Demand side campaigns in LULUCF:

Assessing the potential application of demand side campaigns to reduce GHG emissions associated with key agricultural and forestry commodities

April 2010

CEA California Environmental Associates

This study was commissioned by The Climate and Land Use Alliance, a partnership of the ClimateWorks, Ford, Moore, and Packard Foundations.

Executive summary

CEA California Environmental Associates

Demand-side work will not be a *solution*; it is a powerful *tool* to promote better national and international land use policy.

There are three main constraints to keep in mind:

1. Empirical success of *direct* market approaches has been limited to date
2. Success in any one region is likely to be tempered by the leakage of emissions to other regions
3. U.S. and E.U. control a small and diminishing fraction of the end market for key commodities

CEA California Environmental Associates

1. Empirical success of *direct* market approaches is not encouraging: shifting markets rather than stopping markets

- Certification has been a valuable tool, but not a global solution
  - Organics: <1% globally, 2.5% in the U.S., 4-5% Europe
  - FSC: <1% of global forests
  - No certification scheme has attained more than 10% market adoption
  - WWF dialogues (RSPO, BSI, RTRS) are an experiment in mass certification, but still only intend to cover 20-50% of the applicable market (in theory)
  - Little clear consumer willingness-to-pay for eco-labels
- Voluntary certification is an ineffective tool for land-use protection
  - There's typically another buyer for the land. For example, in Indonesia – Wilmar protected high conservation value forest in order to be compliant with RSPO. The local government ended up rescinding the permit, and sold the land to another company
- Other market approaches (boycotts, financing, retail standards) have the same limitation: they shift the market, they don't end the market
- Ultimately, we don't care about the commodities *per se*; we care about the land, so market work is an indirect mechanism to create change

CEA California Environmental Associates

2. Leakage: overall demand for commodities is inelastic and convertible land is cheap and abundant

- Demand for food and biofuels is expected to increase cropland 17 - 44% by 2020
- Total commodity demand is essentially inelastic:
  - "The demand for overall food and feed—as opposed to any particular grain—is inelastic. Increases in cropland will provide most replacement grain because they are cost-effective and fast (Searchinger, 2008)."
- Land is cheap: it's the easiest way to produce crops
  - The world has many convertible acres – maybe up to 2.5 billion hectares
- Marginal elasticity of land use is high
  - Searchinger (2008) estimated that 84% of the land used for U.S. corn ethanol production would be replaced by land put into production elsewhere

Data source: Searchinger 2008

CEA California Environmental Associates

3. The U.S. and E.U. control a small and diminishing fraction of the end market for key commodities

- The U.S. and E.U. comprise only 16% of global population, falling to <10% this century. The U.S. and E.U.'s shares of our target commodities are disproportionately small:
  - Brazilian beef: ~7%
  - Indonesian palm oil: ~10%
  - Indonesian pulp and paper: unknown – but little direct consumption
- Financing is also shifting to the developing world through the growth of sovereign wealth funds and domestic banks. Engaged banks (e.g. Equator Principle banks) play a small role for our target commodities
  - Palm oil financing dominated by banks in Indonesia, China, Malaysia and Singapore
  - Brazilian financing dominated by Brazilian national banks
  - Planned growth in the Congo driven by the Chinese

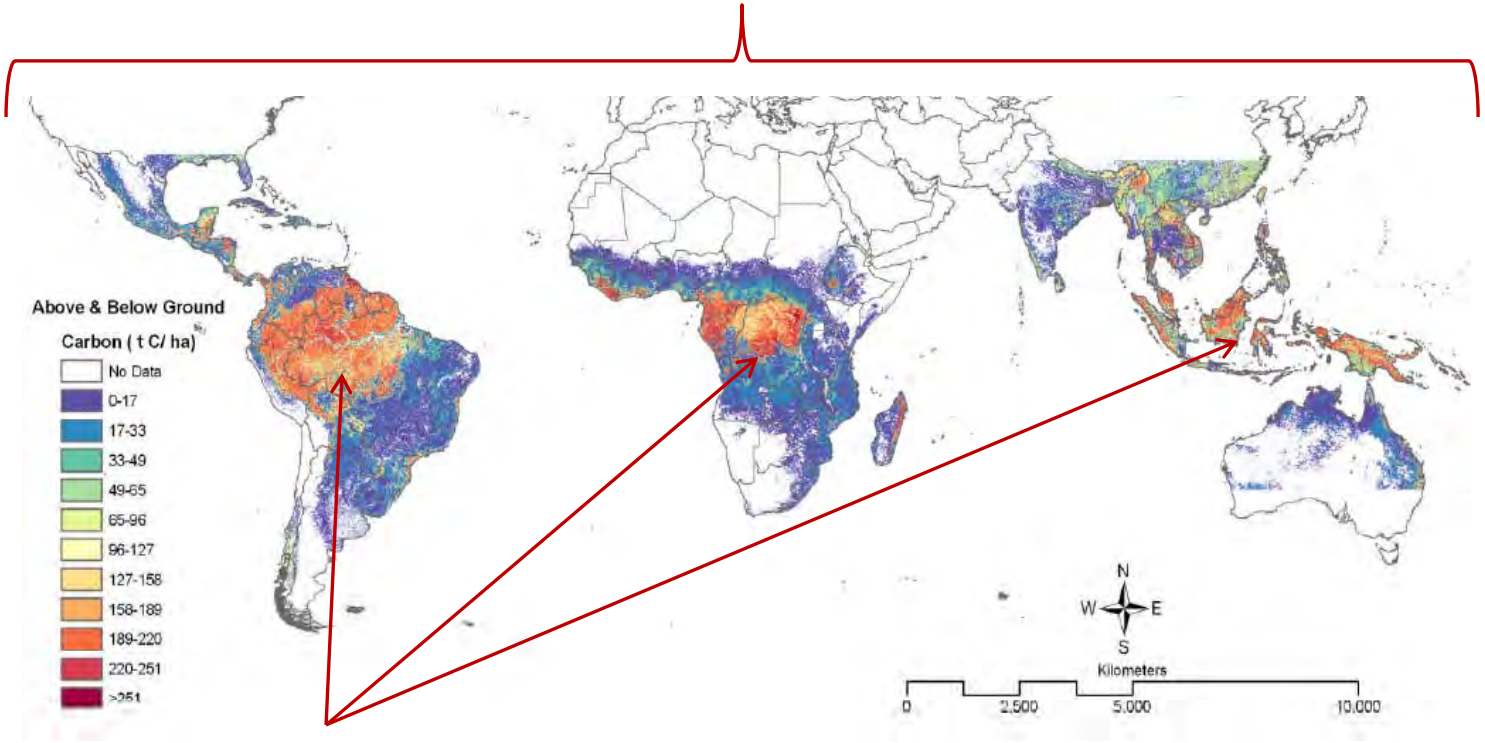
CEA California Environmental Associates

Guiding principles: how to create effective demand side campaigns

1. Place market work in service to domestic land use policy reform efforts
   - Moratoriums and purchasing standards are not universal and do not apply across commodities. We may be able to slow leakage rates but if the emissions occur in 30 years rather than 10 years, we see little gain
   - *Permanence* requires strong land use policy. The role of the market is to create controversy and political space to build and enforce policy reform
2. Prioritize protection of carbon *dense* landscapes with high projected emissions rates
   - Stopping emissions from carbon dense landscapes with the highest emissions rates minimize losses to leakage, especially in the short run
3. Along with multinational brands, leverage trade and biofuel mandate policies to swing markets
   - To address our limited market share, we can recruit more multinational corporations as allies, and use trade policies and biofuel mandates to broaden our reach

Executive summary

Top Down: Over the long-run, shift global demand for commodities driving deforestation, while moving toward a robust REDD system



Bottom Up: In the near term, use demand-side campaigns to slow or stem deforestation in critical hotspots

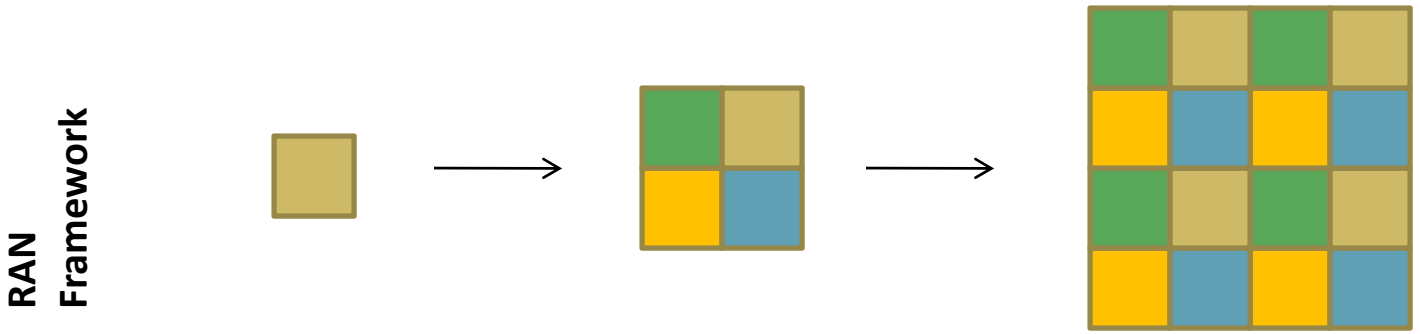
Data source: Figure from EPA 2010, from Saatchi et al. (in prep)

CEA California Environmental Associates

Bottom-up approach: protect the hotspots

Objective: Use market campaigns to stop the hemorrhaging of GHGs from *critical high-carbon lands*

- Campaigns have little hope of changing the market directly. Instead, demand-side campaigns can leverage financing or producer reform, which in turn can increase the political space for more lasting land use solutions. To have the best shot at success, campaigns need to be integrated, multi-pronged efforts:
  - Major buyer engagement, ideally centered around simple product moratoriums
  - Squeezing financing at any relevant choke points
  - Certification as a supporting mechanism to cultivate new political allies and improve traceability for progressive buyer and banks
  - Threat of regulatory drivers in developed markets (Lacey Act, FLEGT, etc.) that further motivate policy reform (fear of market share loss)



CEA California Environmental Associates

Bottom-up goals

1. Brazil: Zero deforestation in the Amazon by 2020. Cut rate of Cerrado deforestation in half

2. Indonesia: Moratorium on further peat conversion by 2012, moving to a zero deforestation policy by 2020

3. Scope prevention in emerging hotspots, e.g. DRC

CEA California Environmental Associates

Top-down approach: reshape global commodity demand

Objective: Reduce net demand for commodities driving land use change and emitting GHGs

- Adjust domestic trade policies to shift commodity economics
  - Biofuels**:** Biofuel mandates in US, EU, Australia, and Japan need to incorporate an ILUC factor. Biofuels account for 14 million ha or 1% of global cropland, but are projected to grow to 50-165 million ha by 2020, representing 11% to 83% of the additional global agricultural land requirement (Gallagher Review, 2008)
  - Apply legality requirements down the supply change: Engage intermediate countries (China, India) as partial allies through the broadened application of illegal trade policies (Lacey Act, Illegal Timber Regulations)
  - Consider trade policy: Shift demand for agricultural commodities to countries with REDD+ agreements through trade incentives (e.g. FLEGT incentives).
- Broaden market engagement to support the growth of this work
  - Cultivate more business and finance allies in developed countries (FFD, Equator Banks)
  - Continued commodity certification dialogues (RSB, BSI, RSPO, cattle, etc.)

CEA California Environmental Associates

Top-down goals

1. Damage control on biofuel mandates: ILUC

2. Engage other countries through trade policy: Lacey Act, Illegal Timber Regulation, FLEGT

3. Build multinational corporate engagement: FFD, roundtables, bank reform to focus on investment community

4. Develop a vision to use market work to support the long-term implementation of an international REDD+ framework

Primary Findings

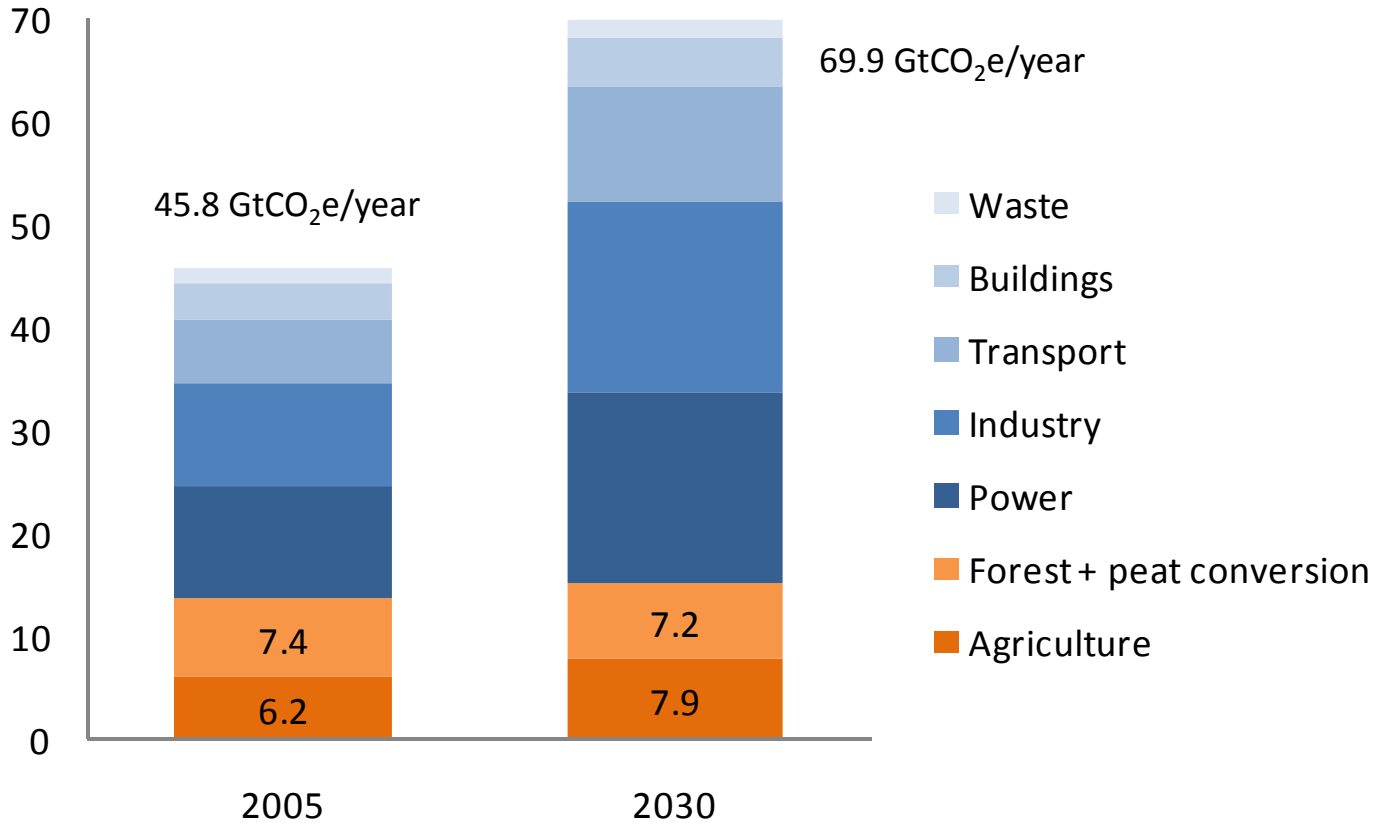
Carbon Analysis – which commodities are important?

Carbon logic

CEA California Environmental Associates

Emissions from land-use and land-use change are 30% of global emissions(13.6 Gt CO_2e/year); dropping as a percentage, but rising overall by 2030

- Projections are not reliable. They are based on historic growth rates, not bottom up estimates. They do not use global agricultural macro-economic modeling.



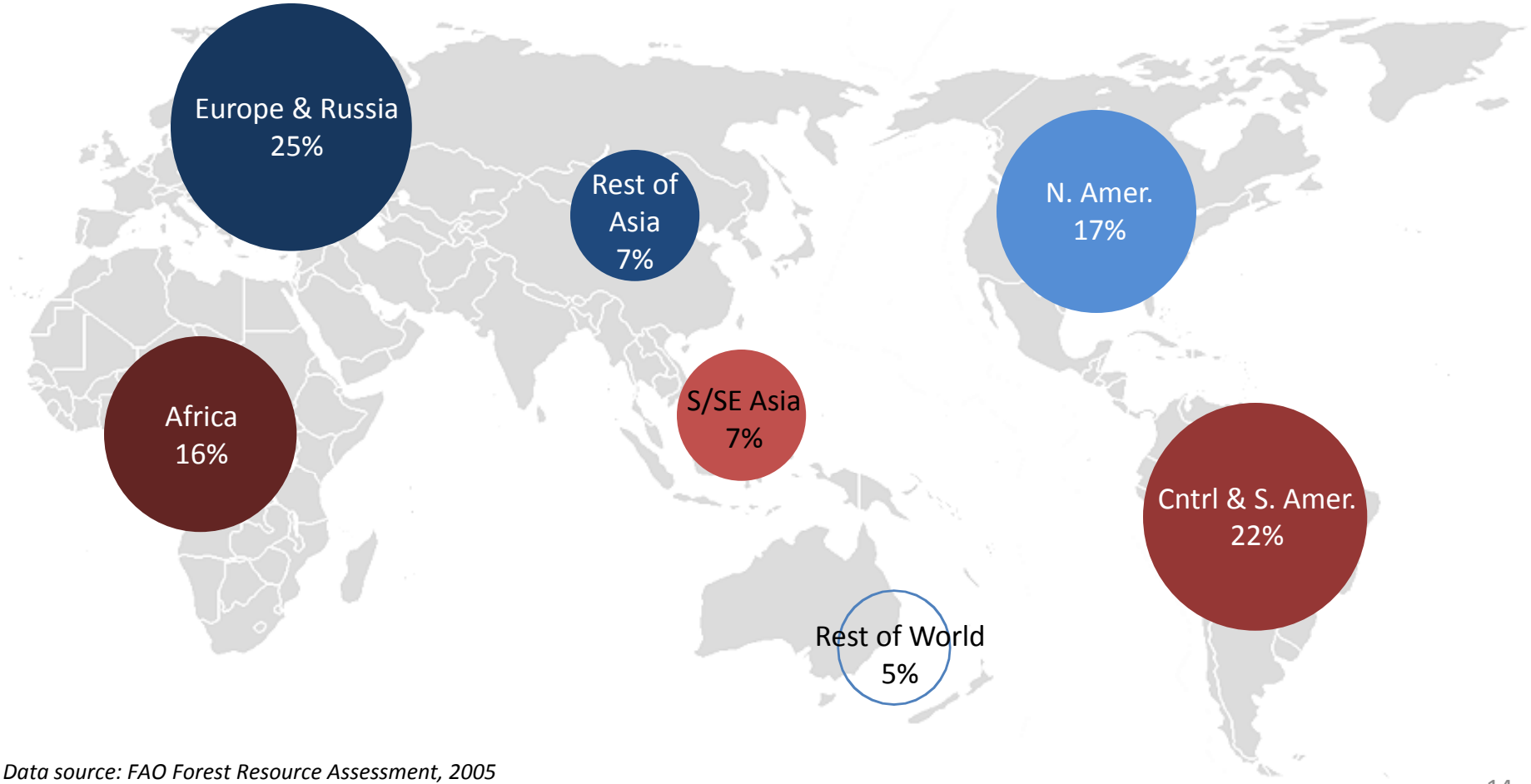
Data source: McKinsey Global Cost Curve 2.0

Carbon logic

CEA California Environmental Associates

~30% of terrestrial land area is covered by forests (3.9 billion ha)

- South and Central America, South and Southeast Asia & Africa together comprise about 45% of global forest cover

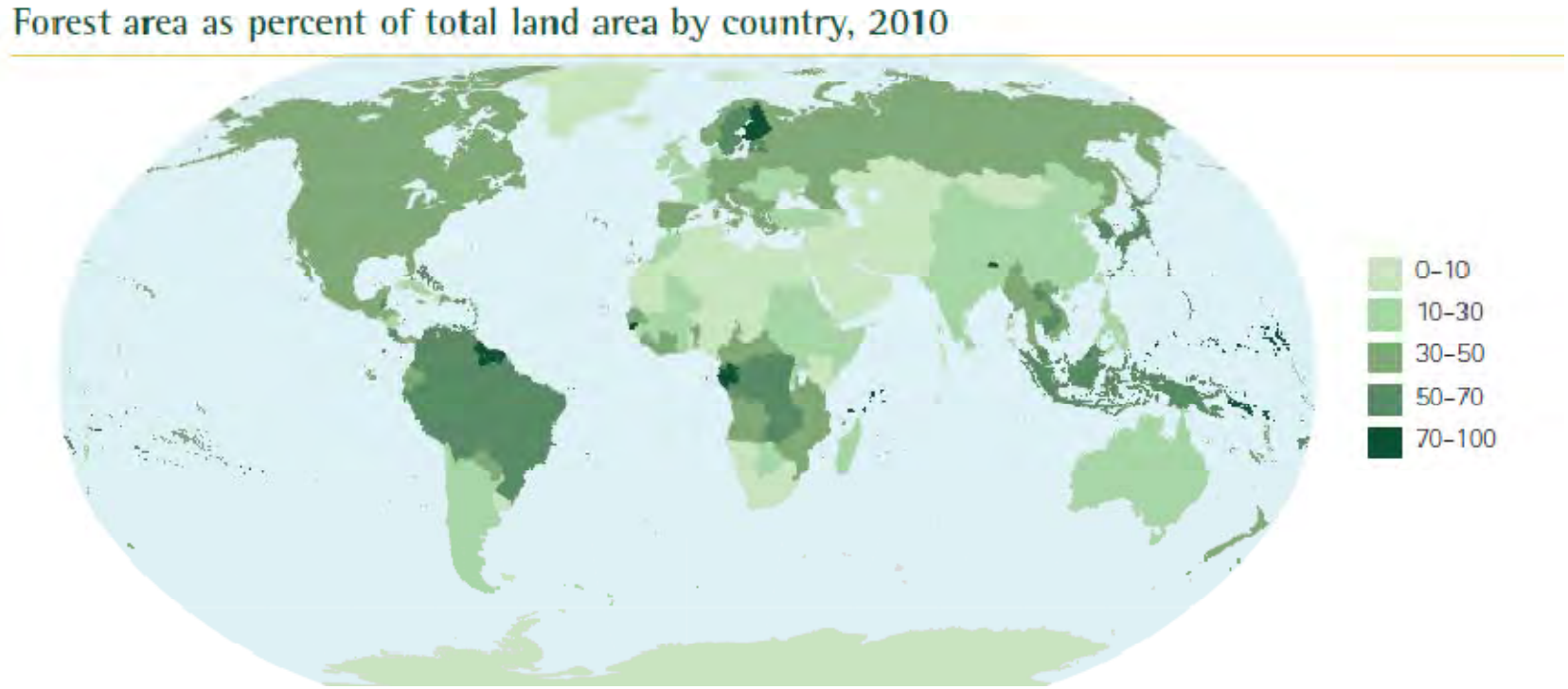


Data source: FAO Forest Resource Assessment, 2005

CEA California Environmental Associates

High-density forest cover exists in Brazil, Indonesia and the Congo Basin

- Boreal forests in Russia and North America are also important global stocks



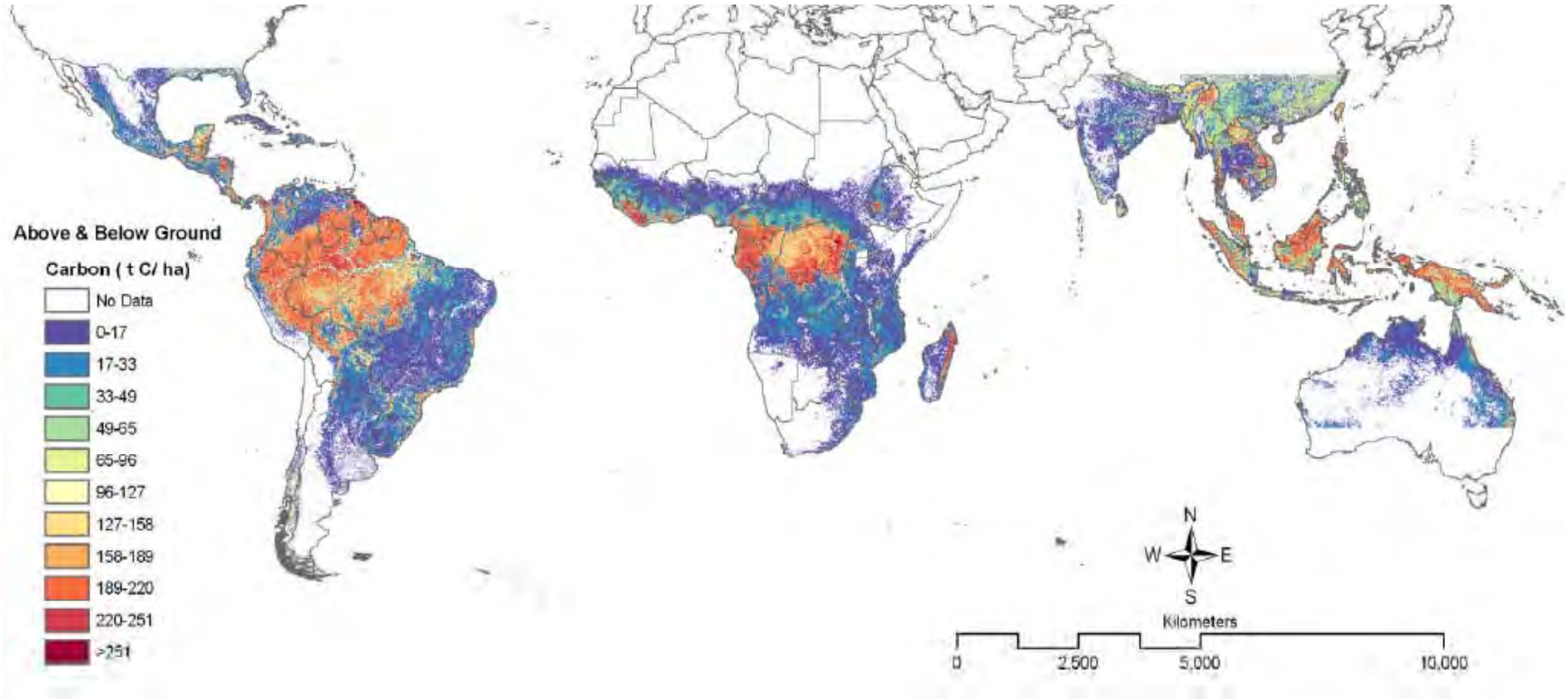
Data source: FAO Forest Resource Assessment, 2010

Carbon logic

CEA California Environmental Associates

The Amazon, the Congo Basin and parts of Indonesia are also home to the highest concentrations of forest carbon

- Emissions per converted hectare vary dramatically: from 600 - 1,150 MT CO2e for forests to 75 - 305 MT CO2e for grasslands

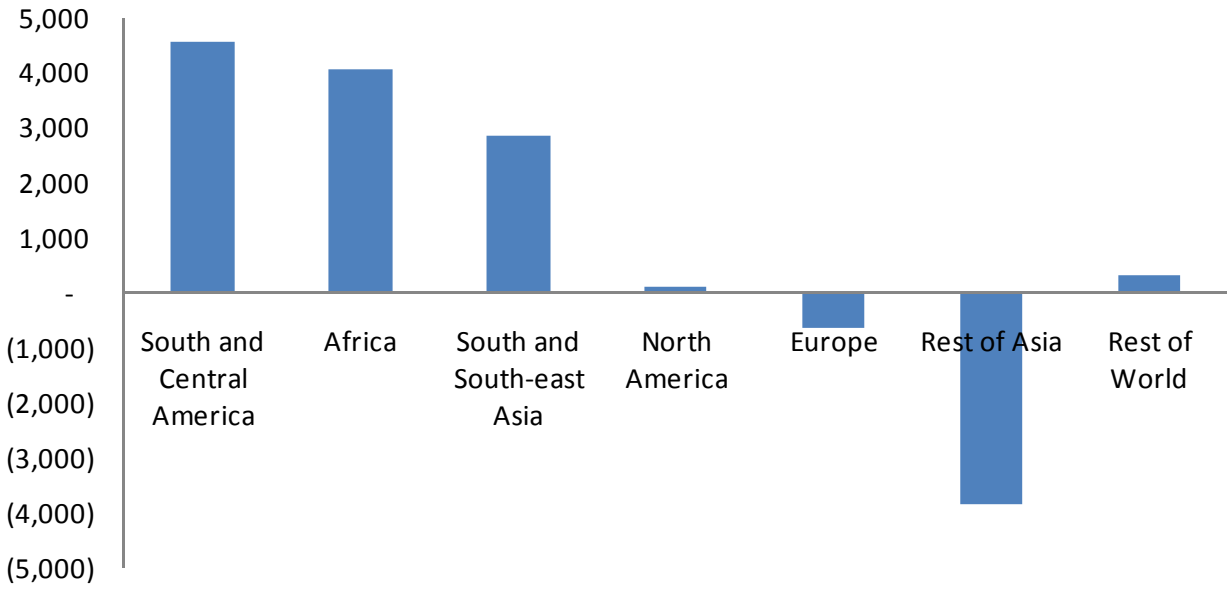


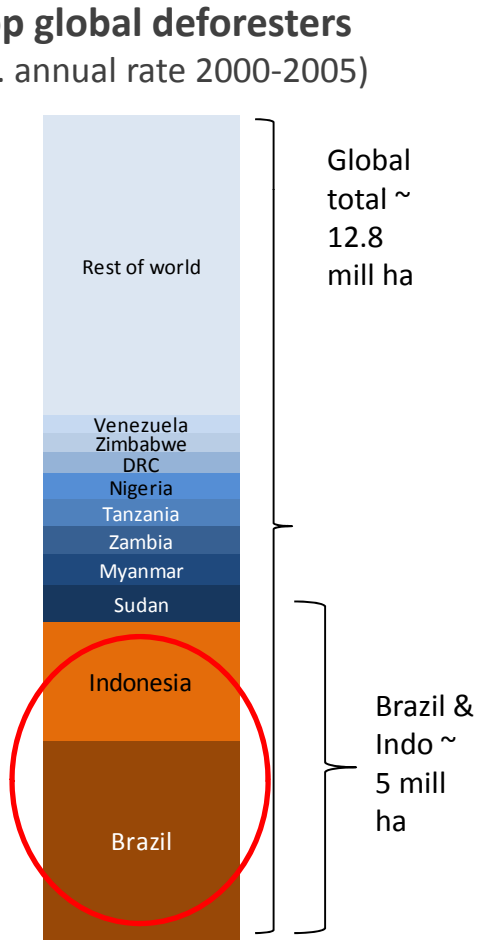
Data source: EPA 2010, from Saatchi et al. (in prep)

