rather than a peer-reviewed source. Source: https://www.zelmeroz.com/archives/1998/ng_cane/QCane99.pdf

E35 - European Commission DG AGRI, “EU sugar sector has shown satisfactory overall resilience since the end of quotas” (31 January 2022)

Read: Read. Supports: the official assessment of the EU sector’s post-quota adjustment. Source: https://agriculture.ec.europa.eu/news/eu-sugar-sector-has-shown-satisfactory-overall-resilience-end-quotas-2022-01-31_en

E36 - Sugar Association of London, history page (founded 1882)

Read: Read. Supports: the London trade association’s origins in 1882. Source: https://sugarassociation.co.uk/sal.php

E37 - “Henry Osborne Havemeyer” (Wikipedia)

Read: Read. Supports: the trust’s mechanics, including seventeen of the country’s twenty-three refineries inside the combination by the end of 1887. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/Henry_Osborne_Havemeyer

E38 - “CSR Limited” (Wikipedia)

Read: Read. Supports: the Colonial Sugar Refining Company’s history in Australia and Fiji. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/CSR_Limited

E39 - “Sugar industry of the Philippines” (Wikipedia)

Read: Read. Supports: Nicholas Loney’s 1856 credit-and-machinery opening, the 1974 spike to sixty-seven cents and crash back to three, and recent production around 2.1 million tonnes. Limitations: a tertiary source. Source: https://en.wikipedia.org/wiki/Sugar_industry_of_the_Philippines

E40 - USDA FAS, “Sugar: World Markets and Trade,” December 2025

Read: Read. Supports: the December 2025 issue of the semi-annual world markets report. Limitations: superseded for current numbers by the May 2026 issue (C92); kept here as the December 2025 state of the data. Source: https://www.fas.usda.gov/sites/default/files/2025-12/sugar.pdf

E42 - The Guardian, “Over a barrel: lack of sugar…” - Cuba’s sugar and rum crisis (30 May 2025)

Read: Read. Supports: the 2024-25 Cuban harvest falling below 150,000 tonnes against a state plan of 265,000, with press estimates near 165,000 - a level one analyst said requires going back to the nineteenth century to match. Source: https://www.theguardian.com/business/2025/may/30/over-a-barrel-lack-sugar-cuba-rum-industry-crisis-harvest

E43 - “C. Czarnikow” (Wikipedia)

Read: Read. Supports: the firm’s history from Julius Caesar Czarnikow’s 1861 City firm through the London Produce Clearing House of 1888 to the present Macquarie and Associated British Foods ownership. Limitations: a tertiary source; the ownership and founding-person details are verified against C124 and C125. Note: in some lists this reference appears as “E43” and in the earlier ledger it carried the alias “C14”; the content is the same. Source: https://en.wikipedia.org/wiki/C_Czarnikow

E44 - Medford Historical Society, “Medford Rum”

Read: Read. Supports: New England distilling: by about 1770 roughly 159 rum distilleries on the mainland, 63 in Massachusetts, converting some six million gallons of molasses a year, with Medford rum a byword for quality. Source: https://medfordhistorical.org/medford-history/about-medford/medford-rum/

E45 - Lloyd’s, “Lloyd’s marine insurance and slavery”

Read: Read. Supports: Lloyd’s own account of marine insurance on the slave-sugar routes, making up perhaps a third to two-fifths of its premium income in the peak decades. Source: https://www.lloyds.com/about-lloyds/history/the-trans-atlantic-slave-trade/lloyds-marine-insurance-and-slavery

E46 - Ronnback, “Sweet business: quantifying the value added in the British colonial sugar trade in the 18th century” (RHE/JILAEH 2014)

Read: Full paper text read. Supports: value added in the British colonial sugar trade worth about 1 percent of British GDP early in the eighteenth century and about 4 percent by its end, most of it captured in the tertiary sector - shipping, insurance, brokerage, refining and distribution - rather than on the plantations. Source: https://e-archivo.uc3m.es/rest/api/core/bitstreams/b05e374f-1e06-4809-acd8-d1164ad0432c/content

E47 - O’Brien, “The Political Economy of British Taxation 1660-1815” (Economic History Review, 1988)

Read: Full paper text read. Supports: the fiscal stake: duties around 34 percent ad valorem on muscovado, and tea and sugar passing “from luxuries to decencies” as mass consumption made them dependable revenue. Source: https://slantchev.ucsd.edu/courses/ps143a/readings/O%27Brien%20-%20Political%20Economy%20of%20British%20Taxation%2C%201660-1815.pdf

E48 - Kopp, Prehn & Brummer, “Preference Erosion - The Case of Everything But Arms and Sugar” (The World Economy, 2016)

Read: Abstract only; the full text is paywalled. Supports: gravity-model evidence that ACP sugar exporters lost ground as Everything But Arms eroded preferences. Limitations: only the abstract is verified. Source: https://onlinelibrary.wiley.com/doi/10.1111/twec.12374

E48b - UNCTAD, “Generalized System of Preferences: Handbook on the Scheme of the European Community”

Read: Read in full. Supports: the EBA sugar liberalisation schedule. In its words: “Only three highly sensitive products - namely, bananas, rice and sugar - are subject to transitional periods, which end on 1 October 2009 with the liberalization of sugar imports” - with tariffs reduced 20, 50 and 80 percent on 1 July of 2006, 2007 and 2008. Source: https://unctad.org/system/files/official-document/itcdtsbmisc25rev3_en.pdf

E49 - Dell & Olken, “The Development Effects of the Extractive Colonial Economy: The Dutch Cultivation System in Java” (REStud 2020 / NBER working paper 24009)

Read: Full working paper read. Supports: the Dutch Cultivation System in Java: the coercive state system at its peak supplying more than a third of Dutch state revenue, then private estates served by colonial banks and the Proefstation Oost-Java breeding station, and the industry’s collapse in the Depression. Source: https://www.nber.org/system/files/working_papers/w24009/w24009.pdf

E50 - Jason W. Moore, “Madeira, Sugar, and the Conquest of Nature in the ‘First’ Sixteenth Century, Part II” (REVIEW, Fernand Braudel Center, 2010)

Read: PDF read. Supports: the Madeira sugar frontier’s self-consumption. In its words: “No cash crop devoured the forest so quickly as sugar”; “a destruction propelled by a fuel-hungry sugar frontier that removed half the island’s accessible forests by the early years of the sixteenth century”; output falling from an “average of 1900 tons in 1505-09 … to barely 300 tons in the 1530s” (peak 2,480 tons in 1506), with the best-grade real price up 50 percent between 1515 and 1520. Limitations: a Marxist world-ecology framing; the empirical passages cited are documented from Portuguese records within the article. Source: https://jasonwmoore.com/wp-content/uploads/2017/08/Moore-Madeira-Part-II-2010-REVIEW.pdf

E51 - US House of Representatives, History, Art & Archives, “Hawaii” (Exclusion and Empire essay)

Read: Page read. Supports: the Big Five sugar companies named (“By 1870 these American descendants had become the ‘Big Five’ sugar companies: Ladd & Company, H. Hackfeld & Company, C. Brewer & Company, Castle & Cooke, and Alexander & Baldwin”); the Reciprocity Treaty of 1875 admitting Hawaiian sugar “under favorable tariff rates”; sugar revenue more than tripling, $1.3 million in 1876 to $4.3 million in 1880; “This economic explosion granted the Big Five enormous leverage, leverage that they parlayed into a political revolution in 1887.” Cited for: the Hawaii passage in the economies chapter: the 1875 treaty terms, the named Big Five, the revenue surge and the 1887 leverage. Limitations: a popular-history essay on an official site, not a monograph; it says “favorable tariff rates”, and the book’s wording follows it. Source: https://history.house.gov/Exhibitions-and-Publications/APA/Historical-Essays/Exclusion-and-Empire/Hawaii/

E52 - La Croix & Grandy, “The Political Instability of Reciprocal Trade and the Overthrow of the Hawaiian Kingdom,” Journal of Economic History (Cambridge)

Read: Abstract read; full text not read. Supports: the authors’ argument that “the political economy of the treaty contributed significantly to the overthrow of the Hawaiian monarchy”; the limited-term 1876 reciprocity treaty worsening Hawaii’s bargaining position through 1883 and the 1890 McKinley Tariff. Cited for: the same Hawaii passage, where the treaty-to-overthrow link is attributed to this economic history. Limitations: abstract only; an argument, cited as one, not settled consensus. Source: https://www.cambridge.org/core/journals/journal-of-economic-history/article/abs/political-instability-of-reciprocal-trade-and-the-overthrow-of-the-hawaiian-kingdom/B9A03A6091D92BB4F32D78A8888DA7AA

Slavery, labour and development studies (EC-1 - EC-9)

EC-1 - SlaveVoyages consortium, “Estimates: Trans-Atlantic Slave Trade” interactive page

Read: The page’s default table was read as served; the destination tables are generated interactively and were not retrievable by a static read. Supports: the totals row of the estimates table, ending at 12,521,354 Africans embarked between 1501 and 1866. Limitations: the figures actually used from this source are the default-table totals; the interactive destination breakdowns were not read. Source: https://www.slavevoyages.org/assessment/estimates

EC-2 - David Eltis, “A Brief Overview of the Trans-Atlantic Slave Trade” (SlaveVoyages introductory essay)

Read: The full essay page was read. Supports: “sugar plantations absorbing well over two thirds of slaves carried across the Atlantic by the major European and Euro-American powers”; “12.5 million slaves had been shipped from Africa, and 10.7 million had arrived”; Middle Passage mortality “between 12 and 13 percent”; “no less than 26 percent of those on board were classed as children”; “as late as 1820, nearly four Africans had crossed the Atlantic for every European”; Brazil about 40 percent of the trade, the United States 5; “the flow of contract laborers from Asia to the Americas ended in 1917”; British suppression absorbing about a tenth of naval resources by the 1840s. Limitations: a synthetic essay, not a peer-reviewed article, though its author is the field’s standard authority. Source: https://www.slavevoyages.org/blog/-brief-overview-of-the-transatlantic-slave-trade/154

EC-3 - David Eltis & David Richardson, “Migration of sugar cultivation from Asia into the Atlantic” (SlaveVoyages map essay)

Read: The full essay page was read. Supports: “Eighty percent of all captives carried from Africa were taken to sugar-growing areas.” Limitations: this metric - a share of all captives - differs from EC-2’s share of the major-power trade; both wordings are kept as the sources give them and were not harmonised. Source: https://www.slavevoyages.org/blog/-migration-of-sugar-cultivation-from-asia-into-the-atlantic/102

EC-4 - Dippel, Greif & Trefler, “Outside Options, Coercion, and Wages: Removing the Sugar Coating” (NBER working paper 20958, 2015)

Read: Abstract and author block read; the full PDF was fetched but the body has not been worked through. Supports: at abstract level, the coercion-wages mechanism for fourteen British West Indies islands, 1838-1913. In its words: “Most of the wage increase can be statistically explained by the reduced coercion of smallholders.” Limitations: abstract-level only; the published Economic Journal 2020 version was not consulted. The same work appears in the book’s literature list as L2. Source: https://www.nber.org/system/files/working_papers/w20958/w20958.pdf

EC-5 - Gonzalez-Quiroz et al., “What do epidemiological studies tell us about chronic kidney disease of undetermined cause in Meso-America?” (Clinical Kidney Journal, 2018)

Read: Read in full, including methods, results, conclusion and figures. Supports: the CKDu epidemiology across 25 studies: pooled odds ratios of 2.42 for males, 1.84 for family history and 2.09 for lowland residence; no significant association for pesticides (1.17), NSAIDs (0.99) or heat stress (1.52, wide interval). In its words: “young agricultural workers of the Pacific coast of Meso-America have been the most affected group.” Limitations: it supplies no death toll; the absence of a significant association is not proof of no causation, and heat-stress causation remains unsettled. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC6070103/

EC-6 - Moraes, Silva & Martins, “Impacts of technological and organizational changes on working conditions in Brazilian sugarcane: an analysis on 2000-2019” (RESR 61(2), 2023)

Read: The English and Portuguese abstracts and the introduction were read; the body has not been worked through. Supports: mechanisation “reached 90% of the national production on average”; 15,488 labour-violation notices from 2000 to 2019 against 280 authorised groups; the commonest irregularities in health and safety, mandatory rest, hours and pay; violations rising to 2013 then falling from 2014 as mechanised harvesting “reduced the number of workers in manual cutting - where irregularities were concentrated” (with enforcement also weakening in the fiscal crisis). Limitations: abstract and introduction only; the author names are as given on the page. A Portuguese-language journal with an English abstract. Source: https://www.scielo.br/j/resr/a/fm8Z7sp6C86SRKgprqhx3SG/?lang=en

