

Foreign Agricultural Service

Global Market Analysis

International Production Assessment Division

Web: <https://ipad.fas.usda.gov>

October 13, 2022

Commodity Intelligence Report

Brazil Palm Oil: Potential and Pitfalls

About 84 percent of global palm oil production comes from Malaysia & Indonesia (USDA-FAS PSD, Palm Oil Explorer). The Brazilian share of global palm oil production is only about 1 percent (570,000 tons), ranking 10th overall. However, Brazil plans to increase its share of the lucrative crop over the next decade. Given what Brazil has accomplished for soybeans and corn in the last decade (increasing production by 87 percent and 55 percent respectively), it's possible they may achieve their goal. From 2010 to 2020, Brazil almost doubled the cultivated area for oil palm and expects to double the area again by 2025 according to Abrapalma (palm oil producers association in Brazil; Figure 1).

Palm Oil Plant

The palm oil plant, *Elaeis guineenses*, belongs to the *Aceraceae* family comprising coconut and date palm and originates from West Africa. Key climatic factors affecting cultivation of palm oil are rainfall, temperature, solar radiation, and relative humidity (Goh et al. 2011). Oil palm requires evenly distributed annual rainfall over 2500 millimeters (mm) or over 150 mm monthly on slightly acidic, well-drained soils for optimal growth. Studies indicate water stress when rainfall is below 100 mm per month resulting in premature senescence and abortion of fruit bunches leading to yield reduction (Benezoli et al. 2021; Wottiez et al. 2017). The crop thrives in tropical humid regions where temperatures range between 22 to 32°C with over 75 percent humidity. The main palm oil producing state in Brazil, Pará, is characterized by over 2800 mm of rainfall (Figure 2), and an average annual air temperature of 26 °C with over 70 percent humidity. Rainfall exceeds 100 mm even in the drier months of August and September.

Although trees begin flowering about 18 months after planting, these early flowers (separate male and female flowers) are removed to promote robust stem and root development. Fruit harvest can begin 2.5 to 3 years after planting with a 25-year life cycle (Goh et al. 2011). Oil palm plantations are often grown in agroforestry intercropping systems with the crops varying during early years. Good management practices and inputs during the first 3 years lead to greater yields, up to 25 tons per fresh fruit bunches/hectare in mature trees. The first 4 to 8 years often yield lower fruit quantities, after which yields remain stable until the trees are 25 years old when yields begin to decline. Once trees are mature, fresh fruit bunches can be harvested every 10 to 14 days. The oil palm is a versatile oil crop that produces a high quantity of oil with a low land footprint, producing 36 percent of global oil production on 8.6 percent of vegetable oil land (Figure 3, Ritchie & Roser 2021). Soybean oil, in comparison, accounts for 26 percent of

total oil production on 39 percent of oil croplands. This makes oil palm highly attractive for small producers looking for a regular source of income.

Growth in Brazil

Brazil's entry into the palm oil market is relatively recent, dating back to 2010 when the federal government launched the Sustainable Palm Oil Production Programme (SPOPP). The main objectives of SPOPP were to foster partnerships between agribusiness and smallholder farmers while developing rural communities, minimize negative environmental impacts from oil palm area expansion, and recover degraded lands (Brandão & Schoneveld 2015). By switching from staples such as cassava to palm oil, the government estimated that a farming family could increase income four-fold. More than 80 percent of palm oil in Brazil is produced in the Amazonian state of Pará where the climate offers an ideal combination of heat, a sufficient number of sunny days, and consistent rain throughout the year (Figures 4 and 5). Initial trials were conducted in the *cerrado* region, but land prices are expensive in the *cerrado* with rains more seasonal and a distinct dry season unsuitable for oil palm.

Brazil ranks 10th globally in palm oil production at 570,000 tons in MY 22/23 (Figure 1), 20,000 tons larger than last year (4 percent) on large industrial plantations. Area is estimated at 190,000 hectares, 5,000 hectares larger than last year (3 percent). Yield is estimated at 3.0 metric tons per hectare (mt/ha).

