Illegal Deforestation and Agricultural Commodities: Uganda

Drafted as of: January 2024

SUMMARY OF RISKS

Risk Score: 72.65 (Higher-risk)[1]

Conflict State: NO[2]

- **Agricultural conversion is the main driver of forest loss in Uganda. The majority of Uganda's forest-risk agricultural products are sold and consumed domestically (particularly cassava, beef, maize, and groundnuts).**
- **Shifting agriculture is responsible for 94 percent of Uganda's forest loss, with a further two percent linked to commercial agriculture and mining.**
- **While there are good data linking commodities to deforestation, there is a severe lack of data specifically linking illegal deforestation to each of the major commodities. Due to governance and enforcement challenges across both the forest and agricultural sectors, it is likely that most commodities linked to deforestation are also linked to at least some form of illegality and some form of due diligence is required to ensure an illegal deforestation-free supply chain.**
- **Export-oriented cash crops are also associated with smaller-scale deforestation, but carry a risk of illegal deforestation upon entering the international supply chain.**
- **Cassava currently leads Uganda's commodity-driven deforestation, though a relatively small percentage of it is exported.**
- **Coffee accounts for only six percent of the country's total deforestation but is experiencing exponential growth (154 percent increase in area under harvest in 2021) and over 90 percent is exported. Coffee is primarily exported to the EU and the United States.**
- **Illegal conversion of forest to agriculture in protected areas has been widely noted in media and NGO reports.**

SUMMARY OF FRCS

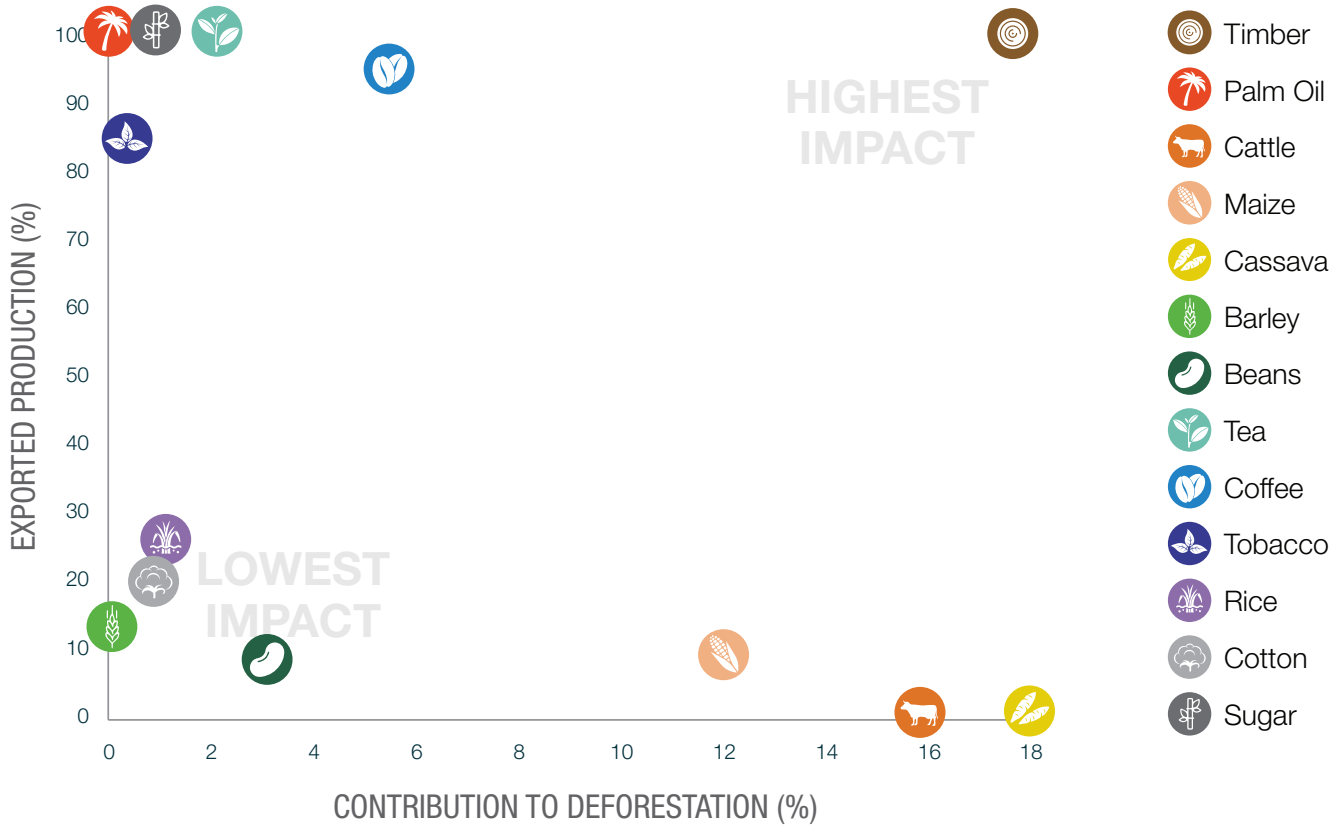
Forest-risk commodities (FRCs) driving the largest share of deforestation (% of deforestation)[a,3]

- Cassava (18%)
- Plantation Timber (19%)
- Cattle (16%)
- Maize (13%)
- Coffee (6%)
- Groundnuts (7%)

Main forest-risk agricultural commodities (FRACs) exported to international markets:

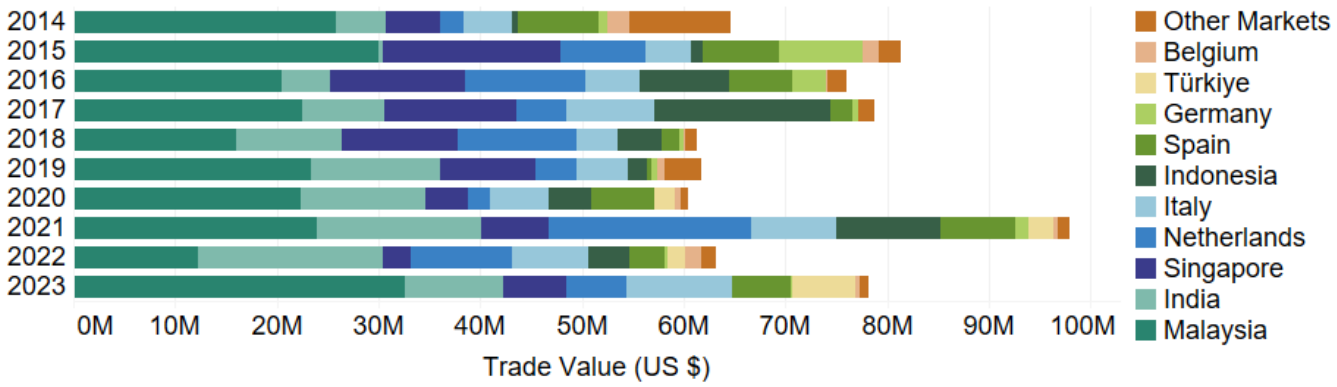
- Coffee
- Cocoa

UGANDA'S AGRICULTURAL PRODUCTS LINKED TO DEFORESTATION AND THEIR EXPORTS, 2020[4,5]



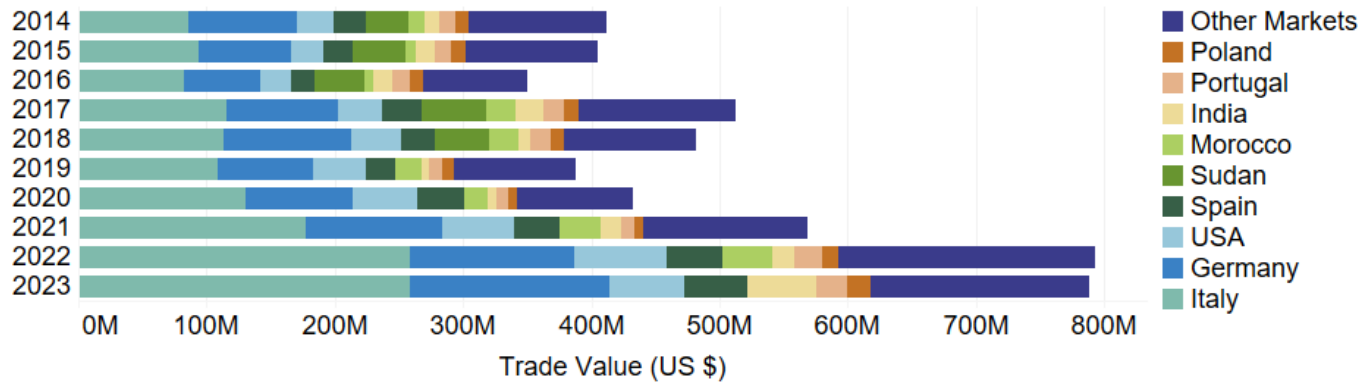
Source: FAO STAT (2020), Pendrill et al. 2022.

UGANDA'S DESTINATION MARKET OF COCOA PRODUCTS (2012-23)[6]



Source: UN Comtrade, compiled by Forest Trends.

UGANDA'S DESTINATION MARKET OF COFFEE PRODUCTS (2012-21)[7]



Source: UN Comtrade, compiled by Forest Trends.

