CODEBOOK

The WOWMA Dataset

on the Emergence of Tax Havens in the Global South (Version 0.2)

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Contents

1 Overview

The *wowma* dataset compiles information on all of the world's tropical and subtropical island jurisdictions for years between 1804 and 2024 to enable analyses of the factors driving tax haven emergence in this geographical and temporal context. The variables so far included are described below. Table 1.2. provides details on our coding of economic structure. Table 2.2. gives the statements from FAO (2014) on which we base our assessment of soil types.

[This is a first version of the dataset and codebook enabling the analyses in Hakelberg, Lukas, Leo Ahrens, and Loriana Crasnic (forthcoming) *The Great Caribbean Divergence: Colonial Economic Structure and the Emergence of Tax Havens in the 'British West Indies'*]

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2 Description of Variables

The variables below are listed in the order in which they appear in the dataset from left to right.

Variable	Description
iso3	Includes ISO 3 identifiers for the countries included in the dataset. The identifiers were obtained using the countrycode package in R (Arel-Bundock et al. 2018).
year	Year for which the data is recorded.
country	Name of the country for which the data is recorded.
maritime	Dummy variable with value 1 for maritime economies and value 0 for plantation economies. Maritime economies are all jurisdictions which do not feature at least one Soil Mapping Unit (SMU) in the Harmonized World Soil Database (HWSD) that is dominated by a soil type that the FAO associates with high agricultural suitability (FAO 2014; FAO and IIASA 2023). We cross-checked this coding with contemporaneous statements by colonial officials in Colonial Reports on the agricultural suitability of our cases. For soil types, shares and statements from colonial reports, see Table A1 below. For statements on the respective agricultural suitability of soil types see Table A2 below.
bis_liabilities	Total liabilities of a country's banks and non-banks towards all foreign reporting banks and institutions in millions of current US$. Underlying quarterly data comes from the Bank for International Settlements' (BIS) Locational Banking Statistics (BIS 2025). Quarterly BIS data was aggregated into yearly data using the mean of quarterly values.
bis_claims	Total claims by a country's banks and non-banks on all foreign reporting banks and institutions in millions of current US$. Underlying quarterly data comes from the BIS Locational Banking Statistics (BIS 2025). Quarterly BIS data was aggregated into yearly data using the mean of quarterly values.

gdp_current	Gross domestic product in current US$. The data source is the United Nations Conference on Trade and Development's (UNCTAD) Data Centre (UNCTAD 2025),
gdp_pc	Gross domestic product in current US$ per capita. The data source is UNCTAD's Data Centre (UNCTAD 2025).
gdp_millions	Gross domestic product in millions of current US$. The data source is UNCTAD's Data Centre (UNCTAD 2025)
population_unctad	The total number of inhabitants in a country or jurisdiction. The data source is UNCTAD's Data Centre (UNCTAD 2024)
reform to Other_cumul	Variables indicating the adoption of tax haven legal technologies from Laffitte (2024). For descriptions and documentation of the data see Laffitte (2024).
hthd_total	The sum of tax haven legal technologies identified by Laffitte (2024) for a given country in a given year.
tic_total	Value of a country's residents' holdings of U.S. long-term securities in a given year. Underlying monthly data in millions of current US$ at market value comes from the Treasury International Capital (TIC) system, Table slt_1d (US Treasury 2025). Monthly data was aggregated into yearly data using the mean of monthly values.
km2	The contemporary surface area for each country in km^2. The data comes from the country profiles included in the United Nations' data app (United Nations 2025).
population	Total population taken from Bulmer-Thomas (2012) Tables A.1 and C.1.
pit	Dummy variable indicating whether a country had a personal income tax in place in a given year. The data was collected from the Public Finance and Legislation sections of the British Colonial Office's Blue Books of Statistics and Colonial Reports. The exact source for each date of adoption is recorded in the variable pit_source.
export_pound_current	Value of merchandise exports in current Pound Sterling. Data for years before 1938 was obtained from the variable "worldasreported" included in the RICardo trade data base. For British colonies, this data was originally collected from the British Colonial Office's Statistical Abstracts and Blue Books of Statistics (Dedinger and Girard 2017). Remaining gaps in the data for British colonies were filled with newly collected data from the Trade and Commerce sections of the Blue Books of Statistics and Colonial Reports. The source for each data point is recorded in the variable export_source.
revenue	Total government revenue in current US$. Data for all Caribbean jurisdictions and all years between 1900 and 1960 was obtained from Bulmer-Thomas (2012, Table C.28). The data for the British Caribbean colonies was originally obtained from the Statistical Abstracts for the British Empire and the Blue Books of Statistics (Bulmer-Thomas 2012, 579-588). Data for British West Indian colonies for years before 1900 is from the variable *revenue_local* and was converted from Pound Sterling to US dollars, using historical exchange rates from the RICardo database (Dedinger and Girard 2017).