EC-7 - Jeffrey A. Frankel, “Mauritius: African Success Story” (NBER working paper 16569, 2010)

Read: Abstract only. Supports: at abstract level, Mauritius’s independence choice. In its words: Mauritius “chose well around the time of independence in 1968, for example opting for the rule of law over nationalization of its sugar plantations.” Limitations: abstract only; Frankel’s immigrant-island hypothesis is not used. The same work appears in the literature list as L20. Source: https://www.nber.org/system/files/working_papers/w16569/w16569.pdf

EC-8 - Mervyn Ratekin, “The Early Sugar Industry in Espanola” (Hispanic American Historical Review 34:1, 1954)

Read: Read in full, in the Spanish translation published in Estudios Sociales (UASD) XXVII:96 (April-June 1994); the English original was not read directly. Supports: the early Hispaniola industry, built on Archivo de Indias documents: cane aboard Columbus’s late-1493 expedition (cuttings from La Gomera, per Las Casas); the 1503 Atienza and Ballester molasses mill at Concepcion de La Vega, the island’s first cane-processing works; early mills modeled on thirteenth-century Egyptian designs; gold’s decline by 1516 pushing encomendero capital into sugar; the 1516 Tapia-Vellosa partnership building the first true sugar mill, on a design derived from Pietro Speciale’s 1449 Palermo vertical roller; a water-powered ingenio averaging about 125 tonnes a year; minimum mill costs rarely below 15,000 gold ducats; the Jeronimo loans of 500 pesos in 1518-19 and Charles I’s treasury loans via Figueroa; profits from the Tapia-Vellosa mill funding daughter mills; and a stable total of 34 mills by the end of the 1530s, holding until the industry’s sudden collapse in the mid-1570s. Limitations: read in translation rather than the 1954 English original. Note the author’s own framing: Ratekin argues the 1493 introduction’s importance “lay in its unimportance” - cane was then a luxury unsuited to a pioneer colony. Source: https://estudiossociales.bono.edu.do/index.php/es/article/download/417/403/805

EC-9 - Stuart B. Schwartz, “Sugar Plantations in the Formation of Brazilian Society: Bahia, 1550-1835” (Cambridge University Press, 1985)

Read: Preview pages only; the full book was not read. Supports: at preview level: about 50 engenhos operating in Bahia by 1590 (Father Francisco Soares, writing in 1589); Gabriel Soares de Sousa’s 1587 Tratado descritivo identifying 36 operating engenhos with more building; the mills concentrated on the bay shores and rivers of the Reconcavo; and the Dutch seizing Salvador in 1624 and destroying Reconcavo engenhos, expelled in 1625 and returning in 1627. These counts cross-check E14’s Brazil-wide figures. Limitations: preview-only reading; nothing beyond the previewed pages is verified. Source: https://dokumen.pub/sugar-plantations-in-the-formation-of-brazilian-society-bahia-1550-1835-9780521309349-9780511870712-9780521313995.html

Origins and early history (O1 - O9)

O1 - Ian W. N. Jones, “The southern Levant in the global history of sugar” (Levant, 2026 online)

Read: Abstract, introduction, and the rise-and-fall and global-connections sections were read; the conclusion was not. Supports: the historiography and dating disputes, the diffusion timeline, and the Levant’s boom and decline. In its words: “no securely identified archaeobotanical examples earlier than the remarkable Middle Islamic period fragments found at Qusayr al-Qadim”; cane cultivated “by at least 3000-3500 BP, probably first in Papua New Guinea”; cane in Sasanian Iran “by the early 7th century AD, but probably no earlier” (citing Potts); the dating of first crystalline sugar “difficult, if not impossible, to resolve.” Limitations: the positions of Denham 2024, Potts 2021, Canavas 2015, Sato 2015, Galloway 1989 and Kirchner 2023 are quoted as summarised by Jones; the Gopal 1964 work behind the early-India dating is paywalled and unsettled. Source: https://www.tandfonline.com/doi/full/10.1080/00758914.2026.2672905

O2 - Garsmeur et al. (CIRAD), “The genomic footprints of wild Saccharum species trace domestication, diversification, and modern breeding of sugarcane” (Cell, online 11 December 2025)

Read: Summary and highlights read; the full text is open but has not been worked through. Supports: genomic confirmation of New Guinea domestication across 390 accessions: S. officinarum domesticated in the New Guinea region from wild S. robustum, its genome a mosaic of robustum subgroups with an unknown, probably East Melanesian, wild Saccharum contributor, and two early diversification centres. Limitations: summary-level reading only, and the paper does not date cultivation. Source: https://www.cell.com/cell/fulltext/S0092-8674(25)01085-2

O3 - Willem M. Floor, “SUGAR” (Encyclopaedia Iranica, 2009, updated 2012)

Read: Read in full. Supports: the Persian etymology, the Sasanian dating position and Makran and Khuzestan production: production “already known in Sasanian Persia around 460 CE”; Khuzestan “literally land of the sugar cane”; Makran’s panidh white sugar exported; shekar from Sanskrit sarkara. Limitations: a specialist encyclopedia whose circa-460 CE dating conflicts with Potts’s early-seventh-century position (as given in O1); both are presented in the book. Source: https://www.iranicaonline.org/articles/sugar-cultivation/

O4 - Sato Tsugitaka, “Sugar in the Economic Life of Mamluk Egypt” (Mamluk Studies Review VIII.2, 2004)

Read: The diffusion and cultivation sections were read with their footnotes; the medicine and festival sections were skimmed. Supports: the Islamic diffusion dates, Mamluk production scale and processing geography: Ibn Hawqal’s Iraq of “no village without sugar cane (qasab sukkar)”; the first Egypt reference in a mid-eighth-century papyrus; al-Nasir’s Mallawi domain at 2,500 feddans; the 1337-38 seizure of 14,000 qintars of raw sugar; Qift’s forty refineries and six pressing factories; Ibn Battuta’s beggars dipping bread at Mallawi’s eleven pressing factories. Limitations: the medieval quotations (al-Jahiz, Ibn Hawqal, al-Maqrizi, Ibn Battuta) are mediated by Sato; von Lippmann’s early dates are quoted only to flag Watson’s caution. Source: https://knowledge.uchicago.edu/nanna/record/1106/files/MSR_VIII-2_2004-Tsugitaka.pdf?withWatermark=0&withMetadata=0&registerDownload=1&version=1

O5 - Yule & Burnell, Hobson-Jobson (1903), entry “SUGAR”

Read: The full entry was read, including its dated primary quotations. Supports: the Greco-Roman quotations, the etymology chain and the 1343 grade taxonomy: Dioscorides (c. 65 AD) on saccharon, “a kind of honey which solidifies in India”; Pliny (c. 70 AD) on the white gum-like substance “ad medicinae tantum usum”; Pegolotti’s circa-1343 grades (mucchera reserved for the Sultan, caffettino, bambillonia, musciatto, dommaschino, chandi); the chain sarkara, sakkara, shakkar, sakcharon, saccharum. Limitations: 1903 philology with some views superseded; all the ancient quotations are mediated by this edition, and the tabasheer debate is Yule’s own argument. Source: https://dsal.uchicago.edu/cgi-bin/app/hobsonjobson_query.py?qs=SUGAR&searchhws=yes

O6 - Zhang Harsa, “The Six Diplomatic Missions in the Early 7th Century between Tang China and India” (Delhi University journal, 2015)

Read: The mission sections, including the sugar material, were read. Supports: the 647 CE Tang sugar mission. In its words (quoting Xin Tang Shu, vol. 221A): “Taizong commanded Yangzhou people to offer sugarcanes, and let craftsmen follow the Indian ways to make sugar, the product of which was much better even than Indian sugar in both color and taste”; and, from a monastic biography, the ambassador Wang Xuance “called up sugar-makers” at Mahabodhi Monastery. Limitations: the Xin Tang Shu and Xu Gao Seng Zhuan passages are quoted within the paper, so they are mediated by Zhang. Source: https://journals.du.ac.in/humsoc/pdf/ZHANG%20Harsa.pdf

O7 - Kate Parry, “Sugar and the English language” (WORD, 2016)

Read: Abstract and opening sections. Supports: the consumption-meaning arc of the word in English. Limitations: partial reading; the paper contains a contestable claim - that sugar was unknown to the Greeks and Romans - which the book treats as an example of how the history gets mistold, not as fact. Source: https://www.tandfonline.com/doi/full/10.1080/00437956.2016.1180001

O8 - Tim Denham, “Early Agriculture and Plant Domestication in New Guinea and Island Southeast Asia” (Current Anthropology 52(S4), 2011)

Read: Abstract only. Supports: at abstract level, the conceptual framework for early New Guinea agriculture. Limitations: abstract-level reading only. Source: https://www.journals.uchicago.edu/doi/full/10.1086/658682

O9 - Jason W. Moore, “Madeira, Sugar, and the Conquest of Nature in the ‘First’ Sixteenth Century, Part I” (REVIEW, Fernand Braudel Center, 2009)

Read: The framing and core sections, with figures, were read. Supports: Madeira’s rise measured: little sugar exported in 1452, 280 tons in 1472, Europe’s leading producer by the 1490s (displacing Sicily and above all Cyprus), a peak of nearly 2,500 tons in 1506, then a contraction of some 90 percent by 1530; and the frontier’s movement on to Sao Tome by the 1540s, Pernambuco by the 1570s, Bahia by the 1620s and Barbados by the 1670s. Limitations: an author-deposited copy of the journal article; the forest-exhaustion thesis is the author’s argument, presented as such in the book. Part II of the same study is E50. Source: https://jasonwmoore.com/wp-content/uploads/2017/08/Moore-Madeira-Part-I-2009-REVIEW.pdf

General and supplementary sources (S1 - S45)

S1 - ACS Symposium Series, “History of Sugar and Sweeteners” (2019)

Read: Search excerpts only; the full text was not read. Cited for: a seven-phase framework of sugar and sweetener history. Source: https://doi.org/10.1021/bk-2019-1314.ch005

S2 - “History of sugar” (Wikipedia)

Read: Read in full. Supports: the domestication of S. officinarum from S. robustum in New Guinea and the Austronesian dispersal of cane as a canoe plant. Limitations: a tertiary reference; load-bearing claims were traced to its own citations. Source: https://en.wikipedia.org/wiki/History_of_sugar

S2b - “Sugarcane” (Wikipedia)

Read: Read in full. Supports: cane botany, the C4 pathway, composition, yields, ratooning, harvest, processing and 2020 production. Limitations: a tertiary reference. Source: https://en.wikipedia.org/wiki/Sugarcane

S2c - “Sugar beet” (Wikipedia)

Read: Read in full. Supports: beet botany, the Marggraf and Achard story, cultivation and the campaign, and 2024 production from FAOSTAT. Limitations: a tertiary reference. Source: https://en.wikipedia.org/wiki/Sugar_beet

S3 - Ulbe Bosma, “The World of Sugar” (Harvard University Press, sample)

Read: The published sample - the introduction and the opening of chapter 1 - was read in full; the full book has not been read. Supports: the framing used from the sample: sucrose as one specific molecule, and the craft problem of coaxing it pure from plant tissue. Limitations: sample only; nothing beyond the introduction and first-chapter opening is verified. Source: https://www.hup.harvard.edu/file/feeds/PDF/9780674279391_sample.pdf

S4 - “Forgetting cane grasses” (Plants, People, Planet)

Read: Search excerpts only; the full text was not read. Cited for: the multistage domestication scenario and the hybrid origins of S. barberi and S. sinense. Source: https://doi.org/10.1002/ppp3.10489

S5 - Databoks summary of USDA “Sugar: World Markets and Trade” country figures

Read: Search excerpts only; the full text was not read. Cited for: 2024/25 production figures by country. Limitations: an aggregator quoting the USDA report rather than the report itself; current figures are anchored in C92. Source: https://databoks.katadata.co.id/en/economics-macro/statistics/684fb9dd29ede/top-10-global-sugar-producing-countries-20242025-is-indonesia-on-the-list

S6 - Michael Dudzik, “The origins of the French beet sugar industry (1806-1815)”

Read: Read in full. Supports: the Saint-Domingue uprising destroying the plantations that supplied France, and the continental blockade from October 1806 cutting France off from colonial sugar. Limitations: the same paper as E19, listed here under the supplementary register. Source: http://www.elektropolis.cz/wp-content/uploads/2022/06/HS_062_Dudzik.pdf

S7 - American Chemical Society landmark page, “Norbert Rillieux and the Multiple Effect Evaporator”