Carbon logic

From 2000-2005, South and Central America, South and Southeast Asia & Africa accounted for over 90% of global deforestation (by ha)

- Brazil and Indonesia together accounted for approximately 40%





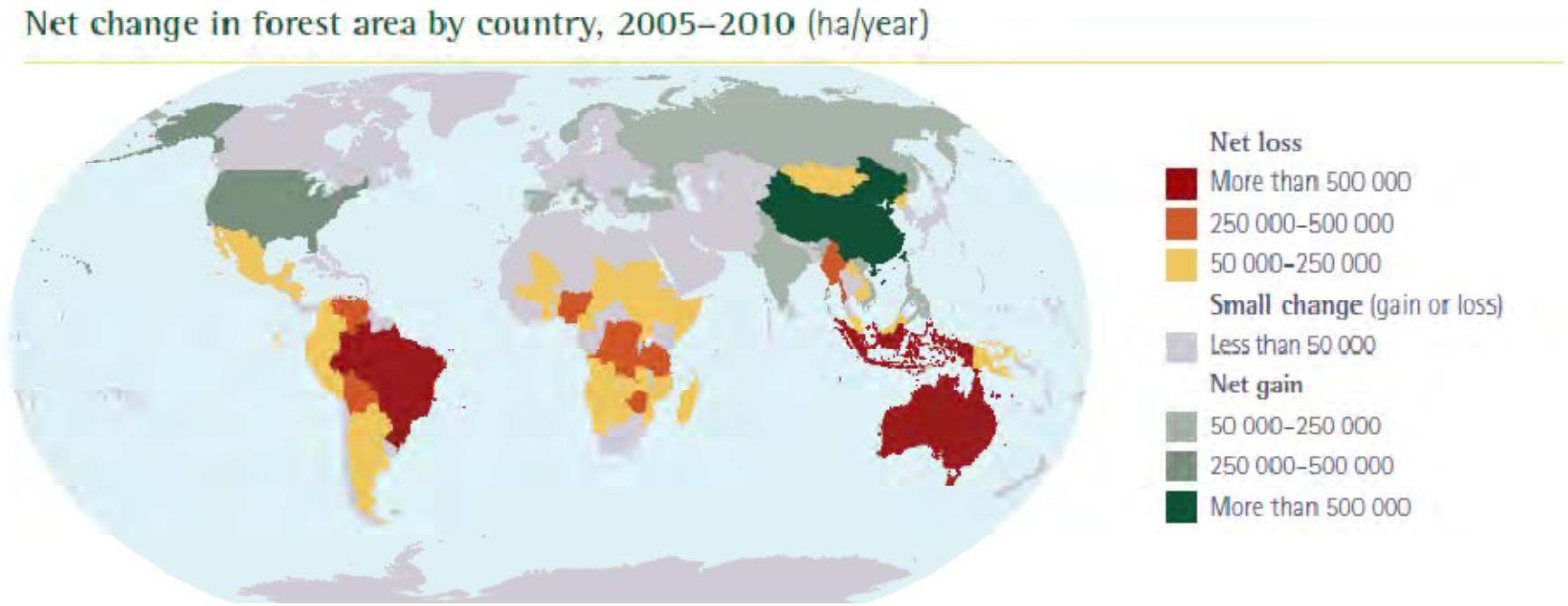
Note: Negative deforestation rates in Asia are due to massive afforestation efforts in China.

Source: FAO Forest Resource Assessment, 2005

CEA California Environmental Associates

Preliminary findings from FAO's Forest Resource Assessment 2010 show that Brazil and Indonesia still lead global deforestation

- Global deforestation rate has slowed from 16 million ha/yr in the 1990s to 13 million ha/yr from 2000-2010.
- Severe fires and droughts in Australia have exacerbated forest loss since 2000



Data source: FAO Forest Resource Assessment, 2010

CEA California Environmental Associates

Data sets for LUCF emissions?

- Our analysis drew from a few different LUCF emissions data sets
- Our primary data source for global LUCF emissions was the World Resource Institute's CAIT model, version 7.0. We used this data set because it provides emissions by country (though there are many data gaps). The last year reported for LUCF emissions in the CAIT data set is 2005
- The WRI/CAIT data set uses the Houghton study as the basis for its LUCF emissions
- The McKinsey Cost Curve 2.0 also references WRI/CAIT and Houghton as its primary sources for LUCF emissions
- We used data from country-level studies in Brazil and Indonesia for more reliable numbers for LUCF emissions in those countries in 2005
  - McKinsey's "Pathways to a Low-Carbon Economy for Brazil" cites LUCF emissions at 1.2 Gt vs. CAIT's 1.8 Gt
  - Private analysis in Indonesia puts LUCF emissions from forests ~1 Gt vs. CAIT's 1.45 Gt
  - We combined these revised numbers with the rest of the CAIT data set to get a "bottom up" global LUCF number of **4.4 Gt CO2e** (vs. WRI's 5.4 Gt)

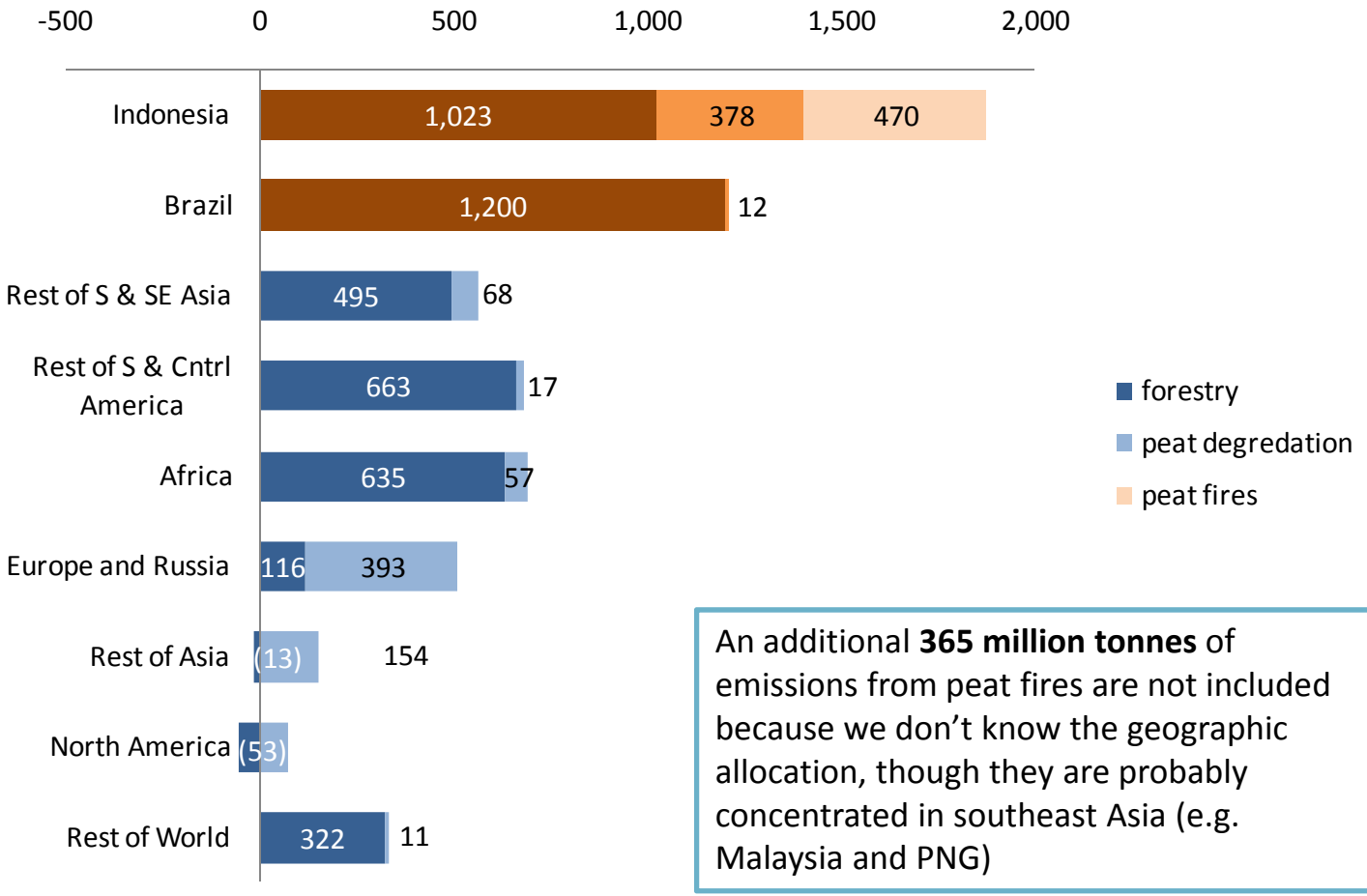
Peat

- We used 2.0 Gt for 2008 global peat emissions which is consistent with several peat studies
  - Adding peat emissions to our "bottom up" global LUCF number gives **6.4 Gt CO_2e** total

CEA California Environmental Associates

Tropical regions are also the top LUCF GHG emitters (2005)

- Brazil and Indonesia accounted for an ~2.2 Gt/yr from 2000-2005



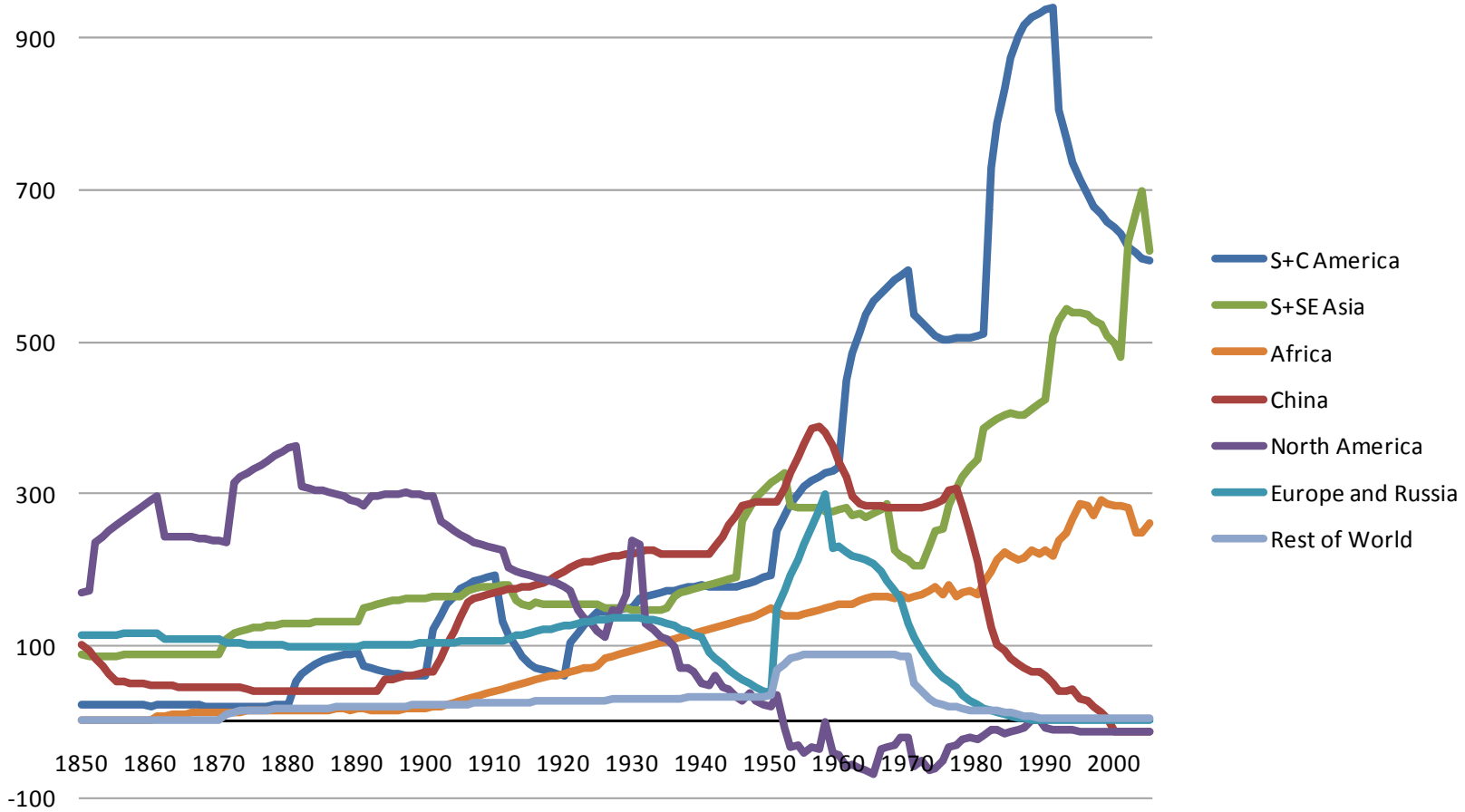
An additional **365 million tonnes** of emissions from peat fires are not included because we don't know the geographic allocation, though they are probably concentrated in southeast Asia (e.g. Malaysia and PNG)

Data source: WRI/CAIT 7.0, Wetlands International, Pathways to a Low-Carbon Economy for Brazil, private analysis

CEA California Environmental Associates

South & Central America, South & Southeast Asia have led LUCF emissions in recent decades. Africa is a distant but growing third

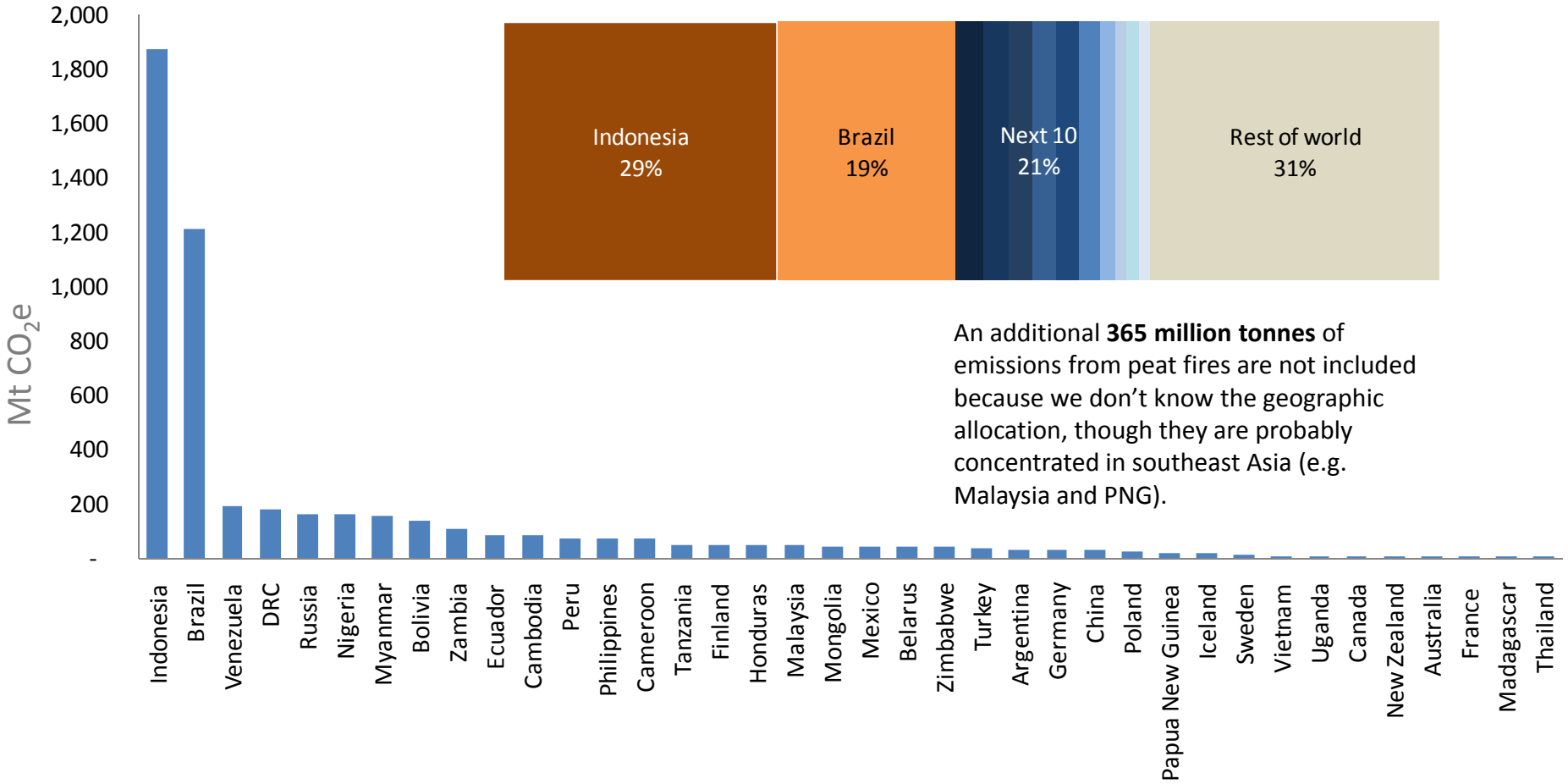
- Error bars are enormous, as high as 100%



Data source: Houghton, R.A. 2008. Carbon Flux to the Atmosphere from Land-Use Changes: 1850-2005. In TRENDS: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.

Carbon logic

Indonesia and Brazil combined LUCF emissions (including peat) total ~ 3 Gt CO_2e. Global emissions ~6.4 Gt CO_2e (2005)

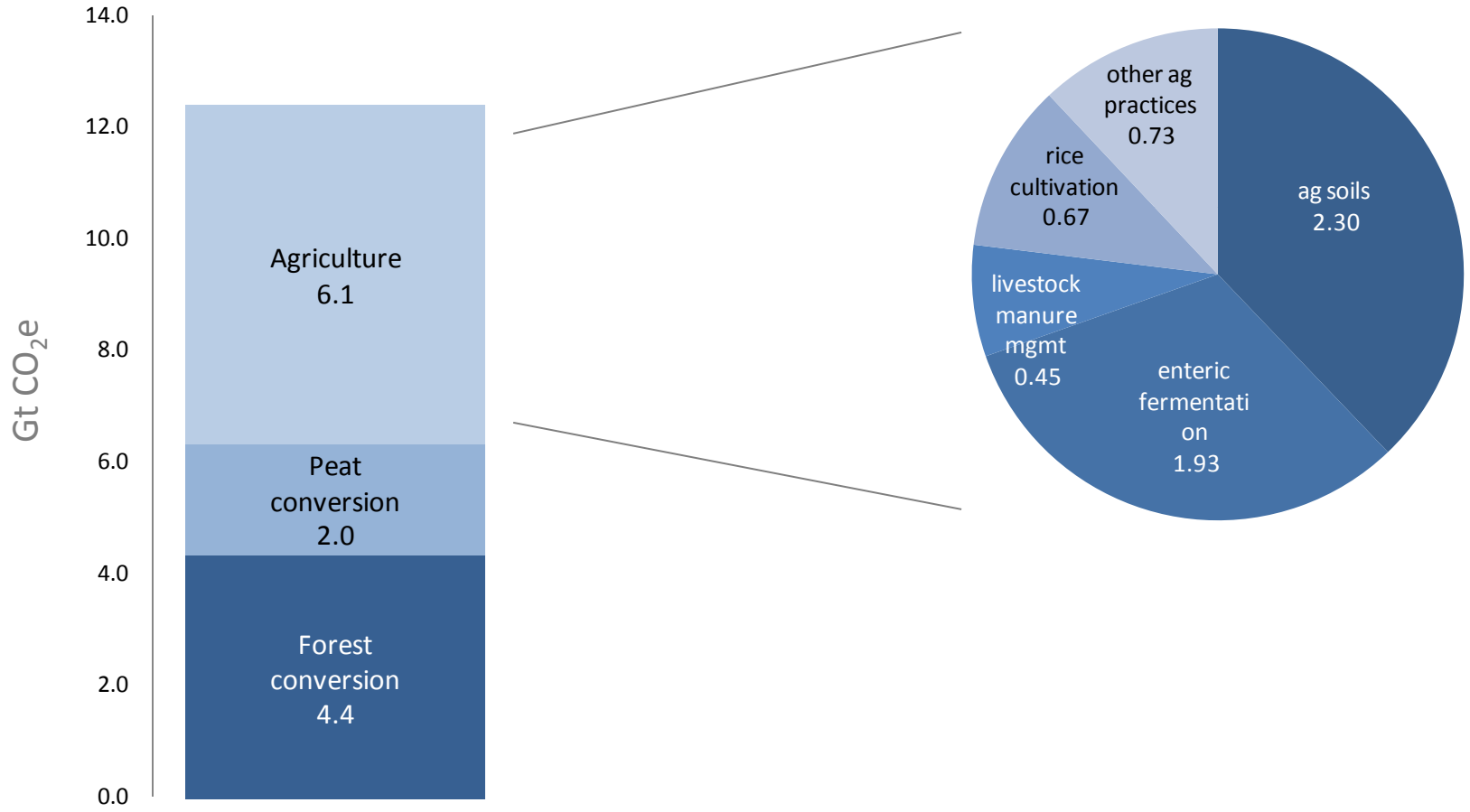


Data source: WRI/CAIT 7.0, Wetlands International, Pathways to a Low-Carbon Economy for Brazil, private analysis

Carbon logic

CEA California Environmental Associates

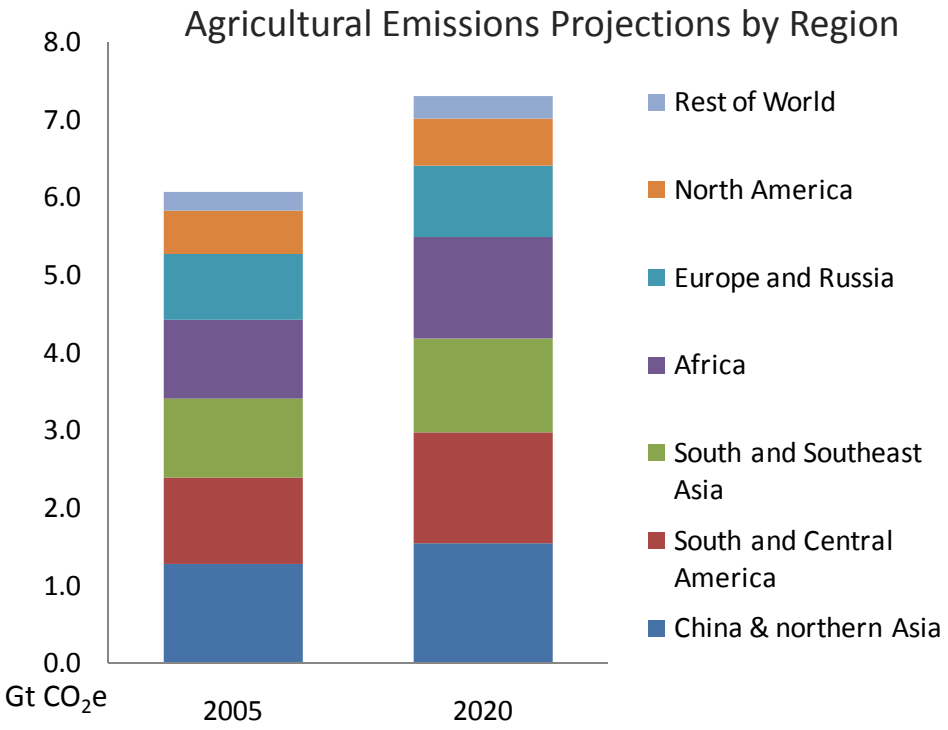
Emissions from on-going agricultural practices are significant (6.1 Gt in 2005), but diverse

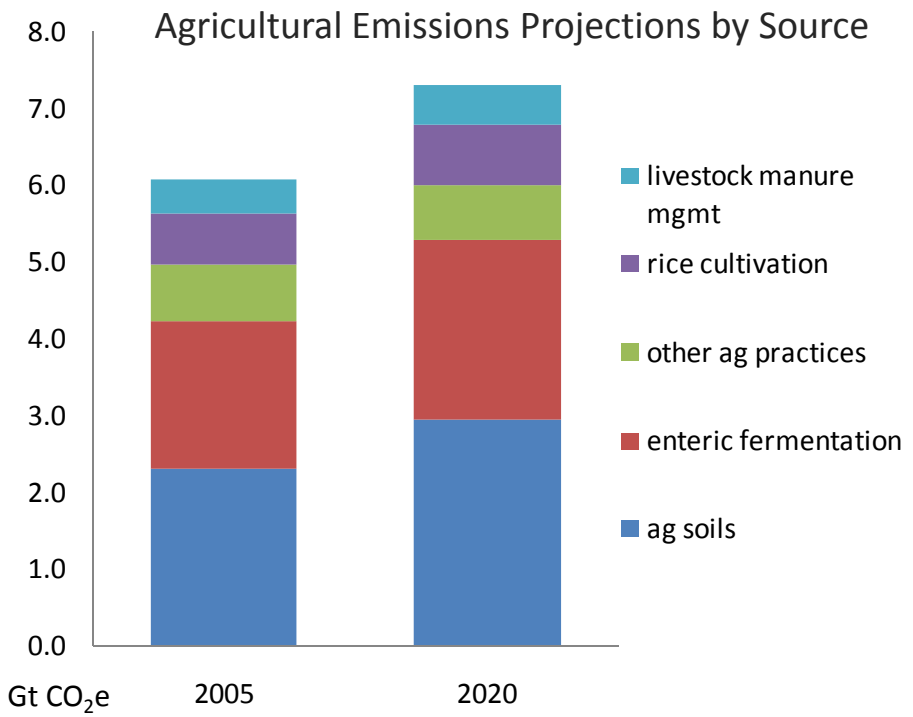


Data source: WRI/CAIT 7.0, Wetlands International, Indonesia's Greenhouse Gas Abatement Cost Curve, Pathways to a Low-Carbon Economy for Brazil, US EPA

Ag emissions are expected to grow by 20% from 2005 – 2020

- Distribution by region and by driver are expected to remain fairly constant
- ~1 Gt (17%) of ag emissions are from ag soils in four countries (China, US, Brazil, Argentina). However, addressing these tonnes would require addressing *every* major crop in each country

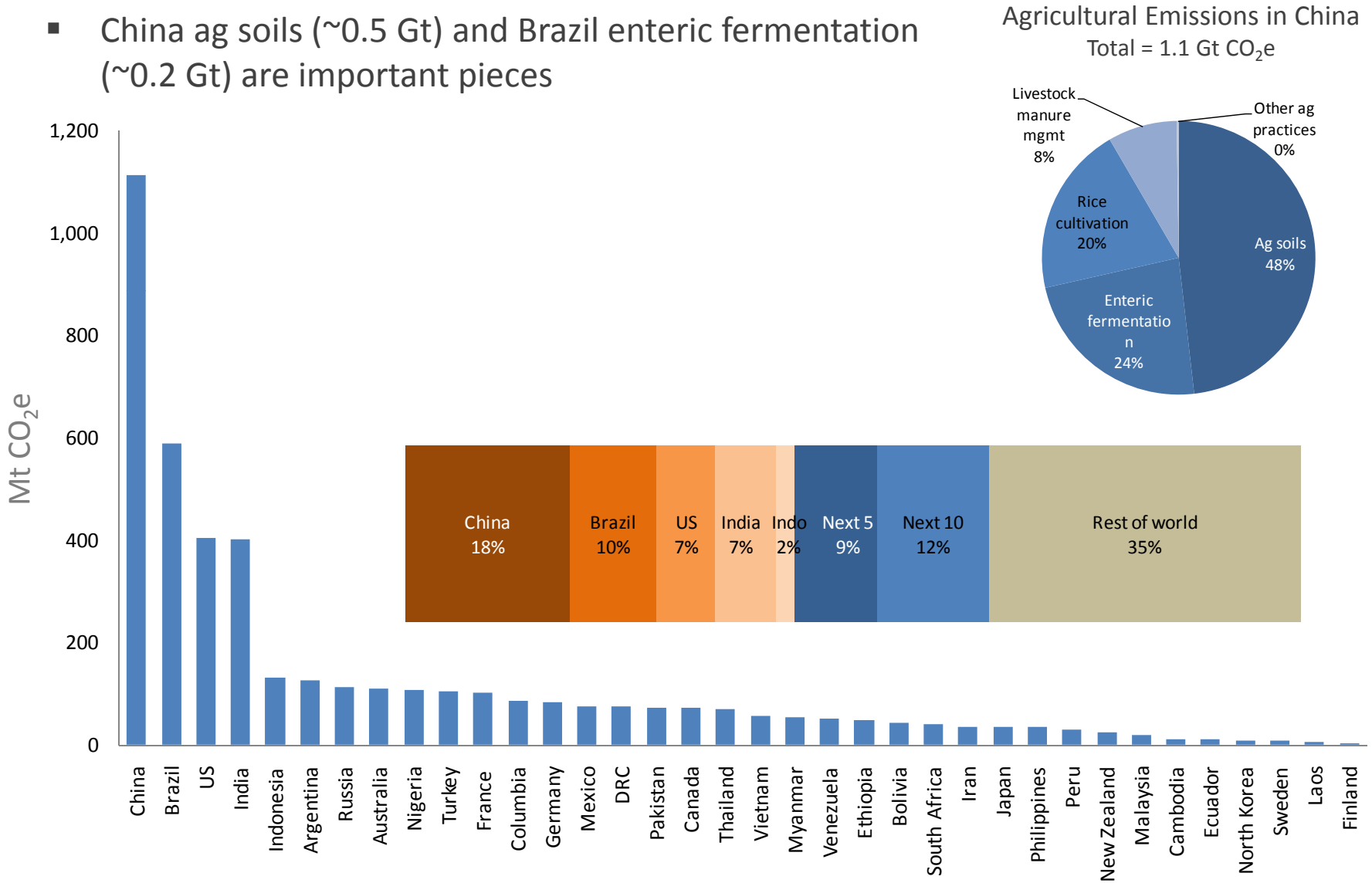




Data source: US EPA "Global Anthropogenic Emissions of Non-CO2 Greenhouse Gases 1990-2020"