expenditure	Total government expenditure in current US$. Data for all Caribbean jurisdictions and all years between 1900 and 1960 was obtained from Bulmer-Thomas (2012, Table C.29). The data for British Caribbean colonies was originally obtained from the Statistical Abstracts for the British Empire and the Blue Books of Statistics (Bulmer-Thomas 2012: 579-588). Data for British West Indian colonies for years before 1900 is from the variable *revenue_local* and was converted from Pound Sterling to US dollars, using historical exchange rates from the RICardo database (Dedinger and Girard 2017).
balance	The balance of the government budget obtained by subtracting *expenditure* from *revenue*.
deficit_perc	The public deficit or surplus as a share of revenue obtained by dividing *balance* by *revenue*.
revenue_local	Total government revenue in local currency. For the British West Indies this data was collected in Pound Sterling from the Public Finance sections of the British Colonial Office's Blue Books of Statistics and Colonial Reports. The source for each data point is recorded in the variable *budget_source*.
expenditure_local	Total government expenditure in local currency. For the British West Indies this data was collected in Pound Sterling from the Public Finance sections of the British Colonial Office's Blue Books of Statistics and Colonial Reports. The source for each data point is recorded in the variable *budget_source*.
rep_gov	A dummy variable taking the value of 1 when a British colony has introduced responsible government and 0 otherwise. The British Colonial Office defined responsible government as a political system in which the cabinet has authority over all government portfolios, except defense, foreign affairs, internal security and public administration, and is responsible to an assembly elected by universal suffrage (cf. Colonial Office 1966, 68–69). Data was collected from the Administration sections of the British Colonial Office's Colonial Reports.
banks_no	The number of commercial banks with branches in the jurisdiction, excluding cooperatives and the Government Savings Bank. Data for British West Indian colonies was collected from the Currency and Banking sections in the British Colonial Office's Colonial Reports.
serv_exp	Value of services exports in current US$. Data for Caribbean jurisdictions comes from Bulmer-Thomas (2012, Table D.7). Assuming that services exports are highly correlated with merchandise imports, we used the growth rate of merchandise imports from 1956-1960 to impute services exports values backwards from 1960 (the first year for which data is reported by Bulmer-Thomas) to 1956. Because Bulmer-Thomas (2012) does not provide services exports data for Bermuda, we estimated the data by subtracting merchandise exports from merchandise imports and then converting the number from Pound Sterling to US$ using historical exchange rates provided by Bulmer-Thomas (2012, Table C.4). This procedure was chosen because of the following assessment by the British Colonial Office:

	"Although the visible balance of trade is adverse, there is a substantial revenue from invisible items, including the tourist business; repairs, particularly during 1955 and 1956, to shipping sustaining damage in the neighbouring seas; accommodation, goods and services, estimated to be worth nearly £3.25 million, supplied to the United States Bases; and the production, estimated to be worth about £1 million, in Bermuda of films for cinematographic and television reproduction. There is also, indirectly, revenue from very considerable investments at generally low rates of interest of United Kingdom capital in Bermudian enterprises; and from the establishment in increasing numbers in Bermuda of international companies estimated to be worth about £500,000. The overall balance of trade is therefore favourable" (Colonial Office 1958, 23–24). Because of the last sentence in the quote, we treat our figures for Bermuda as conservative estimates.
export_source	Is a string variable providing the sources for the data points included in *export_pound_current*.
budget_source	Is a string variable providing the sources for the data points included in *revenue_local* and *expenditure_local*.
maritime_source	Is a string variable providing the statements from the British Colonial Office's Colonial Reports that we used to corroborate our coding of British West Indian colonies into plantation and maritime economies. Also see Table A1 below.
notes	Is a string variable with comments about the data that have not yet been assigned to more specific string variables.
ny_distance	Airline distance between a jurisdiction's main international airport and New York's John F. Kennedy airport in kilometers. The data was obtained from the Air Miles Calculator (www.airmilescalculator.com).
ny_changes	Number of changes necessary to reach the respective country by plane from New York. Data was collected from the Communications sections of British Colonial Reports for the year 1956 or adjacent years if reports for 1956 could not be accessed.
lon_changes	Number of changes necessary to reach the respective country by plane from London. Data was collected from the Communications sections of British Colonial Reports for the year 1956 or adjacent years if reports for 1956 could not be accessed.
int_calls	A dummy variable taking the value of 1 when international calls via a cable connection were possible to and from a given jurisdiction. The data was obtained for British West Indian colonies from the Communications sections of the British Colonial Office's Colonial Reports.