Pará in Brazil has experienced over 200 percent growth in harvested area just in the last decade increasing from 54 to 189,000 hectares (Figure 6, Brandão and Schoneveld, 2015). The other main state growing oil palm is Bahia, where acreage has declined in the last six years from 54 to 13,000 hectares. A new frontier for palm oil production is developing in the Amazon state of Roraima (Ionova 2021), where there is scant data. In 2021, acreage was concentrated in Pará (82 percent of total production), followed by Bahia (16 percent of total production). Peak oil palm harvest occurs during the month of September in Pará.

Oil palm cultivation in Brazil is concentrated on large plantations. Studies point to less than 10 percent area on small farms in Brazil. For example, family farms account for 6.8 percent of the total oil palm area in the state of Pará (Brandão & Schoneveld 2021). These are the farms contracted to feed into the large companies who require small farms to be at least 10 hectares. However, farm sizes less than 10 hectares remain largely unaccounted for. The global palm oil mapping project aims to fill this gap using 10 m Sentinel-2 imagery (Descals et al. 2021).

Opportunities and Challenges for Growth

Globally, growth in palm oil production has skyrocketed because of increasing demand from usage in cosmetics, food products, health products, cattle-feed, and the automotive biodiesel industry. Brazil's palm oil sector is small and has the potential to channel growth into industrial plantations. Brazil contains the largest land area globally that is suitable to

grow oil palm, roughly 50 percent of its land mass (Pirker et al. 2016). The opportunity lies in converting large scale, low-yielding cattle pastures, or degraded lands to oil palm. Larger industrial plantations can be better monitored to meet sustainability goals, while small-scale farms are more challenging to monitor (Figure 7, Descals et al. 2021).

The main challenge to Brazil's expansion of palm oil is that suitable land lies in the biodiversity hotspot of the Amazon rainforest with restrictions on growth. Observers have been raising the alarm that growth in the palm oil sector could come at the expense of further deforestation, conflict, and land grabs. The state of Pará lost almost 9.7 million hectares (11 percent) of its primary humid forest between 2001 and 2021, mostly to agriculture and pasture, according to Global Forest Watch. The primary fear from observers is when primary forest land is directly converted to oil palm (Ionova 2021). In addition to deforestation, expansion of palm oil acreage has resulted in higher land prices, further exacerbating conflict between indigenous groups and new arrivals.

Major production challenges faced by smallholders are expensive high-yielding seed varieties and seedlings, high fertilizer costs, high labor costs, poor road infrastructure, high post-harvest losses, and low market prices offered at processing mills. Other than meeting sustainability challenges, additional threats to oil palm include rising incidence of diseases and pests and greater weather variability due to rising temperatures and reduced rainfall. Simulation modeling predicted greater palm tree mortality under climate change (Murphy et al. 2021) scenarios. Efforts are now underway to develop new cultivars that can be grown outside the humid tropics, and which display greater tolerance to drought. Furthermore, molecular technologies such as CRISPR-Cas-9 offer novel approaches to use gene editing to confer disease resistance, breed more compact trees, and improve yields (Murphy et al. 2021). Replanting low-yielding older trees with newer varieties is expected to increase yields without a parallel increase in the environmental footprint (Murphy et al. 2021).