China leads agricultural emissions

- China ag soils (~0.5 Gt) and Brazil enteric fermentation (~0.2 Gt) are important pieces

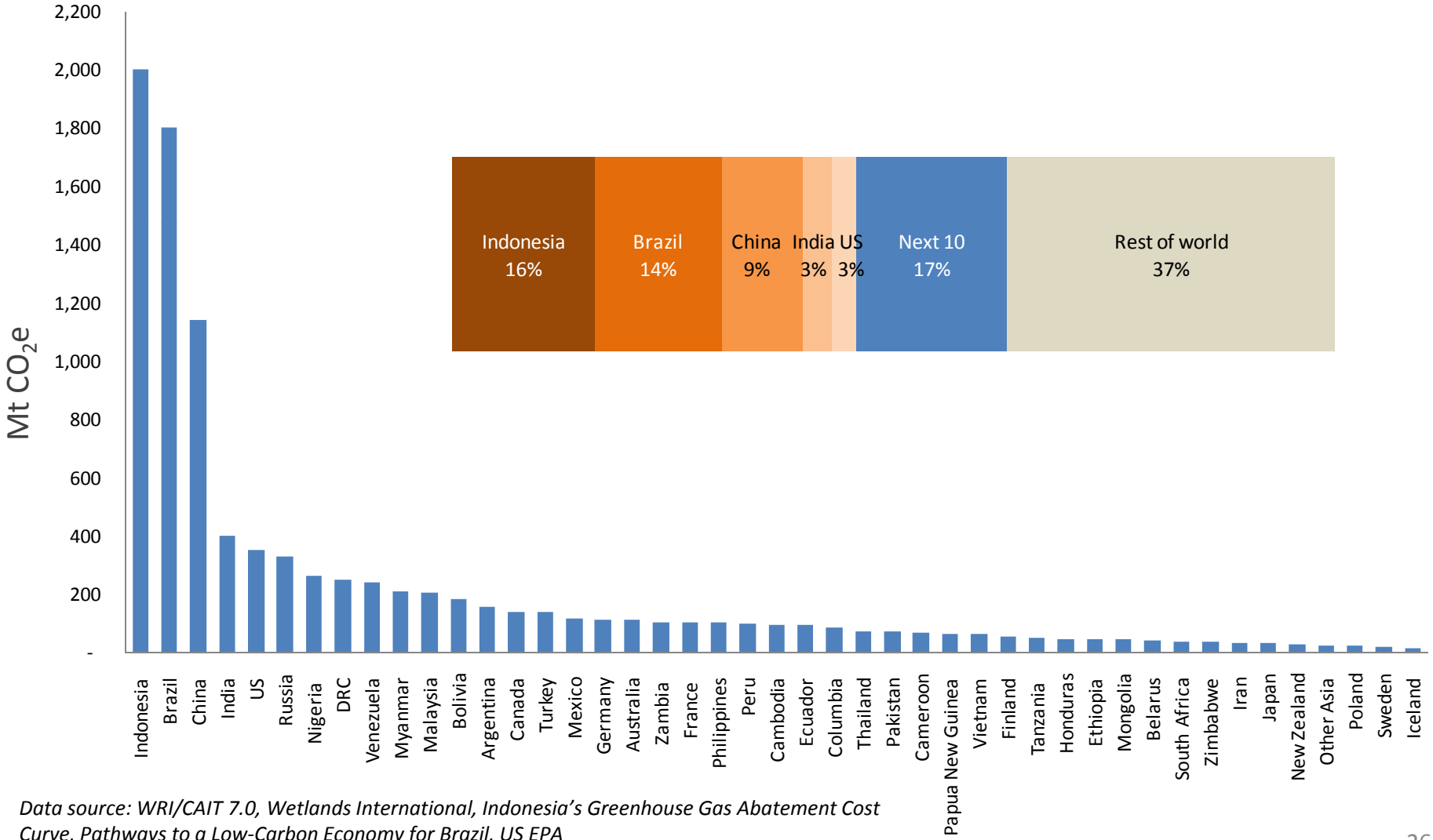


Data source: US EPA "Global Anthropogenic Emissions of Non-CO2 Greenhouse Gases 1990-2020"

CEA California Environmental Associates

Indonesia and Brazil still lead LULUCF emissions

- Indonesia and Brazil combined LULUCF emissions ~3.8 Gt CO_2e out of 12.5 total

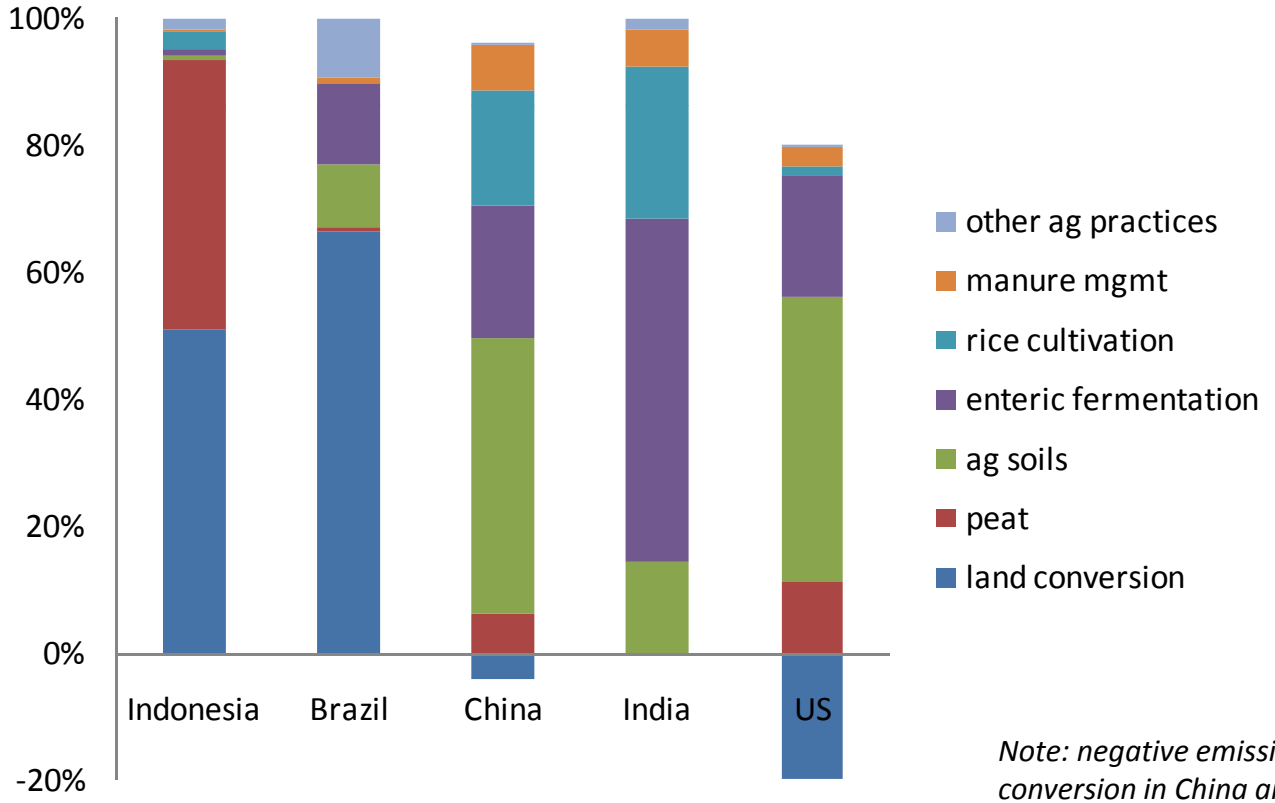


Data source: WRI/CAIT 7.0, Wetlands International, Indonesia's Greenhouse Gas Abatement Cost Curve, Pathways to a Low-Carbon Economy for Brazil, US EPA

CEA California Environmental Associates

Emissions profiles of the leading LULUCF countries vary greatly

- Land conversion of forest and peat lands lead for Indonesia and Brazil
- Agricultural soils (i.e. fertilizers) lead for US and China
- Enteric fermentation is the primary source of emissions for India



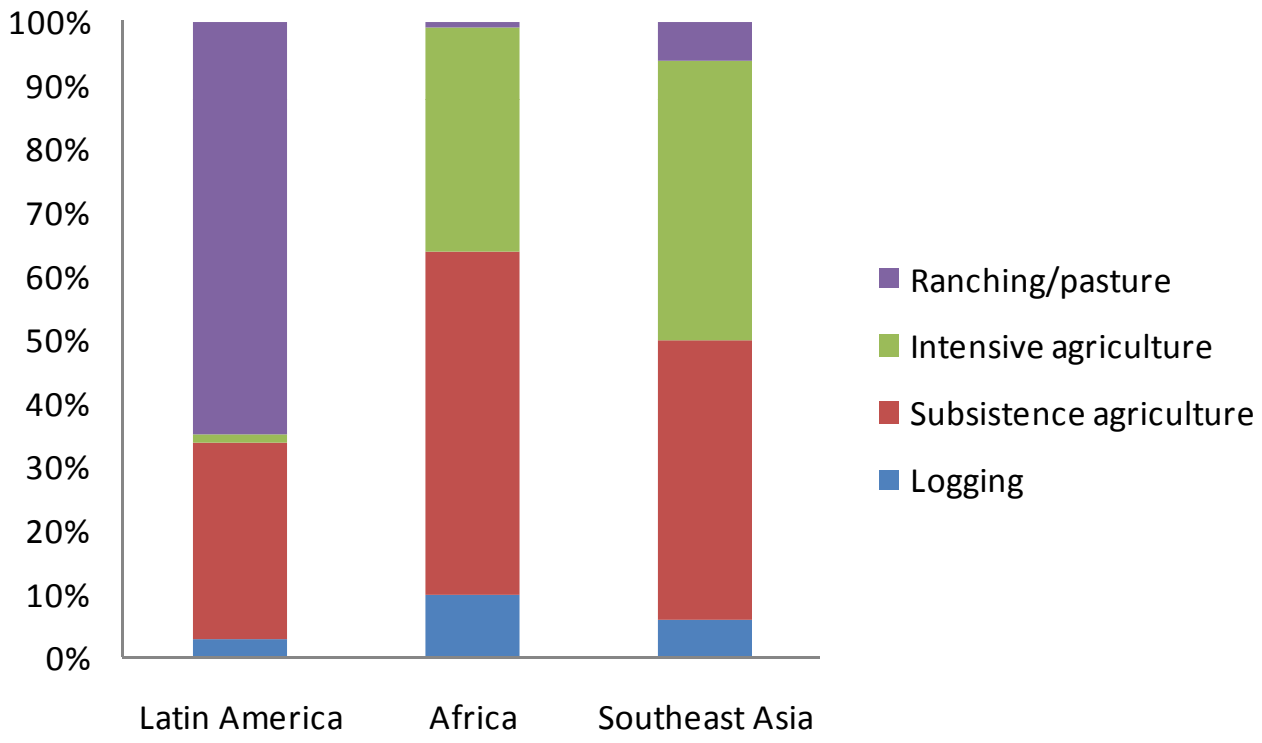
Note: negative emissions from land conversion in China and the US is due to afforestation

Data source: WRI/CAIT 7.0, Wetlands International, Pathways to a Low-Carbon Economy for Brazil, US EPA, private analysis

CEA California Environmental Associates

Drivers of deforestation vary significantly around the world

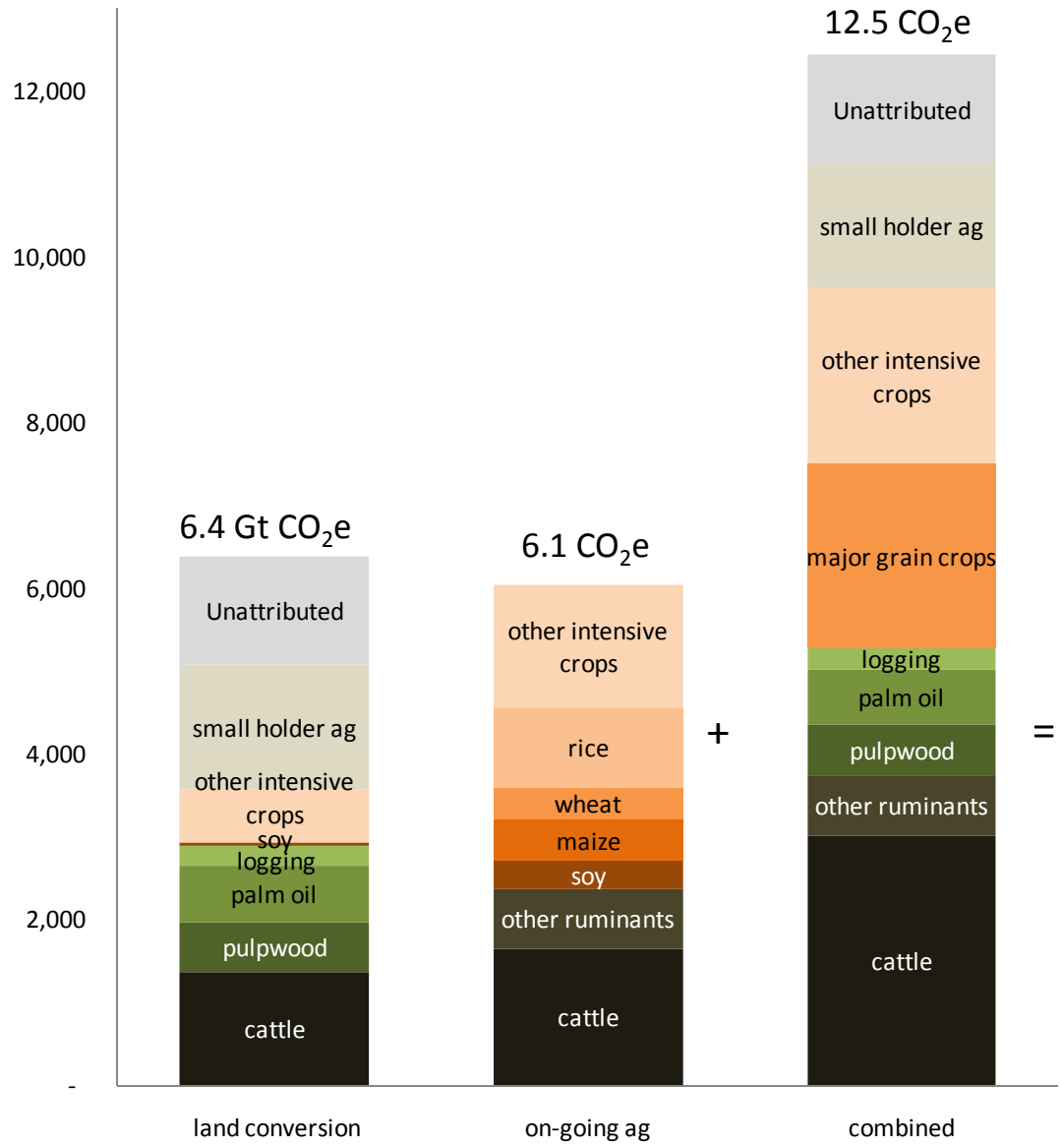
- Logging may be underrepresented because data on illegal logging is poor, logging is closely tied to other drivers, and it typically degrades, not deforests, opening the door for further conversion



Data source: Private analysis

Carbon logic

LULUCF emissions by commodity, 2005



Commodity attribution

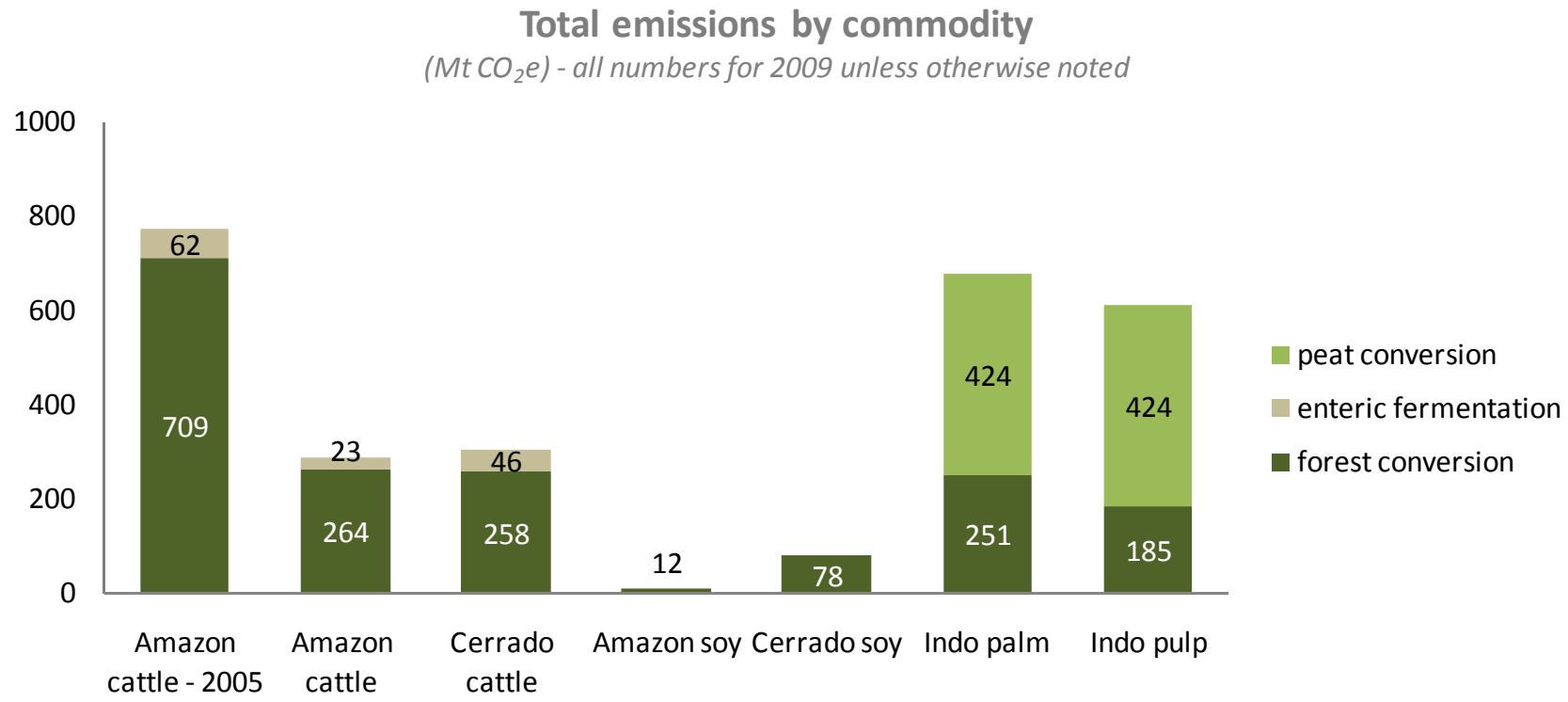
- ~25% cattle, Brazil alone contributes about 50% of these emissions
- ~10% palm oil & pulpwood from peat and forest conversion in Indonesia alone
- ~2% logging, drives little direct deforestation, but can be a significant indirect driver
- ~35% intensive crops
  - ~62% from fertilizers
  - ~22% methane from rice
  - ~15% from land conversion
- ~12% from subsistence ag
- ~10% unattributed, mostly emissions from peat conversion outside of Indonesia
- ~20% Brazil cattle, Brazil soy, Indo palm oil & Indo pulpwood (~2.3 Gt)

Data source: McKinsey "Pathways to a Low-Carbon Economy for Brazil", US EPA, FAOStat, interviews, private analysis

CEA California Environmental Associates

Commodity comparison: Indonesia palm oil and pulpwood lead now that Amazonian cattle emissions have come down

- Amazon emissions from cattle are currently 0.3 Gt CO_2e, down significantly from nearly 0.8 Gt CO_2e in 2005 (due to reduced total deforestation rate and reduced attribution to cattle).
- Soy emissions are minimal thanks to the moratorium & falling commodity prices
- Indonesia palm and pulpwood are both substantial at over 0.6 Gt CO_2e

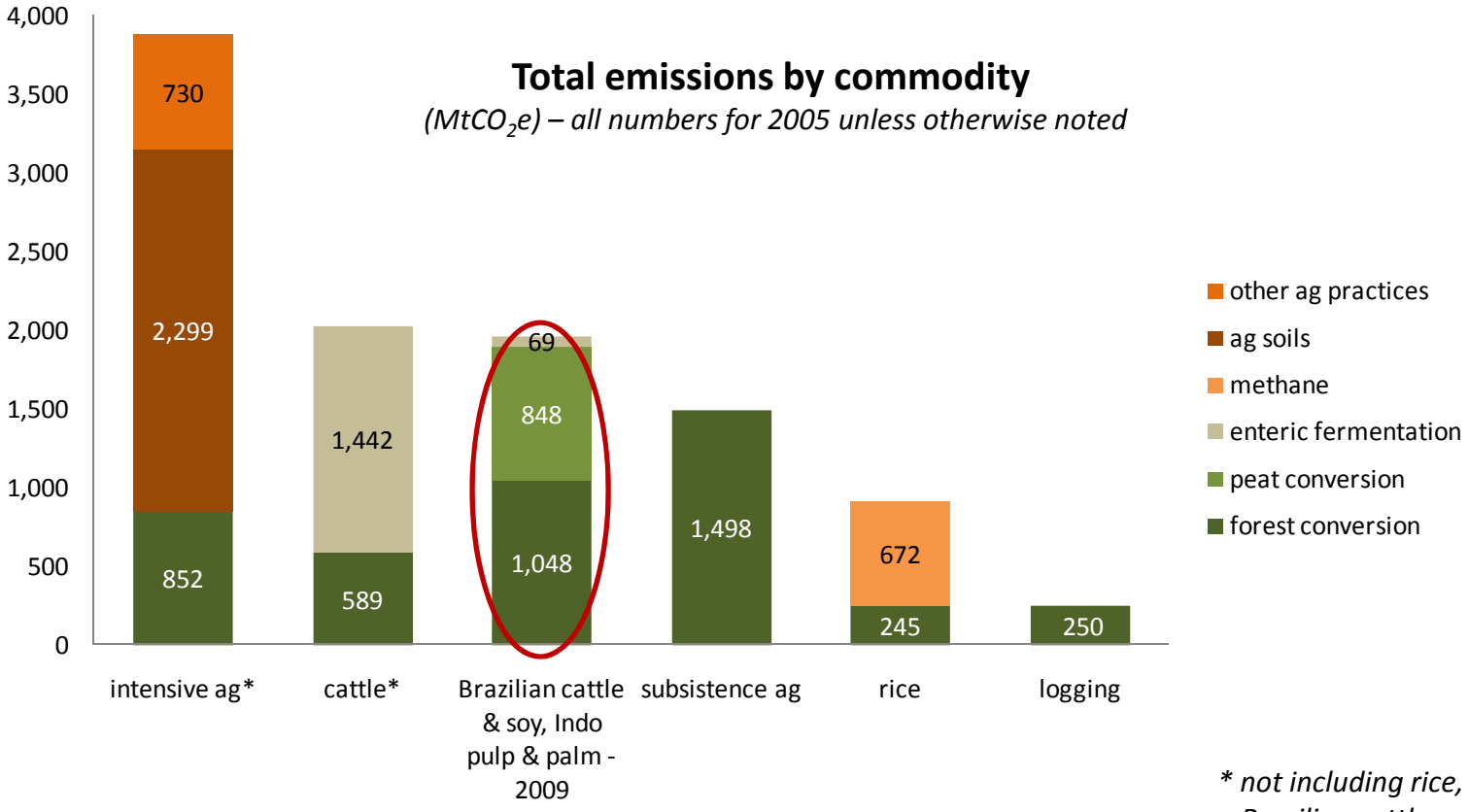


Data source: McKinsey "Pathways to a Low-Carbon Economy for Brazil", US EPA, FAOStat, interviews, priavate analysis

CEA California Environmental Associates

Commodity comparison: combined, our target commodities are comparable to other global drivers of LULUCF emissions

- Brazil cattle & soy and Indonesian palm oil & pulpwood together emit nearly 2.0 Gt CO_2e.