Read: Search excerpts only; the full text was not read. Cited for: multiple-effect evaporation under vacuum and the engineering-historical assessment of Rillieux’s work. Source: https://www.acs.org/education/whatischemistry/landmarks/norbertrillieux.html

S8 - BMA, machinery and equipment catalogue

Read: Search excerpts only; the full text was not read. Cited for: modern extraction, evaporation, crystallisation and centrifugation equipment lines for beet and cane. Source: https://www.bma-worldwide.com/machinery-equipment.html

S9 - Cambridge International Review of Social History, “Plantations and Labour in the Caribbean in the Long Nineteenth Century”

Read: Read level not recorded. Cited for: indenture numbers for the Caribbean. Source: https://www.cambridge.org/core/journals/international-review-of-social-history/article/plantations-and-labour-in-the-caribbean-in-the-long-nineteenth-century/4FCC796F3AE1AA1E218F2EC1DB8B0BD3

S10 - Oxford Research Encyclopedia, “Sugar Plantation Slavery”

Read: Search excerpts only; the full text was not read. Cited for: sugar and the transatlantic slave trade, and plantation demography. Source: https://doi.org/10.1093/acrefore/9780190277734.013.908

S11 - ICE, sugar futures documentation

Read: Search excerpts only; the full text was not read. Cited for: the contract set: Sugar No. 11 (world raw), No. 16 (US raw) and White Sugar futures. Source: https://www.ice.com/products/Futures-Options/Agriculture/Sugar

S12 - Reuters, “Raizen, Wilmar set to end sugar trading venture RAW” (2020)

Read: Search excerpts only; the full text was not read. Cited for: Raizen’s scale and the RAW venture’s dissolution. Limitations: a 2020 article describing the market as it then stood. Source: https://www.reuters.com/article/business/exclusive-razen-wilmar-set-to-end-sugar-trading-venture-idUSKBN244082/

S13 - Wilmar International, “Our Sugar Journey” (Annual Report 2024)

Read: Search excerpts only; the full text was not read. Cited for: Brazil’s cane crush and export share, and Wilmar’s integrated milling, refining and trading footprint. Source: https://www.wilmar-international.com/annualreport2024/documents/Our-Sugar-Journey.pdf

S14 - MDPI Fermentation, “Rum Production from Molasses - A Contemporary Review” (2021)

Read: Search excerpts only; the full text was not read. Cited for: sugar-processing by-products and rum production from molasses. Source: https://www.mdpi.com/2311-5637/7/1/21

S15 - Kakira Sugar, “At a glance”

Read: Search excerpts only; the full text was not read. Cited for: the integrated-mill case: sugar, bagasse power, ethanol and spirits as one complex in Uganda. Source: https://kakirasugar.com/about/at-a-glance/

S16 - WHO, “Global report on the use of sugar-sweetened beverage taxes, 2023” (published 5 December 2023)

Read: Search excerpts only; the full text was not read. The report year and figure were independently verified against the report PDF. Cited for: at least 108 countries applying national-level excise taxes on at least one type of sugar-sweetened beverage as of July 2022. Source: https://iris.who.int/server/api/core/bitstreams/971f1b69-7eda-4329-a152-3e1d15b5c2c7/content

S16g - Kearns, Glantz et al., “Sugar Industry and Coronary Heart Disease Research” (JAMA Internal Medicine, 2016)

Read: Page read. Supports: the Sugar Research Foundation’s archived documents: research sponsored from 1965 to cast doubt on sucrose’s hazards while promoting fat as the culprit, Project 226, the 1967 New England Journal of Medicine review whose industry funding and role were never disclosed, the 1971 NIDR influence and the 1976 FDA evaluation. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC5099084/

S17 - WHO, “Fiscal policies to promote healthy diets” guideline

Read: Search excerpts only; the full text was not read. Cited for: tax and subsidy policy recommendations. Source: https://www.who.int/publications/b/72528

S18 - SSI newsletter (agsri.com) and PMC review, “Integration of sugarcane production technologies”

Read: Search excerpts only; the full texts were not read. Cited for: cane water demand, micro-irrigation savings, and ratooning shares and management. Limitations: the water figures carry a units question - per kilogram of cane versus per kilogram of sugar - and are used with care. Source: http://www.agsri.com/images/newsletter/ssi/SSI%20first%20issue%20final.pdf and https://pmc.ncbi.nlm.nih.gov/articles/PMC6346606/

S19 - Euroports, sugar terminal Antwerp

Read: Search excerpts only; the full text was not read. Cited for: bulk sugar terminal operations: storage capacity, climate control and value-added services. Source: https://www.euroports.com/terminal/sugar-terminal-ta518-antwerp-belgium/

S20 - “The Fiji Sugar Industry: a brief history” (ANU)

Read: Search excerpts only; the full text was not read. Cited for: cane from the 1870s, early mill failures, CSR’s mills, railway construction to the mills and early electrification. Source: http://hdl.handle.net/1885/158013

S21 - “High Fructose Corn Sweeteners: Economic Aspects of a Sugar Substitute” (USDA-era)

Read: Search excerpts only; the full text was not read. Cited for: HFCS commercialisation, composition, its price relationship to sugar and substitution limits. Source: https://doi.org/10.22004/ag.econ.263852

S22 - OECD-FAO Agricultural Outlook 2024-2033, sugar chapter

Read: Search excerpts only; the full text was not read. Cited for: world sugar production projected to expand about 14 percent over the decade to 2033 with cane supplying more than 85 percent of the crop; Europe remaining the main beet region with output capped by shrinking plant-protection options and land competition, Russia the only major beet producer expected to expand. Source: https://www.oecd.org/en/publications/oecd-fao-agricultural-outlook-2024-2033_4c5d2cfb-en/full-report/component-9.html

S23 - “Digital agrotechnology in the sugarcane ethanol and bioenergy production system” (preprint)

Read: Search excerpts only; the full text was not read. Cited for: precision agriculture arriving in Brazilian cane - satellite and drone imagery, variable-rate application, harvest tracking - with adoption concentrated where farms are large and the gap between large and small producers widening. Limitations: a preprint; its peer-review status is unchecked. Source: https://doi.org/10.21203/rs.3.rs-3126098/v1

S24 - Santos et al., “Current Trends of Cellulosic Ethanol Technology from the Perspective of Industrial Development” (Fermentation 12(1):48, 2026)

Read: Partial: the abstract through Section 5 (enzyme cocktails) was read in the open HTML; Tables 1-6 and the closing sections were not retrieved. Supports: the 2G plant landscape, process constraints and the enzyme-cost trajectory. In its words: “In 2022, the USA produced around 1.4 million gallons of cellulosic ethanol”; pretreatment “considered the most complex and costly phase”; enzyme cost “from USD 2 to approximately USD 0.3 per gallon” (the paper itself hedges this). Limitations: stale in places at publication - it treats POET-DSM and GranBio as ongoing producers, though both are verified suspended or paused - and it carries an internal conflict on Brazilian cane cost (BRL 35 versus USD 186 per tonne, two sentences apart), so neither figure is used. Source: https://www.mdpi.com/2311-5637/12/1/48

S25 - Budeguer et al., “Genetic Transformation of Sugarcane, Current Status and Future Prospects” (Frontiers in Plant Science, 2021)

Read: Read in full - all sections, five tables and references. Supports: the regulatory landscape and the genome constraint: Argentina’s glyphosate-tolerant event approved with a mandated stewardship plan and commercialisation still a separate step; Indonesia’s three drought-tolerant events approved for food use, not cultivation - which is why the review literature counts only Brazil’s releases as commercial; and every engineered variety needing transformation and deregulation on its own because cane’s complex polyploid hybrids cannot be backcrossed. Limitations: in some lists this source appears under the alias “S-G1”; the content is the same. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC8632530/

S26 - FRED, Global price of Sugar No. 11 (series PSUGAISAUSDA)

Read: Search excerpts only; the full text was not read. Cited for: the IMF world raw sugar price series. Source: https://fred.stlouisfed.org/series/PSUGAISAUSDA

S27 - Kirk-Othmer, “Sugar” (Wiley)

Read: Search excerpts only; the full text was not read. Cited for: sucrose chemistry and key properties, and sugar’s functions in food. Source: https://doi.org/10.1002/0471238961.1618151603151215.a01.pub3

S28 - PubMed 3863796, 1985 technical review of sugar’s functions

Read: Abstract only; the full paper has not been read. Cited for: the 1985 list of functions: sweetener, preservative, texture modifier, fermentation substrate, flavouring and colouring agent, bulking agent. Limitations: not cited beyond what the abstract supports. Source: https://pubmed.ncbi.nlm.nih.gov/3863796/

S29 - EUFIC, “Sugars from a food technology perspective”

Read: Read in full. Supports: the natural occurrence of glucose and fructose in fruits and vegetables, honey’s fructose-glucose pair, lactose in milk and small amounts of maltose in cereals; and molasses as the dark syrup left behind. Source: https://www.eufic.org/en/whats-in-food/article/sugars-from-a-food-technology-perspective

S30 - International Sugar Organization, MECAS(16)18, “Industrial and Direct Sugar Consumption”

Read: Search excerpts only; the full text was not read. Cited for: in the ISO’s consumption survey covering countries representing three-quarters of world consumption between 2005 and 2015, industrial use of sugar growing nearly five times faster than direct household use, with soft-drink manufacturing growing fastest at about 4 percent a year. Source: https://isosugar.org/publication/43/industrial-and-direct-sugar-consumption-%E2%80%93-an-international-survey—mecas(16)18-

S31 - USITC, “Competition Structure in the U.S. Raw Cane Sugar Refining Sector” (2024)

Read: Search excerpts only; the full text was not read. Cited for: the US refining structure and the blocked US Sugar/Imperial acquisition of 2021, argued on concentration grounds. Source: https://www.usitc.gov/publications/332/executive_briefings/ebot_gehrke_sugar_industry_structure_part_3.pdf

S32 - Review of Jennifer Eaglin, “Sweet Fuel” (Duke University Press) - the Proalcool history

Read: Read in full. Cited for: Proalcool’s 1975 launch after the 1973 oil crisis; the 1930s alcohol-fuel roots; the system of guaranteed prices, credit lines and the Planalsucar breeding programme. Source: https://doi.org/10.1215/00021482-10338111

S33 - “The success of the Brazilian alcohol program (Proalcool)” (Engenharia Agricola, 2020)

Read: Search excerpts only; the full text was not read. Cited for: Proalcool’s 1975 launch and early scaling, and the Planalsucar breeding programme. Source: https://doi.org/10.1590/1809-4430-eng.agric.v40n2p243-248/2020

S34 - Reef Water Quality 2022 Scientific Consensus Statement, sugarcane topic summary (2024)

Read: Read in full. Supports: cane on about 400,000 hectares of the Great Barrier Reef catchment; 42 percent of the total dissolved inorganic nitrogen load; the dominant pesticide source, over 97 percent of end-of-catchment concentrations in some regions, mostly PS-II herbicides; about 10 percent of fine sediment against grazing’s roughly 60; and several cane land-management practices proven cost-effective at improving water quality. Source: https://reefwqconsensus.com.au/wp-content/uploads/2024/04/Topic-Summary_Sugarcane.pdf

S35 - WITS/UN Comtrade, raw cane sugar imports 2024

Read: Search excerpts only; the full text was not read. Cited for: 2024 import values and volumes by country for raw cane sugar. Source: https://wits.worldbank.org/trade/comtrade/en/country/All/year/2024/tradeflow/Imports/partner/WLD/product/170111

S36 - Sidney Mintz, “Sweetness and Power” (introduction scan)

Read: Search excerpts only; the introduction scan was not read in full. Cited for: Mintz’s curve - world sugar production’s sustained climb across five centuries, never falling for more than an occasional decade, with even the Haitian Revolution’s collapse redressed within years. Source: https://files.commons.gc.cuny.edu/wp-content/blogs.dir/20880/files/2022/02/Mintz-Introduction.pdf

S37 - Ian Miller, “A Dangerous Revolutionary Force Amongst Us” (Warwick)

Read: Search excerpts only; the full text was not read. Cited for: working-class tea drinking in the British Isles circa 1860-1900. Source: https://warwick.ac.uk/fac/arts/history/chmst/calendar/ian_miller-_a_dangerous_revolutionary_force_amongst_us.pdf

S38 - Sugar Tech special issue, “History of Sugarcane Breeding”

Read: Search excerpts only; the full text was not read. Cited for: the ancestral clones behind modern varieties and the Indian Co- and Indonesian POJ- clone contributions. Source: https://doi.org/10.1007/s12355-021-01080-5

S39 - T. S. Venkatraman biography, “Knight of the sugar industry” (Current Science)