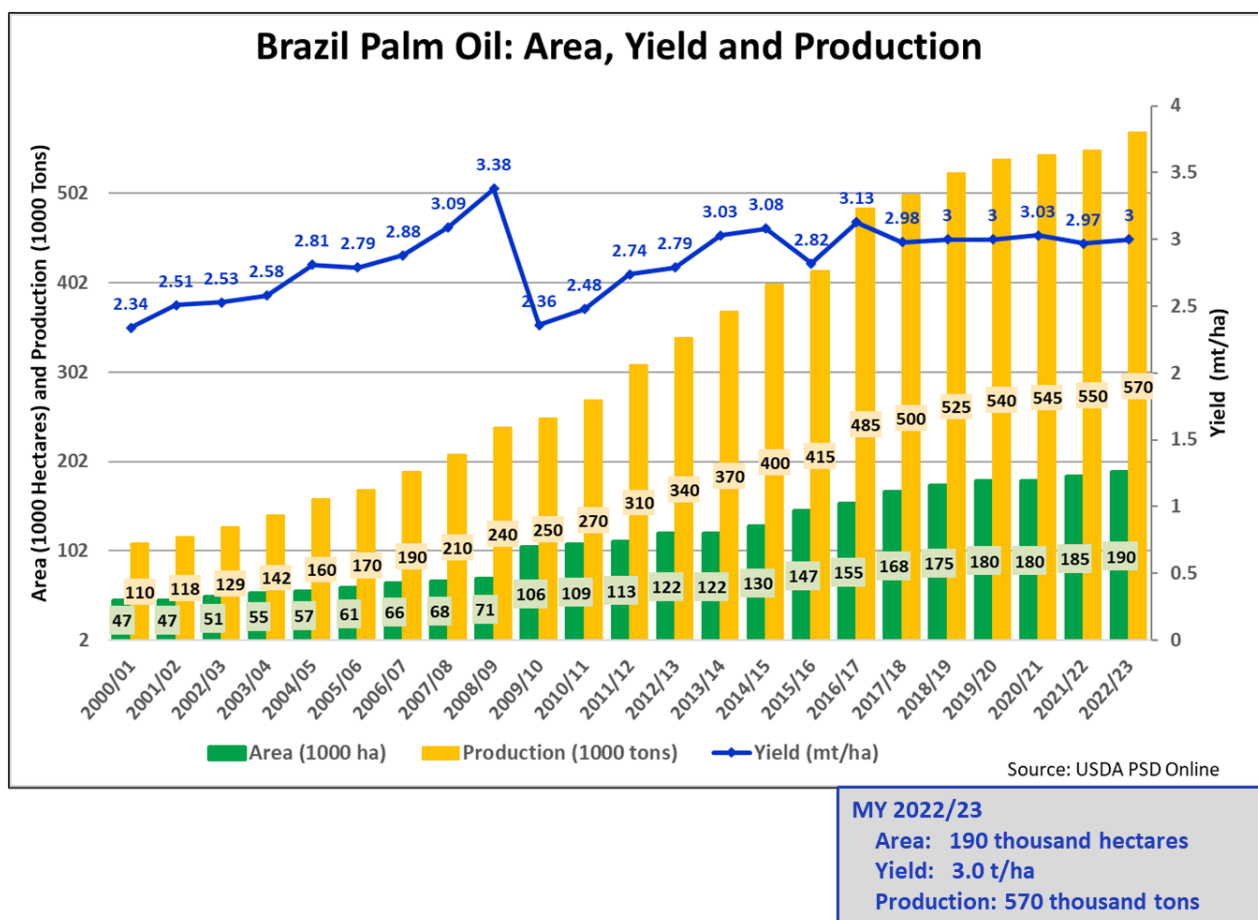


Figure 1. Brazil palm oil area, yield, and production since 2000. Source USDA PSD Online.