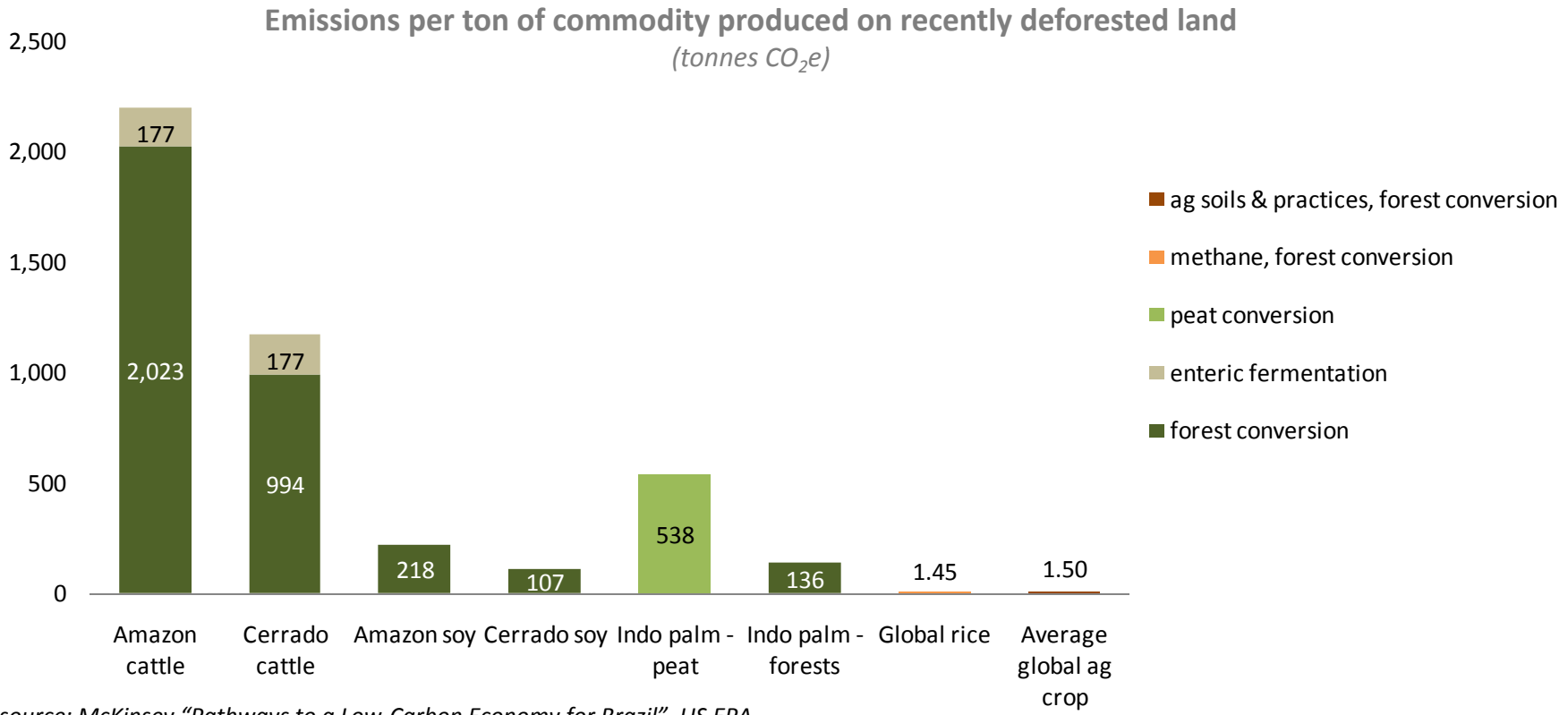
* not including rice, not including Brazilian cattle

Data source: McKinsey "Pathways to a Low-Carbon Economy for Brazil", US EPA, FAOStat, interviews, private analysis

CEA California Environmental Associates

Cattle stand out when carbon intensity is considered (tonne/tonne)

- When grappling with the leakage issue, it's important to also consider the agricultural productivity of lands. Brazilian cattle stand out as high emitting, low productivity.
- Stocking density of cattle in Brazil is very low (~1 cow per ha) & growth rate of cattle is low
- Also, nearly four cows are needed to produce one tonne of beef
- Cerrado emissions per tonne are lower due to lower carbon density of the land

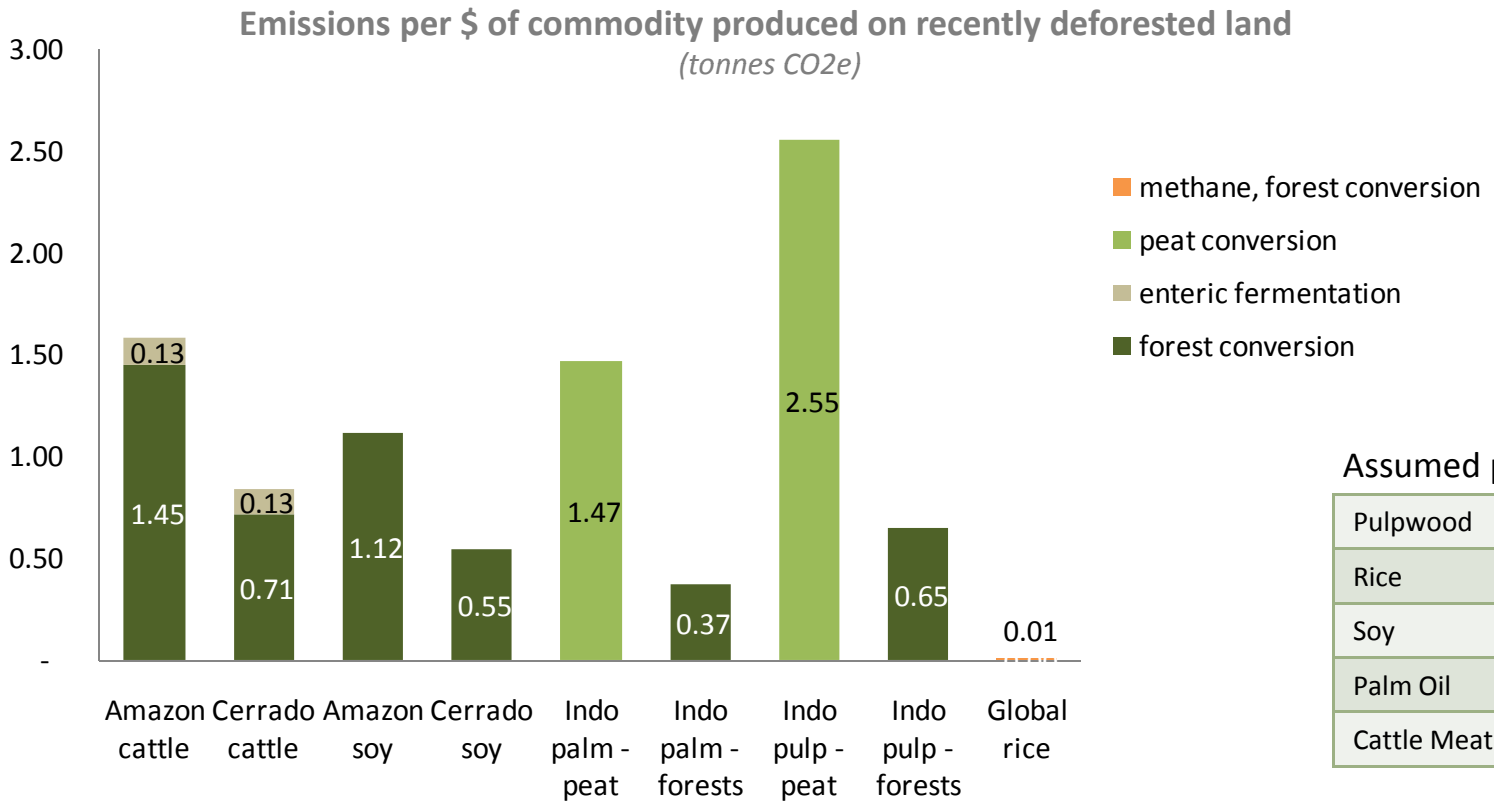


Data source: McKinsey "Pathways to a Low-Carbon Economy for Brazil", US EPA, FAOStat, interviews, private analysis

Carbon logic

Indonesian peatland conversion has the highest emissions per dollar of commodity production

- Comparing commodities by emissions per dollar, cattle emissions drop because of the value of beef. In contrast, pulpwood jumps out as a terrible use of high value peat land. Similarly, palm oil emissions on peat are high, even though it has high yields & prices



Assumed prices per tonne

Pulpwood	$58
Rice	$176
Soy	$365
Palm Oil	$365
Cattle Meat	$1,391

Data source: McKinsey "Pathways to a Low-Carbon Economy for Brazil", US EPA, FAOStat, interviews, private analysis

A note on uncertainty

Our analysis draws from many different reports, data sets, and interviews, most of which do not provide error bars and at best, only provide a brief, qualitative, discussion of uncertainty. The quality of the data for LULUCF greenhouse gas emissions is notoriously poor, so while we cannot credibly quantify the uncertainty in our analysis, it is very high.

Primary Findings
Geographic deep-dives

1. Brazil

Brazil: overview

CEA California Environmental Associates

Cattle-illegal land use connection is the crux

- Huge driver of deforestation in play: ~0.6 Gt in 2009; scenarios run gamut from 0.1 to 1.5+ Gt per year
- Tremendous momentum developed over the last 5 years, with three essential ingredients:
  - Laws and government commitment on the books (Forest Code and PAs)
  - Engaged market players: retailers, brands, and slaughterhouses
  - Strong NGO capacity
- Leakage not a major factor for cattle

CEA California Environmental Associates

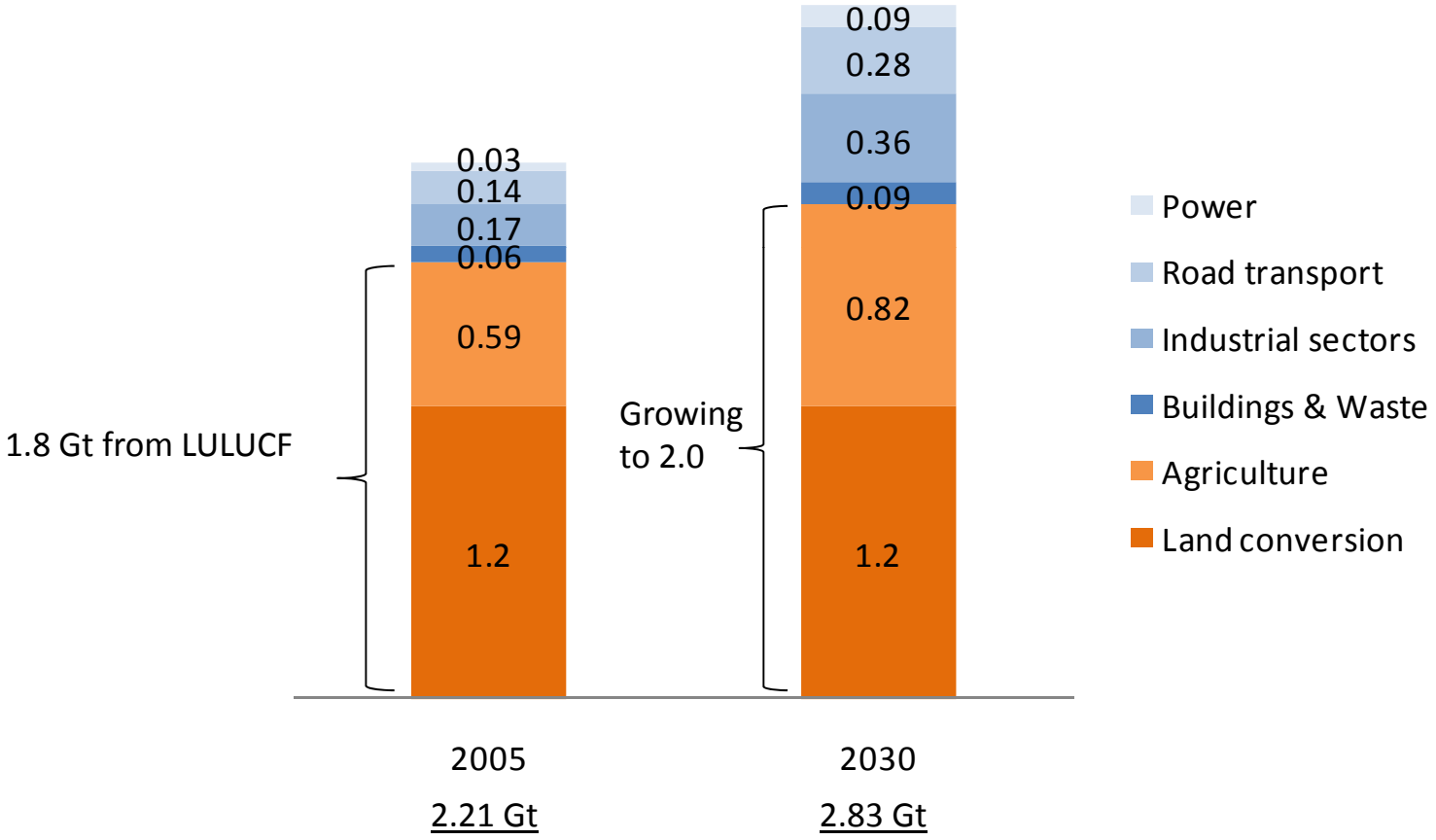
Cattle-illegal land use connection is the crux

- Relative consensus around approach
  - Support and expand the cattle MOU and BNDES lending requirements, particularly in the Legal Amazon
  - Use the MOU and emerging certification momentum to apply market pressure to drive the cadaster and land use reform
  - Continue to build retail and brand engagement
  - Prevent political backsliding (forest code)
- Chain of custody/traceability a major outstanding issue: costly and at some point someone needs to pay or it needs to be mandated
- Supporting efforts around soy moratorium, illegal timber, illegal charcoal; Cerrado protection (new PAs, enforcement) is also important

1. Brazil: Carbon

Brazil: carbon

McKinsey BAU scenario projects LULUCF emissions in Brazil are to grow slightly by 2030

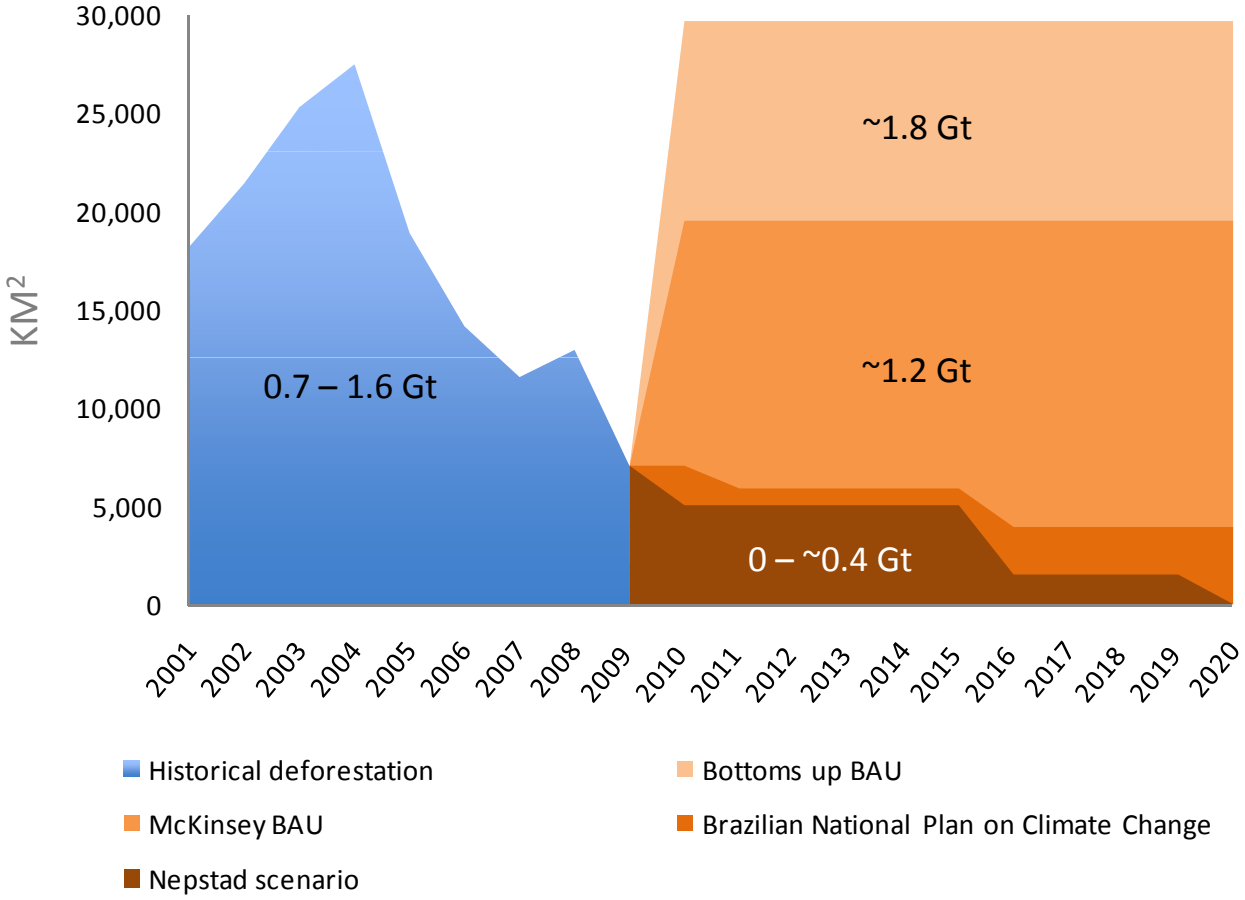


Data source: McKinsey "Pathways to a Low-Carbon Economy for Brazil"

Brazil: carbon

In reality, LUCF emissions are down to ~0.4 Gt/yr in the Amazon

- In 2009 the Amazon biome lost 7,000 km^2, achieving the lowest deforestation rate in decades
- Steep reduction due to economy, legal enforcement, and some market engagement
- Multiple potential BAU scenarios exist; staying on track will be a challenge



Amazon deforestation scenarios

Bottoms up BAU – based on cattle production projections and constant distribution and intensity of cattle

McKinsey BAU – based on average deforestation rate 1995-2005

Brazilian National Plan on Climate Change – Brazilian target of 80% reduction by 2020, but using 1995-2005 average deforestation rate as a baseline

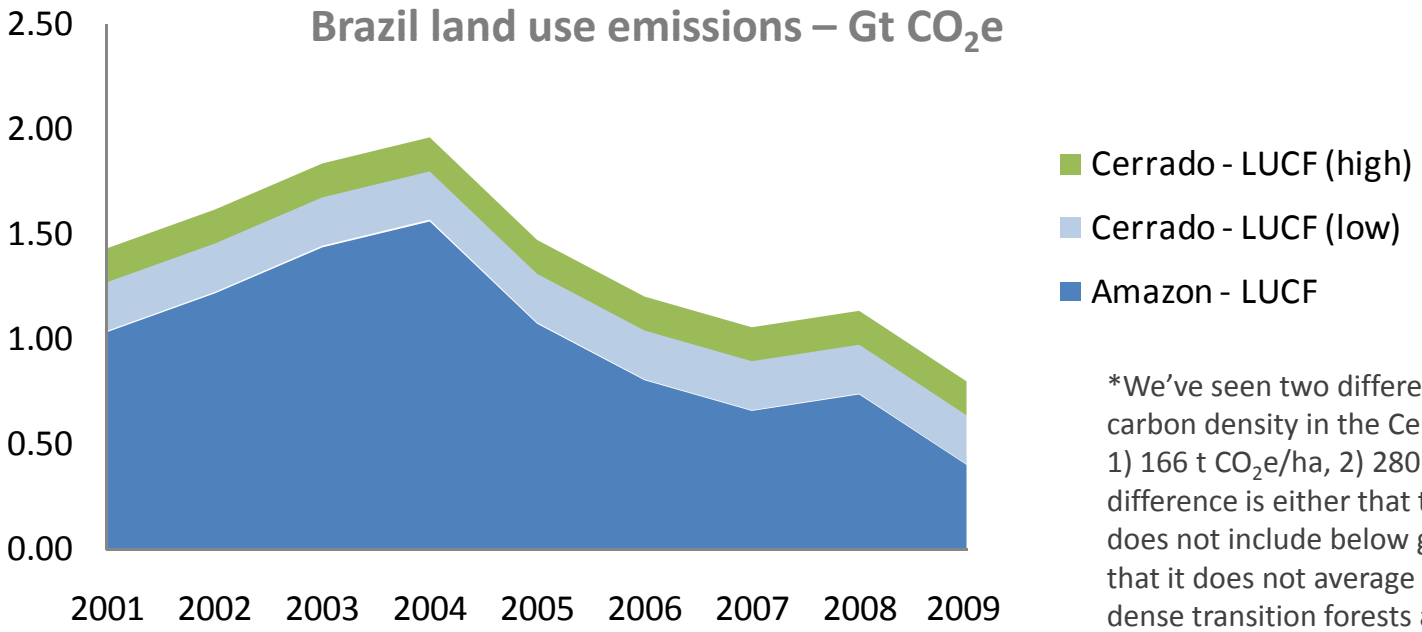
Nepstad scenario – Uses 2009 deforestation rate as baseline and ratcheting down to zero in 2020

Data sources: IPNE, Brazilian AgCensus, IMAZON, McKinsey "Pathways to a Low-Carbon Economy for Brazil", Nepstad et. al.

Brazil: carbon

Recent success in reducing deforestation has not extended to the Cerrado

- Deforestation rates in the Cerrado have averaged ~1.4 million ha/year since 2003
- Assuming 75 T C/ha* in the Cerrado, Brazil's LUCF emissions are currently split evenly between the Amazon and the Cerrado (~0.4 Gt CO_2e per biome) – the Cerrado is half as carbon rich, but is deforesting at twice the rate



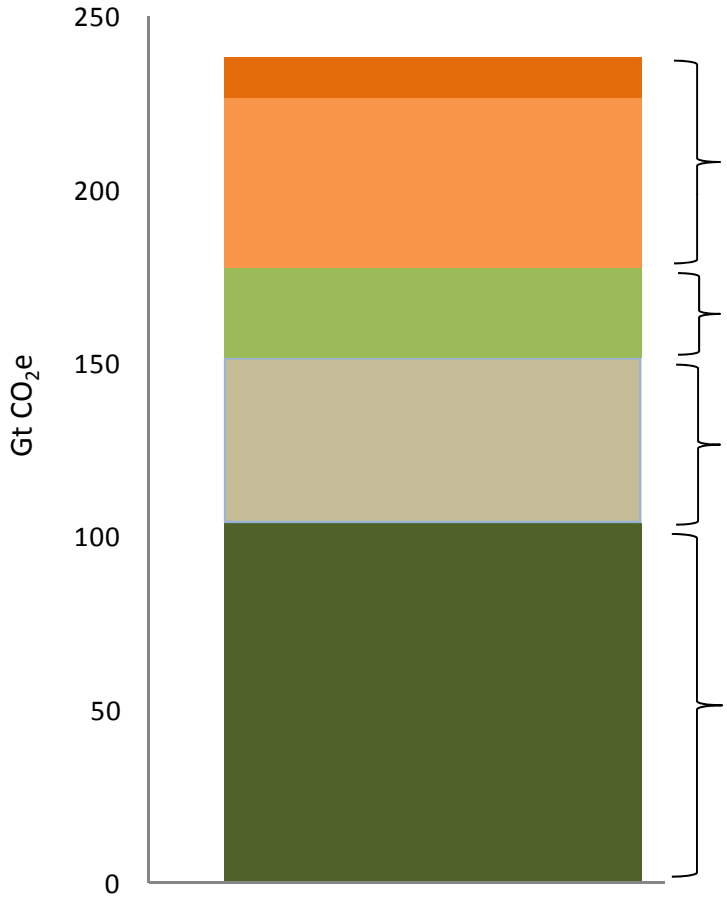
*We've seen two different numbers for carbon density in the Cerrado: 1) 166 t CO_2e/ha, 2) 280 t CO_2e/ha. The difference is either that the first number does not include below ground biomass, or that it does not average in the more carbon-dense transition forests along the border of the Amazon. We have used the higher number for most of our analysis, but show the variance in a few places.

Data source: Nepstad, Brazilian Ministry of Environment, interviews

Brazil: carbon

Approximately a quarter of the Amazon is at risk through 2050: deforestation would lead to 60-80 Gt CO_2e

- Complete deforestation of the Brazilian Amazon biome would produce ~ 240 Gt CO_2e



~25% of the biome is actively threatened, ~60 Gt. Legally, 80% of this is protected by the Forest Code.

We assumed an additional ~30% of the biome is currently inaccessible, though the government is planning to build several new roads. ~26 Gt

~ 20% of the biome has already been deforested or degraded. ~50 Gt

~ 44% of the Amazon biome is already in protected areas (indigenous lands and national parks). ~100 Gt

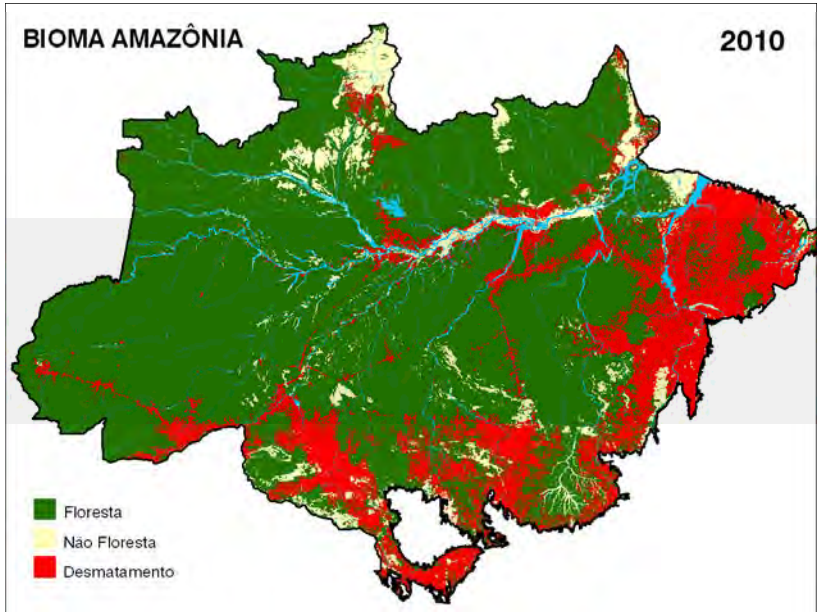
Data source: Nepstad et. al., Interviews

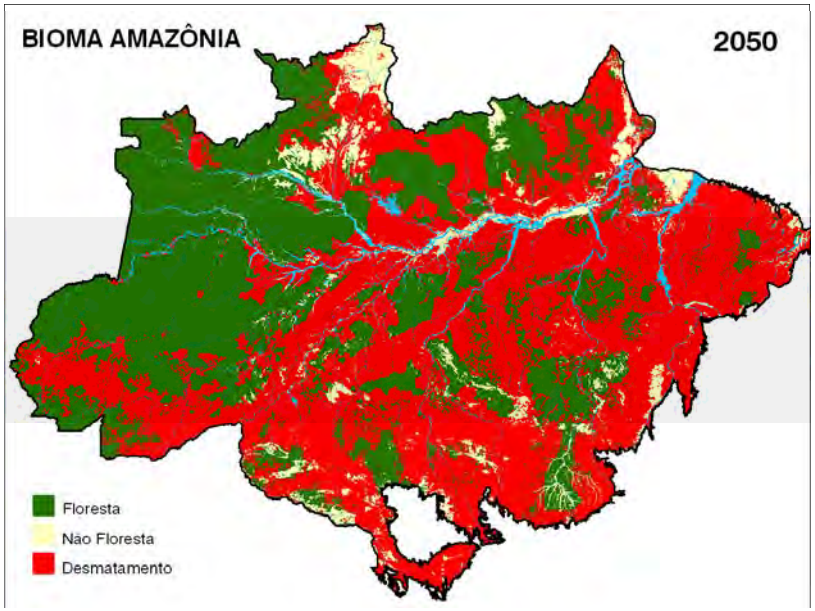
Assuming average carbon density of 570 tonnes CO_2e emissions per ha in the Amazon

Brazil: carbon

Amazon deforestation by 2050, worst case scenario (120 Gt)

- This BAU scenario is based on the absence of conservation plans and the construction of several new roads
- The 2050 scenario represents the destruction of around 40% of the Amazon
- This scenario represents the release of 32 +/- 8 Pg C, ~120 +/- 30 Gt CO_2e

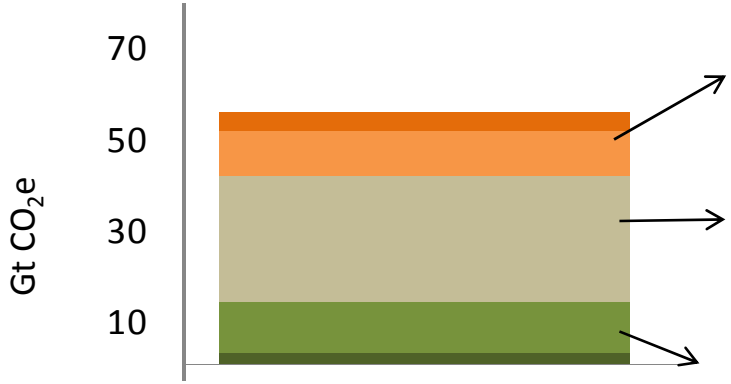




Data source: Nature "Modeling conservation in the Amazon basin" 2006, Greenpeace Brazil

Cerrado: 4 - 15 Gt CO_2e is at risk in the Cerrado through 2050

- The ~200 million ha wooded savannah south and east of the Amazon has been the epicenter of land conversion in Brazil as it is well suited for agriculture
- The total carbon stock in the Cerrado is ~ 55 Gt CO2e
- The current deforestation rate is 2x that of the Amazon (1.4 mill ha/year, ~0.4 Gt CO_2e)
- In the BAU scenario, ~15 Gt CO_2e (50 million ha) are lost over the next 40 years
- In a best-case scenario, protected areas are doubled (to 10%), and forest code is enforced (including on already deforested lands). Net further deforestation is only 15 million ha, or 4 Gt CO_2e
- We can potentially save **10 Gt CO_2e** in the Cerrado over the next 30-40 years



Of the remaining 50 million ha (~ 15 Gt), ~2/3 could theoretically be protected.

About half of the region (~100 million ha) has already been deforested for farms and ranches (~2/3 for cattle).

~ 25% of the Cerrado (50 million ha) is unlikely to be deforested either because it is in protected areas (~5%) or it is poorly suited for cultivation (~20%).

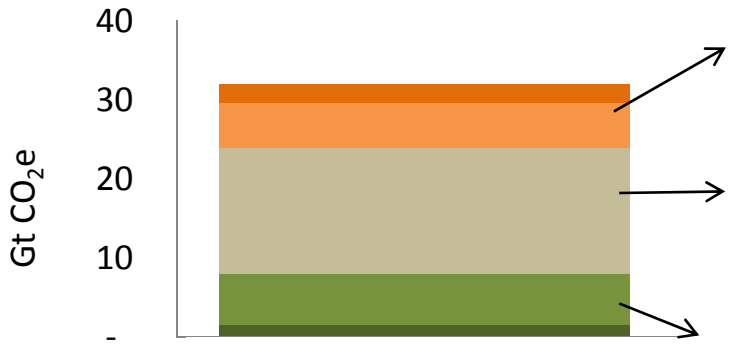
Data sources: Interviews

Assuming average of 280 tonnes CO_2e emissions per ha in the Cerrado

Brazil: carbon

If we redo this analysis with the lower Cerrado numbers, only 2-8 Gt is in play over the next 30-40 years

- Using 45.4 t C/ha, the total carbon stock in the Cerrado is ~ 33 Gt CO_2e, and current emissions are ~0.24 Gt CO_2e
- Assuming the same scenarios for future deforestation in the Cerrado (best case: we double the ha in protected areas and enforce the forest code, worst case: only currently protected areas and areas unsuitable for agriculture are left standing), we can only save **6 Gt CO_2e** over the next 40 years by moving from worst case to best case



Of the remaining 50 million ha (~ 8 Gt), ~2/3 could theoretically be protected.

About half of the region (~100 million ha) has already been deforested for farms and ranches (~2/3 for cattle).

~ 25% of the Cerrado (50 million ha) is unlikely to be deforested either because it is in protected areas (~5%) or it is poorly suited for cultivation (~20%).