LAND-USE SECTOR

Using the FAO definition of 10 percent canopy cover, Uganda's forest area extends for 17.2 Mha.[b,8] Forest area has been decreasing a six percent in total from 2000-2021. Uganda's forest loss peaked in 2017 with an annual loss of 136,114 ha, of which four percent was primary forest.[9] Recent gains in forest cover are from plantations, which come at the cost of national forest.

Deforestation from 2000-2021 reportedly generated 480 Mt CO_2e of CO_2 emissions.[10] During a similar period (2000-2019), Uganda's agricultural sector's emissions footprint increased from 13.5 Mt to 30 Mt according to Climate Watch.[11] Uganda's Forest Reference Emission Level reported 494 million tonnes of CO_2e emitted from deforestation in 2015, 83 percent of which was caused by wildfires.[12]

Privately owned forest is reported to have the highest rates of deforestation and receives little attention from the forest services. Private forest accounted for 68 percent of the total forest land area in 1990, 61 percent in 2005, and only 38 percent in 2015[13]. Private landowners have the right to use their forest as they wish, and most have felled their natural forest for cash income and for conversion into agriculture.[14,15] On private and communal lands, the annual rate of forest loss was reportedly three percent per year, while in National Parks and Wildlife Reserves it was 0.4 percent.[c,16]

Forested Area:

- 1.9 Mha[17]
- 2.6 Mha of 50% cover or 17.2 Mha of 10% cover in 2022[18]
- 0.4 Mha of primary forest in 2021[19]

Deforestation Rate:

- 51,092 ha/year[20]
- 26,838 ha of forest loss (50% cover) in 2021[21]
- 3,751 ha of primary forest loss (50% cover) in 2021[22]

Global ranking for forest loss:[d]

- 61st globally in forest loss (50% cover) in 2021[23]
- 38th in forest loss (50% cover) in the tropics in 2021[24]

Total Gross Emissions from deforestation:[e]

- 17.1 Mt CO_2e in 2021 (50% cover)

Forest Ownership:[25]

- 36% public; 64% private[26]

Domestic Production by FRAC in 2021 and rate of expansion in agricultural land (2010-2021):[27,28]

- Cassava: 2.7 million metric tonnes, expanding 79% in harvest area from 2010-2021
- Timber: 5.8 million m^3 [f], expanding 27% in harvest area from 2010-2021
- Beef: 194,000 metric tonnes, expanding 2% in pasture area from 2010-2021
- Maize: 2.8 million metric tonnes, decreasing 0.5% in harvest area from 2010-2021
- Coffee: 375,000 tonnes, expanding 154% in harvest area from 2010-2021
- Groundnuts: 194,000 tonnes, decreasing 16% in harvest area from 2010-2021

RISKS ASSOCIATED WITH ILLEGAL FOREST CONVERSION

Agriculture is the main driver of forest loss in Uganda. Cassava, cattle, timber, and maize are the leading causes of deforestation, followed by smallholder farming of coffee and banana intercropped with cassava, maize, beans, tomatoes, cabbages, and onions.

Global Forest Watch estimates that shifting agriculture is responsible for 94 percent of Uganda's forest loss, with a further 2 percent linked to commercial agriculture and mining.[29] The REDD+ strategy for Uganda identifies wildfires as the leading cause of deforestation, followed by charcoal and fuelwood production, timber extraction for construction, and smallholder agricultural expansion. Largescale commercial farming comes fifth, and livestock grazing is noted as a problem that is difficult to quantify.[30,31] Household interviews confirmed agriculture as a leading driver of forest loss, with 28 percent and 58.5 percent of households around Budongo and Bugoma, respectively, saying that large-scale commercial and small-scale subsistence farming were significant drivers of deforestation.[32] An underlying cause of agricultural expansion is population growth, which was 3.2 percent in 2021.[33,34,35] In a typical scenario, farmers with small land holdings clear the forest fringes to expand their farmland (although farmers doing this in the Bugiri district recognized that deforestation was increasing the likelihood of pest infestations, diseases, and reduced crop yields).[36] Migrants were found to have a 31 percent greater deforestation footprint than locals, who are more aware of the long-term effects of resource extraction.[37]

An analysis of land use and land-cover change in western Uganda (in the Budongo–Bugoma landscape) over three decades (1990-2020) identified increases in subsistence farmland, commercial farmland, and built-up areas, in addition to a corresponding decline in tropical high forest, grassland, bushland, and wetlands.[38] A similar pattern of land-use change is reported near the Mount Elgon National Park.[39]

National parks have significant conflict as smallholder agricultural expansion has increased in protected area and local people have been evicted.

A study identified significant increases in planted forest and agriculture on the park fringes from 1978-2010. Well-stocked tropical forest experienced the biggest loss, transitioning to low-stocked forest, while agriculture and pasture expanded into shrub and bushland.[40] The agriculture was mostly coffee and banana, intercropped with maize, beans, tomatoes, yams, cabbages, and onions. Planted forest saw significant increases, due partly to restoration efforts.[41]

Mount Elgon National Park had been the site of evictions from encroached parkland in the 1990s and a subsequent effort to restore tree cover on degraded land through tree planting and natural regeneration.[42,43] The park boundaries had been extended in 2002 and the people who lost their land and disputed the new boundary were reportedly practicing "guerrilla agriculture" inside the park as a form of resistance.[44] Uganda's history of evictions led to alienation of local communities from their land, and is an underlying cause of deforestation, according to one analysis.[45] Another example is Bwindi Impenetrable National Park (home to half of the world's population of endangered mountain gorillas), which was created on the ancestral lands of the Batwa people who were evicted without consultation and without compensation.[g,46,47,48]

Cassava has the biggest deforestation footprint of all crops in Uganda. It continues to expand in production area and is primarily produced for the domestic market.

Cassava accounts for 18 percent of embodied deforestation in Uganda.[49] Cassava is linked to over five thousand hectares of deforestation a year, based on 2005-2018 data.[50] Cassava is an important staple food, and 98 percent of what is produced is consumed domestically. Uganda was the third largest producer of cassava in East Africa in 2021, producing nearly three million tonnes.[51] It grows in poor quality soil and is grown by smallholders on plots averaging 0.5-1 ha.[52] The eastern and northern regions lead in the production of cassava, though farmers are constrained by lack of access to improved varieties and the prevalence of diseases such as cassava mosaic disease and cassava brown streak disease.[53]

Tree plantations for firewood, charcoal, and construction are major drivers of deforestation in Uganda, linked to over 5,000 ha of deforestation per year.

The expansion of tree plantations is linked to the loss of over 70,000 ha of natural forest since 2005.[54] Tree crops are in high demand in Uganda because of the reliance on fuelwood and charcoal for energy. According to the National Forestry Authority (NFA), more than 73,000 hectares of private forest and 7,000 hectares of protected forest reserves are destroyed each year for timber and charcoal. Almost all households in Uganda depend on firewood (68 percent) and charcoal (28 percent) for cooking, the former being mostly rural and the latter mostly urban.[h,55,56] Charcoal uses over twice as much wood as fuelwood,[57] and charcoal makers prefer old-growth hardwood tropical species.[58] Many charcoal producers do not have the licenses that are required by the government, so they are felling trees illegally.[59] Buganda region and the north are the biggest producers of charcoal.[60] A study in Bugiri district (bordering Buganda to the east) identified firewood as the most-used forest product, though it was increasingly scarce, with a 28 percent drop in availability over 12 months. In response to the scarcity, 74 percent of interviewees practiced agro-forestry to relieve the wood fuel shortages they were experiencing.[61] Similarly, in Midwestern Uganda, there was a high rate of forest loss in privately owned forest due to charcoal making by local residents, as well as illegal timber extraction, which was dominated by powerful outsiders.[62]

While natural forest under private ownership has all but disappeared, plantations have increased to meet the demand for household fuelwood and commercial timber.[63,64] Plantations increased by 2.96 percent between 2000 and 2015 and were estimated to have increased by 10,000 ha per year from 2015 to 2020.[65] Private sector investment in commercial tree plantations has been encouraged by the government and donors.[66,67]Uganda's REDD+ strategy includes an objective related to large-scale commercial tree plantations, as well as one for smallholders to plant one hectare woodlots on their land.[68] Uganda's land tenure system provides security for smallholders to invest in tree growing, although those with more land, higher education, and active businesses are more likely to plant significant numbers of trees.[69,70,71] However, there is limited access to good quality seedlings, so people use road-side tree nurseries and informal dealers where seedlings are at risk from pests and diseases.[72,73]

Wood is also in demand for construction, with strong domestic use.[74,75] Uganda's only plywood manufacturer, Nileply, reported that access to timber was a limiting factor in their production of plywood and that they had invested in plantations to create an alternative supply, though there was a ten-year wait for the plantations to mature.[76]

Cattle account for 16 percent of Uganda's embodied deforestation.