Brazil Mean Annual Precipitation, 2018-2021

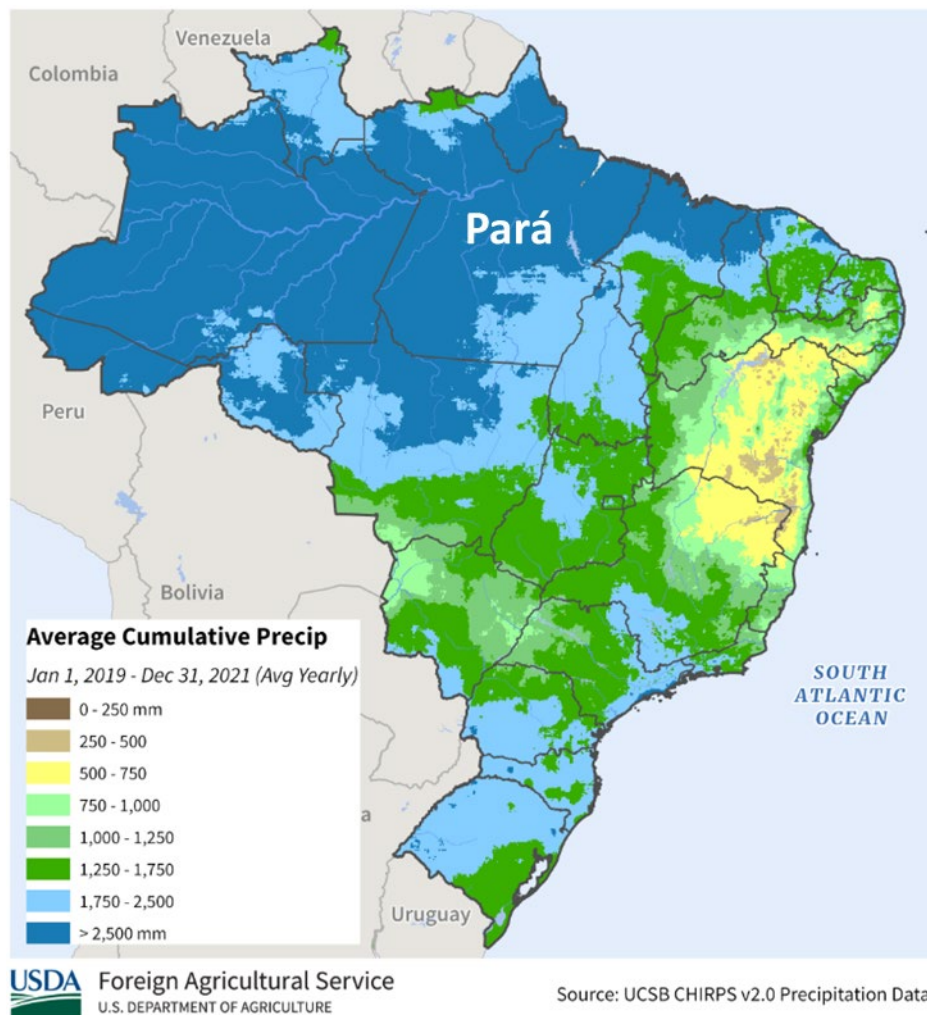


Figure 2. Mean annual rainfall in Brazil. Source: UCSB CHIRPS.