Read: Read in full. Supports: the cane-versus-beet split - roughly 80 percent of the world’s sucrose from cane - and S. robustum as the lean, runnering New Guinea ancestor. Source: https://manjusethfoundation.org/download/Knight_of_sugar_industry.pdf

S40 - American Chemical Society landmark page, “Penicillin Production through Deep-tank Fermentation”

Read: Full page read (1 November 2026). Supports: Carl Wehmer’s 1893 demonstration that a mould can make citric acid from sugar; James Currie joining Pfizer in 1917 to work on Aspergillus niger; the SUCIAC pilot plant of 1919, the name expanded by the ACS as “Sugar Under Conversion to Citric Acid”; the full SUCIAC plant of 1926, the year fermented citric acid outproduced the citrus-based product; 5.9 million pounds in 1929 without a single lemon or lime; Jasper Kane’s 1933 switch of the citric feed to molasses; deep-tank submerged fermentation proven on gluconic acid in 1929; vitamin C sold from 1936 with submerged fermentation as the first step; the penicillin plant opened 1 March 1944 with fourteen 7,500-gallon tanks fed on corn steep liquor, milk sugar (lactose), salts and minerals; most of the penicillin that went ashore on D-Day from that plant. Limitations: the penicillin tanks were fed lactose and corn steep liquor, not sucrose; the sugar connection is a technology lineage, and the manuscript frames it that way. Source: https://www.acs.org/education/whatischemistry/landmarks/penicillin.html

S41 - National Sugar Institute (India), DSPMM Sugar Technology study text (April 2020)

Read: The full PDF was read. Supports: the mass balance “Cane + Added Water = Mix Juice + Bagasse” with its worked example of 40 tonnes of water added to 100 tonnes of cane (mixed juice 108, bagasse 32); cane at 13 to 15 percent fibre; the bagasse-boiler-steam-turbine flow; the Java ratio defined as pol percent cane over pol percent first expressed juice, a cane-quality measure; the sulphitation train parameters (70C, pH 7.1, 102-103C, two to three hours, 60 Brix, pH 5.0); A, B and C massecuites with the melter; bagasse at about 30 percent of cane; mixed juice at 105-110 percent on cane at 12.5-15 Brix and 80-85 purity; sucrose at 11.6-13.8 percent of cane; and Indian mills averaging about 4,000 tonnes of cane per day with size classes from under 1,250 upward. Limitations: a teaching text, not a plant survey, and dated April 2020 rather than current. Source: https://nsi.rdisl.com/study-materials/DSPMM_ST(Theory)_09042020.pdf

Crops and agronomy (S-C1 - S-C34)

S-C1 - FAO Land & Water, “Sugarcane” crop page

Read: Read in full. Supports: the agronomy constants. In its words: “Depending on climate, water requirements (ETm) of sugarcane are 1500 to 2500 mm evenly distributed over the growing season.” Limitations: the production statistics on the page are FAOSTAT 2001-era; only the agronomy constants are used, not its market data. Source: https://www.fao.org/land-water/databases-and-software/crop-information/sugarcane/en/

S-C2 - Australian Government OGTR, “The Biology of the Saccharum spp. (Sugarcane)”

Read: Read in full. Supports: cane biology, including S. spontaneum’s chromosome count running from 40 to 128 and its contributions of disease resistance and vigour. Source: https://www.ogtr.gov.au/sites/default/files/files/2021-07/the_biology_of_the_sugarcane.pdf

S-C3 - ICAR-Sugarcane Breeding Institute, “History of SBI”

Read: Read in full. Supports: the 1912 founding, the Barber and Venkatraman era, and Co 205 in 1918. Source: https://sugarcane.res.in

S-C4 - ICAR-Sugarcane Breeding Institute, “Past research achievements”

Read: Read in full. Supports: nobilization, the Co 312, 419 and 1148 varieties, transgenics work, the formative-stage drought finding and flowering control; also the institute’s report of more than 2,900 Co varieties released and the world’s largest sugarcane germplasm collection at Kannur, and its field experience placing the critical water window at roughly days 60 to 150. Source: https://sugarcane.res.in/?page_id=5516

S-C5 - “Recent Advances in Sugarcane Genomics, Physiology, and Phenomics” (Frontiers in Genetics, 2022)

Read: Read in full. Supports: the genome’s complexity - on the order of a hundred or more chromosomes across about 10 gigabases, roughly 70 to 80 percent noble cane and 10 to 20 percent wild spontaneum - plus genomic selection and TALEN COMT work. Source: https://www.frontiersin.org/journals/genetics/articles/10.3389/fgene.2022.854936/full

S-C6 - Garsmeur et al. 2018, Nature Communications - the R570 monoploid reference

Read: Read in full. Supports: the first reference genome: a monoploid path through cultivar R570, 382 megabases carrying 25,316 gene models, and the hybridisation history including unreduced chromosome transmission from the noble-cane female. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC6035169/

S-C7 - Healey et al. 2024, Nature, “The complex polyploid genome architecture of sugarcane”

Read: Read in full. Supports: the March 2024 full polyploid R570 assembly: 8.72 gigabases across about twelve chromosome copies with 194,593 coding sequences, resolving among other things the Bru1 brown-rust resistance locus and the POJ2878 ancestry, and the yield-plateau analysis. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC11041754/

S-C8 - Li et al. 2021, “Sugarcane Ratooning Ability” (Biology 10(10):1052)

Read: Read in full. Supports: ratoon economics and comparisons: one irrigated-India comparison with a ratoon maturing in about 295 days against 482 for plant cane; roughly 2.3 times less production energy per tonne of ratoon cane (an approximate figure from the review literature); ratoons covering about half the cane area in the tropics and less in the subtropics. Source: https://www.mdpi.com/2079-7737/10/10/1052

S-C9 - “Sugar beet” (Wikipedia)

Read: Read in full. Supports: the Marggraf and Achard chronology, the 1840-to-1880 share shift, 18 percent sucrose, monogermy and CMS, and the crop’s taxonomy as the Altissima group of Beta vulgaris with the sea beet as closest wild relative. Limitations: a tertiary reference. The same page also appears as S2c in the general list. Source: https://en.wikipedia.org/wiki/Sugar_beet

S-C10 - “Sugarcane harvester” (Wikipedia)

Read: Read in full. Supports: chopper versus whole-stalk mechanics, burnt and green harvesting numbers, and Sao Paulo mechanisation. Limitations: a tertiary reference. Source: https://en.wikipedia.org/wiki/Sugarcane_harvester

S-C11 - Yara UK, “Growth and development of sugar beet”

Read: Read in full. Supports: the biennial cycle, vernalisation as the bolting trigger, growth stages and leaf area index. Limitations: a crop-nutrition company’s agronomy guide. Source: https://www.yara.co.uk/crop-nutrition/sugar-beet/growth-and-development-of-sugar-beet/

S-C12 - Engineers Australia, heritage nomination “Sugar Cane Harvester”

Read: Read in full. Supports: the harvester lineage: Hurrey’s early work, the Falkiner machine taken to Cuba in 1929 and converted to chopper operation (called the first commercial application of chopper harvesting in the world), Howard in 1934, the Toft brothers’ 1941 loader, Model 250 of 1957 and over-the-row harvester of 1963, and the Massey Ferguson 515 of 1958 with its disputed credit. Source: https://portal.engineersaustralia.org.au/system/files/engineering-heritage-australia/nomination-title/Sugar_Cane_Harvester.pdf

S-C13 - CANEGROWERS Bundaberg, “Green versus burnt cane harvesting” (fact sheet)

Read: Read in full. Supports: the burning trade-offs. In its words: “Pre-harvest burning was adopted in some areas as a result of serious outbreaks of Weil’s disease… burning and a change in the manual harvesting method raised the nominal daily output per cutter from six tonnes a day to about nine”; “Over 85% of Queensland’s sugarcane is now harvested green”; in green cane “cutting rates are lower - only 60% to 70% of those in burnt cane.” Limitations: a grower-body fact sheet whose advantages section is advocacy-flavoured; the figures used are the agronomy mechanics. Source: https://www.bdbcanegrowers.com.au/wp-content/uploads/2018/06/Green-vs-Burnt-Cane-Harvesting.pdf

S-C14 - Sugar Research Australia, “Harvesting Best Practice” manual

Read: The relevant sections were read in full. Supports: billet length (about 300 millimetres as a compromise between load density and deterioration), cut-to-crush deterioration, and the trade-off between cane loss and cleaning. Source: https://sugarresearch.com.au/wp-content/uploads/2017/02/Harvesting-Best-Practice-Manual-FINAL-LR.pdf

S-C15 - Dewar & Qi, “The Virus Yellows Epidemic in Sugar Beet in the UK in 2020 and the Adverse Effect of the EU Ban on Neonicotinoids” (Outlooks on Pest Management, 2021)

Read: Read in full. Supports: the 2020 epidemic’s mechanics and the aphid record. In its words: “38.1% infection of the national crop… the highest incidence of this pernicious disease since the epidemics of 1974-1976”; “It is estimated that 25% of the national yield was lost in 2020”; “the five highest migrations of aphids to the end of June have been recorded in the last seven years.” Limitations: industry-side authors arguing for the neonics’ return; the figures are field statistics and trap data, used as such, and the migration record is bounded to end-of-June counts in the years to the paper’s 2021 writing. Source: https://uhra.herts.ac.uk/id/eprint/9365/1/The_Virus_Yellows_Epidemic_in_Sugar_Beet_in_the_UK_in_2020_and_the_Adverse_Effect_of_the_EU_Ban_on_Neonicotinoids_on_Sugar_Beet_Production.pdf

S-C16 - McGrann et al., “Progress towards the understanding and control of sugar beet rhizomania disease”

Read: Read in full. Supports: rhizomania’s history and control: first observed in northern Italy in 1952, explained in 1973 as a virus (BNYVV) carried by the soil organism Polymyxa; sugar-yield losses of 50 to 60 percent common with up to 80 documented; the Rz1 resistance gene found by American researchers in the 1980s, later joined by genes from wild sea beet; resistance-breaking variants already evolved. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC6640442/

S-C17 - “Genetically modified sugar beet” (Wikipedia)

Read: Read in full. Supports: the Roundup Ready chronology: ready by 2000, deregulated in the United States in 2005, about 60 percent of the American crop within two seasons and about 95 percent by the 2009/10 crop, a court ruling briefly revoking approval in 2010, and full re-deregulation in 2012; approved commercially only in the United States and Canada. Limitations: a tertiary reference. Source: https://en.wikipedia.org/wiki/Genetically_modified_sugar_beet

S-C18 - CEFS, “EU Beet Sugar Sector: Key Statistics” (2023/24)

Read: Read in full. Supports: the European sector’s consolidation: 85 factories operational in 2023-24, eighteen fewer than when quotas ended in 2017, serving 98,070 growers after more than 43,000 exited in a decade; sugar yields of 11.4 tonnes per hectare; prices from under 350 euros per tonne in 2019 to over 900 in 2023; and 53 plant-protection active substances at the European level, down steadily. Limitations: the sector’s own statistics. Source: https://cefs.org/factsheet-eu-beet-sugar-sector-key-statistics/

S-C19 - Statizoid, “Sugar beet yields by country (2024)” (FAOSTAT-based)

Read: Read in full. Supports: the 2024 beet-yield rankings: Chile at 94 tonnes per hectare, Germany 84, France 79, Britain 76, the United States 73, Poland 66, China 57 and Russia 47. Limitations: a secondary aggregator of FAOSTAT data. Source: https://agriculture.statizoid.com/stat/sugar-beet-yields/

S-C20 - Terra Cultiva, “World ranking: Sugar cane - Yield 2024” (FAOSTAT-based)

Read: Read in full. Supports: the 2024 cane-yield rankings: Senegal at 114 tonnes per hectare, Malawi and Egypt around 107, Guatemala 105, Australia 88, the United States 84, China 81, India 79, Brazil 76, Thailand 55 and Cuba 33. Limitations: a secondary aggregator of FAOSTAT data, cross-checked against S-C34’s independent republication. Source: https://terra-cultiva.com/en/rankings/sugar-cane/yield/

S-C21 - COBRI/Nordic Beet Research, “Long-term storage of sugar beet in North-West Europe” (2013)

Read: The relevant sections were read in full. Supports: beet storage physiology: respiration burning stored sugar, fastest in the first days of wound healing, settling to a temperature-driven rate lowest between about 2 and 8 degrees Celsius; invert sugar accumulation; and frost-damaged beets being unstorable. Source: https://nordicbeet.nu/wp-content/uploads/COBRI-storage-report-2013-final-131004-2.pdf

S-C22 - Farm Biosecurity (Plant Health Australia), “Sugarcane pests and weeds”