Cattle were linked to over 4,600 ha of deforestation per year between 2005 and 2018.[77] Nearly all beef (99 percent) is consumed on the domestic market, with minimal exports to Nigeria, the Democratic Republic of Congo, Tanzania, India, and Kenya.[78] Uganda produced nearly 200,000 tonnes of cattle meat in 2021, roughly double the quantity produced during the 1990s.[79] Uganda has 5.4 Mha of permanent pasture, 0.8 Mha of temporary pasture, and 0.9 Mha of temporary fallow.[80] Productivity is predicted to increase by 2050.[81]

Cattle are concentrated in the cattle corridor, a broad arc of semi-arid land that runs from the southwest to the northeast of Uganda.[82] Of the 11.9 million heads of beef cattle, 49 percent are in agro-pastoral settings, 41 percent in pastoral, 8 percent in commercial ranching, and 2 percent in semi-intensive farms.[i,83] In the pastoral system, farmers move the cattle (mostly indigenous breeds) in search of pastures and water. In the agro-pastoral production system, cattle browse both on private and public pastures, and are sometimes fed with crop by-products.[84,85] The semi-arid ecosystems are vulnerable to drought and climate change, and people suffer from food insecurity.[86] Rangelands are under pressure from crops, and communal land is being privatized and fenced off, resulting in the blocking of cattle migration routes.[87,88] In Nakasongola, 96 percent of rangeland was lost to small-scale farming and bare ground (which increased by 27 percent and 211 percent, respectively, between 1986 and 2013). In contrast, an area with communal land ownership and greater freedom of movement for cattle had less degradation and loss of rangelands.[89]

Uganda's REDD+ strategy aims to reduce degradation of forests through intensification of livestock management.[90] However, in the meantime, the pressure on forests is increasing. Enclosure of rangelands and conversion of communal lands to fields has led cattle herders to migrate in the search of pasture. In Western Uganda, tensions between forest guards and cattle herders have escalated into violent clashes, and locals blame migrant herders who are not under the authority of the local leaders and who do not benefit from local livelihood initiatives.[91] The cattle herders are accused of starting fires to create new growth of grass for their animals, despite the risk of fires going out of control and burning extensive areas of forest.[92]

Maize is linked to nearly 3,500 ha of deforestation per year (12 percent of deforestation), peaking from 2008-2012.[93]

Maize is mostly consumed on the domestic market and only seven percent of its deforestation risk is exported.[94] Maize represents 12 percent of Uganda's deforestation embodied in agriculture.[95] The area under production in 2021 was nearly a million hectares, 1.5 times what it was in 2000, and production (2.8 million tonnes in 2021) was 2.5 times its 2000 level.[96]

Maize exports contributed nearly one percent of Uganda's exports value, worth nearly US$30 million in 2021, primarily sold to Kenya and Tanzania.[97] Maize is widely grown in Uganda, mainly in the Eastern region.[98] It was the second-most cultivated crop by area planted in 2021 after plantains.[99] It is an important source of household income and has also become a staple food, especially in urban areas.[100] Over 70 percent of the maize produced in Uganda is consumed as food, and about 10 percent is used as animal feed.[101]

The government response to illegal encroachment into forests is to evict the farmers. Media reports maize crops being destroyed during evictions.[102,103] Maize is also destroyed by elephants and primates, particularly on farms along or inside the boundary of forest reserves.[104,105]

Groundnuts are linked to 1,900 ha of deforestation per year, accounting for seven percent of Uganda's deforestation.[106]

The area harvested in 2020 was 166 percent bigger than that of 2000, and production increased by 140 percent during the same period.[107] Uganda produced nearly 400,000 tonnes of groundnuts in 2021, making it the fourth largest producer in East Africa after Tanzania, which produces nearly four times as much.[108] In the last three years for which there is data, exports of deforestation-risk groundnuts were zero.[109]

Groundnuts are often grown in the northern and eastern regions of Uganda, where they are well-adapted to the hot, arid conditions.[110] It is the second most common legume crop, after common bean, and improves soil fertility by fixing nitrogen.[111] In Western Uganda along the border of Kibale National Park, it is grown as ground cover interplanted with maize.[112]

Together, coffee and cocoa account for 2,000 ha of deforestation per year, or 7 percent of Uganda's deforestation linked to agricultural commodities. The majority of these crops enter the international supply chain.

Coffee was linked to nearly 1,700 ha of deforestation per year between 2005 and 2018, accounting for 6 percent of Uganda's deforestation linked to agricultural commodities. Of this, 91 percent was exported[113] (over half to EU Member States). Uganda was Africa's second largest producer of coffee in 2021, after Ethiopia, and the seventh largest in the world.[114] There was a rapid 250 percent increase in the area planted with coffee to nearly 700,000 ha after 2010. Production underwent a similar increase to 375,000 tonnes in 2021.[115]

Robusta accounted for 82 percent of coffee production in the 2019-2020 season.[116,117] Robusta grows in the lower-lying regions of central Uganda and is said to have originated in Uganda, with certain varieties occurring naturally in Uganda's rainforests.[118] Arabica, which earns a higher price on the international market, is cultivated above 1,500m altitude and grows in the mountainous regions of East and West Uganda.[119,120] Some Arabica coffee-growing areas are important habitats for endangered species, such as the Albertine Rift region.[121]

Ugandan coffee has a high risk rating (92 out of 100) according to the GMAP evaluation of environmental risk, indicating a high probability and severity of impact on protected areas and terrestrial biodiversity.[122] In contrast, Rainforest Alliance describes the risk to high-conservation value forest, protected areas, and native vegetation as medium-low, a rating which this report perceives as too low (Rainforest Alliance 2021, Negawo & Beyene 2017).[123,124,k]

A majority of community members identified coffee as a cause of land-use change leading to landslides, but said it was "worth the risk" for the income generated.[l,125]

Mount Elgon coffee has benefited from more investment than the Arabica-producing regions in the West, and is recognized as high quality coffee.[126,127] The West is the source of Dry Ugandan Arabica (DRUGAR), which is cheaper and poorer quality, and accounts for over half the Ugandan Arabica crop.[128] Poverty rates are high even in the East where the highest quality coffee is produced: Eastern Uganda coffee farmers said they spend on average 2.7 months with inadequate food supply.[129] The creation of Mount Elgon National Park in 1993 (from a forest reserve first gazetted in 1929) led to evictions and restricted access to the forest, resulting in increased poverty (a 20 percent loss of household income) and people-park conflicts.[130,131,132,133]

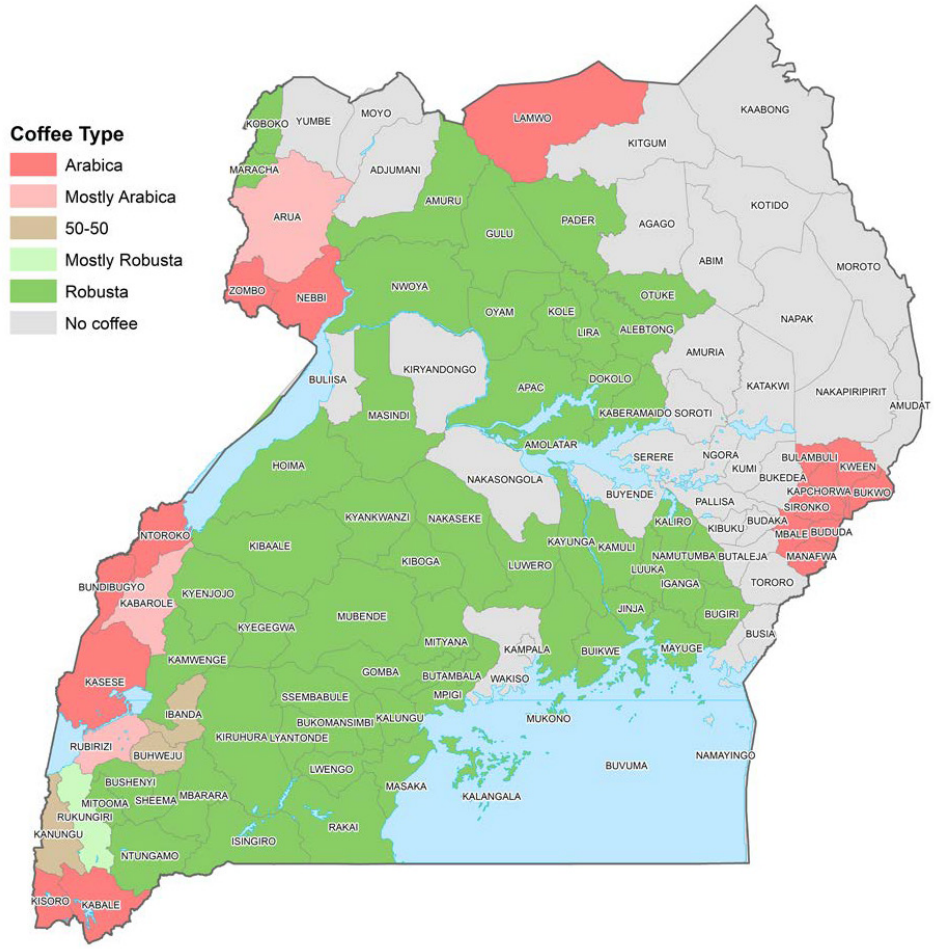
An estimated 1.7 million Ugandan households grow coffee on plots with an average size of 0.23 ha.[134,135] Plot sizes decrease as they are subdivided with each new generation, and productivity is low as trees are old and suffer from disease with little use of inputs.[136] Women do most of the labor on coffee farms in Uganda and children often miss school to work during the coffee harvest season.[137]

The Ministry of Agriculture, Animal Industry, and Fisheries set ambitious production targets to expand the area of coffee under production by five percent in traditional areas and 25 percent in new areas, but there is a lack of investment in smallholders.[138,139] The Uganda Coffee Roadmap has a target to "provide and promote concessions for coffee production on large underutilized tracts of land," with no explanation of how the "underutilized" land will be identified.[140] Meanwhile, climate change models predict rising temperatures and erratic rainfall, bringing increased risk of disease and pests.[141] The coffee yield may fall 50 percent by 2050 due to a reduction in the area suitable for Arabica.[142]