Table 2.1.: Data on the agricultural suitability of (former) British West Indian colonies

		Dominant soil type			Secondary soil type			Tertiary soil type			High	Colonial Reports
Country	**SMU**	**Name**	**Suitability**	**%**	**Name**	**Suitability**	**%**	**Name**	**Suitability**	**%**	**%**	**Comments**
Anguilla	5155	Eutric Cambisol	high	30	Rhodic Nitisol	high	20	Lithic Leptosol	low	20	50	“In Nevis the land is nearly all in the hands of peasant proprietors, and the same is true to an even greater extent in Anguilla” (St. Kitts-Nevis-Anguilla Report 1959-62, p. 66).
Antigua and Barbuda	12000	Haplic Alisol	low	60	Eutric Cambisol	high	40				40	"Arable land in the clay soils of the central plain is used for sugar cane cultivation, which is also the main form of cultivation in other areas where there are transport facilities. The lighter soils are used for the production of cotton and vegetables" (Leeward Islands Report 1953-54, 43)
	12001	Calcic Luvisol	high	50	Haplic Chernozem	high	35	Gleyic Cambisol	high	15	100	
Bahamas	12876	Calcaric Regosol	low	60	Eutric Leptosol	low	40				0	"Agricultural production is mainly in the hands of individual agriculturists. There are few holdings on the plantation scale" (Bahamas Report 54-55, p. 18)
	12877	Eutric Gleysol	mediocre	60	Mollic Gleysol	mediocre	40				0	
Barbados	12352	Eutric Regosol	low	60	Eutric Cambisol	high	40				40	"All arable land has been farmed as plantations for generations and has been owned by the occupiers or worked by local attorneys on behalf of absentee proprietors" (Barabados Report 1958-59, p. 44). "The Upland Plateau consists of Oceanic Beds sometimes 700" thick in parts of St. John and St. Philip parishes. They are known as the "Barbados Earth" and are
	12535	Calcic Luvisol	high	40	Gleyic Cambisol	high	30	Haplic Chernozem	high	30	100	

												mainly chalk much of which has been crystallised during folding and is compact but fractured" (Barbados Report 1958-59, p. 107).
Belize	13386	Vertic Cambisol	high	55	Haplic Vertisol	high	20	Eutric Cambisol	high	15	90	"The north of the country is an area of lower rainfall, annual precipitation decreasing from 70 inches in the Cayo District to 50 inches in Corozal, where the open flat or undulating type of country favours the cultivation of sugar cane and livestock" (British Honduras Report 1966-67, p. 119). "The new settlers commenced the system of rum and sugar production in the north which has continued up to today." "The logwood trade was a heavy contributor to the Imperial Treasury and essential to Britain's rapidly expanding wool and dye trades" (British Honduras Report 1966-67, p. 124).
	13387	Dystric Cambisol	high	40	Chromic Luvisol	high	20	Rendzic Leptosol	low	20	60	
	13388	Eutric Gleysol	mediocre	100							0	
	13389	Dystric Cambisol	high	40	Umbric Ferralsol	mediocre	20	Haplic Ferralsol	mediocre	20	40	
	13390	Haplic Acrisol	mediocre	80	Eutric Gleysol	mediocre	20				0	
	13392	Eutric Cambisol	high	40	Chromic Luvisol	high	20	Rendzic Leptosol	low	20	60	
	13393	Eutric Gleysol	mediocre	50	Eutric Planosol	low	30	Sapric Histosol	low	20	0	
	13394	Eutric Cambisol	high	60	Haplic Luvisol	high	20	Ferric Acrisol	mediocre	20	80	
	13395	Vertic Cambisol	high	50	Eutric Cambisol	high	30	Ferric Acrisol	mediocre	20	80	
	13396	Chromic Cambisol	high	40	Rendzic Leptosol	low	20	Vertic Cambisol	high	20	60	
	13397	Chromic Cambisol	high	40	Rendzic Leptosol	low	20	Vertic Cambisol	high	20	60	
	13398	Vertic Cambisol	high	50	Eutric Cambisol	high	50				100	
Bermuda	4976	Albic Podzol	low	90	Dystric Regosol	low	10				0	“Agricultural production is maintained by small farmers who employ imported Portuguese labour. Holdings, on the whole, are small, the majority being of less than ten acres in extent” (Bermuda report 1946, p. 11).