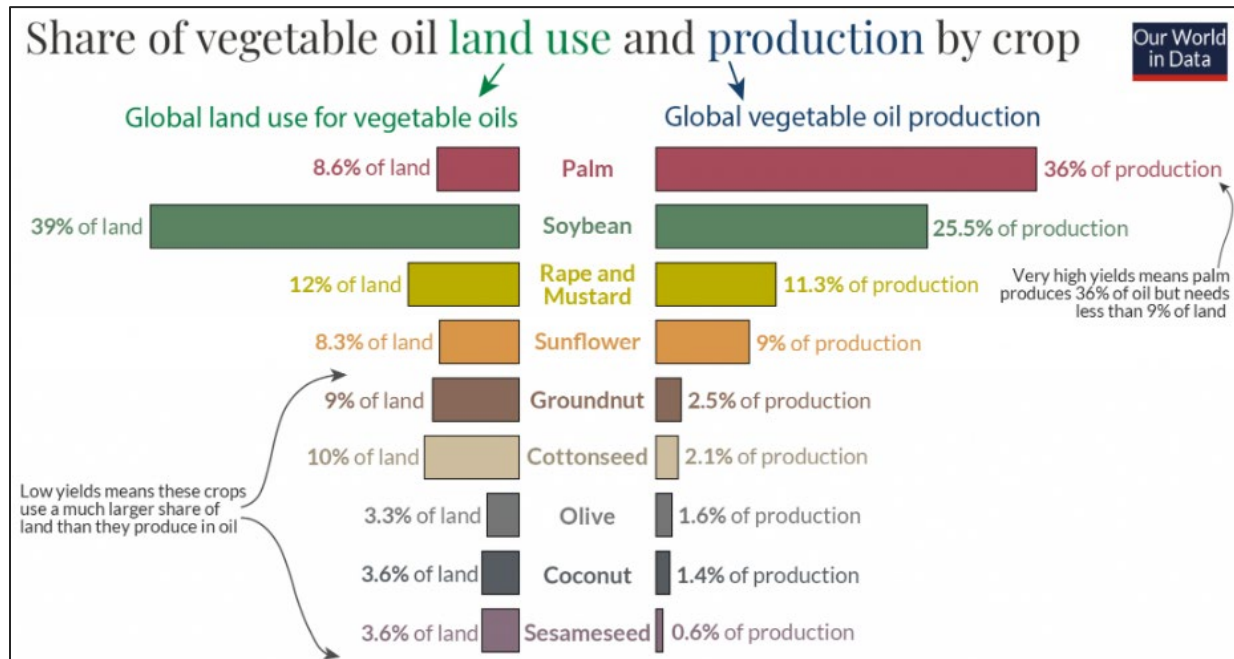


Figure 3. The oil palm crop is the most efficient oil crop, producing the largest yield per unit of land area. Source: Calculated by Ourworldindata.org/cropyields based on data from the UN Food and Agriculture Organization (FAO).