Coffee exports were Uganda's biggest agricultural export in 2021, representing 9 percent of exports worth US$ 540 million.[143] Exports go primarily to the EU (Italy 24 percent, Germany 15 percent, and Spain six percent).[144] The US is Uganda's fourth largest export market accounting for 74 ha of deforestation in 2018, while exports to the UK are linked to 20 ha of deforestation.[145] A study of the link between global demand for commodities, deforestation, and malaria estimated that the demand for Ugandan coffee in Italy (US$88 million), Germany (US$63 million), Belgium (US$40 million), and the US and Spain (both US$21 million) is linked to a risk of up to 5.49 million cases of malaria in Uganda.[m,146]

There are three coffee certifications in Uganda: Fairtrade, UTZ, and Rainforest Alliance. The new Rainforest Alliance 2020 Certification program prohibits deforestation and the destruction of natural ecosystems and integrates the UTZ certification.[147,148] Uganda produced between 10,000 and 12,000 MT of Rainforest Alliance-certified coffee in 2020 and 2021, of which between 1,000 and 3,000 MT was sold on the global market.[149] Fifteen Ugandan coffee producer cooperatives have Fairtrade certification.[150] In total, 65,570 ha of coffee production is certified organic, accounting for 17 percent of the total coffee area.[151]

MAP OF COFFEE-PRODUCING REGIONS IN UGANDA



Source: Morjaria, A., and Sprott, M. (2018). Ugandan Arabica Coffee Value Chain Opportunities. Ugandan Arabica Coffee Value Chain Opportunities. International Growth Centre.

Cocoa was linked to over 400 ha of deforestation per year between 2005 and 2018, nearly 6,000 ha in total.[152]

In 2020, over 35,000 tonnes of cocoa were produced, 96 percent of which were exported,[153] about 50% to Europe and the rest to countries in Asia.

Production nearly doubled between 2010 and 2020, and the extent of cocoa planted increased during the same period from 42,000 ha to 71,000 ha.[154]

According to OEC World, cocoa beans accounted for nearly two percent of Uganda's exports in 2020, worth over US$100 million. The top export destinations were Indonesia (39 percent), Malaysia (23 percent), and India (12 percent). Europe accounted for a fifth of Uganda's cocoa exports, led by Spain (seven percent), the Netherlands (six percent) and Italy (six percent).[155] The US was the seventh largest importer of deforestation-risk cocoa from Uganda in 2018, associated with six ha of deforestation, while the UK is 14th.[156,n,o]

Uganda has over 19,000 ha of organic production of cocoa, representing 32 percent of the total cocoa area and producing 1,320 tonnes of organic cocoa.[157] The main cocoa production areas are Bundibugyo (Western Region) and Mukono (Central Region).[158] The Mukono district had the sixth highest forest loss in 2021, having lost 59,000 ha, while Bundibugyo was 35th.[159]

Illegal encroachment onto protected areas happens often due to decreased law enforcement capacity, and people-park conflicts are common.

Forest reserves are protected by law from being cut, damaged, disturbed, or burnt, and removing forest produce is prohibited unless exempt under the management plan.[160]

However, policy implementation in Uganda is weak: a review found most policies and strategies have not been implemented and are at best selectively implemented.[161] The National Forest Authority (NFA) is described as poorly governed and has been unable to achieve its self-financing targets.[162] One study reports NFA interviewees saying, "we are two staff here in charge of 21 central forest reserves," and complaining that, "we manage 70% of the forests but have no budget allocation from central government."[163] The Forestry Sector Support Department (FSSD), responsible for supervising the NFA, is described by the Ministry of Water and Environment as "ill equipped and ill resourced to adequately fulfil its mandate."[164] Forest policy has been subject to political interference and has failed to coordinate with other sectors.[165] There is encroachment and illegal extraction of forest resources in the Central Forest Reserves, and NFA resources are increasingly being spent on patrols and enforcement. Meanwhile, the Uganda Wildlife Authority earns foreign exchange income from tourism in the national parks and its law enforcement officers are well-armed and receive support from the military.[166,167] The National Environment Act of 2019 established a specialized unit, the Environmental Protection Force, to handle enforcement.[168] Budgetary allocations for biodiversity conservation have increased, but significant shortfalls remain.[169]

Luwero region has experienced more deforestation than any other region, with nearly 100,000 of forest loss between 2001 and 2021.[170] Luwero is adjacent to Kampala and supplies the capital with timber and charcoal. In 2021, Mpigi, west of Kampala and Lira, in central Uganda, had the highest rates of deforestation, both losing over five thousand hectares of forest.[171] The forest is more at risk in areas with high population density, where the increased demand for agricultural land leads to fragmentation of the forest, extension of fields right up to protected area boundaries, and encroachment.[172] The State of Uganda's Forestry 2016 report recognises that encroachments are difficult to manage since the culprits enjoy political patronage.[173] A study modelling land use and land-cover changes between 2005 and 2050 predicts high levels of forest loss due to urbanization and agricultural conversion around Lake Edward in Southwest Uganda (where biodiversity importance is highest) and along Lake Victoria.[174] Uganda's 2019 Wildlife Act introduced stiffer penalties (including life imprisonment as the maximum penalty), but there has been little improvement in the enforcement of laws against wildlife crime.[175]

Ambitious targets for increasing forest cover have not yet been accompanied by political will to work collaboratively with forest communities and smallholders to improve livelihoods and protect forests.

In Uganda's National Development Plan, the government set a target of increasing forest cover to 15 percent of total land cover by 2020.[176] However, it is a long way from being achieved. As of November 2022, the National Forest Authority reportedly had at least 480 active lawsuits against forest encroachers with ill-gotten land titles.[177] However, the problem is systemic when land titles are issued by corrupt staff at land offices for formally untitled land.[178] A survey of 199 community members revealed a perception of high levels of corruption (82 percent) in Uganda's land and forest rights management, with complaints of limited transparency in implementing land and forest property rights.[179]

In areas where there has been sustained effort to protect forests, such as Budongo and Bugoma, forest protection and recovery has been successful, suggesting that what is needed is "a refocusing of the forest debate on practical working schemes."[180] Land-sharing approaches that integrate conservation and food production offer better opportunities than the conservation measures that exclude farmers from the land and pit farmer interests against forest protection.[181] A study of collaborative forest management (CFM) found increased tree growth (a net increase in the basal area of trees) in community managed forest and benefits from heightened patrol activity and vigilance of CFM members. However, community members said that powerful actors caught illegally extracting timber could buy their way out of trouble.[182] Payment for ecosystem services (PES) has proved successful at increasing tree cover in Uganda, noting that private ownership of forest land and generous payments were conditions for success.[183,184] An agricultural extension program also successfully reduced forest loss.[185]

In 2020, the World Bank approved nearly US$150 million for forest management and protected areas in Northern and Western Uganda,[186] which will bring welcome funding, but does not guarantee political will in a context in which politicians have granted forest land to private businesses, and military officers have reportedly encroached on forest reserves.[187] Environmental defenders face multiple challenges, as illustrated by the arrest of six members of AFIEGO staff, a group that campaigns against sugarcane plantations in Bugoma forest.[188] There are opportunities to reduce deforestation in Uganda, but this will require better cooperation between government and local communities, respect for human rights, and better policy implementation.

REPORTS & ADDITIONAL RESOURCES

A list of relevant reports and additional online tools to complement this country report is available at: https://www.forest-trends.org/fptf-idat-home/.

Key additional reading:

1. Bamwesigye, Dastan, Raymond Chipfakacha, and Yeboah Evans. 2022. "Forest and Land Rights at a Time of Deforestation and Climate Change: Land and Resource Use Crisis in Uganda" *Land* 11(11). https://doi.org/10.3390/land11112092.
2. Bendana, Christopher. 2023. "Uganda takes to the courts to stop land grabs and protect forests." *Reuters*, January 9, 2023. https://www.reuters.com/article/uganda-climate-change-land-forests-idUSL8N32Y03G.
3. Ignaciuk, Adriana, Jihae Kwon, Giuseppe Maggio, Marina Mastrorillo, and Nicholas Sitko. 2021. "Harvesting trees to harvest cash crops: The role of internal migrants in forest land conversion in Uganda: FAO Agricultural Development Economics Working Paper." 21-08. FAO. https://www.fao.org/agrifood-economics/publications/detail/en/c/1444893/.
4. Republic of Uganda (ROG). 2020. "National REDD+ Strategy and Action Plan." Ministry of Water and Environment. https://sfg.mwe.go.ug/wp-content/uploads/2022/01/Uganda-REDD-Strategy-Second-Edition-June-2021.pdf.
5. ROG. 2014. "National State of the Environment Report for Uganda 2014." National Environment Management Authority. https://nema.go.ug/sites/all/themes/nema/docs/FINAL%20NSOER%202014.pdf.
6. Opedes, Hosea, Sander Mücher, Jantiene Baartman, Shafiq Nedala, and Frank Mugagga. 2022. "Land Cover Change Detection and Subsistence Farming Dynamics in the Fringes of MENP, Uganda from 1978–2020." *Remote Sensing* 14(10): 2423. https://www.mdpi.com/2072-4292/14/10/2423.

METHODOLOGY & TERMINOLOGY NOTES

[a] Amortized deforestation refers to the amount of deforestation embodied in the production of associated commodities. Not all land-use change results in production of commodities (Pendrill et al. 2022).