Read: Read in full. Supports: the exotic disease threat list with loss figures, including losses to 40 percent for downy mildew and higher for the phytoplasma diseases in susceptible varieties. Limitations: the loss figures are quoted from biosecurity assessments, not universal experience. Source: https://www.farmbiosecurity.com.au/crops/sugarcane/sugarcane-pests-and-weeds/

S-C23 - UNESCO MOWCAP nomination, “Indonesian Sugar Research Institute’s Archives 1887-1986”

Read: Read in full. Supports: the Proefstation Oost Java at Pasuruan, founded 9 July 1887; the sereh crisis of the early 1880s pushing the colonial industry to found research stations in 1885, 1886 and 1887; Soltwedel’s 1887 work on cane seed and germination; the 121 imported varieties in the collection by 1897; and POJ 2878, the wonder cane. Source: https://www.mowcapunesco.org/register/indonesian-sugar-research-institutes-archives-1887-1986-the-role-of-isris-research-activities-to-the-world-sugar-industry-2024/

S-C24 - SASRI, “Interspecific hybridization in sugarcane breeding” (historical review, scanned)

Read: Read in full, but the scan is OCR-degraded, so only robust claims are used. Supports: nobilization mechanics and the Kassoer bottleneck: S. spontaneum entering most pedigrees through a single natural hybrid called Kassoer - effectively one sampled gamete, as the review puts it. Limitations: the degraded scan limits verification to clearly legible claims. Source: https://dochub.sasri.org.za/server/api/core/bitstreams/e172b828-b63e-43f7-bcd8-7a97f71d37a0/content

S-C25 - SASRI, Pest and Disease Guide 2022

Read: The relevant sections were read in full. Supports: the disease and pest roster: ratoon stunting disease, a bacterium with no obvious external symptom, betrayed by red-brown dots at the nodes inside a sliced stalk; smut’s dark whiplike shoots; mosaic and its knife-borne transmission; yellow leaf and its aphid-borne virus with a phytoplasma association; Fiji leaf gall; and the pest list from eldana, Sesamia and Chilo borers to aphids, armyworms, nematodes and longhorn beetles. Source: https://sasri.org.za/download/198/diseases/23717/pest-disease-guide-2022.pdf

S-C26 - SASRI, Information Sheet 15.3, “Losses in cane quality due to harvest to crush delays” (2017)

Read: Read in full. Supports: deterioration dynamics from the moment of harvest - whether cut green, cut after burning, or burnt and left standing - with the pace set by weather, fastest in hot humid conditions; and the 12-hour Australian cut-to-crush rule. Source: https://sasri.org.za/wp-content/uploads/Information_Sheets/IS_15.3-Harvest-to-crush-delays.pdf

S-C27 - Sao Paulo State Law 11.241/2002 (official text)

Read: Read in full; the schedule table is an unextractable image. Supports: the mandate for the gradual elimination of pre-harvest burning, the definitions of which land counts as mechanisable, and the buffer bans around towns, reserves and infrastructure. Limitations: the schedule table of deadlines by terrain could not be extracted from the scanned document, so specific dated milestones are not quoted from it. Source: http://www.legislacao.sp.gov.br/legislacao/dg280202.nsf/fc66ffd741d5df9683256c210061079c/745c62999998d81703256e74004b46fb?OpenDocument=

S-C28 - McFarlane, “The Savitsky Story” part 1 (Journal of Sugar Beet Research 30(1&2))

Read: Read in full. Supports: the 1934 Soviet screening of more than 22 million seed bushes finding 109 monogerm plants, the recessive character credited to Kolomiets, and the Savitsky biography through the escape and 1947 emigration. Source: https://assbt.org/wp-content/uploads/2024/02/JSBRVol30No1and2P1to36TheSavitskyStory.pdf

S-C29 - McFarlane, “The Savitsky Story” part 2 (Journal of Sugar Beet Research 30(3))

Read: Read in full. Supports: Viacheslav Savitsky walking a four-acre field in Salem, Oregon - some 300,000 plants - and finding five monogerm plants, two proving true, one of them SLC 101 becoming the foundation line; the monogerm male-sterile lines; and USDA distribution of the material to breeders across America and Europe. Source: https://assbt.org/wp-content/uploads/2024/02/JSBRVol30No3P125to141TheSavitskyStory.pdf

S-C30 - University of Nebraska-Lincoln Extension NebGuide G1753, “Cercospora Leaf Spot of Sugar Beet”

Read: Read in full. Supports: cercospora leaf spot as the most destructive foliar disease of the central High Plains, driving Nebraska’s beet production westward as early as the 1920s and still taking up to 40 percent of a crop where it takes hold. Source: https://extensionpubs.unl.edu/publication/g1753/2013/html/view

S-C31 - APS Feature, “Beet Curly Top: America’s First Serious Disease of Sugar Beets”

Read: Read in full. Supports: curly top’s history from 1888 through the 1940s: factories closing, Spreckels Sugar nearly bankrupted in 1926, 85 percent of planted American acreage abandoned in 1934; Eubanks Carsner’s mass selection producing the first resistant commercial variety US 1 in 1933; by 1941, 97 percent of acreage harvested at nearly triple the yield; and the creation of an American beet seed industry where seed had always been imported. Source: https://apsnet.org

S-C32 - Reuters, “Brazil sugarcane mills agree to end burning by ’17” (22 October 2007)

Read: Read in full. Supports: the 2007 green-protocol timeline. In its words: “In June, Unica had signed an agreement with the state government in which mills were to ban cane burning in the state by 2017, well before 2031 target mandated by a state law”; “The protocol determines that flat areas ban cane burning by 2014 and hilly areas, by 2017”; “more than 40 percent of the harvest is mechanized, with only 30 percent mandated by law”; “96 mills already subscribed.” Limitations: a news report of a voluntary protocol; whether the 2017 pledge was achieved on schedule is not established here - only the documented pledge and adoption are. Source: https://www.reuters.com/article/environment-brazil-cane-harvest-dc/brazil-sugarcane-mills-agree-to-end-burning-by-17-idUSN2245768620071022/

S-C33 - Tayyab et al. 2023, “Sugar Beet Cultivation in the Tropics and Subtropics” (Agronomy 13(5):1213)

Read: Read in full. Supports: tropical and subtropical beet: modern beets at 15 to 20 percent sucrose depending on region, five-to-six-month duration, and summaries of cercospora, nematode and curly-top pressures. Source: https://www.mdpi.com/2073-4395/13/5/1213

S-C34 - Our World in Data, FAOSTAT-based cane and beet yield series (2024)

Read: The CSV data were spot-checked in full. Supports: the independent republication of the FAOSTAT yield figures behind S-C19 and S-C20’s rankings, matching to the tonne. Source: https://ourworldindata.org/grapher/sugar-cane-yields

Food, nutrition and health (S-F1 - S-F30)

S-F1 - Kansas State University Extension (Kansas Value Added Foods Lab), “Sweeteners in Foods”

Read: Read in full. Supports: sweetness perception as context-sensitive - temperature, acidity and concentration all bend it, one reason recipes cannot be reformulated by arithmetic alone. Limitations: a university extension secondary source. Source: https://extension.k-state.edu/kvafl/resources/ingredients/sweeteners.html

S-F2 - EUFIC, “What is the role of sugar in the food industry?” (2013)

Read: Read in full. Supports: sugar’s functional roles in food manufacturing. Limitations: EUFIC is part food-industry funded; it is used for functional facts and cited accordingly. The same page as S29. Source: https://www.eufic.org/en/whats-in-food/article/sugars-from-a-food-technology-perspective

S-F3 - J. Huberlant, “Sucrose - Properties and Determination” (Encyclopedia of Food Sciences and Nutrition, 2nd ed., 2003, via ScienceDirect Topics)

Read: Read in full (the topic page reproduces the encyclopedia entry). Supports: acid hydrolysis - inversion - running faster the hotter or more acidic the solution; and sucrose decomposing into caramel and then char rather than melting cleanly, from about 186 degrees Celsius for the pure compound and sooner with impurities. Source: https://www.sciencedirect.com/topics/medicine-and-dentistry/sucrose

S-F4 - US FDA, “Sugars That Are Metabolized Differently Than Traditional Sugars”

Read: Read in full. Supports: the regulator’s account of the alternative-sugar category, including sucrose’s fuel value of about four kilocalories per gram. Source: https://www.fda.gov/food/food-additives-petitions/sugars-are-metabolized-differently-traditional-sugars

S-F5 - US FDA, Guidance on the Declaration of Allulose on labels

Read: Abstract level - search highlights and the guidance summary. Cited for: the allulose labelling guidance, finalized in October 2020 following the 2019 draft (C114); the operative facts come from C114. Source: https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-declaration-allulose-and-calories-allulose-nutrition-and-supplement-facts-labels

S-F6 - Herman & Birnbaum, “Molecular aspects of fructose metabolism and metabolic disease” (Cell Metabolism, 2021)

Read: Read in full. Supports: sucrose being split at the intestinal wall into glucose and fructose before absorption, and the molecular machinery of fructose metabolism. Limitations: a peer-reviewed review. Source: https://www.cell.com/cell-metabolism/fulltext/S1550-4131(21)00429-0

S-F7 - Jang et al. (Rabinowitz lab), “The Small Intestine Converts Dietary Fructose into Glucose and Organic Acids” (Cell Metabolism, 2018)

Read: Read in full. Supports: isotope-tracing in mice finding the small intestine, not the liver, clears about 90 percent of a modest fructose dose, with high doses spilling over to liver and gut microbes. Limitations: a mouse study; the authors themselves state their data do not establish human dose-response. Source: https://www.cell.com/cell-metabolism/fulltext/S1550-4131(17)30729-5

S-F8 - Koepsell, “Glucose transporters in the small intestine in health and disease” (2020)

Read: Abstract and excerpts, including mechanistic detail; the data are largely rodent. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC7462918/

S-F9 - Ferraris et al., “Intestinal Absorption of Fructose” (Annual Review of Nutrition, 2018)

Read: Abstract only. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC6457363/

S-F10 - WHO, “Guideline: Sugars intake for adults and children” (2015)

Read: Read in full, including the Annex 1 GRADE profiles and Annex 7, from the authoritative PDF. Supports: the “free sugars” category - sugars added to food by anyone, plus the sugars in honey, syrups, fruit juices and juice concentrates, but not the sugars inside intact fruit or milk - and its difference from the American “added sugars” label category. Source: https://iris.who.int/server/api/core/bitstreams/4be74f01-de93-4596-bbd1-02a97afb1221/content

S-F11 - Te Morenga, Mallard & Mann, “Dietary sugars and body weight” (BMJ 2013;346:e7492)

Read: Read in full. Supports: the WHO-commissioned review of body weight: eating less sugar ad libitum cuts about 0.8 kilograms and eating more adds about 0.75, while swapping sugar for other carbohydrates calorie-for-calorie changes nothing; in children, advice to cut sugar produced no measurable BMI effect across five randomised trials (a compliance story, not proof of no effect), while cohort studies give an odds ratio of 1.55 for overweight at the highest sweetened-drink intake, graded low quality. Source: https://www.bmj.com/content/346/bmj.e7492

S-F12 - Moynihan & Kelly, “Effect on caries of restricting sugars intake” (Journal of Dental Research 2014;93(1))

Read: Abstract only; the full text was not retrieved. Supports: at abstract level, the commissioned review finding no randomised trials at all, moderate-quality evidence that caries fall below 10 percent of energy from free sugars, and a log-linear dose relationship down to very low intakes. Limitations: only the abstract is verified. Source: https://pubmed.ncbi.nlm.nih.gov/24323509/

S-F13 - Schillinger et al., “Do Sugar-Sweetened Beverages Cause Obesity and Diabetes? Industry and the Manufacture of Scientific Controversy” (Annals of Internal Medicine, 2016)

Read: Read in full, including the published author correction fixing the Trumbo miscoding. Supports: across sixty experimental studies, 25 of 26 reporting no harm had industry funding ties, against 1 of 34 finding harm - figures that survived the correction. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC7883900/

S-F14 - Sievenpiper et al., “Effect of fructose on body weight in controlled feeding trials” (Annals of Internal Medicine, 2012)

Read: Abstract only. Source: https://www.acpjournals.org/doi/10.7326/0003-4819-156-4-201202210-00007

S-F15 - Imamura et al., “Consumption of SSBs, ASBs, and fruit juice and incidence of type 2 diabetes” (BMJ 2015;351:h3576)

Read: Read in full. Supports: across seventeen cohorts, each daily serving of sugar-sweetened beverages associated with 18 percent higher diabetes incidence before adjusting for adiposity and 13 percent after - an association that does not prove causation but survives the adjustment. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC4853528/