British Virgin Islands	27704	Luvic Kastanozem	mediocre	40	Luvic Phaeozem	high	20	Haplic Luvisol	high	20	40	"The Colony, comprising as it does scattered islands separated by long distances, is at a disadvantage when it comes to agricultural development, but when to these disadvantages are added rugged topography, low rainfall and a harsh dry season, the difficulties of development become acute" (BVI report 1957-58, pp. 19-20).
Cayman Islands	17715	Calcaric Regosol	low	60	Eutric Leptosol	low	40				0	"Even the layman's eye can see at once that the geological formation is not conducive to modern methods of agriculture: there is an area of arable land on top of the bluff in Cayman Brac, but elsewhere cultivable soil is to be found only in pockets separated by rock, either actually outcropping, or coming so close to the surface as to prevent the use of a plough. There are many cracks and fissures in the rock, usually with fertile soil in them, and excellent citrus, pawpaws, bananas, breadfruit, and ground crops such as cassava and yams, can be grown and harvested, but only by manual labour under wasteful conditions, so that agriculture offers little reward. In some parts there are good pastures, and a few of the islanders still go in for raising cattle (Cayman Islands Report 1957-58, p. 35).
Dominica	16181	Haplic Ferralsol	mediocre	40	Vertic Cambisol	high	30	Umbric Andosol	high	30	60	"The organisation of productive activity is divided between plantation and peasant agriculture and there are no large local

												companies. Peasant agriculture is responsible for the bulk of food production for local consumption and also preponderates in the production of vanilla and bay oil, while estate agriculture produces the greater portion of the other export staples and this form of organisation operates at a higher level of productive efficiency" (Dominica Report 1947, p. 20).
Grenada	16997	Vertic Cambisol	high	40	Haplic Ferralsol	mediocre	25	Vitric Andosol	high	20	60	"The island's exports are entirely agricultural. Food for local consumption is also produced, but the quantities are usually short of the minimum needs of the population. The major export crops are cocoa, nutmegs, and bananas. Small quantities of citrus, as lime oil, and cotton are also exported" (Grenada Report 1957, p. 18).
	16998	Eutric Cambisol	high	60	Haplic Vertisol	high	40				100	
Guyana	17067	Umbric Gleysol	mediocre	45	Thionic Histosol	low	20	Eutric Fluvisol	high	20	20	"Sugar and by-products. These comprise by far the most important agricultural exports of the colony. Their export value amounts to more than four times the export value of rice. The latter is the only other export crop of significance. Total production of sugar in the colony was 250,111 tons of which 244,913 tons were produced by estates and 5,198 tons by farmers" (Guyana Report 1955, p. 86).
	17068	Dystric Leptosol	low	60	Dystric Regosol	low	20	Haplic Acrisol	mediocre	20	0	
	17069	Haplic Ferralsol	mediocre	40	Haplic Acrisol	mediocre	35	Dystric Leptosol	low	25	0	
	17070	Dystric Leptosol	low	55	Xanthic Ferralsol	mediocre	30	Eutric Leptosol	low	15	0	
	17071	Haplic Ferralsol	mediocre	85	Ferralic Cambisol	high	15				15	
	17072	Haplic Ferralsol	mediocre	50	Dystric Plinthosol	low	30	Xanthic Ferralsol	mediocre	20	0	
	17073	Xanthic Ferralsol	mediocre	40	Albic Plinthosol	low	30	Dystric Leptosol	low	15	0	
	17074	Xanthic Ferralsol	mediocre	50	Ferric Acrisol	mediocre	20	Dystric Planosol	low	15	0	