[b] The FAO defines forest as "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ." Forest Trends uses this definition in the analysis sections of East Africa reports because the majority of forest is open canopy. In Uganda, only 15 percent of the forest (2.6 Mha) has greater than 50 percent cover. Uganda's Ministry of Water and the Environment defines forest as "a minimum area of 1 Ha, minimum crown cover of 30%, and comprising trees able to attain a height of at least 4 metres.".

[c] This is from the State of Uganda's Forestry 2016, published by MWE. In the same year (2016), the National Environment Authority published the State of the Environment Uganda 2014 report which gave different figures: a rate of forest loss of 2.2 percent in private forests and 0.9 percent in Protected Areas, giving an average of 1.8 percent per year.

[d] Forest loss is defined as the complete removal of forest cover. Forest cover is defined as areas with greater than 50 percent tree cover that are greater than five meters tall.

[e] This dashboard quantifies the amount of greenhouse gas emissions (expressed in mega-tonnes [Mt] of carbon dioxide equivalent emissions) from deforestation and other disturbances (forest fire and drainage of organic soils), as reported by Global Forest Watch (using methodology from Harris et al. 2021).

[f] FAOSTAT total of: Sawlogs and veneer logs, coniferous; Sawlogs and veneer logs, non-coniferous; Other industrial roundwood, non-coniferous (production); Sawnwood, coniferous; and Sawnwood, non-coniferous all.

[g] According to a Constitutional Court ruling, which also applied to Echuya Central Forest Reserve, Mgahinga Gorilla National Park, and Bwindi Impenetrable National Park.

[h] In rural areas, 81 percent use fuelwood, while in urban areas, 66 percent use charcoal..

[i] In addition, twenty percent of households engage in dairy farming (NSDS 2021), and milk production in 2021 was 1.7 million tonnes (FAOSTAT 2023)..

[j] Negawo and Beyene surveyed forest plots in Eastern Uganda and found that the number of indigenous tree species on coffee farms was lower than that of forest reserve, as was tree species richness per plot. Rainforest Alliance said this research found that "the diversity of tree species in coffee farms in Uganda is reasonable comparable to that of the forest reserve."

[k] The Rainforest Alliance cites a source saying it is likely that "farmers contribute to the preservation of native vegetation and on-farm biodiversity," but this is not evidenced. A study of Baduda District (near Mount Elgon) found that most farmers mixed coffee with subsistence crops such as beans and bananas, though the level of inter-cultivation varied widely. New research on farmer attitudes to native vegetation reported that, unless farmers were in a program promoting agroforestry, they were not aware of the benefits of shade trees in enhancing the value of the coffee beans, though they might plant trees for fuelwood or fruit. All the farmers interviewed thought that coffee grown under shade was more likely to be attacked by pests and diseases than unshaded coffee, and the majority were not pruning the trees shading their coffee (pruning is required to reduce the risk of disease).

[l] One village elder reportedly said: "People plant a lot recently...a lot of coffee for market. When they plant [coffee] they cut the trees, even up on the mountains."

[m] Demand for raw cotton also contributes to these risk cases, with exports worth US$15 million going to South and Southeast Asia. .

[n] The overall country governance risk scores reflect Forest Trends' 2021 updated assessment of national-level independent political, governance, business, economic and corruption indices which draw on a broad range of relevant underlying data from the World Bank, African Development Bank, Asian Development Bank, Inter-American Development Bank, International Fund for Agricultural Development's programming criteria, United Nations and governmental aggregated data, as well as independent surveys and other primary data to provide an average relative governance and corruption risk score for 211 countries globally. Countries scoring less than 25 are considered "Lower-Risk," countries scoring between 25 and 50 are "Medium-Risk" and countries scoring above 50 are "Higher-Risk." The risk scores can only give an indication of the likely level of illegal deforestation in a country and ultimately speaks to the risk that corruption and poor governance undermines rule of law in the land sector. A full methodology is available on the ILAT Risk website: https://www.forest-trends.org/fptf-ilat-home/.

[o] UN Comtrade data and OEC's trade data vary. UN Comtrade indicates that Spain and Italy each accounted for 10% of Uganda's cocoa exports, while the Netherlands accounted for 4% (see chart 2). This difference highlights the variability that can occur in international trade data due to different data collection and standardization methods, internal validation practices, and potential updates or revisions.

WORKS CITED

[1] The overall country governance risk scores reflect Forest Trends' 2021 updated assessment of national-level independent political, governance, business, economic, and corruption indices which draw on a broad range of relevant underlying data from the World Bank, African Development Bank, Asian Development Bank, Inter-American Development Bank, International Fund for Agricultural Development's programming criteria, United Nations and governmental aggregated data, as well as independent surveys and other primary data to provide an average relative governance and corruption risk score for 211 countries globally. Countries scoring less than 25 are considered "Lower-Risk," countries scoring between 25 and 50 are "Medium-Risk" and countries scoring above 50 are "Higher-Risk." The risk scores can only give an indication of the likely level of illegal deforestation in a country and ultimately speaks to the risk that corruption and poor governance undermines rule of law in the land sector. A full methodology is available on the ILAT Risk website: https://www.forest-trends.org/fptf-ilat-home/.

[2] World Bank Group's Fragile, Conflict and Violence Group. 2022. "Harmonized List of Fragile Situations." World Bank Group's Fragile, Conflict and Violence Group. Accessed Jan 9th, 2023. https://www.worldbank.org/en/topic/fragilityconflictviolence/brief/harmonized-list-of-fragile-situations.

[3] Pendrill, Florence, Toby Gardner, Patrick Meyfroidt, U. Martin Persson, Justin Adams, Tasso Azevedo, Mairon Bastos Lima, Matthias Baumann, Philip Curtis, Veronique de Sy, Rachael Garrett, Javier Godar, Elizabeth Dow Goldman, Matthew Hansen, Robert Heilmayr, Martin Herold, Tobias Kuemmerle, Michael Lathuillière, Vivian Ribeiro, Alexandra Tyukavina, Mikaela Weisse, and Chris West. 2022. "Disentangling the numbers behind agriculture-driven tropical deforestation." *Science* 377(6611). https://doi.org/10.1126/science.abm9267.

[4] Pendrill et al. 2022.

[5] FAOSTAT, 2022.

[6] United Nations Statistics Division. 2024a. "UN Comtrade." United Nations Statistics Division. Accessed June 24, 2024. https://comtrade.un.org/data/.

[7] Ibid.

[8] GFW. 2022. "Uganda." Global Forest Watch. https://www.globalforestwatch.org/map/country/UGA/?map=eyJjYW5Cb3VuZCI6ZmFsc2V9.

[9] Ibid.

[10] Harris, Nancy, David Gibbs, Alessandro Baccini, Richard Birdsey, Sytze de Bruin, Mary Farina, Lola Fatoyinbo, Matthew Hansen, Martin Herold, Richard Houghton, Peter Potapov, Daniela Requena Suarez, Rosa Roman-Cuesta, Sassan Saatchi, Christy Slay, Svetlana Turbanova, and Alexandra Tyukavina. 2021. "Global maps of twenty-first century forest carbon fluxes." *Nature Climate Change* 11(3): 234-240. https://www.nature.com/articles/s41558-020-00976-6.

[11] Climate Watch. 2022. "Uganda." https://www.climatewatchdata.org/countries/UGA.

[12] Republic of Uganda (ROG). 2020. "National REDD+ Strategy and Action Plan." Ministry of Water and Environment. https://sfg.mwe.go.ug/wp-content/uploads/2022/01/Uganda-REDD-Strategy-Second-Edition-June-2021.pdf.

[13] Ministry of Water and Environment. 2016. *Sector Performance Report 2016*. Accessed July 19, 2024. https://www.mwe.go.ug/sites/default/files/library/SPR%202016.pdf.

[14] Twongyirwe, Ronald, Mike Bithell, and Keith Richards. 2018. "Revisiting the drivers of deforestation in the tropics: Insights from local and key informant perceptions in western Uganda." *Journal of Rural Studies* 63: 105-119. https://www.sciencedirect.com/science/article/pii/S0743016717309142.

[15] ROG. 2013a. "The National Forest Plan, 2011/12 – 2021/22." Ministry of Water and Environment. https://faolex.fao.org/docs/pdf/uga176203.pdf.

[16] ROG. 2016a. "Agriculture Sector Strategic Plan: 2015/16-2019/20 (draft)." Ministry of Agriculture, Animal Industry and Fisheries. https://faolex.fao.org/docs/pdf/uga181565.pdf.

[17] FAOSTAT. 2022. "For cattle, the change in pasture area is based on the FAOSTAT categories: land under permanent meadows and pastures, land under temporary meadows and pastures, and temporary fallow." The extent of plantations is sourced from FAO FRA 2020 https://fra-platform.herokuapp.com/UGA/fra2020/extentOfForest/.

[18] GFW. 2023. "Uganda." Global Forest Watch. https://www.globalforestwatch.org/map/country/UGA/?map=eyJjYW5Cb3VuZCI6ZmFsc2V9.

[19] Ibid.

[20] FAO 2020

[21] GFW 2023

[22] GFW 2023

[23] GFW 2023

[24] GFW 2023

[25] FAO. 2020a. Global Forest Resources Assessment 2020, Main Report. Rome, Italy: FAO. Accessed March 24, 2022. http://www.fao.org/3/ca9825en/CA9825EN.pdf.

[26] ROG 2013a. National Forest Plan. https://mwe.go.ug/sites/default/files/National%20Forest%20Plan%20Uganda.pdf.

[27] FAOSTAT. 2022.