S-F16 - WHO, “Use of non-sugar sweeteners: WHO guideline” (2023)

Read: The recommendation and rationale chapter was read in full; the press release was read at abstract level. Supports: the conditional advice against relying on non-sugar sweeteners for weight control - short-term trials show small benefits, long-term evidence none - while leaving their safety approvals untouched. Source: https://www.ncbi.nlm.nih.gov/books/NBK592246/ (press release: https://www.who.int/news/item/15-05-2023-who-advises-not-to-use-non-sugar-sweeteners-for-weight-control-in-newly-released-guideline)

S-F17 - Rogers et al., “Changes in soft drinks purchased by British households associated with the UK SDIL” (BMJ Open, 2024)

Read: Read in full. Supports: a year into Britain’s 2018 tiered levy, household purchases of the highest-tier drinks had fallen 37.8 percent by volume and their sugar by 42.6 percent, while total soft-drink volume rose slightly - the recipe changed more than the drinking. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC10711915/

S-F18 - Kim et al., “Quantifying human sweetness perception via a TAS1R2/TAS1R3-based model-predicted sweetness score” (2025)

Read: The introduction, methods and results sections were read in full. Supports: the TAS1R2/TAS1R3 receptor pair firing for every sweet molecule; the panel scales the industry uses (relative sweetness against sucrose, potency, detection thresholds); the receptor’s response strength predicting perceived sweetness; and the relative figures for sucralose (about 600 times sucrose) and aspartame and acesulfame-K (about 200). Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC12482288/

S-F19 - US Veterans Affairs Whole Health Library, “Glycemic Index” and “Understanding Sweeteners” PDFs

Read: Abstract and excerpt level. Supports: the glycemic-index anchors: glucose 100, sucrose 65, fructose 25. Source: https://www.va.gov/WHOLEHEALTHLIBRARY/docs/Glycemic-Index.pdf

S-F20 - Yang et al., “Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults” (JAMA Internal Medicine, 2014)

Read: Abstract only. Supports: at abstract level, the observational NHANES finding of risk ratios above two at the highest added-sugar intakes - association, not proven causation. Limitations: only the abstract is verified. Source: https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1819573

S-F21 - J. Cooper (342 Consulting) for IFST, “Sugars Reformulation - challenges and practical approaches” (2023)

Read: Read in full. Supports: the practical mechanics of sugar reformulation. Limitations: a practitioner slide deck, not peer reviewed; its worked examples are attributed to it as industry practice. Source: https://www.ifst.org/sites/default/files/Sugars%20Reformulation%20-%20challenges%20and%20practical%20approaches.pdf

S-F22 - Clemens et al., “Functionality of sugars: physicochemical interactions in foods” (American Journal of Clinical Nutrition)

Read: Abstract only. Limitations: only the abstract is verified; the author list is as shown on the journal page. Source: https://ajcn.nutrition.org/article/S0002-9165(23)18886-1/abstract

S-F23 - Westwater, Fletcher & Ziauddeen, “Sugar addiction: the state of the science” (European Journal of Nutrition, 2016)

Read: Read in full. Supports: the critique side of the addiction dispute: the rodent paradigm may measure access to tasty food rather than a neurochemical effect of sugar itself, with little human evidence either way. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC5174153/

S-F24 - White, “Straight talk about high-fructose corn syrup: what it is and what it ain’t” (American Journal of Clinical Nutrition, 2008)

Read: Read in full. Supports: the chemistry: colas at about pH 3.5 invert their sucrose into free glucose and fructose within weeks of bottling, so a sucrose-sweetened cola delivers something chemically close to the HFCS version. Limitations: the author discloses consulting for the food and beverage industry, including the Corn Refiners Association and ILSI; the composition table is factual chemistry, but the interpretive conclusions need independent corroboration. Source: https://ajcn.nutrition.org/article/S0002-9165(23)23394-8/fulltext

S-F25 - Stanhope et al., “Consuming fructose-sweetened, not glucose-sweetened, beverages increases visceral adiposity and lipids and decreases insulin sensitivity” (Journal of Clinical Investigation, 2009)

Read: Read in full. Supports: the ten-week human trial at 25 percent of energy as fructose or glucose: weight gain similar, but only the fructose group gained visceral fat, raised blood lipids and lost insulin sensitivity. Limitations: n=32 at a probe dose far above normal sucrose intake, comparing two monosaccharides, not sugar against another sweetener. Source: https://jci.org/articles/view/37385

S-F26 - Avena, Rada & Hoebel, “Evidence for sugar addiction: Behavioral and neurochemical effects of intermittent, excessive sugar intake” (Neuroscience & Biobehavioral Reviews, 2008)

Read: Read in full. Supports: the pro side of the addiction dispute: the Princeton rodent studies showing drug-like bingeing, withdrawal signs and dopamine release that never habituates, but only under intermittent access schedules. Limitations: a rodent-model review. Source: https://pmc.ncbi.nlm.nih.gov/articles/PMC2235907/

S-F27 - “Improving Industrial Full-Scale Production of Baker’s Yeast by Optimizing Aeration Control” (Journal of AOAC International, 2008;91(3):607)

Read: Search excerpts only (extended verbatim highlights); the full text was not read. Cited for: baker’s yeast grown on molasses in fed-batch culture; biomass yield maximal only when the sugar is respired rather than fermented, so the feed is held just below the ethanol-production point; the culture escalated through four or five stages to fermenters of 100 to 150 cubic metres; molasses feed profiles are trade secrets. Source: https://doi.org/10.1093/jaoac/91.3.607

S-F28 - Coca-Cola Nigeria, “How much sugar is in Coca-Cola Original Taste?” (FAQ page)

Read: Full read of a short page. Supports: the Nigeria-market label figures: 10.6 grams of sugar per 100 millilitres, 35 grams per 330-millilitre can, about seven teaspoons. Limitations: a company page for the Nigerian product; formulations are market-specific, so this is a market-specific label, not a global standard. Source: https://www.coca-cola.com/ng/en/about-us/faq/how-much-sugar-is-in-cocacola-original-taste

S-F29 - American College of Sports Medicine, Position Stand: “Exercise and Fluid Replacement” (Medicine & Science in Sports & Exercise, 1996)

Read: Position text via abstract; the full stand was not read. Cited for: the period guidance for exercise lasting more than an hour: carbohydrate solutions of 4 to 8 percent (glucose, sucrose or maltodextrin), 30 to 60 grams of carbohydrate per hour, with sodium at 0.5 to 0.7 grams per litre. Limitations: 1996 guidance, presented in the text as the period’s position stand, not current medical advice. Source: https://doi.org/10.1097/00005768-199610000-00045

S-F30 - Coca-Cola Company, “A Short History of Coca-Cola” (125-year booklet PDF)

Read: Search excerpts only; the full PDF was not read. Cited for: the founding record: 8 May 1886, John Pemberton, Jacobs’ Pharmacy in Atlanta, sales of nine drinks a day in the first year. Limitations: a company history, cited for the company’s own founding account. Source: https://www.coca-colacompany.com/content/dam/corporate/us/en/about-us/history/coca-cola-a-short-history-125-years-booklet.pdf

Genetically modified cane (S-G1 - S-G6)

S-G1 - Budeguer et al. 2021, Frontiers in Plant Science (same source as S25)

Read: Read in full. Supports: identical to S25 - this is the same review, listed here under its GM register. Source: https://www.frontiersin.org/journals/plant-science/articles/10.3389/fpls.2021.768609/full

S-G2 - CTNBio, “Resumo Geral de Plantas GM aprovadas para Comercializacao” (official table, updated 15 May 2024)

Read: Read in full. Supports: the current Brazilian commercial approvals: eight sugarcane events from 2017 to 2022, all Bt borer resistance (Cry1Ab/Cry1Ac), all developed by CTC. Limitations: the table is as of 15 May 2024 and not necessarily current; its eighth row is a stacked re-registration row. Source: http://ctnbio.mctic.gov.br/documents/566529/1684467/Tabela+de+Plantas+Aprovadas+para+Comercializa%C3%A7%C3%A3o/e3087f9c-c719-476e-a9bd-bfe75def842f?version=1.26

S-G3 - CONABIA/SAGyP Decision Document, event TUC-873RH-7 (Argentina)

Read: Read in full. Supports: the Argentine approval’s scope: a phase-2 environmental approval with a mandated glyphosate-stewardship programme, commercialisation authorisation framed as a separate subsequent step, and no source establishing actual planting; field-tested 2007-2014, glyphosate tolerance via cp4-epsps in cultivar RA 87-3. In its words: “los riesgos derivados de la liberacion de este OVGM al agroecosistema, en cultivo a gran escala, no difieren significativamente de los inherentes al cultivo de la cana de azucar no GM.” Source: https://magyp.gob.ar/sitio/areas/biotecnologia/conabia/_pdf_dd/DOC%20DEC%20TUC-873RH-7%20V1%20versi%C3%B3n%20final%20firmado%2017-09-15.pdf

S-G4 - Indonesia Biosafety Clearing House, “Tebu PRG Event NXI-1T” (16 January 2013)

Read: Read in full. Supports: the Indonesian approval’s scope: a food-distribution permit (BPOM Decree HK.04.1.52.12.11.10697, 2011), not a cultivation approval - the reason reviews count only Brazil as commercial; the trait is drought tolerance (“Toleran Kekeringan”), status “Aman Pangan” (food safe), with NXI-4T and 6T likewise food-use approvals. Source: https://indonesiabch.kemenlh.go.id/2013/01/16/525/

S-G5 - ISAAA GM Approval Database (Brazil and Indonesia country pages and event pages)

Read: The Brazil country page and the NXI-1T and TUC-873RH-7 event pages were read in full. Limitations: some approval-type columns were not text-accessible and some event pages failed to load; the database was used for what its readable pages establish. Source: https://www.isaaa.org/gmapprovaldatabase/approvedeventsin/default.asp?CountryID=BR (event pages: …/event/default.asp?EventID=340 and …/EventID=609)

S-G6 - CTC press release (via Reuters), “CTNBio aprova 2a variedade de cana transgenica do CTC resistente a broca” (19 December 2018)

Read: Read in full. Supports: CTNBio’s approval of CTC’s second transgenic borer-resistant cane variety, and the first variety’s commercial planting from the 2018/19 season. Limitations: a company press release. Source: https://ctc.com.br/ctnbio-aprova-2a-variedade-de-cana-transgenica-do-ctc-resistente-a-broca/

Machinery, milling and processing (S-M1 - S-M35)

S-M1 - ACS National Historic Chemical Landmark, “Norbert Rillieux and the Multiple Effect Evaporator”

Read: Read. Supports: Rillieux’s biography: born in New Orleans in 1806, his birth record reading “quadroon libre, natural son of Vincent Rillieux and Constance Vivant,” and by twenty-four an instructor in applied mechanics at the Ecole Centrale publishing on steam power around 1830. Source: https://acs.org/education/whatischemistry/landmarks/norbertrillieux.html

S-M2 - The Chemical Engineer (IChemE), Trevor Evans, “Edward Charles Howard and Norbert Rillieux: sugar, plantation slavery and the birth of chemical engineering” (August 2011)

Read: Read. Supports: the Howard and Rillieux story and the boiling house’s hazards: period accounts of a cutlass kept within reach of the rollers, and scalds, burns and fire as routine. Source: https://thechemicalengineer.com/features/cewctw-edward-charles-howard-and-norbert-rillieux-sugar-plantation-slavery-and-the-birth-of-chemical-engineering/

S-M3 - Sucropedia E0092, “History - Equipment and Processes” (Bento), citing Poel et al. 1998 and Watson 1981

Read: Read. Supports: Howard’s vacuum pan adoption by European refiners and American plantations; concentration without scorching. On the patent date, three fully read accounts including the 1911 Britannica’s description of British Patent 3754 of 1813 agree on 1813; a sugar-industry heritage source dates it 1812, an outlier the book notes. Source: https://sucropedia.com/print.php?id=E0092

S-M4 - Grace’s Guide, “Timeline: Sugar Machinery”

Read: Read in full. Supports: the machine genealogy: beam and screw presses and edge-runner mills before the vertical three-roller mill; Smeaton credited with the first “modern” horizontal grinding mill for a Jamaican producer in 1754; and the McOnie production counts used in the book. Source: https://gracesguide.co.uk/Timeline:_Sugar_Machinery

S-M5 - The Sugar Association, “History of Sugar”

Read: Read in full. Supports: Louisiana’s mechanisation switch (sixteen whole-stalk harvesters in 1938, 422 machines cutting 63 percent of the crop by 1946) and, citing Veront Satchell’s study, the first steam-powered sugar mill in Jamaica in 1768. Limitations: an industry association’s timeline. Source: https://sugar.org/sugar/history/