	17075	Haplic Ferralsol	mediocre	40	Arenosol	low	30	Ferric Acrisol	mediocre	30	0	
	17076	Fibric Histosol	low	50	Thionic Histosol	low	30	Sulfidic Gleysol	mediocre	20	0	
	17077	Haplic Ferralsol	mediocre	50	Dystric Plinthosol	low	30	Dystric Gleysol	mediocre	20	0	
	17078	Haplic Ferralsol	mediocre	55	Dystric Regosol	low	15	Nitisol	high	15	15	
	17079	Haplic Acrisol	mediocre	50	Xanthic Ferralsol	mediocre	30	Haplic Lixisol	mediocre	20	0	
	17080	Haplic Lixisol	mediocre	50	Haplic Acrisol	mediocre	35	Dystric Leptosol	low	15	0	
	17081	Ferralic Cambisol	high	50	Eutric Regosol	low	25	Carbic Podzol	low	25	50	
	17082	Haplic Ferralsol	mediocre	60	Haplic Acrisol	mediocre	25	Umbric Leptosol	low	15	0	
	17083	Dystric Leptosol	low	100							0	
	17084	Albic Plinthosol	low	40	Carbic Podzol	low	20	Umbric Gleysol	mediocre	20	0	
	17085	Claric Arenosol	low	55	Xanthic Ferralsol	mediocre	30	Gleyic Podzol	low	15	0	
	17086	Haplic Ferralsol	mediocre	65	Claric Arenosol	low	35				0	
Jamaica	17311	Haplic Ferralsol	mediocre	40	Vertic Cambisol	high	25	Eutric Leptosol	low	20	25	"The sugar industry has always held an important place in the Colony's agricultural programme. Recent years have seen a rapid expansion in production due partly to increased acreage as lands become useless for Banana growing, owing to the presence of Panama disease, but largely also to greater efficiency in field and factory practice" (Jamaica Report 1938, p. 18).
	17312	Haplic Vertisol	high	80	Calcaric Phaeozem	high	20				80	
	17313	Eutric Leptosol	low	50	Dystric Cambisol	high	50				50	
	17314	Eutric Leptosol	low	40	Eutric Regosol	low	30	Dystric Cambisol	high	30	30	
	17315	Haplic Vertisol	high	45	Thionic Histosol	low	40	Calcaric Phaeozem	high	15	60	
Montserrat	18047	Haplic Ferralsol	mediocre	40	Vertic Cambisol	high	30	Umbric Andosol	high	30	60	"The economy of the island is necessarily agricultural and the chief

												crop continues to be sea island cotton" (Montserrat Report 1957, p. 3). "Of this total [16,700] it is estimated that some 10,500 acres are owned by estates (much of which is operated on a rental basis) and some 6,200 acres are owned and managed by peasant proprietors" (Montserrat Report 1957, p. 12).
St. Kitts and Nevis	17714	Haplic Ferralsol	mediocre	40	Vertic Cambisol	high	30	Umbric Andosol	high	30	60	"In St. Kitts most of the cultivable land, which consists of the lower slopes of the hills, is divided into large, privately-owned sugar plantations ("estates"). The labourers grow subsistence crops of sweet potatoes, yams, cassava, maize, peas, beans, greens, bananas, etc. on the upper parts of the slopes. In Nevis the land is nearly all in the hands of peasant proprietors, and the same is true to an even greater extent in Anguilla" (St. Kitts-Nevis Report 1959-62, p. 66).
St. Lucia	17717	Eutric Cambisol	high	60	Haplic Vertisol	high	40				60	"In places, the mountain streams debouch into fertile alluvial valleys in which is concentrated most of the island's commercial agriculture. In the northern valleys the soils consist of alluvium from the surrounding hills and are added to each year by flooding streams. Typically, they are brown silicious loams of considerable depth which tend to become heavier and more in need of drainage in the
	17716	Vertic Cambisol	high	40	Haplic Ferralsol	mediocre	25	Vitric Andosol	high	20	60	