[28] FAOSTAT. 2022. "For cattle, the change in pasture area is based on the FAOSTAT categories: land under permanent meadows and pastures, land under temporary meadows and pastures, and temporary fallow." The extent of plantations is sourced from FAO FRA 2020 https://fra-platform.herokuapp.com/UGA/fra2020/extentOfForest/.

[29] GFW. 2022.

[30] ROG. 2020. "National REDD+ Strategy and Action Plan."

[31] Ministry of Water and Environment. 2021. Uganda REDD+ Strategy, Second Edition. Accessed July 19, 2024. https://sfg.mwe.go.ug/wp-content/uploads/2022/01/Uganda-REDD-Strategy-Second-Edition-June-2021.pdf.

[32] Twongyirwe, Ronald, Mike Bithell, and Keith Richards. 2018. "Revisiting the drivers of deforestation in the tropics: Insights from local and key informant perceptions in western Uganda." *Journal of Rural Studies* 63: 105-119. https://www.sciencedirect.com/science/article/pii/S0743016717309142.

[33] World Bank. 2023. "Population Growth (annual %) – Uganda." World Bank. https://data.worldbank.org/indicator/SP.POP.GROW?locations=UG.

[34] ROG. 2020. "National REDD+ Strategy and Action Plan."

[35] ROG. 2014. "National State of the Environment Report for Uganda 2014." National Environment Management Authority. https://nema.go.ug/sites/all/themes/nema/docs/FINAL%20NSOER%202014.pdf.

[36] Kutiote, Emmauel, Patricia Tarlue, Nasir Umar, Prudence Chanda, Aisha-Lul A.N., Patricia Nalumansi, and Pius Mbuya. 2019. "Deforestation of Igwe Forest and its Effects on Livelihood Patterns of Peripheral Communities in Bugiri District, Uganda." African *Journal of Agriculture and Food Science* 2(1): 41-53. https://abjournals.org/african-journal-of-environment-and-natural-science-research-ajensr/wp-content/uploads/sites/15/journal/published_paper/volume-2/issue-1/AJENSR_0nC5KECf.pdf.

[37] Ignaciuk, Adriana, Jihae Kwon, Giuseppe Maggio, Marina Mastrorillo, and Nicholas Sitko. 2021. Harvesting trees to harvest cash crops: The role of internal migrants in forest land conversion in Uganda: FAO Agricultural Development Economics Working Paper 21-08. FAO. https://www.fao.org/agrifood-economics/publications/detail/en/c/1444893/.

[38] Kusiima, Samuel, Anthony Egeru, Justine Namaalwa, Patrick Byakagaba, David Mfitumukiza, Paul Mukwaya, Sylvanus Mensah, and Robert Asiimwe. 2022. "Interconnectedness of Ecosystem Services Potential with Land Use/Land Cover Change Dynamics in Western Uganda." *Land* 11(11): 2056. https://www.mdpi.com/2073-445X/11/11/2056.

[39] Kusiima et al. 2022.

[40] Opedes, Hosea, Sander Mücher, Jantiene Baartman, Shafiq Nedala, and Frank Mugagga. 2022. "Land Cover Change Detection and Subsistence Farming Dynamics in the Fringes of MENP, Uganda from 1978–2020." *Remote Sensing* 14(10): 2423. https://www.mdpi.com/2072-4292/14/10/2423.

[41] Ibid.

[42] Mugagga, Frank. 2015. "The Effect of Land Use on Carbon Stocks and Implications for Climate Variability on the Slopes of Mount Elgon, Eastern Uganda." *International Journal of Regional Development* 2(1): 58. https://www.researchgate.net/publication/276500728_The_Effect_of_Land_Use_on_Carbon_Stocks_and_Implications_for_Climate_Variability_on_the_Slopes_of_Mount_Elgon_Eastern_Uganda.

[43] Bamwesigye, Dastan, Azdren Doli, and Petra Hlavackova. 2020. "REDD+: An Analysis of Initiatives in East Africa Amidst Increasing Deforestation." *European Journal of Sustainable Development* 9(2): 224–237. https://ecsdev.org/ojs/index.php/ejsd/article/view/1023.

[44] Cavanagh, Connor Joseph and Tor Benjaminsen. 2017. "Guerrilla agriculture? A biopolitical guide to illicit cultivation within an IUCN Category II protected area." *The Journal of Peasant Studies* 42(3-4): 725-745. https://doi.org/10.1080/03066150.2014.993623.

[45] Waiswa, Daniel, Marc Stern, and Stephen Prisley. 2015. "Drivers of Deforestation in the Lake Victoria Crescent, Uganda." *Journal of Sustainable Forestry* 34(3): 259-275. https://doi.org/10.1080/10549811.2014.1003565.

[46] Twongyirwe et al. 2018.

[47] Ayoreka, Adolf. 2021. "Deprived of their forests, Uganda's Batwa adapt their sustainable practices." *Mongabay*, October 27, 2021. https://news.mongabay.com/2021/10/deprived-of-their-forests-ugandas-batwa-adapt-their-sustainable-practices/.

[48] Kasozi, Ephraim. 2021. "Court Condemns Government for Non-Payment of Batwa over Eviction." *Uganda Radio Network*, August 20, 2021. https://ugandaradionetwork.net/story/court-condemns-government-for-non-payment-of-batwa-over-eviction.

[49] Pendrill et al. 2022.

[50] Ibid.

[51] FAOSTAT. 2023.

[52] Kleih, Ulrich, David Phillips, John Jagwe, and Michael Kirya. 2019. "Cassava market and value chain analysis–Uganda case study." *Gates Open Res* 3(187). https://gatesopenresearch.org/documents/3-187.

[53] Akongo, Graceline, Otim Anyoni, Laban Turyagyenda, and Anton Bua. 2021. "Effects of Improved Cassava Varieties on Farmers' Income in Northern Agro-ecological Zone, Uganda." *Sustainable Agriculture Research* 10(2): 1-65. https://www.researchgate.net/publication/350788510_Effects_of_Improved_Cassava_Varieties_on_Farmers%27_Income_in_Northern_Agro-ecological_Zone_Uganda.

[54] Pendrill et al. 2022.

[55] ROG. 2021. "Statistical." Uganda Bureau of Statistics. https://www.ubos.org/publications/statistical/

[56] Tumuhimbise, Alex. 2021. "Rush to turn 'black diamonds' into cash eats up Uganda's forests, fruits." *Mongabay*, June 17, 2021. https://news.mongabay.com/2021/06/rush-to-turn-black-diamonds-into-cash-eats-up-ugandas-forests-fruits/.

[57] ROG. 2020.

[58] Twongyirwe et al. 2018.

[59] Tumuhimbise. 2021.

[60] Ibid.

[61] Kutiote et al. 2019.

[62] Mawa, Christopher, Fred Babweteera, and David Mwesigye Tumusiime. 2022. "Conservation outcomes of collaborative forest management in a medium altitude semideciduous forest in Mid-western Uganda." *Journal of sustainable forestry* 41(3-5): 461-480. https://doi.org/10.1080/10549811.2020.1841006.

[63] Twongyirwe et al. 2018.

[64] ROG. 2013a. "The National Forest Plan, 2011/12 – 2021/22." Ministry of Water and Environment. https://faolex.fao.org/docs/pdf/uga176203.pdf.

[65] FAO. 2020b.

[66] ROG. 2013.

[67] Tumuhe, Charles, Sylvia Nyamaizi, George Gawaya, and Juliet Kiguli. 2021. "Incentives Influencing Tree Planting in the Albertine Rift Region, Uganda." *Journal of Sustainable Forestry* 40(6): 558-572. https://doi.org/10.1080/10549811.2020.1790393.

[68] ROG. 2020.

[69] Arvola, Anne, Maria Brockhaus, Maarit Kallio, Thu Thuy Pham, Dao Thi Linh Chi, Hoang Tuan Long, Ani Adiwinata Nawir, Somvang Phimmavong, Reuben Mwamakimbullah, and Paul Jacovelli. 2020. "What drives smallholder tree growing? Enabling conditions in a changing policy environment." *Forest Policy and Economics* 116. https://doi.org/10.1016/j.forpol.2020.102173.

[70] Kagaha, David. "Contribution of small holder tree growers to government effort in increasing the tree cover in Uganda. A case study of Kaliro district." PhD diss., Makerere University, 2019. http://dissertations.mak.ac.ug/handle/20.500.12281/7095.

[71] Nabukwasi, Teddy. "Tree Growing and Diversity on Farm Landscapes in Buwalasi Sub-County, Uganda." PhD diss., Makerere University, 2020. http://makir.mak.ac.ug/handle/10570/8634?show=full.

[72] Odoi, Juventine, Joel Buyzina, and Clement Okia. 2019. "Tree seed and seedling supply and distribution system in Uganda." *Small-scale Forestry* 18(3): 309-321. https://www.researchgate.net/publication/333326563_Tree_Seed_and_Seedling_Supply_and_Distribution_System_in_Uganda.

[73] Musoke, Mike. "Tree farming expert system: a case of eucalyptus & pine species." PhD diss., Makerere University, 2019. http://makir.mak.ac.ug/handle/10570/9967.

[74] Arvola et al. 2020.

[75] Lyatuu, Justus. 2018. "Frustrated timber exporters beg government for permits." *The Observer,* November 12, 2018. https://observer.ug/businessnews/59158-frustrated-timber-exporters-beg-gov-t-for-permits.

[76] Kleih et al. 2019.

[77] Pendrill et al. 2022.