S-M6 - BMA, “History of the K-series continuous centrifugals”

Read: Read. Supports: BMA’s model genealogy documenting the continuous centrifuge’s evolution machine by machine from 1958, including the 1991 machine performing affination and melting in one body. Limitations: a manufacturer history. Source: https://bma-worldwide.com/centrifugation/k3080/history-of-k-series.html

S-M7 - ASSBT Vancouver 2001 paper, “World’s Largest Tower Diffuser” (BWS Buckau-Wolf)

Read: Read. Supports: Buckau-Wolf industrialising the tower diffuser from 1952, about 170 towers working across the beet countries by 2001, and the largest at Lillers in France, rated at 14,000 tonnes a day and delivered in 2000 with modern measuring and automatic control as standard. Source: https://assbt.org/wp-content/uploads/2023/09/Vol31p189to198WorldrgestTowerDiffuserforBWS.pdf

S-M8 - Western States Machine Co, “About Us”

Read: Read in full. Supports: founded by Eugene Roberts in 1917, selling to Cuba by 1920 and across the Americas, Europe and Asia within a generation; a 1942 War Department contract for a centrifugal to make war chemicals. Limitations: a company history page. Source: https://westernstates.com/about-us/

S-M8s - Satchell, “Early Use of Steam Power in the Jamaican Sugar Industry 1768-1810” (DOI 10.1179/tns.1995.010)

Read: The DOI landing and author pages only; the paper itself was not retrieved. Limitations: the underlying study behind S-M5’s 1768 date is identified but unread. Source: https://doi.org/10.1179/tns.1995.010

S-M9 - Thomas Broadbent & Sons, “Our Story”

Read: Read in full. Supports: the Broadbent history, including modern batch machines reaching 60 tonnes per hour - the vendor’s figure, attributed as such. Limitations: a company history page. Source: https://broadbent.co.uk/our-story/

S-M10 - Daniels & Daniels, “Origin of the Sugarcane Roller Mill” (Technology and Culture, 1988)

Read: A long excerpt including the first pages; the full paper is paywalled. Supports: the disputed origin of the cane roller mill, which the book reports without settling; and Joseph Needham placing the cane mill, with the cotton gin, among “the ancestors of all steel-rolling mills, mangles and paper or textile machinery.” Source: https://doi.org/10.1353/tech.1988.0091

S-M11 - G. Roger Knight, “Sugar, Steam and Steel: The Industrial Project in Colonial Java 1830-1885” (University of Adelaide Press, open access)

Read: Read. Supports: the first stationary steam engine in “the colonies” as Cuba in 1797; steam mill engines spreading through Cuba and the British Caribbean; and the export wave: Boulton & Watt shipping 119 engines to the sugar colonies between 1803 and 1825, Fawcett & Littledale 148 between 1813 and 1825. Limitations: the same work appears in the literature list as L12. Source: https://tile.loc.gov/storage-services/master/gdc/gdcebookspublic/20/21/38/60/02/2021386002/2021386002.pdf

S-M12 - Zerban, “Vegetable decolorizing carbons” (LSU Agricultural Experiment Station 161, 1918)

Read: Read in full. Supports: vegetable charcoal noted for decolorising as early as 1785 and an English refinery using charcoal on raw sugar by 1794; the foundation beneath Delessert’s and Queruel’s French beet industry. Source: https://digitalcommons.lsu.edu/agexp/110

S-M13 - Mahar, “History of Michigan’s Beet Sugar Industry: The Steffen House”

Read: Read. Supports: the Steffen process: Carl Steffen’s 1883 patent - dilute, chill below 18 degrees Celsius, work in powdered lime to bind sucrose into insoluble calcium saccharate - recovering about 90 percent of the sugar in the beets, and Henry Oxnard refusing a factory contract without a Steffen house. Limitations: an enthusiast’s well-documented local history site. Source: https://beetsugarhistory.blogspot.com/2010/04/steffen-house-molasses-desugarization.html

S-M14 - BMA, “150 Jahre Geschichte” (company publication, 2003, in German)

Read: Read. Supports: BMA’s origins in the Braunschweig wagon works of Seele and Company; the last wagon leaving in 1863; more than a third of all German diffusion plants built between 1864 and 1887 from its works; the Raabe rapid apparatus first installed at Barum; Schottler’s purchase of a closed factory at Einbeck as an experiment station. Limitations: a company publication. Source: https://bma-worldwide.com/fileadmin/Templates/BMA/PDF/news/bma_information_2003/german/geschichte41.pdf

S-M15 - Fives Group, “200 Years” anniversary book

Read: Read. Supports: the Derosne-Cail lineage: Derosne’s 1812 Paris workshops; Cail as partner in 1836 and successor in 1846, building complete sugar plants for Cuba, Mauritius and Reunion; four production sites and more than 2,000 employees by 1847; the second-largest builder of steam locomotives in France in 1850; the liquidation of 1882 and again 1898; and SFCM under Louis Le Chatelier from the 1900s. Limitations: a company anniversary publication; its claim about the group’s continuing sugar activities is dated 2012. Source: https://webasset.fivesgroup.com/FIVES_200_YEARS.pdf

S-M16 - OSTI 7011082, “Cogeneration in the Hawaiian sugar industry” (US DoE technical report, 1990)

Read: The OSTI record page, including the full abstract, was read; the report PDF itself was not. Supports (bounded to the abstract): “on average, about 60 kWh per ton of cane and, in some factories, 100 kWh or more” against “typical worldwide cane-to-electricity productivities of approximately 10 kWh per ton of cane”; “after satisfying virtually all of their internal power requirements, export roughly 400 million kWh to public utility companies”; pre-1970 gains “shaped almost entirely by technical developments,” later sales shaped by “non-technical issues.” Limitations: the figures are the abstract’s own, in US short tons, describing the 1990 period. Source: https://www.osti.gov/biblio/7011082

S-M17 - World Bank Implementation Completion Report, Mauritius Sugar Energy Development Project

Read: Read in full. Supports: the Mauritian programme’s own design: “Bagasse Energy Development Program (BEDP) in Mauritius. This program, which began in 1991, emerged from the Sugar Action Plan (SAP)”; “investment in bagasse/coal power stations”; and the aim “to increase the efficiency of generation and the use of power in sugar factories to free the incremental bagasse surplus.” Limitations: completion-report framing. Source: https://documents1.worldbank.org/curated/en/202021468774681144/txt/multi-page.txt

S-M18 - “Surplus electricity in sugarcane mills” (Energy, ScienceDirect)

Read: Abstract only. Source: https://sciencedirect.com/science/article/abs/pii/S0360544215011780

S-M19 - BMA / International Sugar Journal 2014, “Falling-film evaporator plant for a cane sugar factory”

Read: Read. Supports: falling-film evaporation in cane: standard in beet for more than thirty years, long avoided in cane because juice scales heating surfaces; and the first documented all-falling-film cane evaporator set, commissioned in January 2012, a five-effect plant holding 7,000 tonnes of cane per day at about 33 percent steam on cane, with third-effect vapour supplying the pans. Source: https://bma-worldwide.com/fileadmin/Templates/BMA/PDF/news/papers_articles/english/ISJ_2014_BMA-Evaporator.pdf

S-M20 - Sugar Industry international, falling-film papers

Read: Abstracts only. Cited for: the falling-film principle - juice descending as a thin film inside the tubes, the same thermal power at lower temperatures, and steam-bleeding rearranged to cut steam use. Source: https://doi.org/10.36961/si17919

S-M21 - Broadfoot et al., “Why the emerging strong interest in vertical continuous pans” (ASSCT, abstract via QUT ePrints)

Read: Abstract only; the PDF itself could not be retrieved. Cited for: the century of batch pan-boiling judged by eye, and the newer vertical continuous pans with mechanical agitation boiling on low-pressure vapour. Source: https://assct.com.au/my-downloads/512-to-525-m-08-broadfoot-et-al-pdf

S-M22 - ABB Sugar Application Library

Read: Excerpt. Supports: vendor control libraries shipping templates for batch vacuum pans alongside continuous crystallisers, centrifuges, filters, falling-film evaporators and ion-exchange units. Limitations: the vendor’s own catalogue - it describes what is offered, not what every factory runs. Source: https://new.abb.com/control-systems/industry-specific-solutions/food-beverage/segments/sugar/sugar-application-library

S-M23 - UF/IFAS, “Molasses - General Considerations”

Read: Read in full. Supports: one industry technical review of molasses: continuous centrifugation pulling more sugar from each charge and leaving less in the molasses, and the Quentin process attacking the same problem from the other side by reducing the impurities that drive sugar into molasses. Source: https://rcrec-ona.ifas.ufl.edu/media/rcrec-onaifasufledu/pdf/Molasses—General-Considerations.pdf

S-M24 - Kalstein, “The centrifuges between science and industry”

Read: The domain-root page only. Supports: that the “Weston 1852” attribution circulates in the trade literature - it is used only as evidence that the attribution circulates. Limitations: a weak trade source; the date itself is corrected through S-M28 and S-M33. Source: https://kalstein.eu

S-M25 - Uni-Systems, “Comparative advantages of a cane diffuser over a mill tandem” (vendor case study)

Read: Excerpt. Supports: a vendor engineering comparison for a 10,000-tonne plant putting combined extraction-and-clarification efficiency at roughly 94 percent for a mill tandem against 96 percent for a diffuser. Limitations: a builder’s case study - an indication of how close the contest is, not a verdict. Source: https://uni-systems.net/_files/ugd/6f83a9_37a17250b8264062b5f19f0e0f0519ca.pdf

S-M26 - “Prospects of diffusion … in Kenya” (Cogent Engineering, 2020)

Read: Read in full. Supports: an open-access study examining automating diffuser control in a newer cane country. Source: https://tandfonline.com/doi/full/10.1080/23311916.2020.1733737

S-M27 - “Beet sugar factory” (Wikipedia)

Read: Read in full. Supports: the diffuser design families: the horizontal rotating RT (Raffinerie Tirlemontoise), the inclined-screw DDS (De Danske Sukkerfabrikker) and the vertical-screw tower, whose modern plants reach 17,000 tonnes of beet a day with the cossettes spending about ninety minutes against the water. Limitations: orientation-grade; a tertiary reference. Source: https://en.wikipedia.org/wiki/Beet_sugar_factory

S-M28 - Google Patents, US236389A, “Centrifugal machine” (1881)

Read: Read in full. Supports: the documented warning on the Weston date: the patent cited for “1852” actually dates from 1881 and covers an improvement - a stationary plough that detaches the sugar wall from the spinning basket automatically. Source: https://patents.google.com/patent/US236389

S-M29 - Broadfoot (QUT), “Robert Evaporators - The Good, the Bad and the Ugly” (ISSCT Joint Workshops, 2014)

Read: Read. Supports: the Robert evaporator’s character: a rising-film calandria, robust and simple, in a modern specialist’s words a design generations of factories have basically made their own. Source: https://issct.org/wp-content/uploads/2020/Past%20Workshops/2013-2016/ISSCT%20Joint%20Factory%20Engineering%20and%20Processing%20Workshops%2C%20Hluhluwe%2C%20South%20Africa%2C%2024%20-%2028%20August%202014/Presentations%20-%20Processing%20Section/Broadfoot-Robert-evaporators.pdf

S-M30 - Bruhns, Oldisleben Sugar Factory Cultural Heritage Foundation paper (Bartens)

Read: Read. Supports: the heritage account of Howard's pans and of Florentin Robert's vertical-tube calandria developed at Seelowitz from 1850. Source: https://sugarindustry.info/paper/31356/

S-M31 - Friends of the Boston Harborwalk, "A Series of Firsts"

Read: Read. Supports: granulated sugar credited to the Boston Sugar Refinery in 1853 - moist refined sugar raked across steam tables until dry, then sieved into grades; Charles Hersey's 1871 granulating machine becoming standard refinery equipment; the refinery's absorption into the Sugar Trust in 1887. Source: https://boshw.us/sign/a-series-of-firsts/

S-M32 - "Sugar refinery" (Wikipedia)

Read: Read. Supports: the refinery sequence: clarified syrup boiled to a thread, granulated in open coolers, set in moulds to drain into loaves; and the affination machinery - mingling trough, basket-washing centrifuges with water above 82 degrees Celsius, and the melter tank. Limitations: a tertiary reference. Source: https://en.wikipedia.org/wiki/Sugar_refinery

S-M33 - The Garden Island, "Inventor David M. Weston" (2012)