Brazil Palm Oil Plantations and Mills

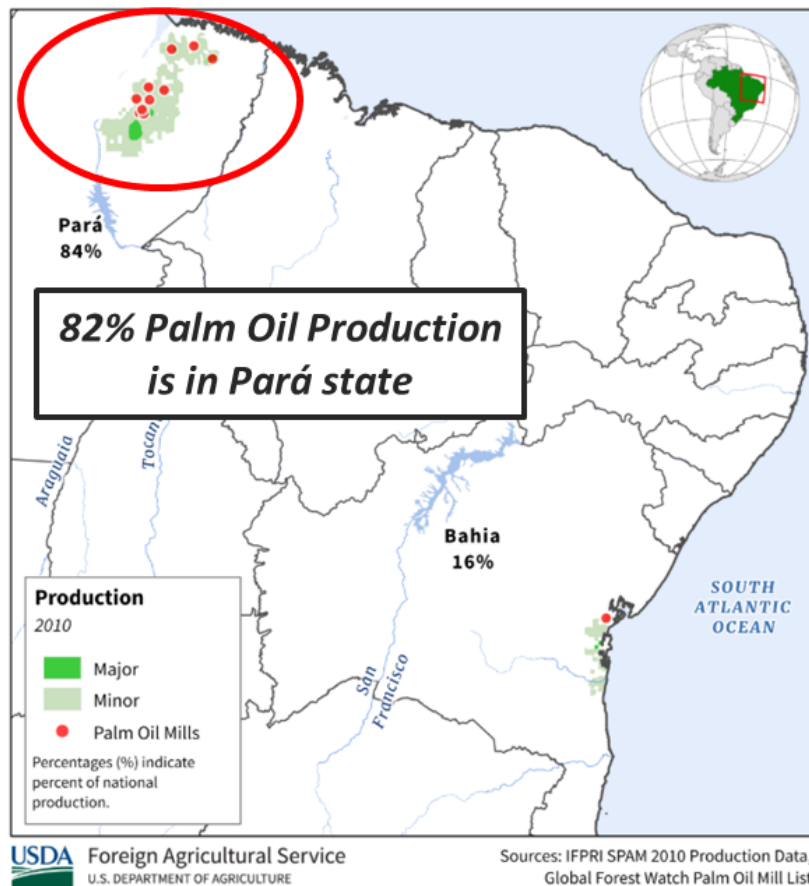


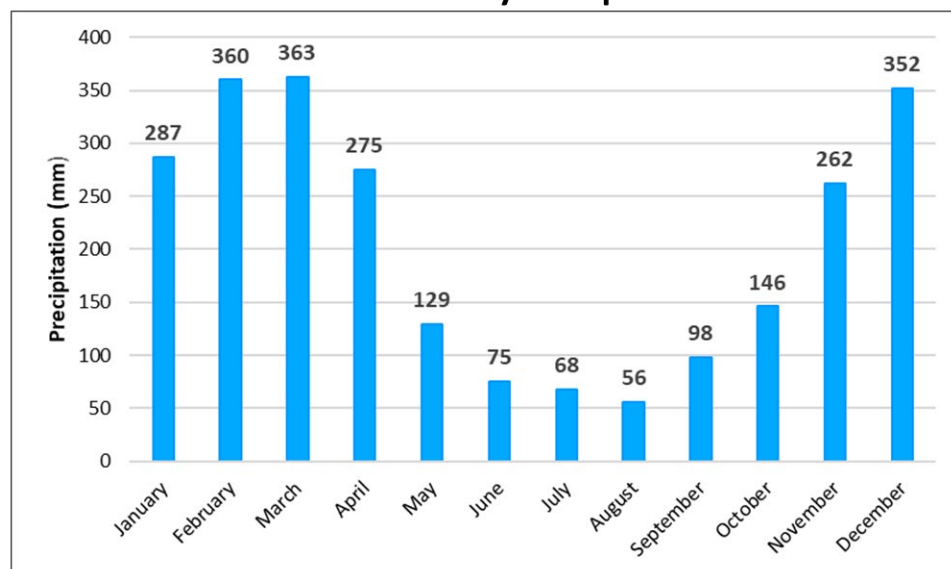
Figure 4. The majority of Brazil's oil palm crop is grown in two states – Pará (82 percent of total) and Bahia (roughly 16 percent of total production). Mills are generally located on the plantations or nearby to maintain a high quality. Fresh fruit bunches need to be processed within 48 hours to avoid the oil going rancid. Sources: IBGE, IFPRI Spatial Production Allocation Model, Global Forest Watch palm oil mills list.

Brazil Biomes



(a)

Brazil Palm Oil : Mean Monthly Precipitation in Pará State



Source: UCSB CHIRPS

(b)

Figure 5. (a) The palm oil plant grows best in tropical humid regions of the world. In Brazil, the state of Pará, in the Amazon ecoregion, produces 82 percent of Brazil palm oil production. (b) Monthly precipitation averages 200 mm and annual totals are over 2400 mm in 2021. Source: Hargreaves, P. (2008). Phytosociology in Brazil. *J Plant Sci Biotechnol*, UCSB CHIRPS.