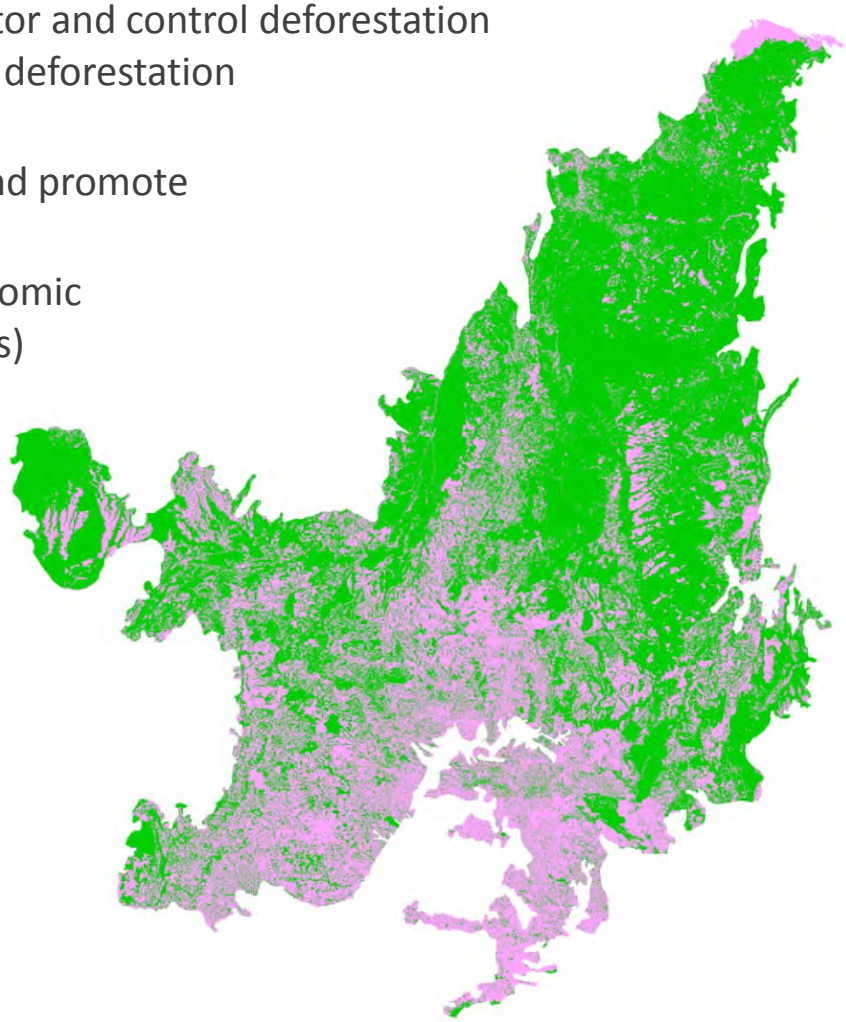
Data sources: Interviews

Assuming average of 166 tonnes CO_2e emissions per ha in the Cerrado.

CEA California Environmental Associates

Cerrado deforestation by 2050, BAU scenario

- In mid-March, the Brazilian government announced a plan to reduce deforestation in the Cerrado. The main components are to:
  - implement a permanent program to monitor and control deforestation (by suspending the concession of any new deforestation licenses on critical regions)
  - increase the number of protected areas and promote zoning plans on the region
  - stimulate the adoption of alternative economic activities (those that explore native species)



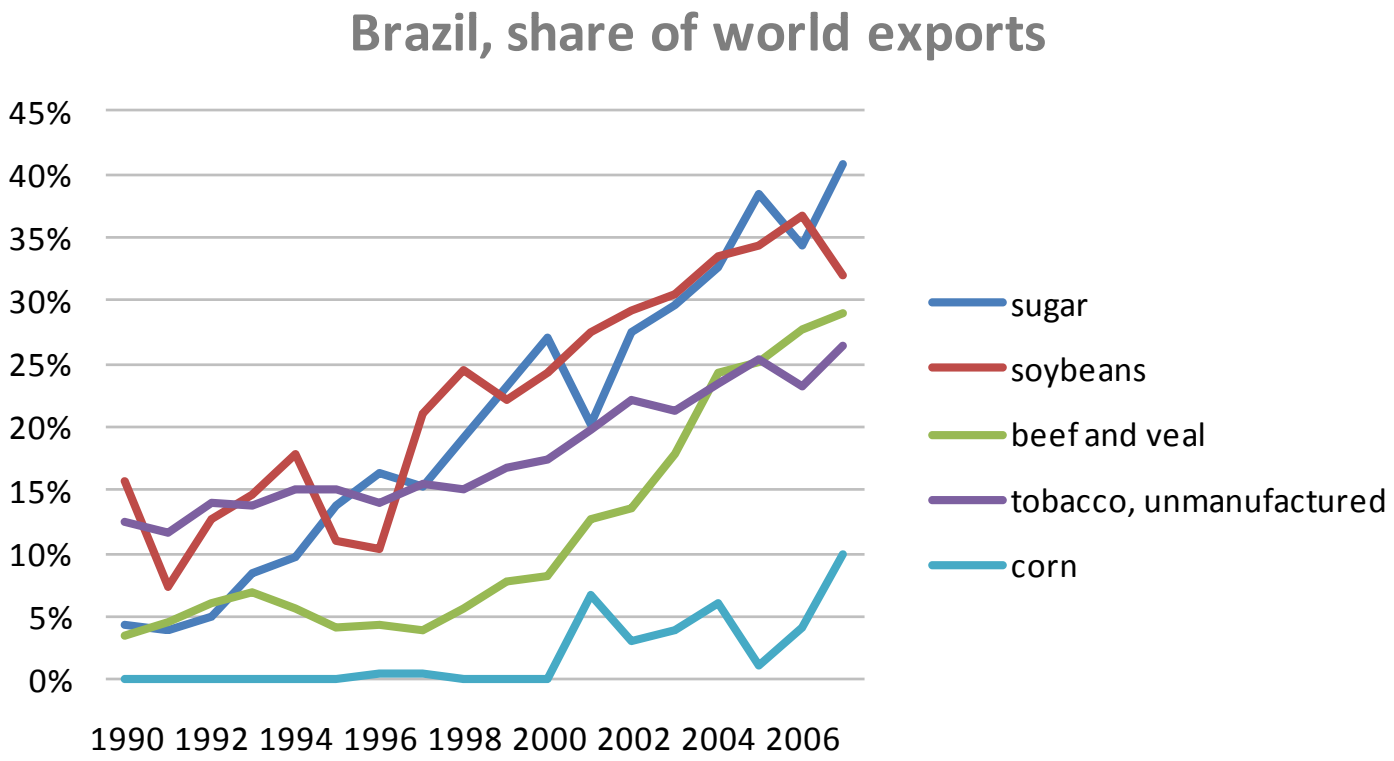
Data sources: Ricardo Machado

1. Brazil – commodity drivers

Brazil: commodities

Brazil is increasingly becoming one of the world's bread baskets

- The Amazon and the Cerrado together comprise ~85% of Brazil's land area. Further development is unavoidable given the importance of agriculture to the Brazilian economy
- Favorable exchange rates and reduction in domestic trade barriers have helped speed growth, along with considerable domestic investment in agricultural industries
- In 2008, agriculture represented 25% of Brazil's GDP (18% from crops, 7% from livestock) and 36% of its export revenues

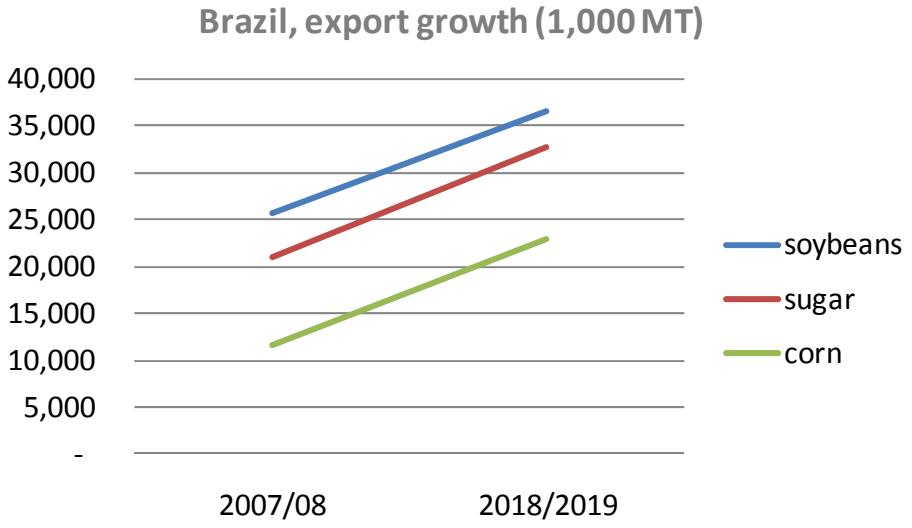


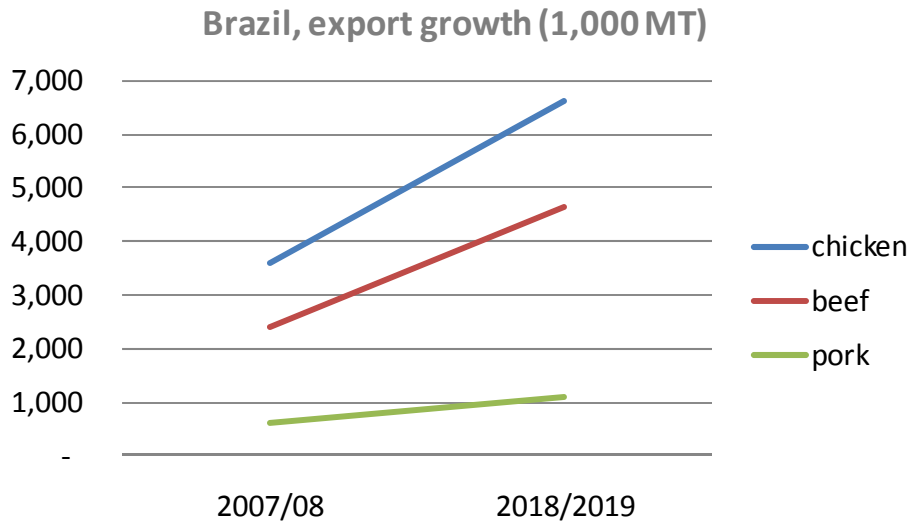
Data source: USDA Foreign Agricultural Service, Product, Supply and Distribution Online database & FAOTradeStat

Brazil: commodities

The growth of Brazil's ag sector is projected to continue as global population rises to 9 billion and living standards increase

- Brazilian agriculture will increase 25% in the next decade
- The Brazilian government projects its share of global beef exports will double by 2018, when it expects to supply two thirds of the global export market
- Government officials consider these estimates to be conservative, but also stress that "increased production could be achieved through technological gains and does not depend on a large expansion of planted area"





Data source: USDA Foreign Agricultural Service, Brazilian Ministry of Agriculture's Ten-Year Projections, 2008

Brazil: commodities

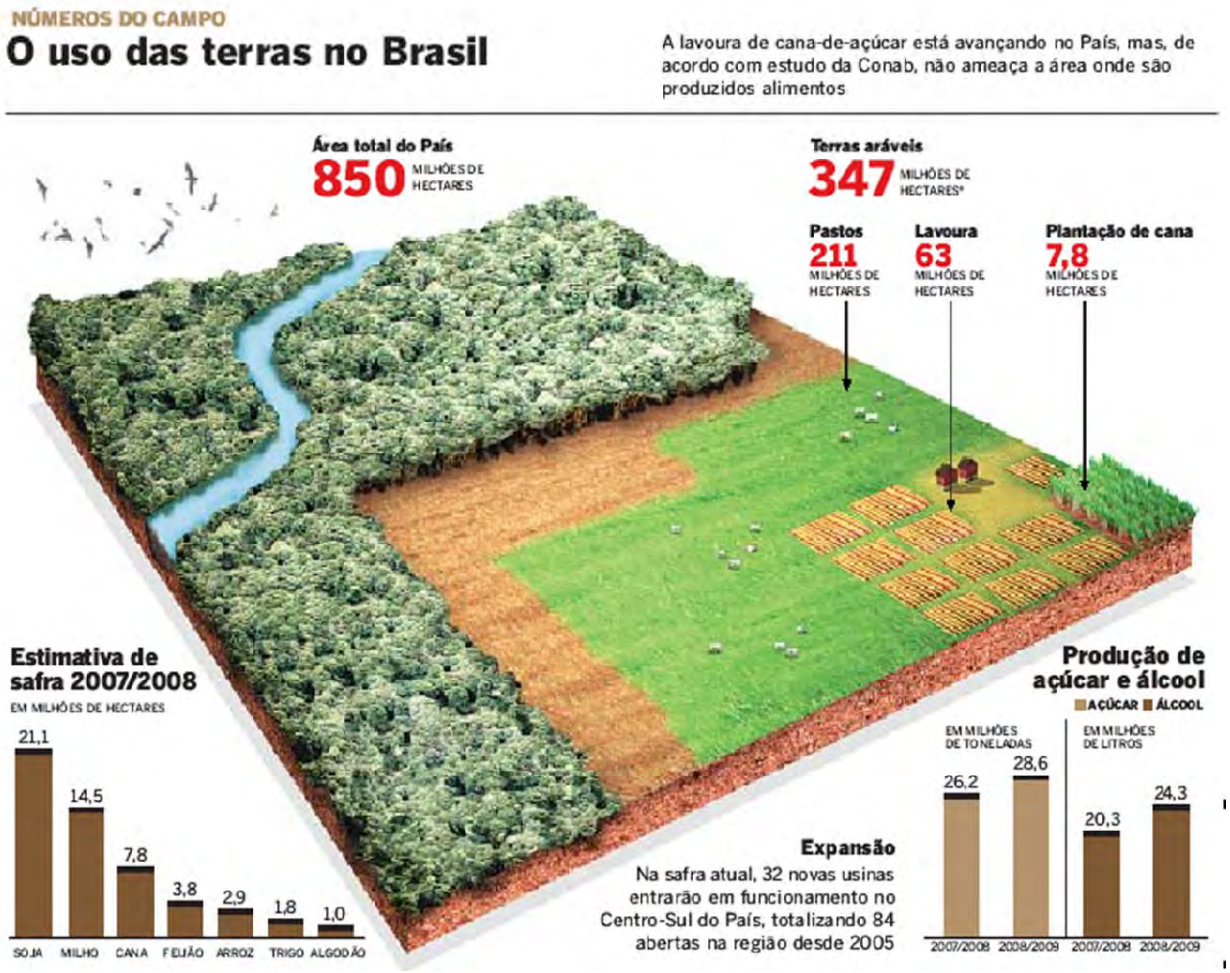
CEA California Environmental Associates

Intensive agriculture is rarely a direct driver of forest conversion

- However it can be difficult to quantify its indirect impact (by pushing cattle further into the frontier)
- There is plenty of deforested land to expand agriculture; it just needs to be used rationally

Land use in Brazil (million ha)

- total country: 850
- arable land: 347
- pasture: 211
- farms: 63
  - soy: 21.1
  - maize: 14.5
  - sugar: 7.8



Data source: Courtesy of Christopher Wells, Groupo Santander Brasil

Brazil: commodities

CEA California Environmental Associates

There are multiple drivers of deforestation in the Amazon & Cerrado, but cattle is the lead driver in both biomes

Cattle are the primary direct driver of deforestation in the Amazon and Cerrado and should be the focus of market efforts	• **Cattle are a cost effective way to establish land as "productive", a key step in securing land title** • **Currently ~80% of deforested Amazonian land is used for cattle grazing** • **Cattle's carbon footprint is raised further by enteric fermentation**
Agricultural commodities (e.g. soy and sugar cane) are important indirect drivers and should be kept out of the Amazon	• The boom in soy prices in early 2000s pushed cattle into the Amazon, and caused some direct conversion as well • Further expansion will be limited as only a small fraction of the remaining Amazon has appropriate conditions for soy • Though sugarcane is primarily grown in the southern Cerrado, its growth has displaced soy and in turn cattle, putting indirect pressure on the Amazon frontier
Secondary drivers (e.g. timber, charcoal and land speculation) must be addressed for long term stability, though It can be difficult to discern the magnitude of their direct impact	• Land titling and governance systems in the Amazon region are weak. Few people have clear land title. Clearing land with cattle is a way to gain title and speculate on the rising value of the land • This dynamic is more pronounced in the Amazon than the Cerrado • The illegal sale of timber helps to finance land clearing and the establishment of cattle production • Charcoal from soft woods is used to make pig-iron for the steel industry. In a few discrete regions near steel mills, the charcoal market is a significant driver of deforestation

1. Brazil – cattle

Brazil: cattle

CEA California Environmental Associates

With ~25% of the country in pasture and increasing numbers of cattle in the Amazon, the future management of this supply chain is the key to reducing land use emissions in Brazil.

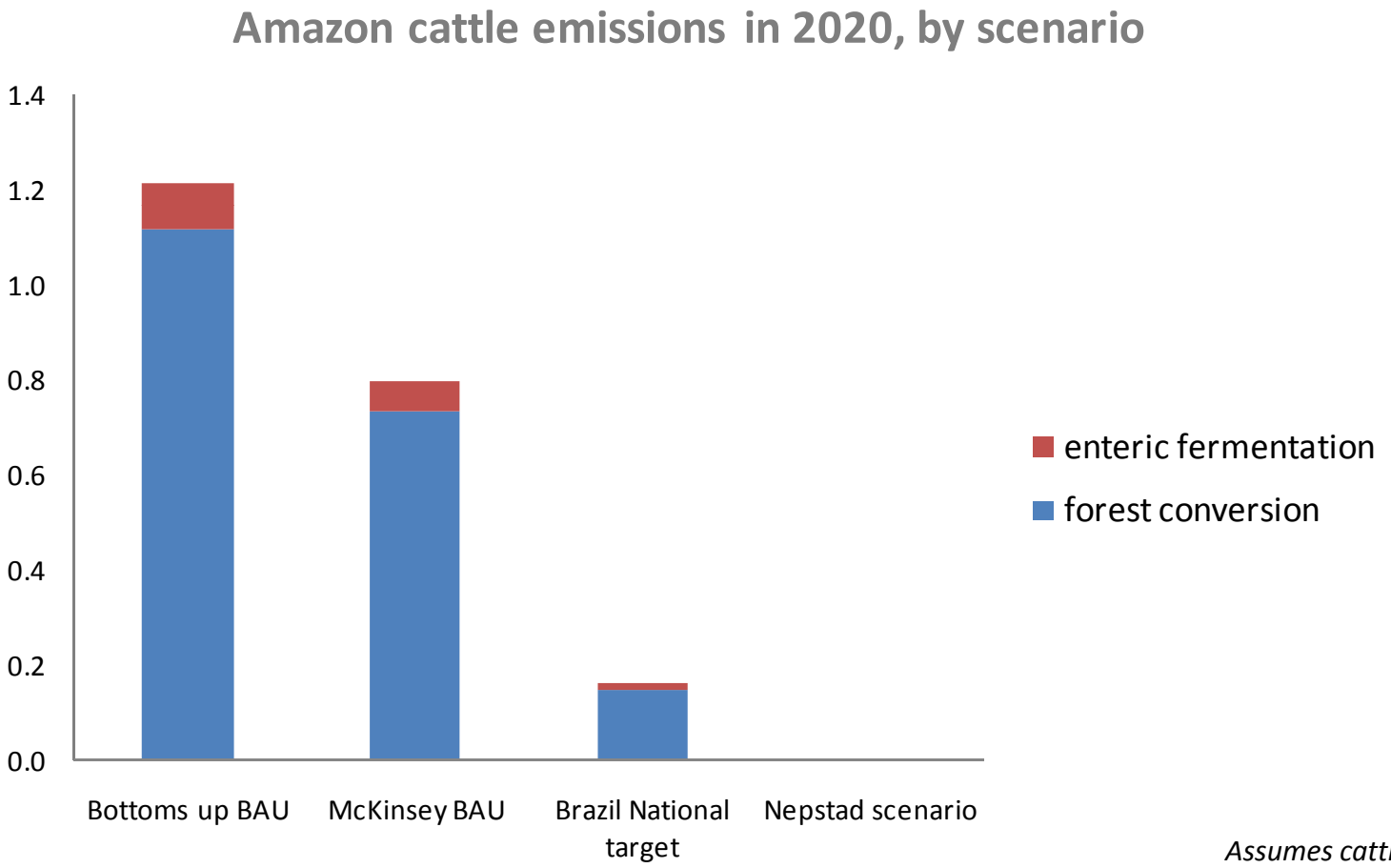
Points of leverage

- Market pressure: Pressure on the cattle industry has heated up significantly in the past year, catalyzed in part by NGO action. Many actors across the chain are engaging in solutions. Pressure on the industry needs to persist until the underlying governance can be strengthened (3-5 years)
- Legal pressure: State prosecutors in Para and Mato Grosso are clamping down on illegal actors in the cattle chain. Continued monitoring and enforcement of the chain is an important complement to market pressure
- Legalization of land holdings: Ultimately, strong land use policy and governance is needed to protect the forest. Developing traceability through the cattle supply chain depends on legalization of the producers through land and environmental cadasters

Brazil: cattle

CEA California Environmental Associates

Keeping cattle out of the Amazon and permanently protecting the biome is as much as a 1.2 Gt CO_2e/year lever



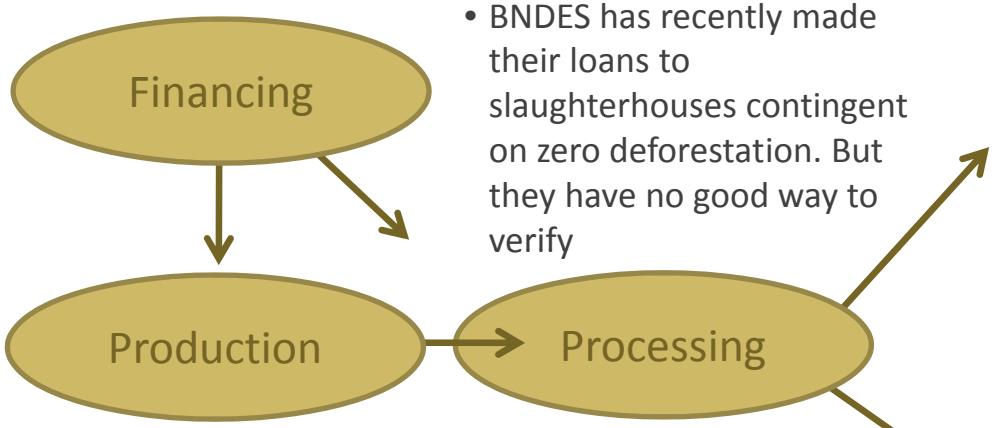
Assumes cattle intensity (1.08 head/ha) and cattle attribution (80%) remain constant

Data sources: IPNE, Brazilian AgCensus, IMAZON, McKinsey, Nepstad

Brazil: cattle

CEA California Environmental Associates

Cattle: very fractured production, choke point with slaughterhouses, primarily domestic consumption. The challenge is solving chain of custody



- BNDES has recently made their loans to slaughterhouses contingent on zero deforestation. But they have no good way to verify

- Over 2 million ranching operations
- At least 3 steps in the supply chain *before* processing – makes chain of custody difficult
- Many producers do not have legal land title

- Top 3 players (JBS, Marfrig, Minerva) together control ~80% of Brazil's beef exports (2009) and just under 40% of Brazilian slaughter capacity
- Processing industry has revenues in the billions
- Financed primarily by BNDES, as well as IFC, IDB & private banks

Domestic market

- ~75% of Brazilian beef is consumed domestically
- ~50% of the domestically consumed beef is sold in supermarkets
- ~20% is sold by top three chains (WalMart, Carrefour, Grupo Pao de Acucar
- Considerable informal beef sector in Brazil

Export market

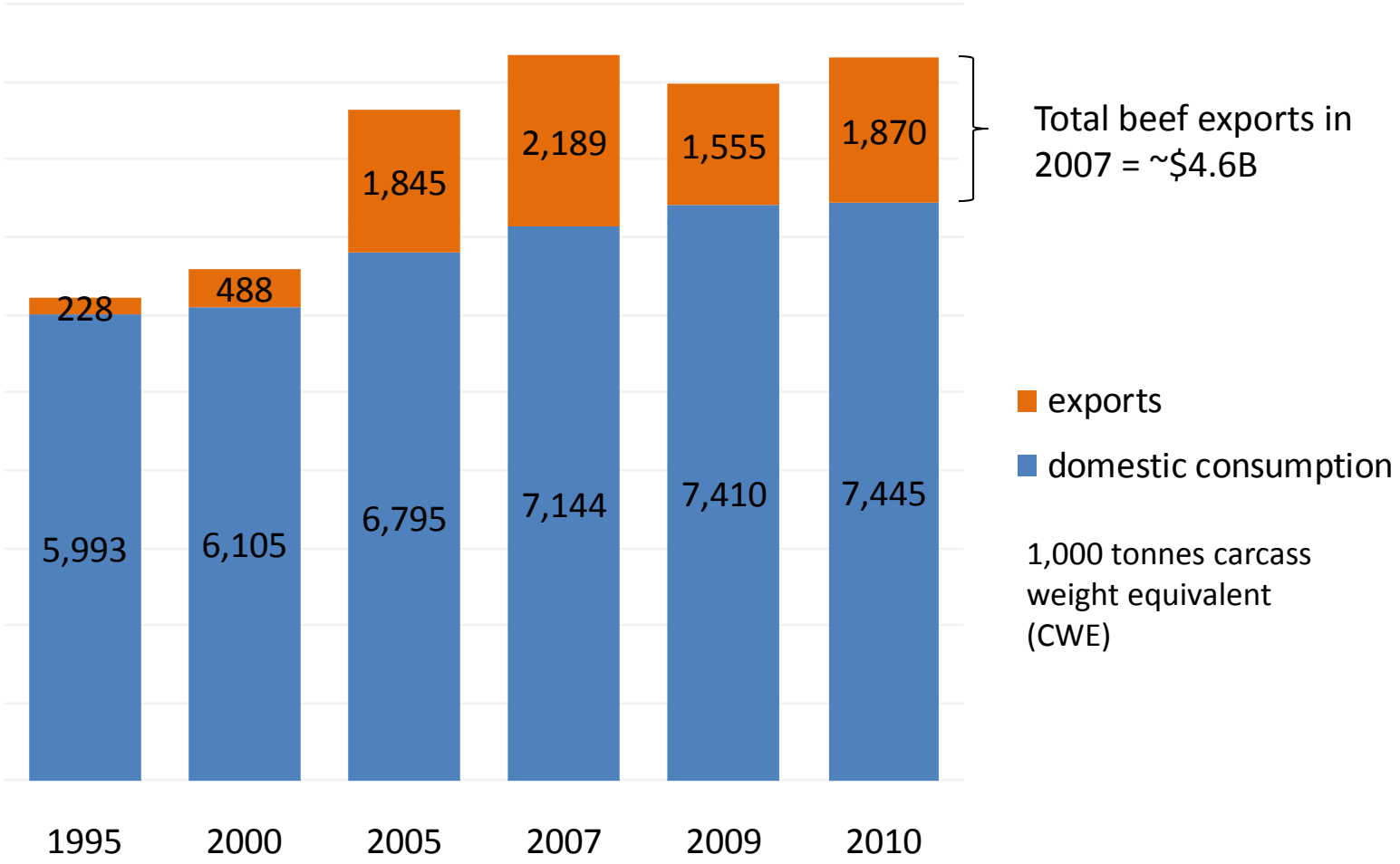
- Exports have more that doubled as a % of Brazilian production in last 10 years
- Top export markets (2007) include 1) Russia (~25%), 2) Middle East (22%), 3) Europe (23%), 4) Hong Kong (China) (5%), 5) US (6%)
- US and EU markets only consume ~7% of total beef output
- Leather exports are small by volume, but buyers are high profile brands (Nike, Timberland, Toyota, IKEA, Gucci)

Data source: Amigos da Terra, Greenpeace, Brasil Censaro Agropecuario 2006, Associacao Brsileira das Industrias Exportadora de Carne (ABIEC) Interviews

Brazil: cattle

Recent growth in cattle production has been partly driven by exports

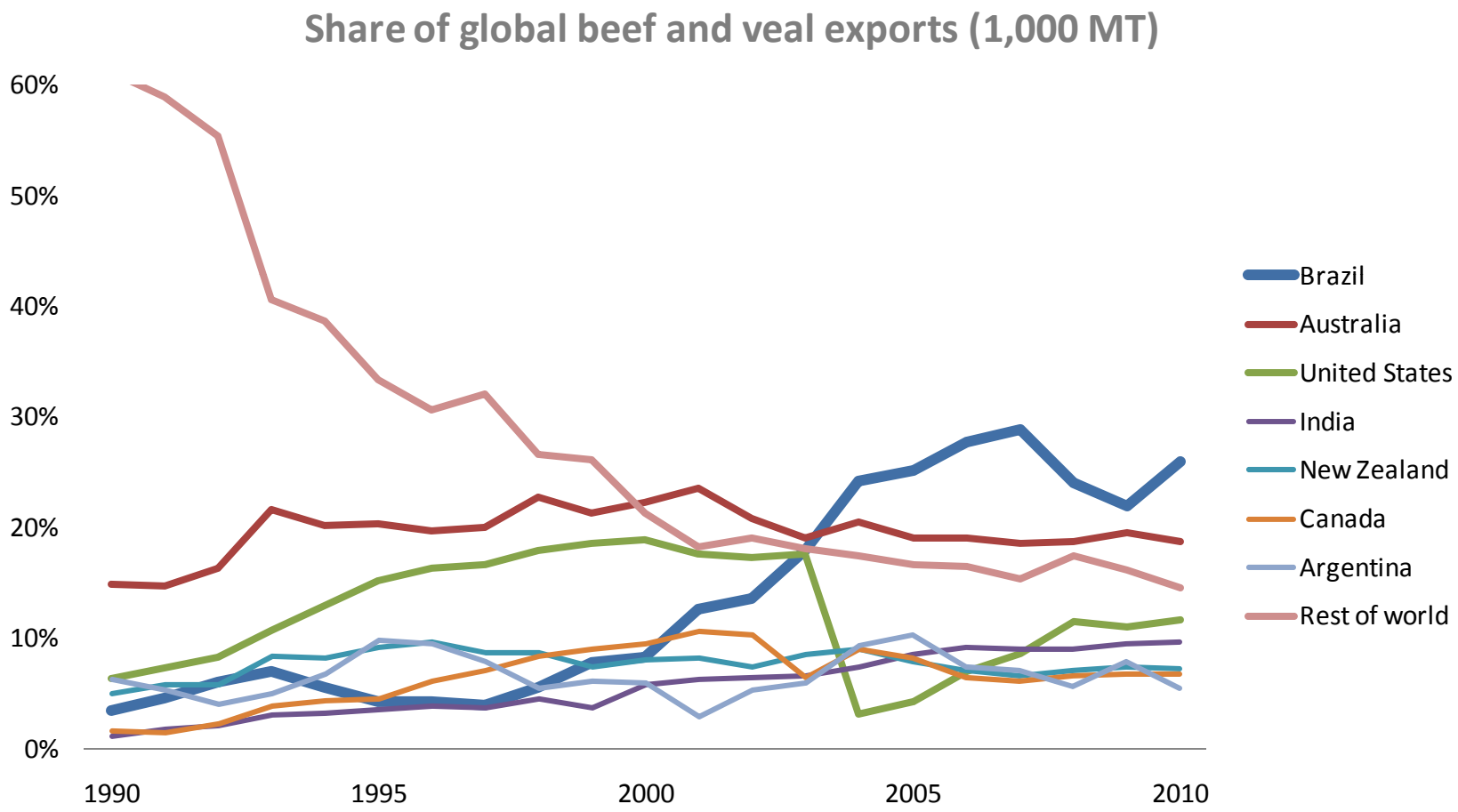
- Exports have grown from 4% of total production in 1995 to 24% in 2007