												broader parts of the valleys. In the south the soils, both in the valleys and on the lower hillsides, tend to be lighter, better drained and less fertile (St. Lucia Report 1957-58, p. 50).
St.Vincent and the Grenadines	27606	Vertic Cambisol	high	40	Haplic Ferralsol	mediocre	25	Vitric Andosol	high	20	60	"The soils are deep, light and porous, enabling St. Vincent to grow cotton and arrowroot which would otherwise be restricted to drier islands" (St. Vincent Report 1960-61, p. 42). "The coastal lowlands and valleys are all cleared for cultivation" (St. Vincent Report 1960-61, p. 43).
Trinidad and Tobago	27091	Haplic Lixisol	mediocre	50	Dystric Cambisol	high	30	Eutric Cambisol	high	20	50	"The vast areas of cocoa and sugar cane, staple crops of the island and ist mainstay before the discovery of oil, owe their cultivation to these two systems of human labour which disappeared when they were no longer economically tenable in the face of the rising industrial age. The trade balance is principally maintained by the exportation of oil and its by-products, of which the Colony is the largest producer in the British Empire" (Trinidad & Tobago Report 1946, p. 72).
	27092	Dystric Planosol	low	50	Thionic Gleysol	mediocre	25	Gleyic Cambisol	high	25	25	
	27093	Luvic Phaeozem	high	40	Gleyic Luvisol	high	20	Eutric Gleysol	mediocre	20	60	
	27094	Eutric Gleysol	mediocre	80	Alic Stagnosol	mediocre	20				0	
	27095	Eutric Cambisol	high	70	Calcic Luvisol	high	30				100	
	27096	Calcic Luvisol	high	60	Haplic Chernozem	high	40				100	
Turks and Caicos	27090	Eutric Leptosol	low	60	Calcaric Regosol	low	40				0	"There is practically no agriculture carried on in the salt islands, but in the Caicos, corn, beans and other crops are grown in sufficient quantities for local needs" (Turks & Caicos Report 1959-60, p. 25).

Notes: SMU stands for Soil Mapping Unit, the reported numbers are the IDs of the respective SMUs. The Column “High %” reports the share of land covered by soil types highly suitable for agriculture. Data on countries’ SMUs and soil types comes from IIASA and FAO (2023). Comments on agricultural suitability come from the Agriculture and/or Geography sections of British Colonial Reports, the exact source is given in the brackets at the end of the comment.

Table 2.2.: Agricultural suitability of soil types according to the Food and Agriculture Organization

Soil Type	Suitability	Page in Source	Explanation
Acrisol	mediocre	p.145	"Low-input farming on Acrisols is not very rewarding" "Adapted cropping systems with complete fertilization and careful management are required if sedentary farming is to be practised"
Alisol	low	p.146	"Toxic levels of A1 at shallow depth and poor natural soil fertility are further constraints" "A significant proportion of Alisols are unproductive for a wide variety of crops" "Where fully limed and fertilized, crops on Alisols [...] may eventually grade into Luvisols"
Andosol	high	p.147	"Andosols have a high potential for agricultural production" "Andosols are generally fertile soils" "The strong phosphate fixation of Andosols is a problem"
Anthrosol	mediocre	p. 148-149	Plaggic horizon: "favourable physical properties, but many have less favourable chemical characteristics" "Today, these soils receive generous doses of fertilizers" Hortic horizon: "They have been enriched with organic manure" "garden soils" Irragric horizon: "Anthrosols with irragric horizons are formed as a result of prolonged sedimentation (predominantly silt and clay) from irrigation water" Terric horizon: "Eventually these modified surface layers of mineral material turned into terric horizons that gave the soil much improved properties for arable cropping compared to the original surface soil" "These soils have a terric horizon and were the most productive lands of the Aztec empire; now most of these soils are affected by salinization"
Arenosol	low	p. 150-151	"Low coherence, low nutrient storage capacity and high sensitivity to erosion are serious limitations of Arenosols in the dry zone" "Uncontrolled grazing and clearing for cultivation without appropiate soil conservation can easily destabilize these soils, reverting them back to shifting dunes" "Arensosols in the humid and subhumid temperate zone have limitations similar to those of the dry zone, albeit that drought is a less serious constraint" "Arenosols in the humid tropics are best left under their natural vegetation" "permanent cultivation of annual crops would require management inputs that are usually not economically justifiable"