[78] FAOSTAT. 2022.

[79] FAOSTAT. 2022.

[80] Ibid.

[81] FAO. 2019. The future of livestock in Uganda: Opportunities and challenges in the face of uncertainty. Rome, Italy: FAO. https://www.fao.org/documents/card/en?details=ca5420en.

[82] ROG. 2013b. "National Agriculture Policy." Ministry of Agriculture, Animal Industry and Fisheries. https://faolex.fao.org/docs/pdf/uga160265.pdf.

[83] FAO. 2019.

[84] Ibid.

[85] Thornton, Philip, Dolapo Enahoro, Nelly Njiru, Mark van Wijk, Laurie Ashley, Laura Cramer, Polly Ericksen, and Michael Graham. 2019. Program for climate-smart livestock systems, country stocktake: Uganda. Nairobi, Kenya: International Livestock Research Institute (ILRI). https://cgspace.cgiar.org/handle/10568/106293.

[86] Mayanja, Maureen, John Morton, James Bugeza, and Akiiki Rubaire. 2022. "Livelihood profiles and adaptive capacity to manage food insecurity in pastoral communities in the central cattle corridor of Uganda." *Scientific African* 16. https://www.sciencedirect.com/science/article/pii/S2468227622000722.

[87] Nimusiima, Alex, Charles P.K. Basalirwa, Majaliwa J.G. Mwanjalolo, David Kirya, Revocatus Twinomuhangi, Fahd Rasul, Bob Ogwang, and M.I.A. Rehmani. 2018. "Predicting the Impacts of Climate Change Scenarios on Maize Yield in The Cattle Corridor of Central Uganda." *Journal of Environmental and Agricultural Sciences* 14: 63-78. https://www.researchgate.net/publication/325699947_Predicting_the_Impacts_of_Climate_Change_Scenarios_on_Maize_Yield_in_The_Cattle_Corridor_of_Central_Uganda.

[88] Byenkya, Gilbert, Swidiq Mugerwa, Steven Barasa, and Emmanuel Zziwa. 2014. "Land use and cover change in pastoral systems of Uganda: Implications on livestock management under drought induced pasture." *African Crop Science Journal* 22: 1013-1025. https://www.researchgate.net/publication/279497523_LAND_USE_AND_COVER_CHANGE_IN_PASTORAL_SYSTEMS_OF_UGANDA_IMPLICATIONS_ON_LIVESTOCK_MANAGEMENT_UNDER_DROUGHT_INDUCED_PASTURE.

[89] Ibid.

[90] ROG. 2020.

[91] Blum, Mareike, 2020. "Whose climate? Whose forest? Power struggles in a contested carbon forestry project in Uganda." *Forest Policy and Economics* 115. https://www.sciencedirect.com/science/article/pii/S138993411930382X.

[92] Ibid.

[93] Pendrill et al. 2022.

[94] Ibid.

[95] Ibid.

[96] FAOSTAT. 2022.

[97] OEC. 2023. "Uganda." OEC. https://oec.world/en/profile/country/uga. Accessed February 23, 2023.

[98] Ahmed M., 2012. Analysis of incentives and disincentives for maize in Uganda. Rome, Italy: FAO. https://www.fao.org/3/at587e/at587e.pdf.

[99] FAOSTAT. 2022.

[100] Ahmed. 2012.

[101] Ibid.

[102] Emmanuel, Okello. 2022a. "RDC intervenes in land row between Bunyoro kingdom and NFA." *Uganda Radio Network*, May 31, 2022. https://ugandaradionetwork.net/story/rdc-intervenes-in-land-row-between-bunyoro-kingdom-nfa-.

[103] Emmanuel, Okello. 2022b. "Security bosses investigate UPDF police officers for extortion in Bugoma Forest Reserve." *Uganda Radio Network*, August 21, 2022. https://ugandaradionetwork.net/story/security-bosses-investigate-updf-police-officers-for-extortion-in-bugoma-forest-reserve.

[104] Ojok, Michael. 2022. "Stray elephants destroy acres of crops in Nwoya." Observer, July 1, 2022. https://www.monitor.co.ug/uganda/news/national/stray-elephants-destroy-acres-of-crops-in-nwoya-3866040.

[105] Wallace, Graham and Catherine Hill. 2012. "Crop Damage by Primates: Quantifying the Key Parameters of Crop-Raiding Events." *PloS ONE* 7(10). https://www.researchgate.net/publication/232232967_Crop_Damage_by_Primates_Quantifying_the_Key_Parameters_of_Crop-Raiding_Events.

[106] Pendrill et al. 2022.

[107] FAOSTAT. 2022.

[108] Ibid.

[109] Pendrill et al. 2022.

[110] Kalule, David, Moses Biruma, and Carl Deom. 2010. "Overview of groundnuts research in Uganda: Past, present and future." *African Journal of Biotechnology* 9(39): 6448-6459. https://www.researchgate.net/publication/261508020_Overview_of_groundnuts_research_in_Uganda_Past_present_and_future/link/0deec5346a95cbd692000000/download.

[111] Witcombe, Alexia. 2021. "Nutrient Cycling on Smallholder Farms in Uganda and Malawi." PhD diss., Michigan State University, 2021. https://www.proquest.com/openview/677ce4c7e100a5b03a7942bb9d431c1a/1?pq-origsite=gscholar&cbl=18750&diss=y.

[112] Ibid.

[113] Pendrill et al. 2022.

[114] FAOSTAT. 2022.

[115] Ibid.

[116] Uganda Coffee Federation. 2021. "The Uganda Coffee Industry." Uganda Coffee Federation. https://ugandacoffeefederation.org/resource-center/uganda-coffee-industry/.

[117] International Coffee Organization. 2019. "Country Coffee Profile: Uganda." International Coffee Organization. https://www.ico.org/documents/cy2018-19/icc-124-8e-profile-uganda.pdf.

[118] Ugandan Coffee Federation. 2021.

[119] Austin, Kelly. 2017. "Brewing unequal exchanges in coffee: A qualitative investigation into the consequences of the java trade in rural Uganda." *Journal of World-Systems Research* 23(2): 326-352. https://www.researchgate.net/publication/319074765_Brewing_Unequal_Exchanges_in_Coffee_A_Qualitative_Investigation_into_the_Consequences_of_the_Java_Trade_in_Rural_Uganda.

[120] Social Impact Solutions (SHIFT). 2020. "Sustainable Living Incomes – Uganda: Living Income Benchmark Study and Report." SHIFT. https://www.shiftsocialimpact.com/slibenchmarksreport.

[121] Rainforest Alliance. 2021. "Origin Issue Assessment, Uganda – Coffee." Rainforest Alliance. https://www.rainforest-alliance.org/wp-content/uploads/2021/10/Origin-Issue-Assessment-Uganda.pdf.

[122] International Finance Corporation. 2023. "Global Map of Supply Chain Risks in Agro-Commodity Production." *International Finance Corporation*. https://gmaptool.org/report/overview/uga/coffee.

[123] Rainforest Alliance. 2021.

[124] Negawo, Worku and Dejene Beyene. 2017. "The role of coffee-based agroforestry system in tree diversity conservation in Eastern Uganda." *Journal of landscape Ecology* 10(2): 1-18. https://www.researchgate.net/publication/318184377_The_Role_of_Coffee_Based_Agroforestry_System_in_Tree_Diversity_Conservation_in_Eastern_Uganda.

[125] Austin, Kelly and Maria Theresa Mejia. 2019. "The political economy of landslides and international aid relief: a qualitative investigation in rural Uganda." *Journal of Political Ecology* 26(1): 720-737. https://www.researchgate.net/publication/338056072_The_political_economy_of_landslides_and_international_aid_relief_a_qualitative_investigation_in_rural_Uganda.

[126] Morjaria, Ameet and Martin Sprott. 2018. Ugandan Arabica Coffee Value Chain Opportunities. London, UK: International Growth Centre. https://www.theigc.org/sites/default/files/2018/09/Morjaria-and-Sprott-2018-final-paper.pdf.

[127] Uganda Coffee Development Authority. 2022. "Monthly Report – December 2022." Uganda Coffee Development Authority. https://ugandacoffee.go.ug/sites/default/files/2023-01/December%202022.pdf.

[128] Morjaria et al. 2018.

[129] SHIFT. 2020.

[130] Degroote, Emma. "The Colonial Legacy of Coffee Production bordering Mount Elgon National Park." Master's diss., Ghent University, 2021. https://lib.ugent.be/en/catalog/rug01:003013344?i=3&q=%22Emma+Degroote%22&search_field=author.

[131] Himmelfarb, David and Connor Joseph Cavanagh. 2018. "Managing the contradictions: Conservation, communitarian rhetoric, and conflict at Mount Elgon National Park." In Conservation and Development in Uganda, edited by Chris Sandbrook, Connor Joseph Cavanagh, and David Tumusiime, 85-103. Oxfordshire, UK: Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9781315200538-5/managing-contradictions-david-himmelfarb-connor-joseph-cavanagh.

[132] Vedeld, Pål, Connor Joseph Cavanagh, Jon Petursson, Charlotte Nakakaawa, Ricarda Moll, and Espen Sjaastad. 2016. "The political economy of conservation at Mount Elgon, Uganda: Between local deprivation, regional sustainability, and global public goods." *Conservation and Society* 14(3): 183-194. https://www.researchgate.net/publication/308680440_The_Political_Economy_of_Conservation_at_Mount_Elgon_Uganda_Between_Local_Deprivation_Regional_Sustainability_and_Global_Public_Goods.