Data source: USDA FAS PSDOnline

Brazil: cattle

Brazil is now the leader in global beef exports



Data source: USDA Foreign Agricultural Service (FAS), "Brazil Semi-Annual Livestock Report, 2009", USDA FAS Product, Supply, and Distribution (PSD) Online

Brazil: cattle

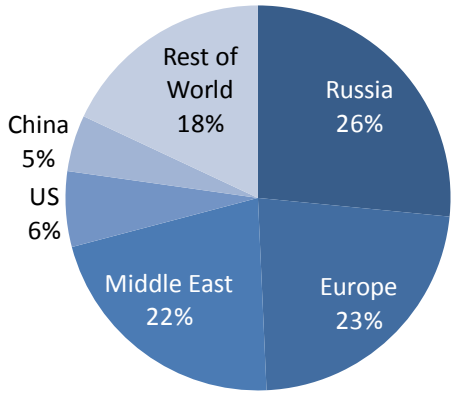
Though domestic sales dominate and most export markets are disengaged, several multinational brands buy Brazilian cattle products

- EU markets also have strict health controls which permeate the beef supply chain.
- Leather is a only 10% of the Brazilian cattle market, but a good target for campaign work because of the value of the associated brands. Total Brazil leather exports, 2008 = $1.8B

Nearly ¼ of Brazilian beef exports go to the EU. The EU has strict controls on Brazilian beef for health reasons (hoof and mouth), restricting some Amazonian beef from the export market

35% of Brazil's leather exports go to China where they are made into shoes and furniture for Nike, Timberland, IKEA and others

30% of Brazil's leather exports go to Italy, where they are made into high value handbags and other products

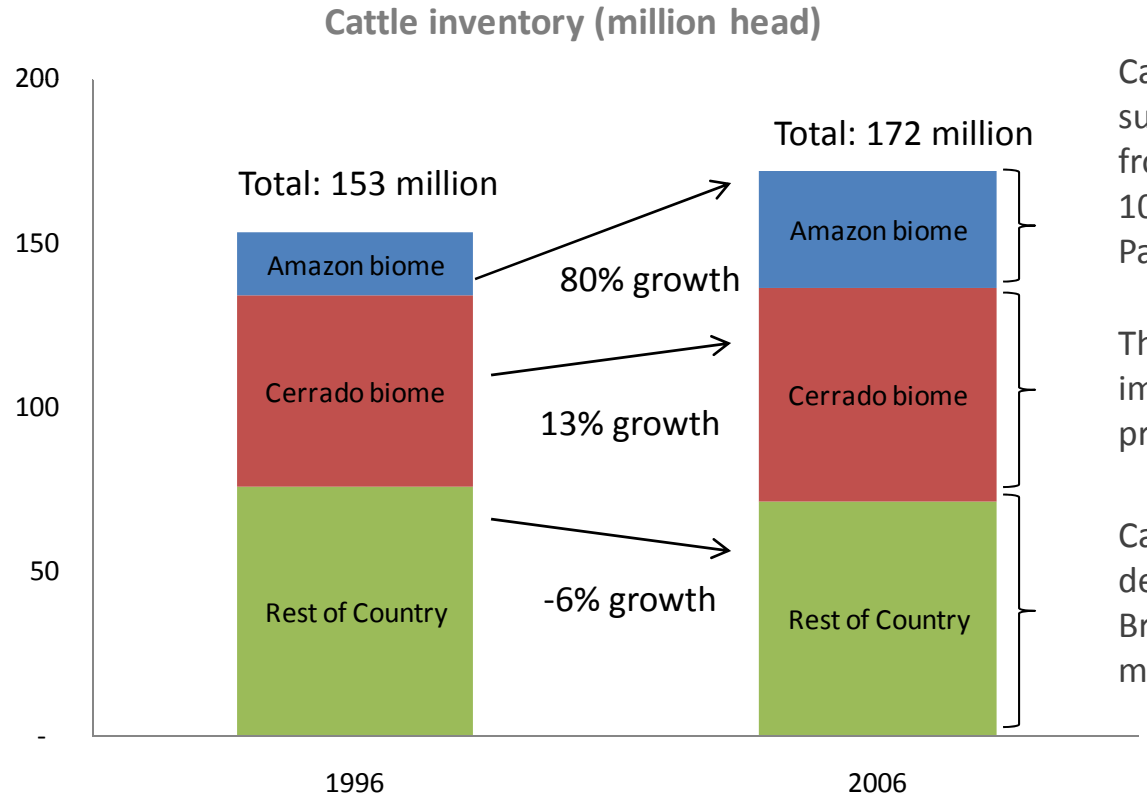


Data source: Associacao Brsileira das Industrias Exportadora de Carne (ABIEC), Greenpeace

Brazil: cattle

The growth of the cattle sector in Brazil is having an increasing impact on the Amazon as cattle populations shift to that region

- Between 1990 – 2008, the herd size in the Legal Amazon has grown from 21.1 million head (18% of national total) to 71.4 million (36% of national total)
- Slaughter capacity in the Legal Amazon also grew significantly in these years



Cattle populations have grown substantially along the Amazon frontier, with inventory growth over 100% in the Amazonian states of Para, Rondonia, and Acre

The Cerrado continues to be an important region for cattle production

Cattle populations have started to decline in the southern regions of Brazil, displaced to the north by more intensive agricultural crops

Data source: Brasil Censaro Agropecuario, 2006, IMAZON

Meat processing has consolidated considerably in the last 10 years

- Together, the 3 top meat processors account for ~40% of total processing capacity and ~80% of exports. They are an important choke point in the supply chain
- Since the publication of the Amigos da Terra and Greenpeace reports, JBS purchased another large beef company in Brazil, Bertin. We were unable to attain up-to-date information, but based on previous data for the two companies, JBS may now control ~20% of fresh/frozen, ~60% of processed beef exports, and ~20% of leather exports, as well as Bertin's cosmetics and pet industry clients

	JBS	Marfig	Minerva
	The world's largest producer of processed meat, ~10% of global market	Fourth largest global producer of beef products	Data unavailable
Slaughter capacity in Brazil	22 slaughterhouses 18,900 head/day	9 slaughterhouses 13,300 head/day	6,600 heads/day – 14% in the Amazon 5,000 hides/day – leather
Suppliers	12,000 in Brazil	Data unavailable	Data unavailable
Major international buyers/products	Burger King, KFC, Kraft, Heinz	• Processed meat accounts for 40% of sales • Sells to: Tesco, WalMart, Metro, Kraft, Oakfields Foods	• Lead exporter of live cattle • Sells to: Oakfields Foods and SAMPCO
Financing	BNDES holds 13% of company shares, and has provided an ~$1.2B loan *since* requiring zero deforestation from borrowers	BNDES owns 15% of the company's equity	Has received financing from BNDES and Banco da Amazonia.

Data source: Amigos da Terra, "Time to Pay the Bill", Greenpeace "Slaughtering the Amazon", interviews

Brazil: cattle

CEA California Environmental Associates

The leakage effect of Brazilian cattle should be relatively minor

- Carbon intensity of Amazon and Cerrado is relatively high
- Comparatively low stocking rates in Brazil, at 1.08 head/hectare
- Considerable potential for increased intensification of production. Several interviewees expected Brazil would maintain roughly the same production levels through increased stocking rates
- Relatively high use of pasture in Brazil: IPCC estimates of pasture usage for cattle are also encouraging in that cattle production outside of Brazil is less dependent on pasture (99% Latin America; 95% Africa; 81% North America; 50% Asia; 32% Western Europe; 30% Eastern Europe; 22% India)
- A shift to other commodities would also be beneficial given the enteric fermentation associated with beef and the relatively low caloric production per hectare
- Most of Brazil's beef production is domestically consumed, such that the international trade effects will be less moderated
- Limited modeling results are supportive. Iowa State* completed a working paper in February on the effects of a cattle tax in the US. They found increased land use emissions from additional cattle, primarily in Brazil. Brazil accounted for 90% of the additional emissions due to the size of the industry, "the low stocking rate, and the high carbon values of the forest and Cerrado." The effect of reduced of cattle production in Brazil was not estimated, but by the same logic, the gains should reduce the leakage losses

**Data source: Dumortier et al. 2010. Modeling the effects of pasture expansion and yield increase on emissions from land-use change. Working Paper 10-WP 504. Iowa State University.*

1. Brazil – soy

Brazil: soy

CEA California Environmental Associates

Soy is an increasingly important export crop for Brazil (~$8.4B in exports, 2007). Production is expected to increase by over 40% in the next decade

- Soy expansion in the Cerrado is rational from a global production perspective
- However, strong land use policies need to ensure that it is neither displacing cattle into the Amazon nor directly converting land in the Amazon

Points of leverage

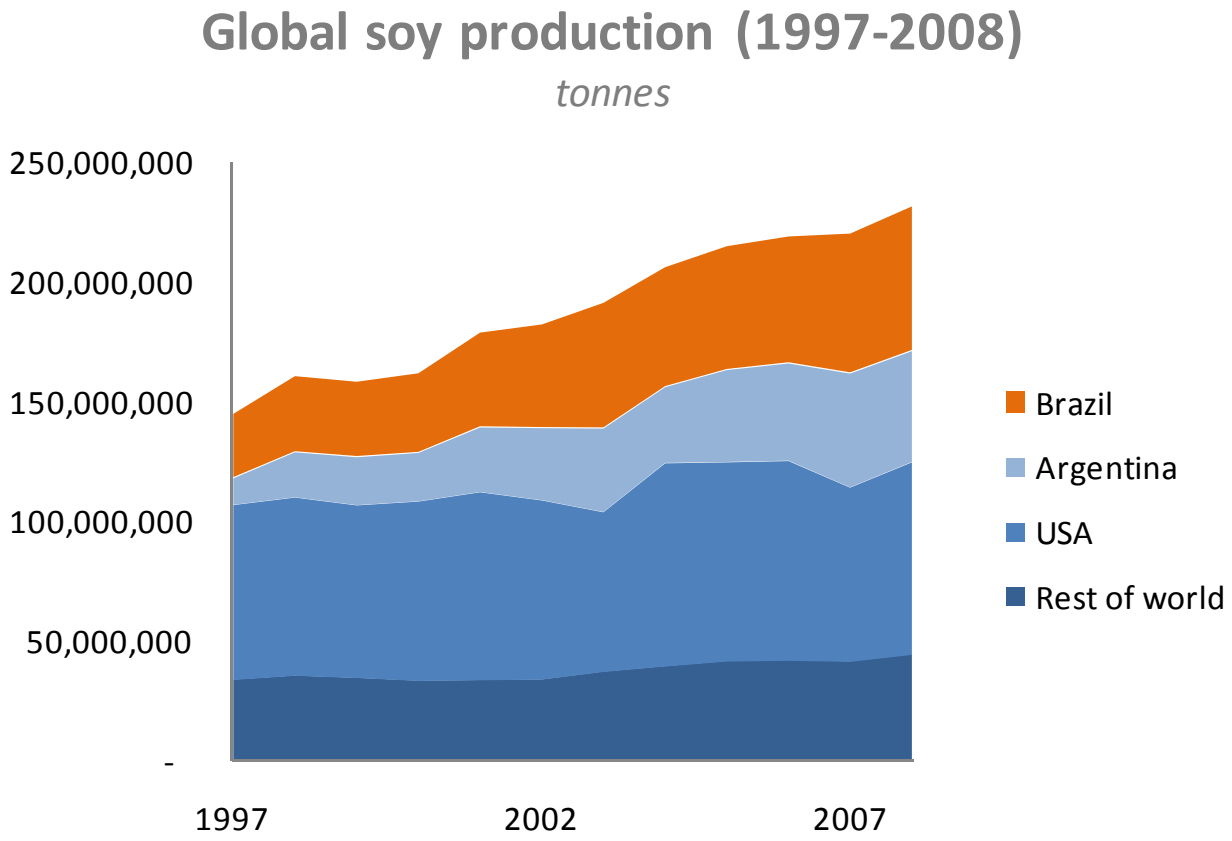
- Market pressure: A moratorium on soy from recently deforested lands in the Amazon, put in place in 2006, has been largely successful in stopping direct soy conversion
- Legalization of land holdings: Ultimately, strong land use policy and governance is needed to protect the forest. Developing traceability through the cattle supply chain depends on legalization of the producers through land and environmental cadasters.
- Monitoring: Connect land registries to publically accessible satellite data for enhanced monitoring

Data source: FAOStat, USDA Foreign Agricultural Service, Brazilian Ministry of Agriculture's Ten-Year Projections, 2008

Brazil: soy

Soy has been a rapidly growing export crop for Brazil

- In 2007, Brazil provided 26% of the world's soy, up from 18% in 1997
- Brazil trails only the US as a global soy producer

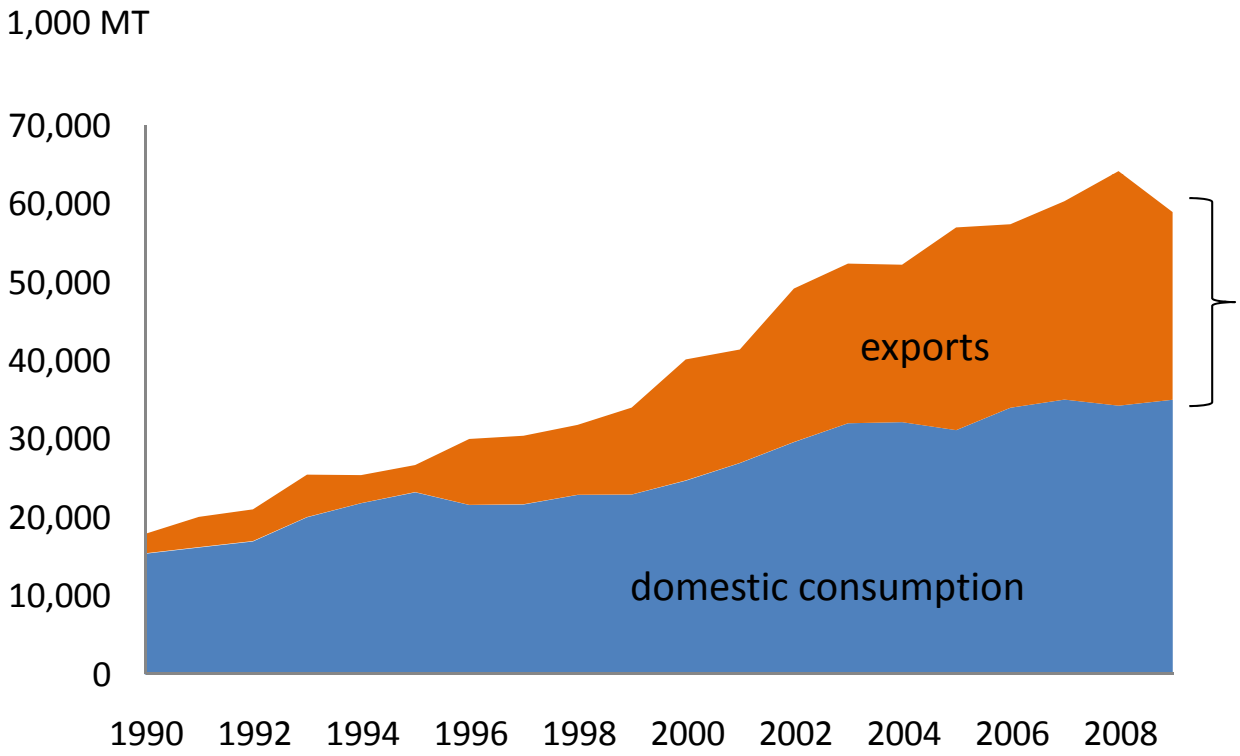


Data source: FAOStat, USDA Foreign Agricultural Service, Brazilian Ministry of Agriculture's Ten-Year Projections, 2008

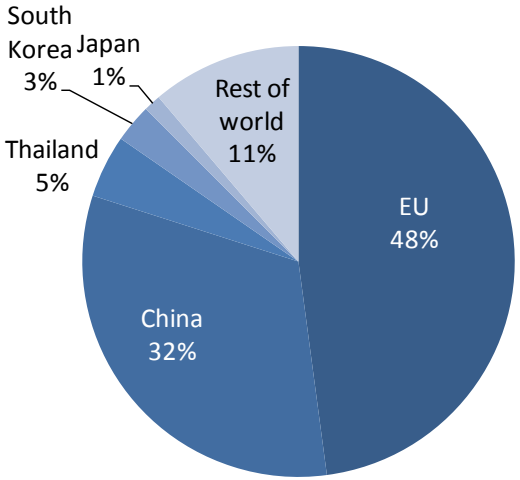
Brazil: soy

Almost 40% of Brazilian soy is exported, primarily to EU and China

- Exports to China are growing quickly, especially as they start to increase grain-fed livestock production



Export markets for combined soybeans, meal and oil (2008)

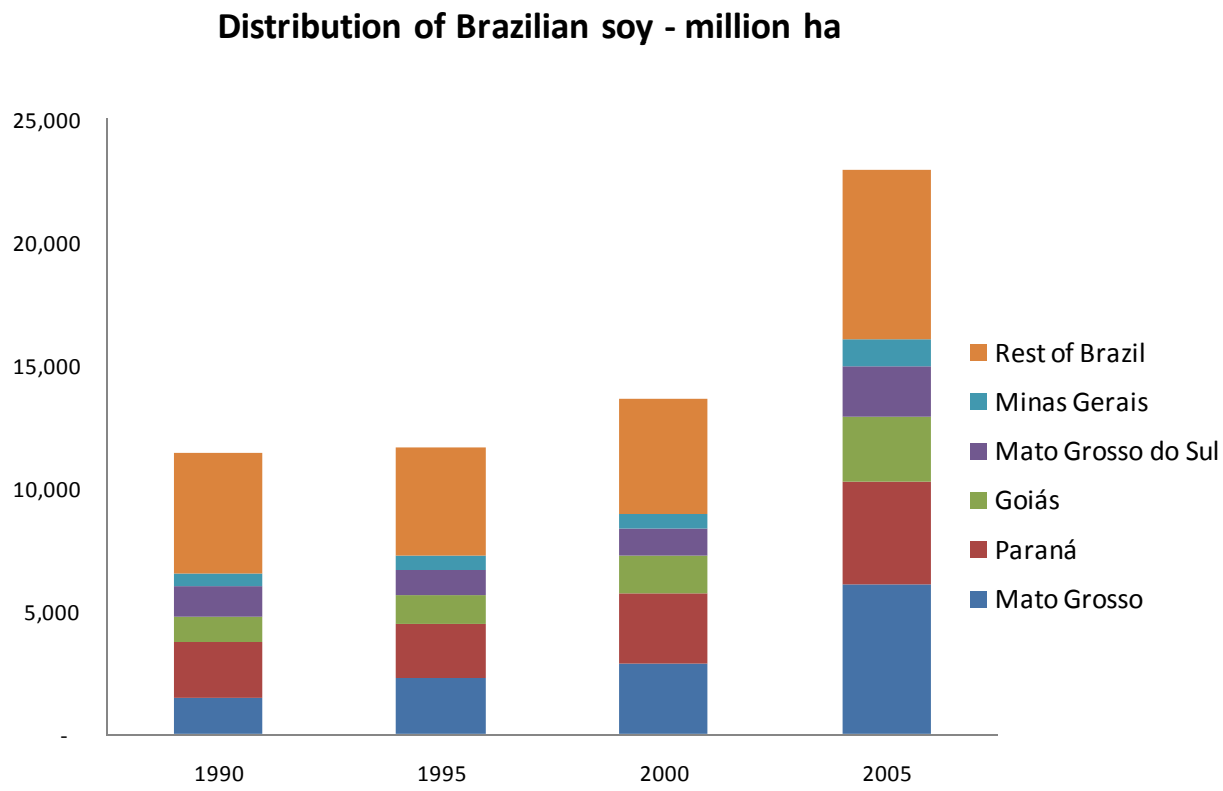


Data source: USDA FAS PSDOnline, Oil World, Oil World "Soybeans, Oil & Meal" commodity update, Dec. 2009

Brazil: soy

Land in soy cultivation doubled from 1995-2005, growing fastest in the Cerrado and Amazonian frontier

- Yields grew 60% from 1990-2008 (1.7 to 2.8 tonnes/ha)
- From 1995-2005, land in soy cultivation grew fastest in Mato Grosso (163%) and Goias (137%)

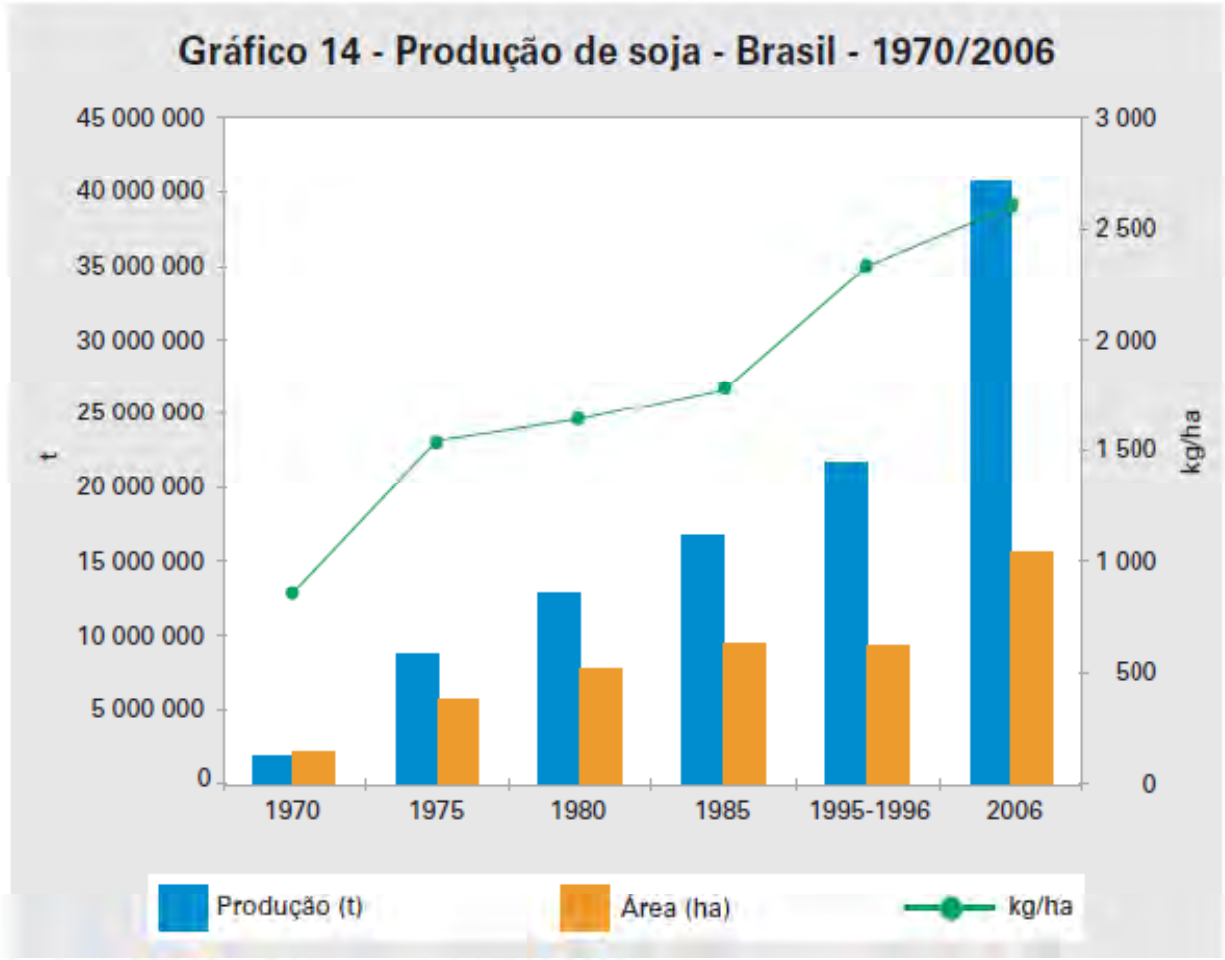


Data source: Brasil Censaro Agropecuario, 2006

Brazil: soy

Soy intensity is improving

- Yields grew 60% from 1990-2008 (1.7 to 2.8 tonnes/ha)



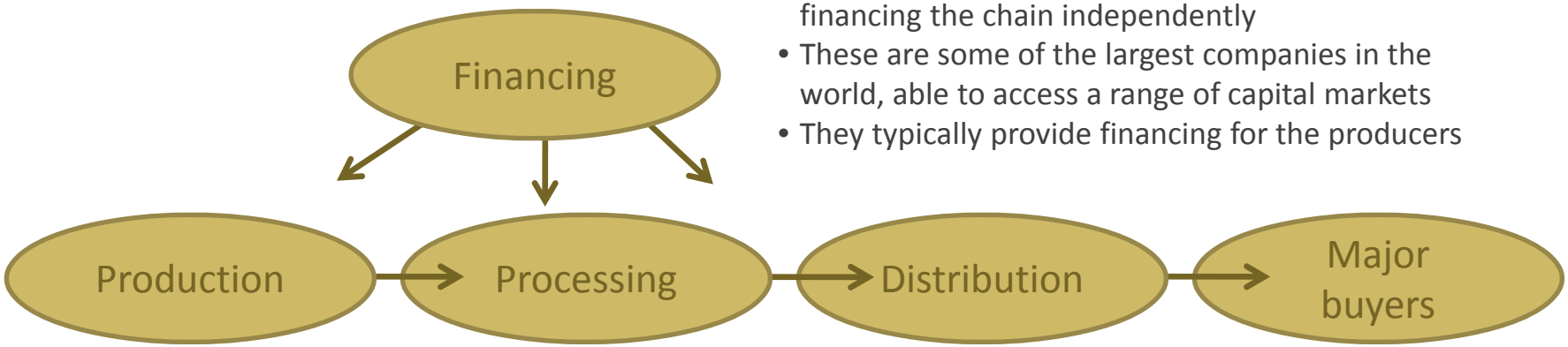
Fonte: IBGE, Censo Agropecuário 1970/2006.

Data source: Brasil Censaro Agropecuario, 2006

Brazil: soy

Soy: heavily concentrated and vertically integrated
Cargill, ADM, Bunge dominate

- The major players in the soy industry are capable of financing the chain independently
- These are some of the largest companies in the world, able to access a range of capital markets
- They typically provide financing for the producers



- ~200,000 soy farms. The largest number of farms is found in the south though Mato Grosso (where the farms tend to be larger)
- Total area in soy cultivation is ~22 million ha
- Soy farmers are typically financed by their suppliers and/or buyers (e.g. Bunge, Cargill, ADM)

- Processing capacity is dominated by the major grain traders (ADM, Bunge, Cargill)
- Soybeans can be sold whole or crushed into oil
- Brazil exports ~60% of its soybeans whole, ~40% crushed

- The major grain traders control the distribution of soybeans. They typically own the transportation infrastructure (grain elevators, ships) and even sometimes the ports

- Globally, ~70% of soy is used for animal feed. China's shift to grain diets for its livestock is rapidly raising the demand for soy
- Globally ~20% is used for oil and ~10% goes into food products
- Pressure along the chain comes from the several international brands that use soy (primarily as animal feed) in their supply chains (e.g., McDonalds, Burger King)

Data source: Greenpeace, Brasil Censaro Agropecuario 2006, Grist

Brazil: soy

CEA California Environmental Associates

Brazilian soy and leakage?