Calcisol	mediocre	p. 152	"Calcisols reach their full productive capacity only when irrigated carefully" "Some 20 vegetable crops have been grown successfully on irrigated Calcisols fertiliezd with nitrogen, phosphorus and trace elements such as iron and zinc"
Cambisol	high	p. 153	"Cambisols generally make good agricultural land and are used intensively" "Cambisols with high base saturation in the temperate zone are among the most productive soils on earth" "Cambisols in the humid tropics are typically poor in nutrients but are still richer then associated Acrisols or Ferralsols"
Chernozem	high	p. 154	"Russian soil scientist rank the deep, central Chernozems among the best soils in the world" "Preservation of the favourable soil structure through timely cultivation and careful irrigation at low watering rates prevent wind and water erosion" "Application of P fertilizers is required for high yields"
Cryosol	low	p.154-155	"Removal of the peat layer on top of the soil or of the vegetation and/or disturbance of the surface soil often lead to alterations of the permafrost depth and to rapid and drastic environmental changes with possible damage to buildings" "Overgrazing leads rapidly to erosion and other environmental damage"
Durisol	low	p.155-156	"The agricultural use of Durisols is limited to extensive grazing" "erosion of the surface soil is widespread" "Durisols may be cultivated with some success where sufficient irrigation water is available"
Ferralsol	mediocre	p. 156-157	"Most Ferralsols have good physical properties" "Great soil depth, good permeability and stable microstructure make Ferralsols less susceptible to erosion than most other intensely weathered tropical soils" "The chemical fertility of Ferralsols is poor; weatherable minerals are scarce or absent, and cation retention by the mineral soil fraction is weak" "Maintaining soil fertility by manuring, mulching and/or adequate (i.e. long enough) fallow periods or agroforestry practices, and prevention of surface soil erosion, are important management requirements" "Fertilizer selection and the mode and timing of fertilizer application determine to a great extent the success of agriculture on Ferralsols"
Fluvisol	high	p. 158	"The good natural fertility of most Fluvisols and attractive dwelling sites on river levees and on higher parts in marine landscapes were recognized in prehistoric times" "Paddy rice cultivation is widespread on tropical Fluvisols with satisfactory irrigation"
Gleysol	mediocre	p. 159-160	"For many Gleysols, the main obstacle to utilization is the necessity to install a drainage system to lower the groundwater table"

			"Adequately drained Gleysols can be used for arable cropping, dairy farming and horticulture" "Underwater and tidal Gleysols are used for fishing or shrimp production"
Gypsisol	mediocre	p.160-161	"Where such soils are in the vicinity of water resources, they can be very productive" "However, even soils containing 25 percent powdery gypsum or more could still produce excellent yields [...] if irrigated at high rates in combination with forced drainage"
Histosol	low	p.161-162	"The properties of the organic material and the type of peat determine the management requirements and land use possibilities of Histosols" "Natural peats need to be drained, and normally also limed and fertilized in order to permit cultivation of normal crops" "Another common problem encountered when Histosols are drained is the oxidation of sulfidic minerals" "The sulfuric acid produced effectively destroys productivity unless lime is applied copiously, making the cost of reclamation prohibitive"
Kastanozem	mediocre	p.163	"Kastanozems are potentially rich soils; periodic lack of soil moisture is the main obstacle to high yields" "Irrigation is nearly always necessary for good yields" "Phosphate fertilizers might be necessary" "Wind and water erosion is a problem"
Leptosol	low	p.164	Leptosols have a resource potential for wet-season grazing and as forest land" "Erosion is the greatest threat to Leptosol areas" "Leptosols on hill slopes are generally more fertile than their counterparts on more level land. One or a few good crops could perhaps be grown on such slopes but at the price of severe erosion."
Lixisol	mediocre	p.165	"Preservation of the surface soil with ist all-important organic matter is of utmost importance" "Tillage and ersosion control measures [...] help to conserve the soil" "The low absolute level of plant nutrients and the low cation retention by Lixisols makes recurrent inputs of fertilizers a precondition for continous cultivation" "Perennial crops are to be preffered to annual crops, particulary on sloping land"
Luvisol	high	p.166	"Most Luvisols are fertile and suitable for a wide range of agricultural uses" "Luvisols on steep slopes require erosion control" "Luvisols with a high silt content are susceptible to structure deterioation where tilled when wet or with heavy machine"
Nitisol	high	p.167	"Nitisols are among the most productive soils of the humid tropics" "quite resistant to erosion" "The good workability of Nitisols, their good internal drainage and fair water holding properties are complemented by