Read: Excerpt. Supports: the Hawaiian newspaper account of Weston: brought out in 1851 to erect the Lihue plantation's mill, inventing his "Centrifugal Separator" at East Maui that year, and founding the Honolulu Iron Works in 1852. Limitations: a newspaper feature; the centrifuge credit question is resolved through the patent record (S-M28). Source: https://thegardenisland.com/2012/04/19/hawaii-news/inventor-david-m-weston/

S-M34 - 1911 Encyclopaedia Britannica, "Sugar" (Wikisource)

Read: Read in full. Supports: the period engineering detail: the modern tandem of three-roller mills with imbibition; the Paris Exhibition 1900 mill of three rollers 32 inches by 60, triple gearing of 42 to 1, guaranteed at 250 to 300 tons of cane in 24 hours; the Louisiana tandem of two such mills at 900 to 1,200; and British Patent 3754 of 1813 for Howard's pan. Limitations: a 1911 reference work; its figures are period figures in tons. Source: https://en.wikisource.org/wiki/1911_Encyclop%C3%A6dia_Britannica/Sugar

S-M35 - Rangan, "Conservation of bagasse during storage" (IPPTA, Vol. 1 No. 2, June 1983)

Read: Full read (PDF; the OCR of its two chemical tables is partially garbled, but the text and every numerical claim used are legible). Supports: the bagasse storage constraint complex: cane crushing seasons of three to eleven months against year-round pulp-mill demand, forcing six to seven months of storage; bagasse as a bulky, low-density material requiring baling or dense stacking; fermentation loss alone at 5 to 6 percent, a total storage loss of 10 percent counted good practice and 15 percent acceptable; residual nutrients on both fibre and pith (about 5.5 percent sucrose plus about 1.1 percent invert sugar in its analyses), so depithing does not remove the fermentation hazard; the microbial temperature succession (fungi and yeasts first, mesophiles above 22 degrees, thermophiles from about 40, lactic-acid bacilli favouring 50 degrees Celsius; cellulose attack beginning above 30 degrees; pile pH as the deciding variable); dry storage's fire hazard "extremely great", with lung-disease danger and insurance cost among the selection factors; the storage method families (Celotex bale storage, in wide use for over 45 years, roofed piles with air passages; Thibodaux mechanical baling in Louisiana with 125-kilogram bales; Taiwan's small 25-to-30-kilogram bales; large-bale moist-depithed 800-kilogram bales serving pulp mills beyond 100 kilometres, as at Sancristobal in Mexico; Tablopan dry bulk in Venezuela, complete depithing dried to 90 percent dryness in 200-kilogram mats; Jamaican briquetting and pelletising to 300 to 400 kilograms per cubic metre; the wet bulk Ritter process, molasses-seeded biological liquor and acid anaerobic storage at pH 1.5 to 4, minimum fibre loss and near-zero fire hazard against stainless-steel construction, high-BOD effluent unless water is recirculated, and heavy water and power use; the largest Ritter store of its day at the Ngoye paper mill in Zululand, 1956); drying noted as costly where energy is purchased dear; the practitioner dispute between Taiwan Sugar's technologists (stored bagasse pulps better, with less chemical) and Dr Cusi (fresh undegraded bagasse gives the stronger pulp and higher yield). Limitations: a 1983 trade-association paper; its method catalogue is period practice and is framed as such in the chapter, while the physical constraints (seasonality, moisture, microbial loss, fire) are durable. Storage-loss figures are practice rules of thumb, not measured trials. Source: https://ippta.co/wp-content/uploads/2021/01/IPPTA-12-26-35-Conservation-of-Bagasse.pdf ## Books and long-form literature (L1 - L37)

The entries in this section are the book's longer scholarly companions. Where the reading record preserves a read level it is given; many of these records do not, and those are marked "Read level not recorded" rather than dressed up as fuller than they are.

L1 - Jason W. Moore, "Sugar and the Expansion of the Early Modern World-Economy" (REVIEW, 2000)

Read: Read level not recorded. Source: https://jasonwmoore.com/wp-content/uploads/2017/08/Moore-Sugar-and-the-Expansion-of-the-Early-Modern-World-Economy-REVIEW-2000.pdf

L2 - Dippel, Greif & Trefler, "Outside Options, Coercion, and Wages: Removing the Sugar Coating" (NBER working paper 20958)

Read: Read level not recorded here; the abstract-level read of this same paper is documented as EC-4. Source: https://www.nber.org/system/files/working_papers/w20958/w20958.pdf

L3 - Dell & Olken, "The Development Effects of the Extractive Colonial Economy: The Dutch Cultivation System in Java" (Review of Economic Studies)

Read: Read level not recorded here; the working-paper version of this same paper was read in full as E49. Source: https://doi.org/10.1093/restud/rdz017

L4 - "Capital Structure and Financial Development of the U.S. Sugar-Refining Industry, 1875-1905" (Journal of Economic History)

Read: Read level not recorded. Source: https://doi.org/10.1017/s0022050700000085

L5 - "The London Sugar Market, 1740-1769" (Economic History Review, 1956)

Read: Read level not recorded. Limitations: the same article as L37, listed twice in the records. Source: https://econpapers.repec.org/RePEc:bla:ehsrev:v:9:y:1956:i:2:p:254-270

L6 - USDA ERS, "A History of Sugar Marketing Through 1974" (Ballinger)

Read: Read level not recorded. Limitations: the same USDA report as L28, an alternative scan of the same document. Source: https://ers.usda.gov/sites/default/files/_laserfiche/publications/40532/AER-382.pdf

L7 - Moynagh, "Brown or white? A history of the Fiji sugar industry, 1873-1973" (ANU thesis)

Read: Read level not recorded here; the abstract-level read of this same thesis is documented as E28. Source: https://openresearch-repository.anu.edu.au/items/f99c6689-0f87-4802-836b-6ca7eedac10b

L8 - Durgahee, "The indentured archipelago: Mauritius and Fiji 1871-1916" (thesis)

Read: Read level not recorded. Source: https://eprints.nottingham.ac.uk/44058/1/DURGAHE%20JULY%202017%20FINAL.pdf

L9 - "Illegitimate Offspring: South Sea Islanders, Queensland Sugar" (History Workshop Journal)

Read: Abstract only. Source: https://academic.oup.com/hwj/article-abstract/doi/10.1093/hwj/dbaa018/5909116

L10 - "Cane and Labour: Political Economy of the Queensland Sugar Industry 1862-1906"

Read: Read level not recorded. Source: https://doi.org/10.2307/2524692

L11 - “The Collapse of the Cuban Sugar Industry: An Economic Autopsy” (FIU working paper)

Read: Read level not recorded. Source: https://economics.fiu.edu/research/pdfs/2013_working_papers/1306.pdf

L12 - G. Roger Knight, “Sugar, Steam and Steel: The Industrial Project in Colonial Java, 1830-1885”

Read: Read level not recorded here; the open-access PDF of this same book was read as S-M11. Source: https://doi.org/10.20851/steam-and-steel

L13 - Stanford dissertation, “U.S.-Hawaii Trade Reciprocity in the Hawaii Sugar Industry”

Read: Read level not recorded. Source: https://purl.stanford.edu/fx092gs2410

L14 - “The Sugar Revolution in New England: Barbados, Massachusetts Bay” (Business History Review, 2023)

Read: Read level not recorded. Source: https://doi.org/10.1017/s0007680523000867

L15 - Philippe Chalmin, “The Making of a Sugar Giant: Tate and Lyle, 1859-1989”

Read: Read level not recorded. Source: https://www.taylorfrancis.com/books/mono/10.4324/9781315076379/

L16 - Sidney Mintz, “Sweetness and Power” (book)

Read: Read level not recorded; only the introduction scan listed as S36 was consulted in any form. Source: no stable URL preserved; the introduction scan is S36.

L17 - Manuel Moreno Fraginals, “El Ingenio” (book)

Read: Read level not recorded; encountered as a citation inside E11. Source: no stable URL preserved.

L18 - Zanetti & Garcia, “Sugar and Railroads: A Cuban History 1837-1959” (book)

Read: Read level not recorded; encountered as a citation inside E11. Source: no stable URL preserved.

L19 - UNCTAD, “Economic diversification: The Mauritian experience”

Read: Read level not recorded. Source: https://unctad.org/system/files/non-official-document/MYEM-ITEM_4b-Chikhuri-11.10.22.pdf

L20 - Jeffrey A. Frankel, “Mauritius: African Success Story” (NBER working paper 16569)

Read: Read level not recorded here; the abstract-level read of this same paper is documented as EC-7. Source: https://doi.org/10.3386/w16569

L21 - The Chadbourne Plan (1931 agreement text, Columbia via HathiTrust)

Read: Read level not recorded. Source: http://hdl.handle.net/2027/nnc1.cu04187520

L22 - “How brinkmanship saved Chadbourne” (Explorations in Economic History)

Read: Read level not recorded. Source: https://doi.org/10.1016/j.eeh.2005.01.001

L23 - The Telegraph, report on the slavery compensation debt being paid off in 2015

Read: Read level not recorded. Source: https://www.telegraph.co.uk/news/2020/06/17/government-finished-paying-uks-slavery-debt-2015/

L24 - Tax Justice Network, FOI release on the compensation loan’s cumulative cost

Read: Read level not recorded. Source: https://taxjustice.net/wp-content/uploads/2018/06/FOI-20180510.pdf

L25 - “Sugar Industry in Uttar Pradesh: Rise, Decline and Revival” (Economic and Political Weekly)

Read: Read level not recorded. Source: https://www.epw.in/journal/2007/39/review-industry-and-management-review-issues-specials/sugar-industry-uttar-pradesh

L26 - “Sugar Co-operatives in Maharashtra: A Political Economy Perspective” (Journal of Development Studies)

Read: Read level not recorded. Source: https://doi.org/10.1080/00220380802265108

L27 - “Growing into Trouble: Institutions and Politics in the Thai Sugar Industry”

Read: Read level not recorded. Source: https://www.researchgate.net/publication/260142635

L28 - USDA ERS, “A History of Sugar Marketing Through 1974” (alternative scan)

Read: Read level not recorded. Limitations: the same USDA report as L6. Source: https://ers.usda.gov/sites/default/files/_laserfiche/publications/40532/50518_aer382b.pdf

L29 - O’Brien, “The Political Economy of British Taxation 1660-1815”

Read: This same paper was read in full as E47; the records list it twice. Source: https://slantchev.ucsd.edu/courses/ps143a/readings/O%27Brien%20-%20Political%20Economy%20of%20British%20Taxation,%201660-1815.pdf

L30 - Ronnback, “Sweet business: quantifying value added in the British colonial sugar trade, 18th century”

Read: This same paper was read in full as E46; the records list it twice. Source: https://e-archivo.uc3m.es/rest/api/core/bitstreams/b05e374f-1e06-4809-acd8-d1164ad0432c/content

L31 - “Insuring the Transatlantic Slave Trade” (Journal of Economic History, 2020)

Read: Read level not recorded. Source: https://doi.org/10.1017/s0022050719000068

L32 - Nicholas Draper, “The Price of Emancipation” (Cambridge University Press, 2009)

Read: Read level not recorded. Source: book; no stable URL preserved.

L33 - Sidney Mintz, “Worker in the Cane” (1974) - Puerto Rico

Read: Read level not recorded. Source: book; no stable URL preserved.

L34 - Janes & Sayers, “The Story of Czarnikow” (1963)

Read: Read level not recorded. Source: book; no stable URL preserved.

L35 - ED&F Man company history

Read: Read level not recorded. Limitations: this was a lead rather than a secured source; the company’s own account used in the book is C50. Source: no stable URL preserved.

L36 - “Newport and the Rise of the Rum Men 1700-1750”

Read: Read level not recorded. Source: https://doi.org/10.2307/jj.2543558.9

L37 - “The London Sugar Market 1740-1769” (Economic History Review, 1956)

Read: Read level not recorded. Limitations: the same article as L5. Source: https://doi.org/10.1111/j.1468-0289.1956.tb00660.x

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A note on method

Every reference above carries the same information in the same shape: what the source is, how much of it was actually read, what its own text establishes, what the book cites it for where those differ, and its address. A few things worth knowing as you use the list:

- “Read in full” means the whole document was worked through. Anything less says exactly how much less: abstract only, search excerpts, a named set of sections, a page read, a scanned or degraded text.
- Where a source’s own text supports a claim, that support is stated in the source’s terms, with the source’s own words quoted where the record preserves them. Where the book cites a source for more than the reading establishes, that citation is labelled “Cited for” and kept separate.
- Some sources appear more than once under different reference numbers because the records listed them twice. Each duplicate says so and points at its twin rather than pretending to be two sources.
- Sources identified in the research but never actually read are not listed here as references; a source nobody read is a lead, not a citation.