- Because the Amazon is much more carbon intensive than other soy growing regions, shifting soy out of the Amazon to other biomes (inside or outside Brazil) will almost certainly be a win
- However, Brazilian soy is relatively productive, comparable to other soy growing regions, so no obvious intensity gains
- Soy is also an efficient crop from a calorie to ha perspective
- Because soy is internationally traded and much of Brazil's soy crop is exported, a reduction in soy production in Brazil is likely to move elsewhere
- A focused effort to prevent the expansion of soy into the Cerrado should not be a priority for GHG reasons, though there are many other ecological reasons to curb agricultural expansion in the Cerrado biome (e.g. watershed health, biodiversity)

Data source: Dumortier et al. 2010. Modeling the effects of pasture expansion and yield increase on emissions from land-use change. Working Paper 10-WP 504. Iowa State University.

1. Brazil – Logging

Brazil: logging

Logging

- **Illegal logging is still a major threat to the Amazon. This problem has yet to be "cracked", but the Lacey Act amendments provide a new tool that should be tested**
- Brazil's timber industry has not been well studied in recent years. The best data we could find is from 2004
- In 2004, the timber sector produced 24.5 million m^3 of roundwood (about 6.2 million trees), generating ~10.4 million m^3 of processed wood. Although this level of output remained relatively stable between 1998-2004, the total roundwood consumption dropped by 13% thanks to efficiency gains
- Brazil is the second largest producer of tropical hardwood in the world, behind Indonesia
- Para is the #1 timber producing state, followed by Mato Grosso, then Rondonia
- 36% of this wood is exported, primarily to the US and the EU
  The rest is used domestically, primarily in the south of Brazil
- The value of timber exports in 2004 was $940 million,
  $543 million from Para state

Mahogany

- Major NGO efforts shut down the legal mahogany trade a few years ago. Mahogany is now listed under CITES as a "endangered species"

Brazil: logging

CEA California Environmental Associates

Charcoal

- **In a few regions of the Legal Amazon, the demand for charcoal made from soft woods is an indirect, and sometimes direct, driver of deforestation. Campaign work could be effective here because the industry is small and concentrated, major brands are involved (notably car manufacturers), and the labor infractions are also serious (room to employ other legal levers)**
- Charcoal is made into pig iron in a few mills in the Legal Amazon. Pig iron is then used in Brazil, the US, and other countries as a material for cars and other manufactured goods
- About 30,000 people depend on the production of charcoal for their livelihoods
- The industry is notorious for slave labor and child labor
- The affected area is concentrated around the pig iron mills and the railway connecting them to the ports

2. Indonesia

Indonesia: overview

Moratorium on peat conversion should be the focus of market work

- Building political will to declare and enforce a peat moratorium
  - Incredibly carbon rich lands: density is an order of magnitude higher than the Amazon – *leakage is not a concern*
  - ~150 Gt of CO_2e stored in just 22 million ha of peat lands in Indonesia. ~40+ Gt at risk by 2050

Indonesia: overview

Many serious challenges to working in Indonesia…

- Weak governance and institutions
- Ubiquitous government and corporate corruption
- Little engagement by Indonesian consumers / citizens
- Agribusiness industry largely financed by Asian banks
- Developing world dominates export markets for key commodities

… but there are some promising political signs

- Government commitment to reduce GHG by 26% by 2020, or 41% with REDD payments
- BAPPENAS recommendation to declare peat moratorium: "The utilization of the country's peatlands constitutes ~1% of GDP, yet accounts for almost 50% of emissions."
- Ministry of Agriculture review of concession permits and consideration of peat moratorium
- Some progressive leadership at provincial/regional level

Indonesia: overview

CEA California Environmental Associates

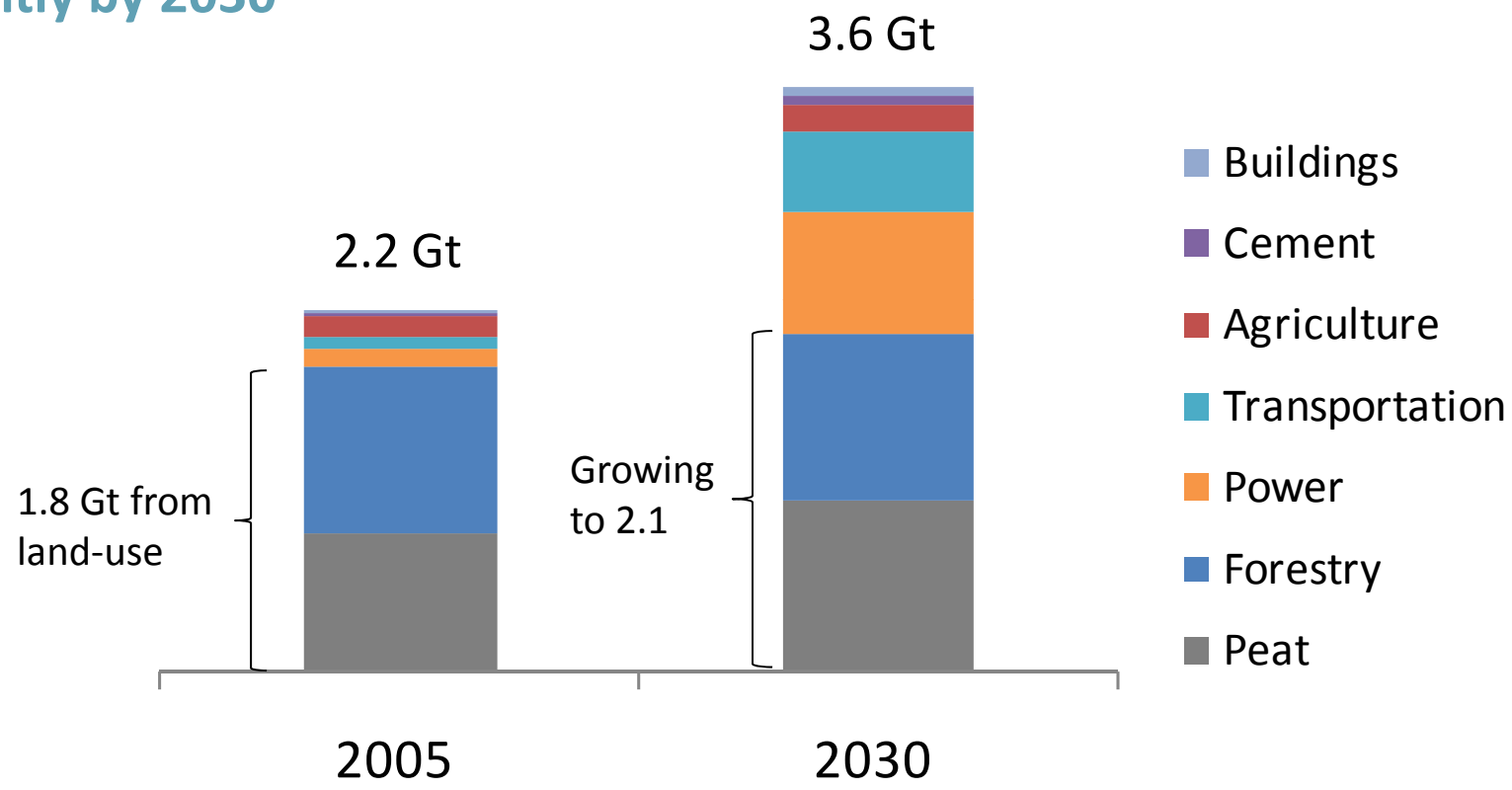
Market work is not a silver bullet in Indonesia: need to push for strong political action on multiple fronts

- **Palm oil** – driver of ~50% peat & ~25% forest conversion
  1. Create pressure and risk through major buyer cancellations & suspensions - e.g. recent Unilever, Nestle, Neste Oil wins
  2. Slow financing of industry to slow growth of the industry and add to political pressure
  3. Support RSPO to help build corporate advocates for strong policy
- **Pulp wood** – driver of ~50% peat & ~20% forest conversion
  1. Slow financing of industry – financing to pulp mills is a critical choke point, potential to reduce "lock in"
  2. Create pressure and risk through major buyer cancellations & suspensions – e.g. Staples, Office Depot, Wal-Mart, fashion companies
  3. Lacey Act – challenging, but may draw in compliance from Chinese producers (sourcing pulp from Indonesia and exporting finished product to U.S. and E.U.)

2. Indonesia – carbon

Indonesia: carbon

BAU scenario projects LULUCF emissions in Indonesia are to grow slightly by 2030



2005: 850 Mt CO2e from peat, and 1,023 Mt from forestry

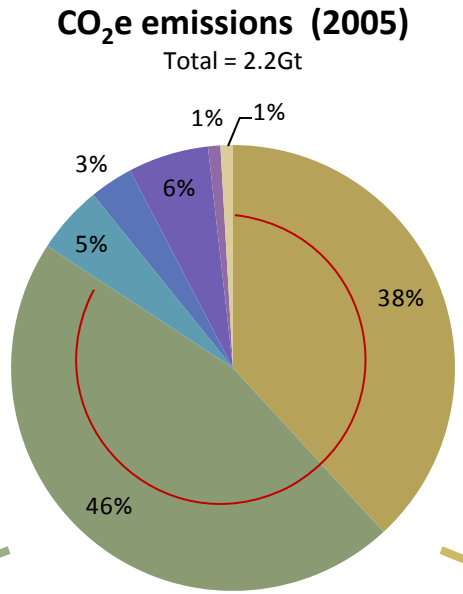
- Indonesia contributed one-third of global LULUCF emissions

2030: 2.1 Gt per year in 2030 in BAU scenario

- 24% growth in peat to 1 Gt
- no change in forestry

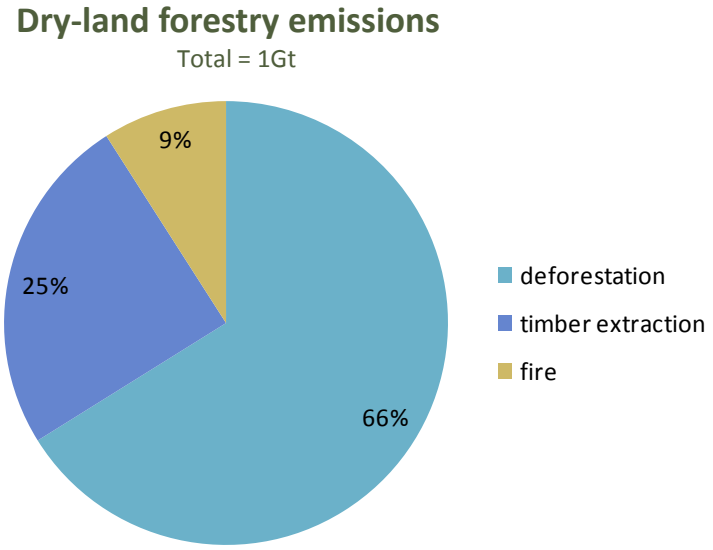
Data source: private analysis

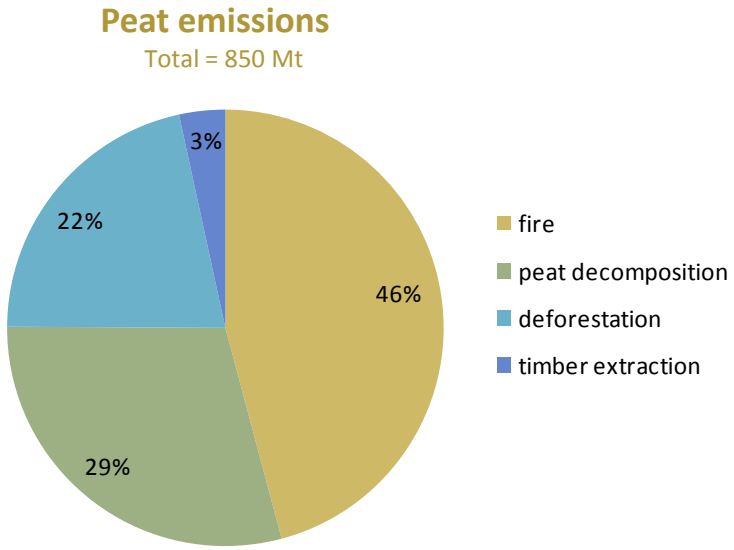
Indonesia: carbon



Emissions are split between peat and dry-land forests

Emissions from peat conversion are complex, but are dominated by fire and decomposition



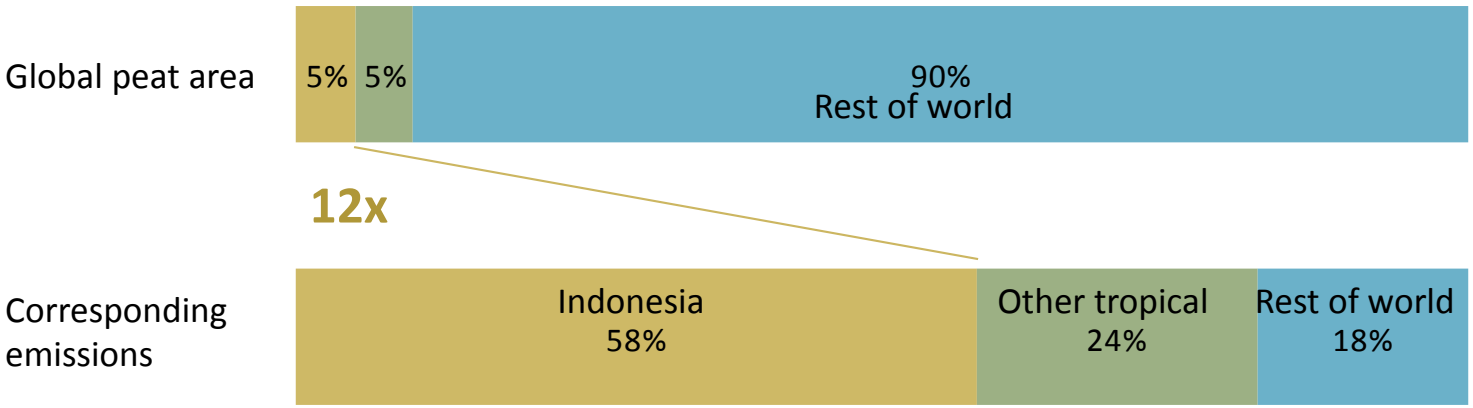


Data source: private analysis

Indonesia: carbon

In 2005, Indonesia contributed one third of global LULUCF emissions

- Its share may be rising, given declining deforestation rates in Brazil
- Nearly 50% of Indonesia's LULUCF emissions are associated with peat loss
- Indonesia's peatlands are extremely carbon-rich
  - Indonesia's peatlands store ~40 Gt C. By comparison, the Brazilian Amazon stores ~40-60 Gt C
  - Its relative contribution of global emissions from peat decomposition is 12 times greater than its relative contribution to global peat area

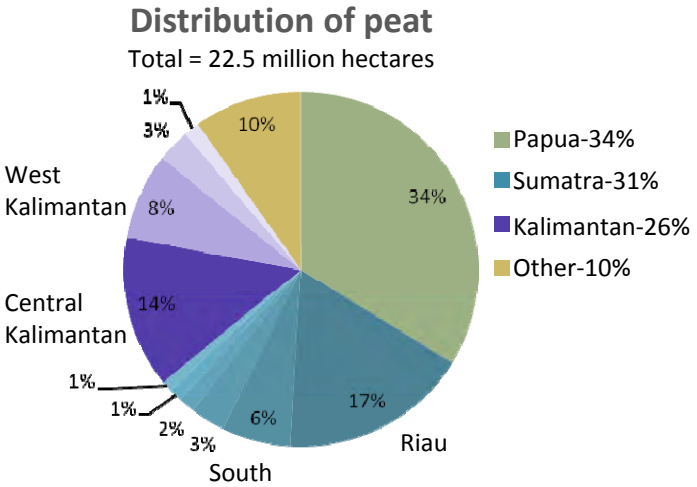


Data source: Hooijer et al (Wetlands International), private analysis

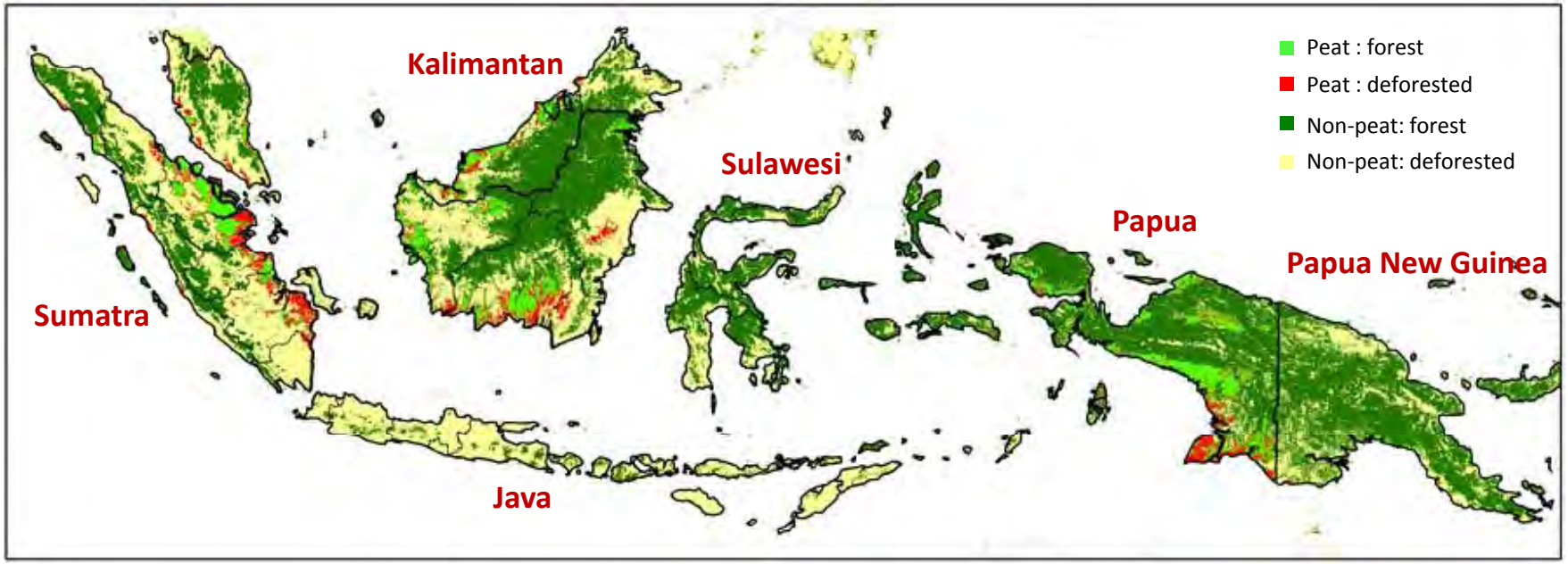
Indonesia: carbon

Indonesia's hotspots of peatlands

- Distribution of peatlands is equally spread across Papua, Sumatra and Kalimantan
- But focus should be on:
  - Riau has highest percentage of peat coverage
  - East Kalimantan had highest annual rate of deforestation



Land cover (2000)



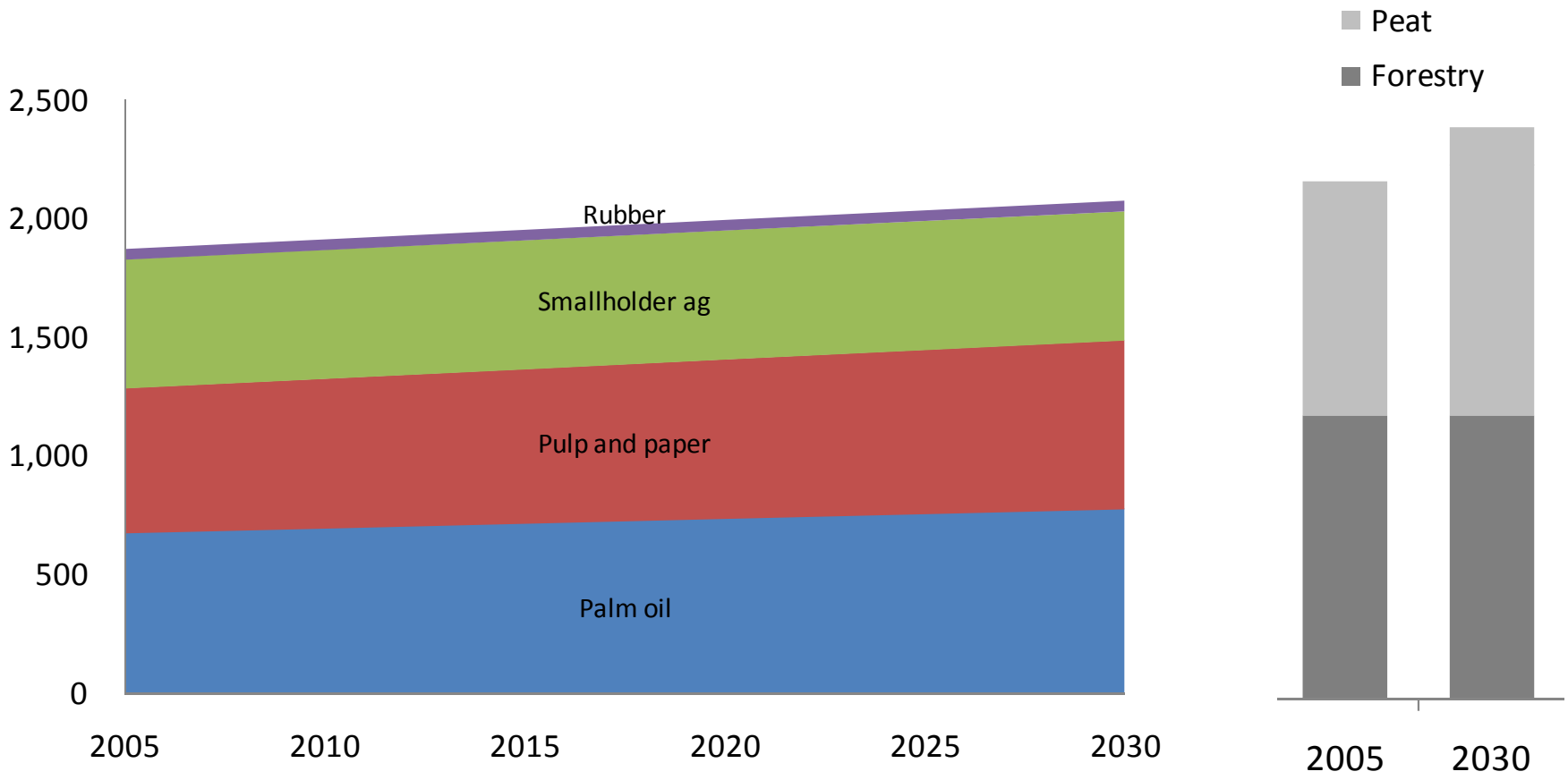
Data source: Delft Hydraulics, "Peat CO2 assessment of CO2 emissions from drained peatlands in SE Asia"

2. Indonesia – commodity drivers

Indonesia: commodities

Palm oil and pulp and paper are the most concentrated, identifiable commodities driving LULUCF emissions growth

LULUCF emissions by land-type and commodity (Mt CO_2e)

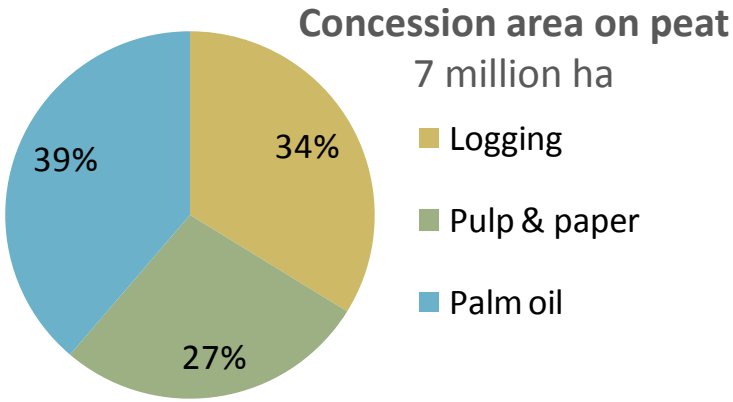


Data source: private analysis

Indonesia: commodities

Concessions on peatlands are roughly equally distributed across the commodities

- Palm oil has greatest share of allocation on peatlands (39%)
  - Indonesian Palm Oil Research Institute estimates that two-thirds of all currently productive oil palm plantations involved deforestation
  - Half of future palm oil expansion is expected to occur on peatlands because the more desirable dry lands are occupied
  - Smallholders are projected to contribute half of future production
- Furthermore, both palm oil and pulpwood have a high concentration of concession area on peatlands: 25% of their concessions are on peat
- Logging has the second largest share of allocation on peatlands (34%)
  - But a lower percentage of its concession area is on peatlands (10%)



Data source: Delft Hydraulics, "Peat CO2 assessment of CO2 emissions from drained peatlands in SE Asia", Greenpeace

Indonesia: commodities

Caveats to the commodity concessions data

- First, concession data is not 100% accurate; overlaps between different types of concessions is common due to poor government records and corruption
- Second, concession area does not mean actual in-use status, nor actual intended use
  - Land conceded for palm oil may in fact be cleared for timber in order to generate interim cash flow (plantations do not generate income for first 2-3 years of plantings)
  - Thus, land may not actually be converted to plantations though government law requires planting within 2 years of clearing
- Smallholders do not require concessions
  - Thus, their use of land and peat for palm oil is not reflected

Indonesia: commodities

The production practices of palm oil and pulp wood plantations lead to higher peat emissions than logging

- Suitability of peatlands for agriculture is generally low in the absence of intensive management (e.g. drainage, fertilization)
  - Only a few commercial crops grow well on peatlands: oil palm, rubber, and pineapple
- Both require intensive drainage, which leads to decomposition
  - For palm oil, the lower the water table, the better it grows
  - For timber plantations, a low water table is less important
  - However, for logging, drainage does occur due to construction of transportation canals, but it is less extensive
- Drainage leads to higher susceptibility to fires
  - And in particular, palm oil grown by smallholders is likely to come from land cleared using fire
- General consensus is that logging is a lower threat to peat

Data source: private analysis, Delft Hydraulics

2. Indonesia – palm oil

Indonesia: palm oil

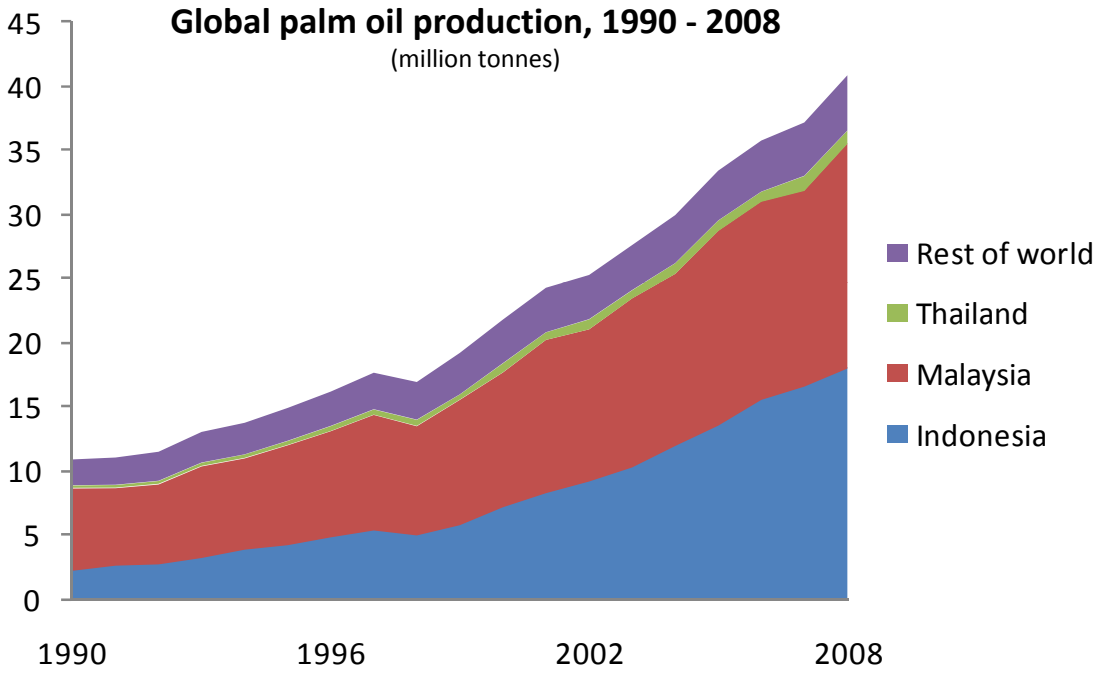
Indonesia's visibility as the world's leading palm oil producer makes it vulnerable to market pressure and can influence the government to protect peatlands

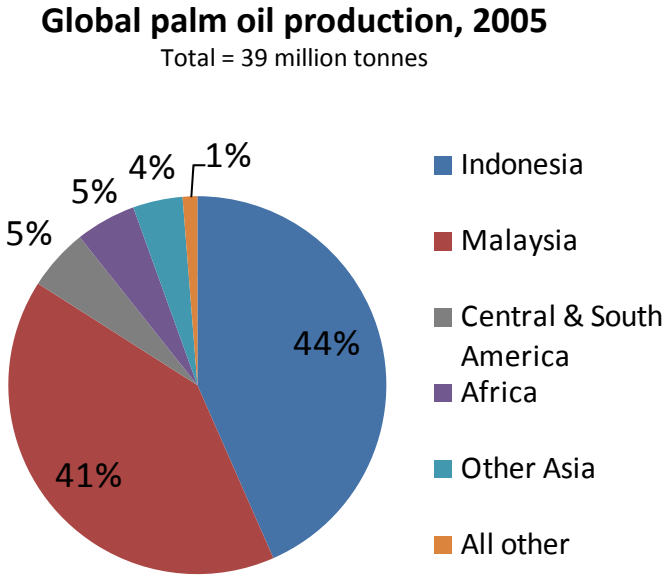
Points of leverage

- Market pressure: Recent buyer cancellations send strong market messages down the supply chain to producers and traders; additional cancellations could create a "tipping point"
- Financing: Moratorium on palm oil lending by IFC has raised awareness among the financial community
- Certification: Strengthening RSPO and building its reputation is important to create a legitimate platform for buyer/supplier transactions.
- Spatial planning/land-swaps: Ultimately, stronger land planning and policy is needed to increase rational land-use and allocation of concessions