			chemical (fertility) properties that compare favourably with those of most other tropical soils" "High P sorption calls for application of P fertilizers"
Phaeozem	high	p.168	"Phaeozems are porous, fertile soils and make excellent farmland" "Wind and water erosion are serious hazards"
Planosol	low	p.169	"Land use on Planosols is normally less intensive than that on most other soils under the same climate conditions" "Yields are modest even on drained and deeply loosened soils" "Fertilizers are needed for good yields" "Some Planosols require application of more than just NPK fertilizers, and their low fertility level may prove difficult to correct" "Where temperature permits paddy rice cultivation, this is probably superior to any other kind of land use"
Plinthosol	low	p.170-171	"Plinthosols present considerable management problems" "Poor natural soil fertility [...] are serious limitations" "Many Plinthosols outside of the wet tropics have continuous petroplinthite at shallow depth, which limits the rooting volume to the extent that arable farming is not possible; such land can at best be used for low-volume grazing" "Soils with high contents of pisoliths [...] are still planted with food crops and tree crops [...], but the crops suffer from drought in the dry season"
Podzol	low	p.172	"The low nutrient status, low level of available moisture and low pH make Podzols unattractive soils for arable farming" "Aluminium toxicity and P deficiency are common problems" "Podzols are generally best used for extensive grazing or left under their natural vegetation"
Regosol	low	p.172-173	"The low moisture holding capacity of these soils calls for frequent applications of irrigation water; sprinkler or trickle irrigation solves the problem but is rarely economic" "Where rainfall exceeds 750 mm/year, the entire profile is raised to its water holding capacity early in the wet season" "Many Regosols are used for extensive grazing"
Retisol	low	p.174	"The agricultural suitability of Retisols is limited because of their acidity, low nutrient levels, tillage and drainage problems, and for many Retisols because of the cool climate with its short growing season and severe frost during the long winter" "Livestock farming is the main agricultural land use on Retisols [...]; arable cropping [...] plays a minor role"

Solonchak	low	p.175	"Excessive accumulation of salts in soil affects plant growth [negatively]" "Strongly salt-affected soils have little agricultural value" "Only after the salts have been flushed from the soil (which then ceases to be a Solonchak), good yields may be hoped for" "Application of irrigation water must not only satisfy the needs of the crop, but excess water must be applied above the irrigation requirement in order to maintain a downward water flow in the soil and to flush excess salts from the root zone"
Solonetz	low	p.176-177	"The suitability of virgin Solonetz for agricultural use is dictated almost entirely by the depth and properties of the surface soil. A deep (> 25 cm) humus-rich surface soil is needed for successful arable crop production" "Most reclamation attempts start with incorporation of gypsum, or exceptionally, calcium chloride in the soil" "The majority of the world's Solonetz have never been reclaimed and are used for extensive grazing or lie idle"
Stagnosol	mediocre	p.177	"The agricultural suitability of Stagnosols is limited because of their oxygen deficiency resulting from stagnating water above a dense subsoil. In the wet season these soils are too wet, while they may be too dry for crop production in the dry season" "Drained Stagnosols can be fertile soils due to their moderate degree of nutrient leaching"
Technosol	low	p.178	"Technosols are strongly affected by the nature of the material or the human activity that placed it. They are more likely containing toxic substances than soils from other RSGs and have to be treated with care"
Umbrisol	mediocre	p.179-180	"Many Umbrisols are under a natural or near-natural vegetation cover" "The planting of perennial crops and bench or contour terracing offer possibilities for permanent agriculture on gentler slopes" "Where conditions are suitable, cash crops may be grown" "Highland coffee on Umbrisols demands high management inputs to meet its stringent nutrient requirements"
Vertisol	high	p.181	"These soils have considerable agricultural potential, but adapted management is a precondition for sustained production" "The comparatively good chemical fertility and their occurrence on extensive level plains where reclamation and mechanical cultivation can be envisaged are assets of Vertisols" "Their physical soil characteristics, and notably their difficult water relations, cause management problems" "The physical properties and the soil moisture regime of Vertisols represent serious management constraints" "Cotton is known to perform well on Vertisols"

Source: FAO (2014).

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