[133] Petursson, Jon and Pål Vedeld. 2015. "The 'nine lives' of protected areas. A historical-institutional analysis from the transboundary Mt Elgon, Uganda and Kenya." *Land Use Policy* 42: 251-263. https://www.sciencedirect.com/science/article/abs/pii/S0264837714001756.

[134] International Coffee Organization. 2019.

[135] Solymosi, Katalin and Grit Techel. 2019. Brewing up climate resilience in the coffee sector: Adaptation strategies for farmers, plantations, and producers. Utrecht, The Netherlands: IDH. https://www.idhsustainabletrade.com/uploaded/2019/06/Brewing-up-climate-resilience-in-the-coffee-sector-1.pdf.

[136] SHIFT. 2020.

[137] Rainforest Alliance. 2021.

[138] ROG. 2016a. "Agriculture Sector Strategic Plan: 2015/16-2019/20 (draft)." Ministry of Agriculture, Animal Industry and Fisheries. https://faolex.fao.org/docs/pdf/uga181565.pdf.

[139] Solymosi et al. 2019.

[140] Uganda Coffee Development Authority. 2017. "Coffee Roadmap." Uganda Coffee Development Authority. https://ugandacoffee.go.ug/coffee-roadmap.

[141] International Center for Tropical Agriculture (CIAT). 2019. "Climate-smart coffee in Uganda." International Center for Tropical Agriculture. https://alliancebioversityciat.org/stories/climate-smart-coffee-uganda.

[142] ROG. 2018. "National Adaptation Plan for the Agricultural Sector." Ministry of Agriculture, Animal Industry and Fisheries. https://faolex.fao.org/docs/pdf/uga192521.pdf.

[143] OEC. 2023.

[144] Ibid.

[145] Pendrill et al. 2022.

[146] Chaves, Leonardo, Jacob Fry, Arunima Malik, Arne Geschke, Maria Sallum, and Manfred Lenzen. 2020. "Global consumption and international trade in deforestation-associated commodities could influence malaria risk." *Nature Communications* 11(1): 1-10. https://www.nature.com/articles/s41467-020-14954-1.

[147] Rainforest Alliance. 2022. "Coffee certification data report 2021." Rainforest Alliance. https://www.rainforest-alliance.org/wp-content/uploads/2022/05/Coffee-Certification-Data-Report-2021.pdf. Accessed February 23, 2023.

[148] Wexler, Josie. 2022. "Tea and coffee certification schemes." Ethical Consumer, April 11, 2022. https://www.ethicalconsumer.org/food-drink/tea-coffee-certification-schemes. Accessed 02.23.2023.

[149] Rainforest Alliance. 2022.

[150] Flocert. 2023. "Fairtrade customer search." Flocert. https://www.flocert.net/about-flocert/customer-search/

[151] GIZ. 2020. Boosting Organic Trade in Africa: Country Market Brief for Uganda. Eschborn, Germany: GIZ. https://www.giz.de/en/downloads/Market-Brief_Uganda_WEB.pdf.

[151] Pendrill et al. 2022.

[153] FAOSTAT. 2022.

[154] Ibid.

[155] OEC. 2023.

[156] Commodityfootprints.earth. "Tracking the environmental impacts embedded in commodity consumption." Commodityfootprints.earth. https://commodityfootprints.earth/. Accessed February 23, 2023.

[157] GIZ. 2021. Sector Brief Uganda: Organic Agriculture. Eschborn, Germany: GIZ. https://www.giz.de/de/downloads/SectorBrief_Uganda_Organic-Agriculture.pdf.

[158] Gopaulchan, David, Labert Motilal, Frances Bekele, Séverine Clause, James Ariko, Harriet Ejang, and Pathmanathan Umaharan. 2019. "Morphological and genetic diversity of cacao (Theobroma cacao L.) in Uganda." *Physiology and Molecular Biology of Plants* 25(2): 361–375. https://link.springer.com/article/10.1007/s12298-018-0632-2.

[159] GFW. 2022.

[160] ROG. 2003. National Forestry and Tree Planting Act, 2003. June 17, 2003. https://www.nfa.go.ug/images/National_Forestry_and_Tree_Planting_Act_2003.pdf. Accessed February 24, 2023.

[161] Ampaire, Edidah, Laurence Jassogne, Happy Providence, Mariola Acosta, Jennifer Twyman, Leigh Winowiecki, and Piet van Asten. 2017. "Institutional challenges to climate change adaptation: A case study on policy action gaps in Uganda." *Environmental Science & Policy* 75: 81-90. https://doi.org/10.1016/j.envsci.2017.05.013.

[162] ROG. 2016b.

[163] Waiswa et al. 2015.

[164] ROG. 2016b.

[165] Galabuzi, Charles, Gerald Eilu, Gorettie Nsubuga Nabanoga, Nelson Turyahabwe, Lucy Mulugo, Esezah Kakudidi, and Nicole Sibelet. 2015. "Has the evolution process of forestry policies in Uganda promoted deforestation?" *International Forestry Review* 17(3): 298-310. https://doi.org/10.1505/146554815815982657.

[166] Guyson, Nangayi. 2021. "Tourism provides up to 60% of the Uganda Wildlife Authority's operating revenue." Mongabay, December 21, 2021. https://news.mongabay.com/2021/12/lockdown-underscores-ugandas-overreliance-on-tourism-to-fund-conservation/.

[167] ROG. 2016b.

[168] ROG. 2019. The National Environment Act, 2019. February 24, 2019. https://nema.go.ug/projects/national-environment-act-2019.

[169] Convention on Biological Diversity. 2023. "Country Profiles: Uganda." Convention on Biological Diversity. https://www.cbd.int/countries/profile/?country=ug. Accessed February 24, 2023.

[170] GFW. 2022.

[171] Ibid.

[172] ROG. 2014.

[173] ROG. 2016b.

[174] van Soesbergen, Arnout, Andrew Arnell, Marieke Sassen, Benjamin Stuch, Rüdiger Schaldach, Jan Göpel, Joost Vervoort, Daniel Mason-D'Croz, Shahnila Islam, and Amanda Palazzo. 2017. "Exploring future agricultural development and biodiversity in Uganda, Rwanda and Burundi: a spatially explicit scenario-based assessment." *Regional Environmental Change* 17(5): 1409-1420. https://link.springer.com/article/10.1007/s10113-016-0983-6.

[175] Mongabay. 2022. "Cold case: Half-hearted prosecution lets ivory traffickers escape in Uganda." Mongabay, March 4, 2022. https://news.mongabay.com/2022/03/cold-case-half-hearted-prosecution-lets-ivory-traffickers-escape-in-uganda/.

[176] National Planning Authority. 2022. "National Development Plan." National Planning Authority. http://www.npa.go.ug/development-plans/national-development-plan-ndp/.

[177] Bendana. 2023.

[178] Ibid.

[179] Bamwesigye, Dastan, Raymond Chipfakacha, and Yeboah Evans. 2022. "Forest and Land Rights at a Time of Deforestation and Climate Change: Land and Resource Use Crisis in Uganda" *Land* 11(11). https://doi.org/10.3390/land11112092.

[180] Twongyirwe et al. 2018.

[181] Jeary, Katy, Matt Kandel, Giuliano Martiniello, and Ronald Twongyirwe. 2018. "Conservation and agriculture: finding an optimal balance?" In Conservation and Development in Uganda, edited by Chris Sandbrook, Connor Joseph Cavanagh, and David Tumusiime. Oxfordshire, UK: Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9781315200538-10/conservation-agriculture-katy-jeary-matt-kandel-giuliano-martiniello-ronald-twongyirwe?context=ubx&refId=a4ad52ff-dbfa-42b8-98df-aff808988818.

[182] Mawa et al. 2020.

[183] Jayachandran, Seema, Joost de Laat, Eric Lambin, Charlotte Stanton, Robin Audy, and Nancy Thomas. 2017. "Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation." *Science* 357(6348): 267-273. https://www.science.org/doi/10.1126/science.aan0568.

[184] Cárdenas, Juan Camilo. 2017. "Cash incentives avert deforestation." *Nature Climate Change* 7(10): 688-689. https://www.nature.com/articles/nclimate3397.

[185] Abman, Ryan, Teevrat Gar, Yao Pan, and Saurabh Singhal. 2020. "Agriculture and deforestation." Available at SSRN 3692682. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3692682.

[186] World Bank. "World Bank invests 148.2 million to improve Uganda's forest management and provide benefits to communities including refugees." Press release, April 23, 2020. https://www.worldbank.org/en/news/press-release/2020/04/23/world-bank-invests-1482-million-to-improve-ugandas-forest-management-and-provide-benefits-to-communities-including-refugees. Accessed February 23, 2023.

[187] Bamwesigye et al. 2022.

[188] Gyuse, Terna. 2022. "Ugandan activists' arrest slammed as threat to space for rights defenders." *Mongabay*, October 28, 2021. https://news.mongabay.com/2021/10/ugandan-activists-arrest-slammed-as-threat-to-space-for-rights-defenders/

This Illegal Deforestation and Agricultural Commodities Dashboard (Dashboard) was drafted by Forest Trends and funded by a grant from the United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs. The opinions, findings, and conclusions stated herein are those of the authors and do not necessarily reflect those of the United States Department of State or any other party. The United States supports efforts to raise awareness of and combat global illegal logging and associated trade. This dashboard contributes to these ongoing efforts.