Brazil Palm Oil: State Level Area Harvested, Yield and Production

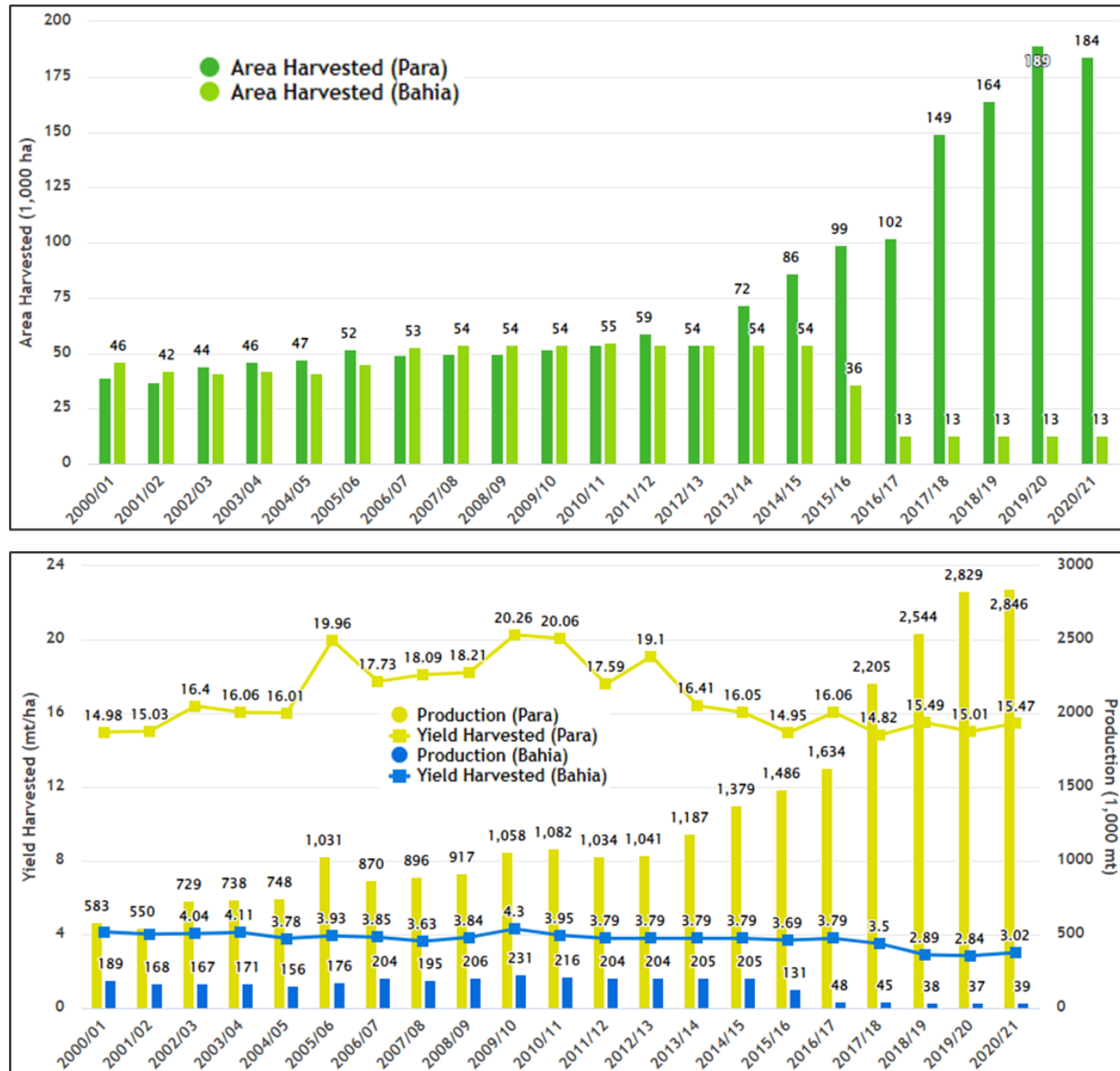


Figure 6. State-level palm oil area and production. Area tripled in the state of Pará while area reduced in Bahia. Source: IBGE.

Brazil Palm Oil Plantations and Mills

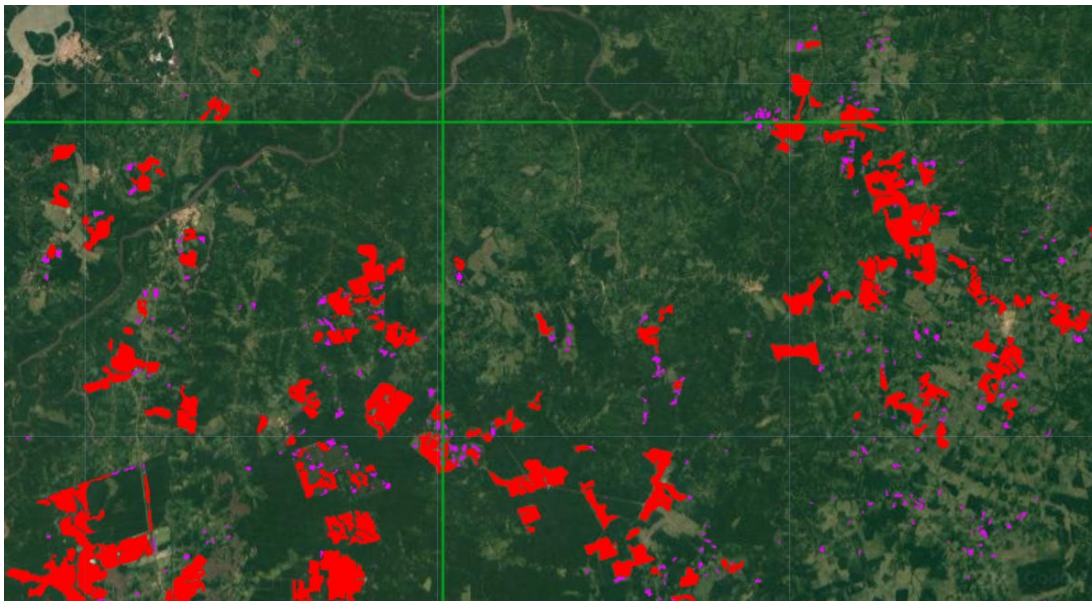
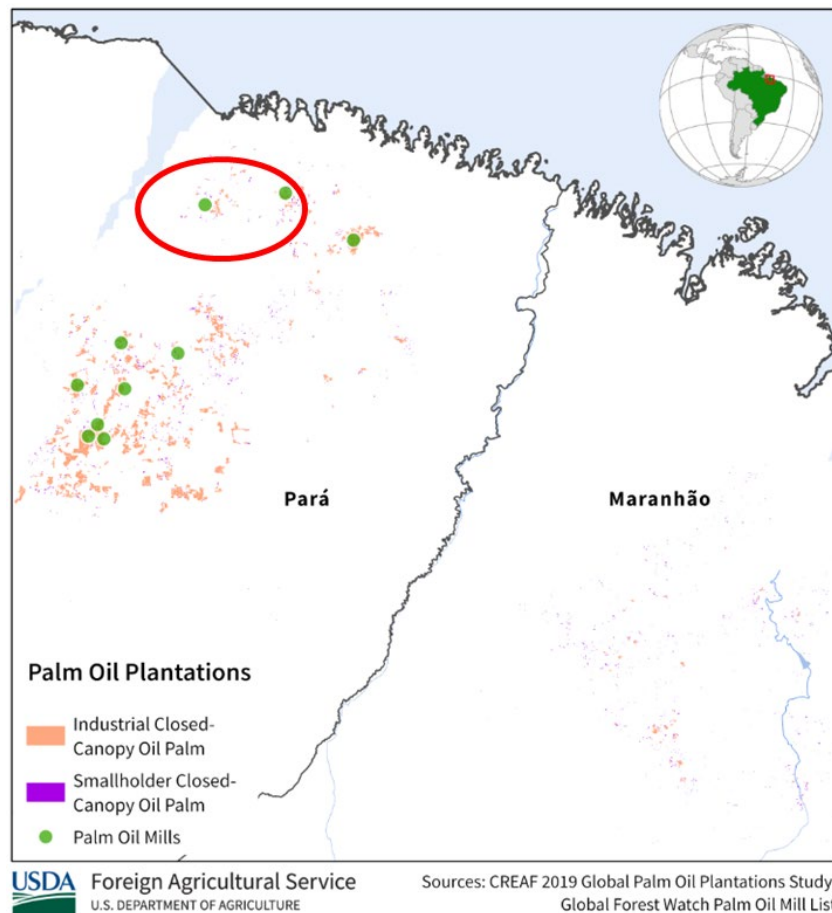


Figure 7. National production estimates for Brazil only include large plantations and therefore miss the growth of smallholder plantations. Mapping efforts such as the global oil palm map highlight smallholder areas. Bottom map shows more details from the encircled area in the top map. Source: Global Palm Oil Map (Descals et al. 2021), Global Forest Watch palm oil mills list.

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