Indonesia: commodities

Palm oil: Indonesia produces almost 50% of global palm oil





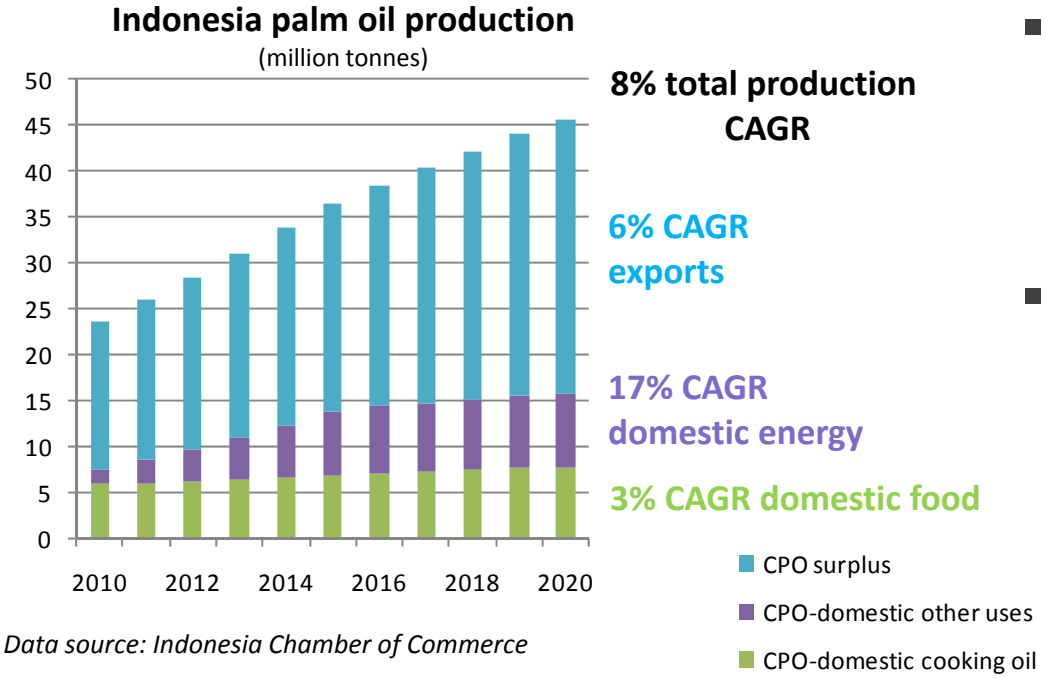
Indonesia's production of palm oil is expected to grow, driven by domestic biofuel targets and export markets to developing countries for food use

Data source: USDA FAS PSDOnline

Indonesia: commodities

Food and energy demand are fueling Indonesia's growth in palm oil

- Government is projecting significant increases in domestic and foreign demand. Has plans for additional 20 million hectares of palm oil plantations (versus 9 million hectares for pulpwood and 2.2 million for mining)
- Ministry of Environment will allow up to 2 million hectares of peat to be converted for palm oil (less than 3 meters deep); decree ends 15-month moratorium on peat initiated by President in Dec 2007

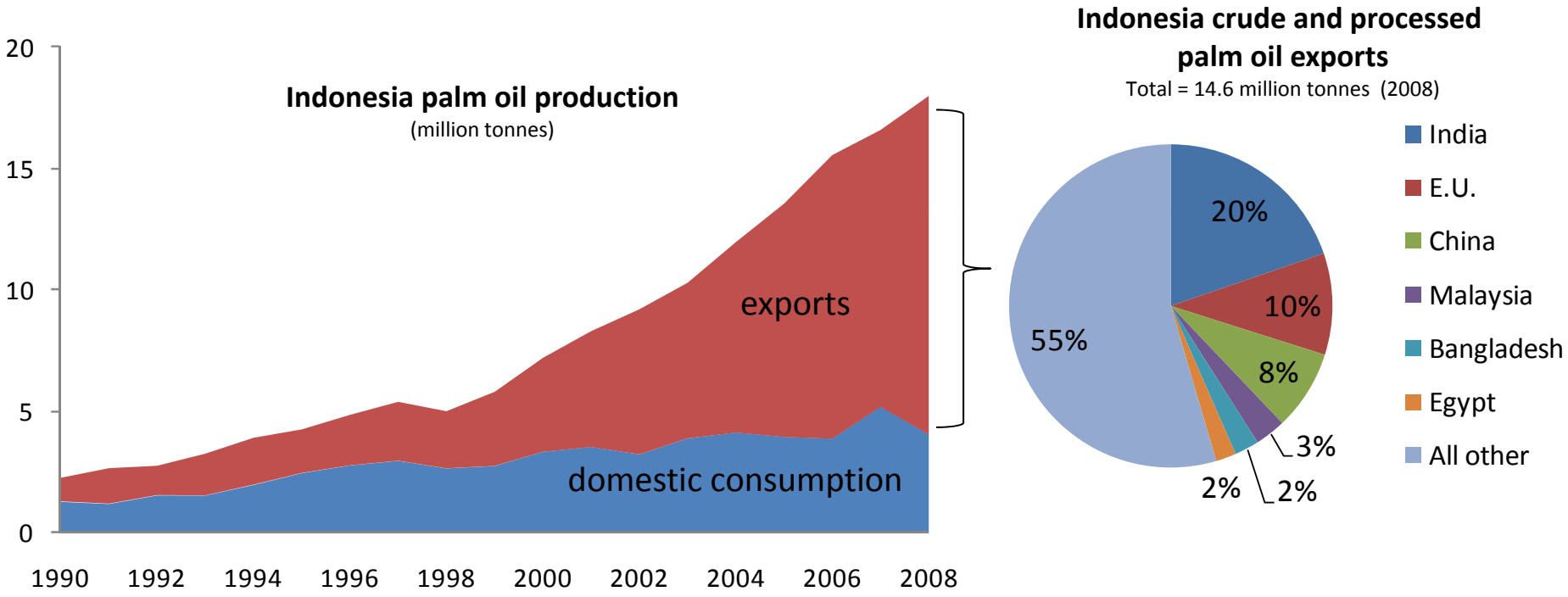


Data source: Indonesia Chamber of Commerce

- Biodiesel usage mandate increasing from 1 million kiloliters in 2010 to 5 million in 2020
- Currently only 5% of global palm oil supply is used for biodiesel; demand projections expected to increase significantly

Indonesia: commodities

Palm oil: U.S. and E.U. are not major end-markets of Indonesia's exports; combined, they import only 10% of global supply



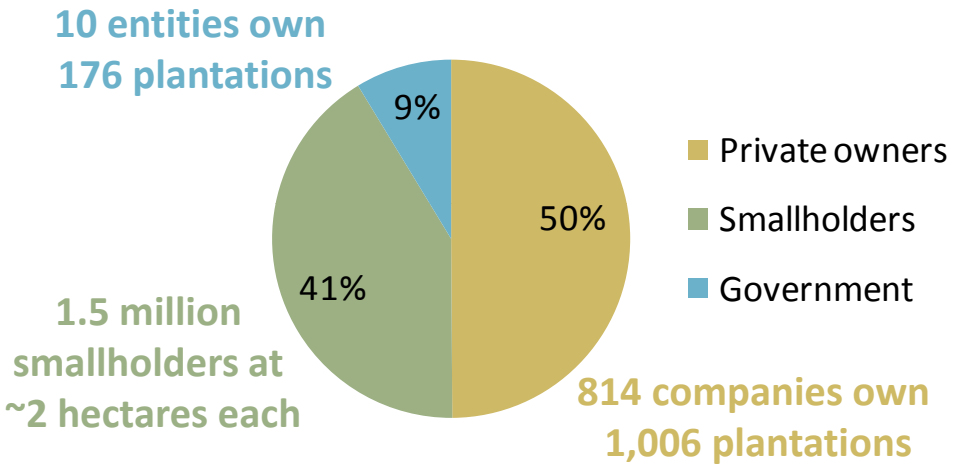
- Indonesia's export markets will be difficult to influence
- China and India use palm oil as a cooking oil; typically sold unbranded and not via large-chain retail systems

Data source: USDA FAS PSDOnline, Oil World

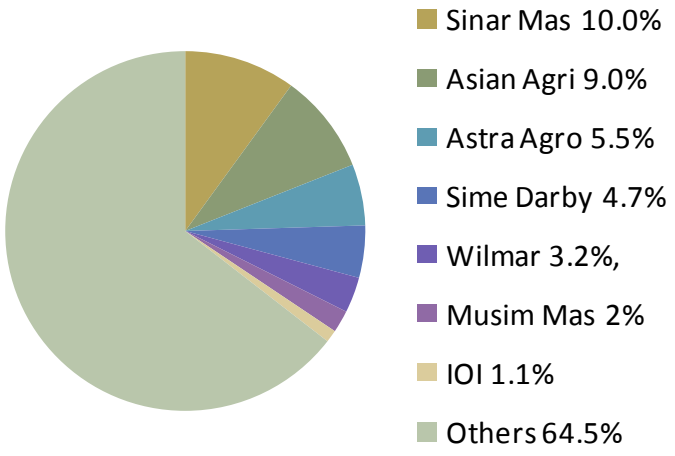
Indonesia: commodities

Palm oil: Production is extremely fragmented within Indonesia

Ownership of plantation area
Total = 7 million ha



Crude palm oil production
Total = 16.9 million tonnes (2007)



Collectively, the top 7 companies producing crude palm oil possess just over 1/3 market share

Data source: Indonesia Ministry of Agriculture; Greenpeace

Indonesia: commodities

Palm oil: End-buyer demand in E.U. and U.S. has little direct control over production, but traders are an aggregation point

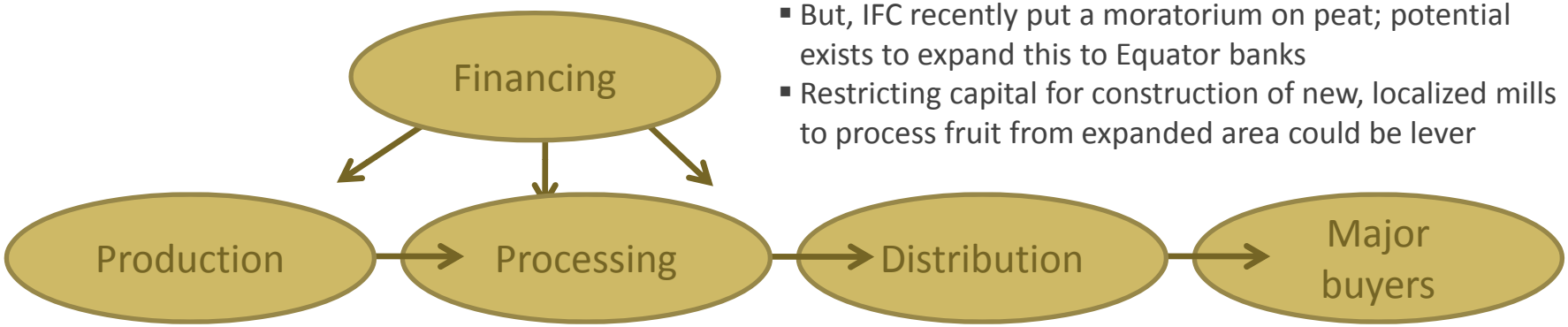
- U.S./E.U. high-profile consumer brands do not control the market
  - Unilever consumes 4% of global supply
    - As customer of Sinar Mas, accounts for only 3% of its palm oil sales
  - Nestle consumes less than 1% of global supply
    - As customer of Sinar Mas, accounts for 0.2% of palm oil sales
  - Proctor and Gamble also consumes less than 1% of global supply
- However, a handful of companies play a critical role in the supply chain with operations in plantations, buying from third parties (including smallholders), milling, trading and distribution
  - Cargill exported around 700,000 tonnes of CPO in 2004, equivalent to 11% of Indonesia's CPO export volume
  - Wilmar/ADM joint venture sources more than 55% of its palm oil production from third party plantations

Data source: Greenpeace, Friends of Earth

Indonesia: commodities

Palm oil: fragmented supply chain with concentrated end-markets means less space for market solutions

- Rarely use project finance
- Increasingly financed by Chinese
- Several large conglomerates involved, so tough to constrain capital to these players
- But, IFC recently put a moratorium on peat; potential exists to expand this to Equator banks
- Restricting capital for construction of new, localized mills to process fruit from expanded area could be lever



- 7 million hectares of production
- 17 million tonnes CPO in 2007
- Extremely **fragmented**, ~40% is produced by smallholders
- Top 7 corporate producers control ~35% market share; largest corporate producer (Sinar Mas) owns ~10%

- **Complex** chain, multiple steps in processing
- Access to a palm oil processing mill is a major factor in determining where plantings can be commercially and economically viable
  - Fresh fruit bunches must be processed within 48 hours

- **Traders** are the one possible choke point (Cargill, ADM, IOI, etc.)
- Downstream industries food industry
  - detergent & cosmetics
  - chemicals, biofuels
  - animal feed

- **China and India** are the primary markets
  - Most product goes to unbranded cooking oil
- But, major international brands are involved; good momentum from recent cancellations
- Biofuels market demand artificially driven by government policy

2. Indonesia – pulp and paper

Indonesia: pulp and paper

CEA California Environmental Associates

The high cost of pulp mill construction provides a powerful (but challenging) lever to pull.

Points of leverage

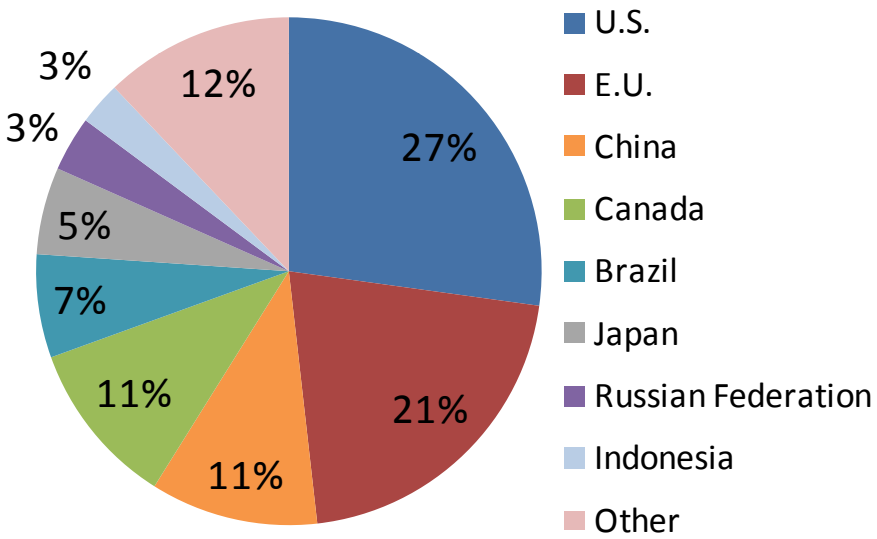
- Financing: Construction of pulp and paper mills in Indonesia require billons of dollars in public and private financing. Several segments of the financial sector must be addressed:
  - IFC and World Bank: expand review of palm oil participation to pulp and paper sector
  - Import credit agencies: pressure foreign agencies to follow U.S. Export-Import Bank's lead in adopting a carbon policy, specifically tracking and reporting of CO2 emissions from projects it supports
  - Equator Principle banks: support adoption of stronger environmental policies and carbon reporting
  - Chinese financial institutions: support burgeoning interest and engagement from Chinese government and banks
- Market pressure: Generate additional major buyer cancellations to follow success in retail and office supply industry
  - Target additional vulnerable end-users of paper, similar to high-end fashion companies sourcing shopping bags and children's book publishers

Indonesia: pulp

On a global scale, Indonesia is a minor producer

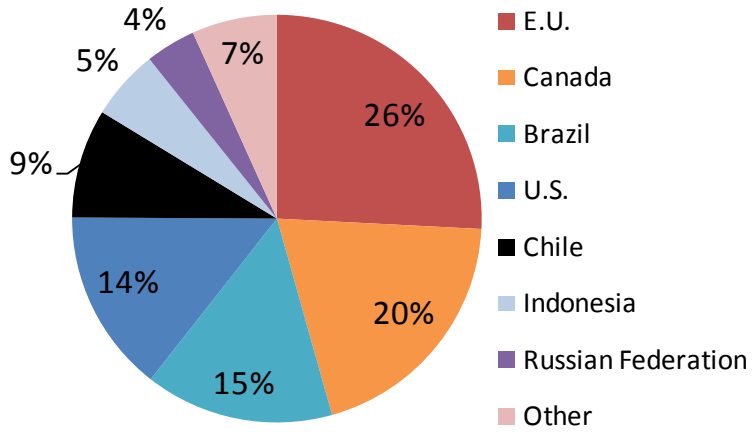
Global pulp for paper production

Total = 192 million tonnes (2008)

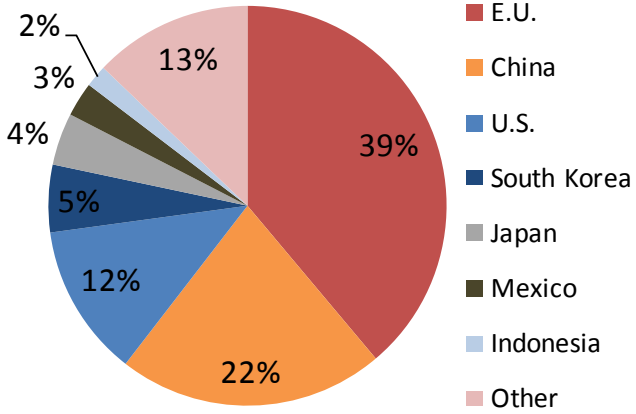


Exports

Total = 47 million tonnes



Imports



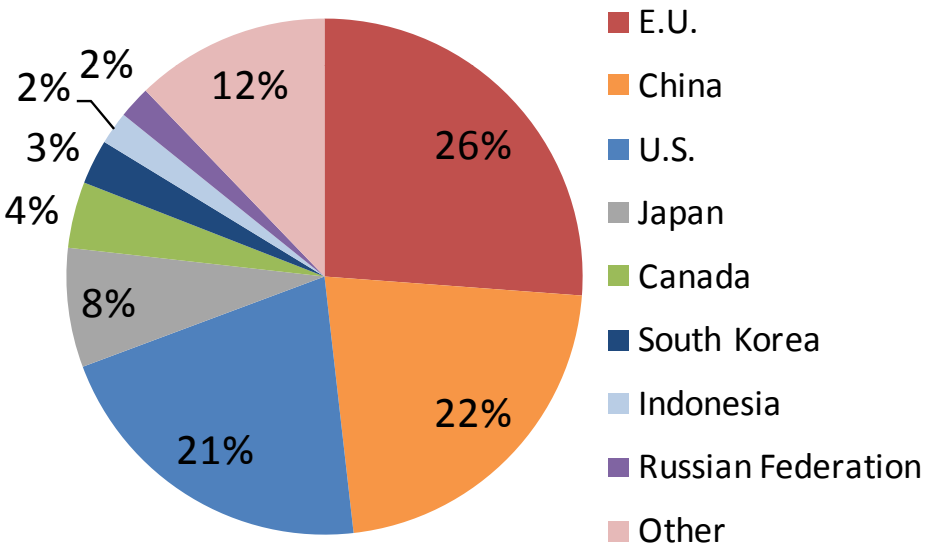
Data source: FAO ForeSTAT

Indonesia: paper

On a global scale, Indonesia is a minor producer

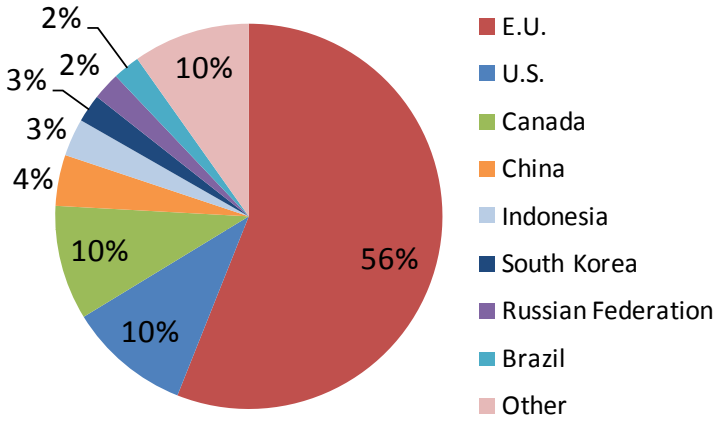
Global paper and paperboard production

Total = 380 million tonnes (2008)

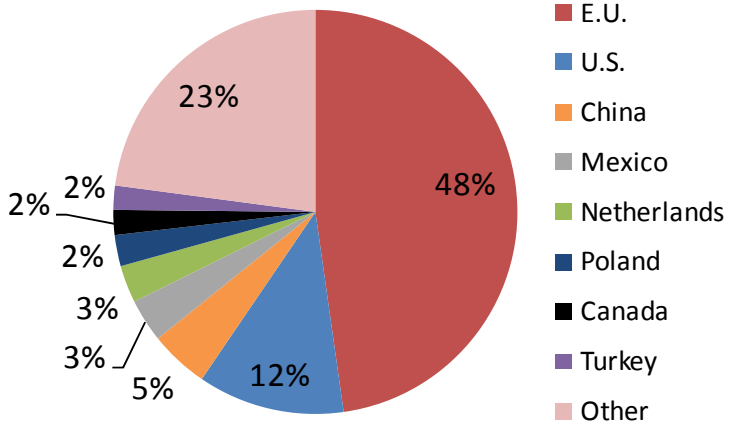


Exports

Total = 114 million tonnes



Imports

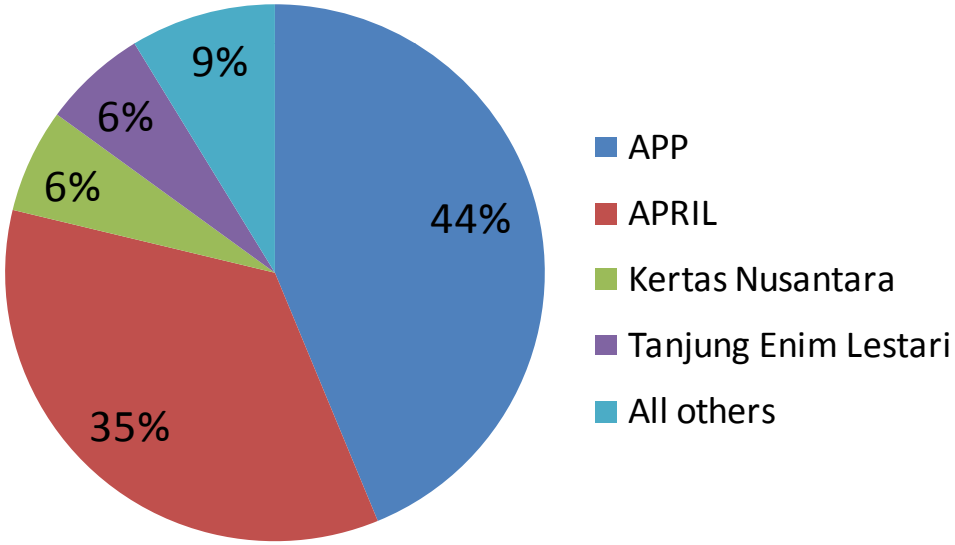


Data source: FAO ForeSTAT

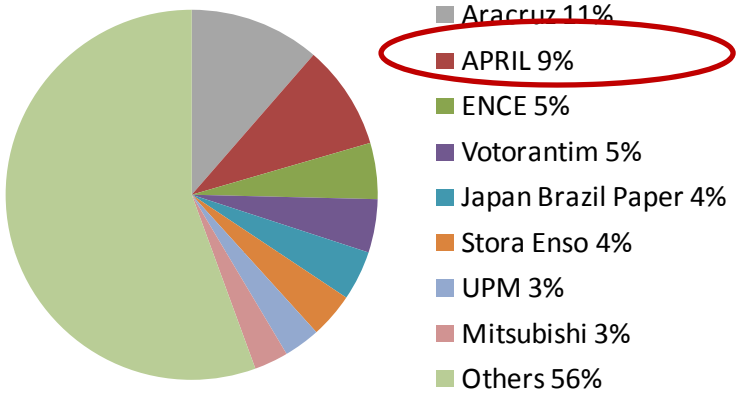
Indonesia: pulp and paper

Indonesia's two largest companies are a strong the global market in specific product categories

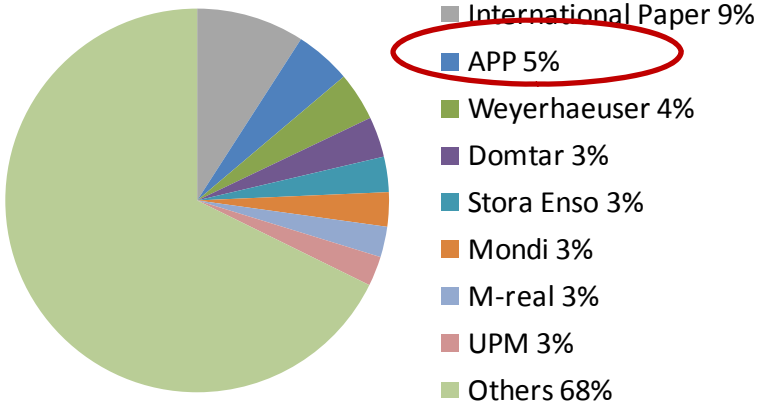
Indonesia market pulp production
Total = 8 million tonnes (2008)



Top 20 global BHKP[1]
Total = 22 million tonnes (2004)



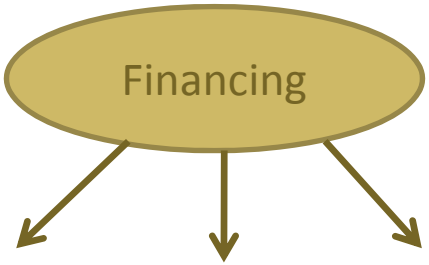
Top 20 global UWF[2]
Total = 58 million tonnes (2004)



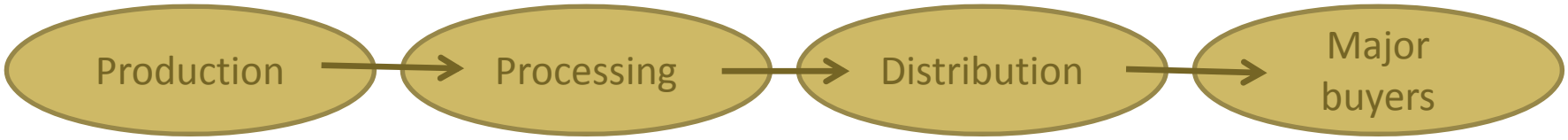
Data source: APRIL
1 BHKP is bleached hardwood kraft pulp (chemical pulp)
2 UWF is uncoated woodfree (less than 10% mechanical pulp; also known as fine paper or free sheet

Indonesia: pulp and paper

Mill financing is the biggest handle



- Financed by Chinese state-owned banks and increasingly less reliant on project finance
- Several large conglomerates involved who own subsidiaries in finance; difficult to constrain access to capital
- But – IFC recently put a moratorium on peat which may carryover into pulp and paper, potential to expand this to Equator banks



- **Domestically concentrated:** APP and April control 80% of Indonesia's pulp capacity (8 million tonnes per year)
- Own world's 2 largest pulp mills, which source 60-70% of fiber supply from natural forests.
- APP controls 40% of Indonesia's pulp capacity and 32% of paper capacity

- **Complex** chain, multiple types of products and grades of pulp and paper

- Several **downstream** uses:
  - 50% packaging 50% (for wide and diverse range of consumer products)
  - 40% printing paper
  - 10% tissue

- 50% of exports go to China, single largest importer of pulp
- But NGO pressure on major buyers have led to cancellations with Sinar Mas:
  - Office Depot, Staples, Metro Group and high-end fashion companies buying shopping bags

Indonesia: commodities

The involvement of different types of financial institutions mitigates investment risk…increasingly, they are addressing the climate risk impact of their investments

- IFC/World Bank participation serves as an arbiter of loan quality and reduces private sector risk
  - Announced intention to invest in plantation operations that develop on degraded lands (250,000 hectares over next 5 years) by investing in commercial rehabilitation, lowering transaction costs of certification and concession allocation issues
- Export credit agency guarantees subsidize business growth of equipment manufacturers and make pulp mill de-bottlenecking and expansion possible
  - Export credit agencies of Germany, Finland, and Sweden were the largest funders of Indonesia's pulp and paper projects, providing $4 billion between 1994-1997
  - U.S. Export-Import Bank announced a carbon policy, the first of any ECA
- However, Indonesia's largest pulp and paper player, APP, is increasing its reliance on domestic and Chinese financial institutions
  - Between 2006 and 2008, Indonesia's domestic banks provided APP and its subsidiaries $325 million
  - Chinese commercial banks $1.14 billion

Data source: Environmental Defense, Bank Track

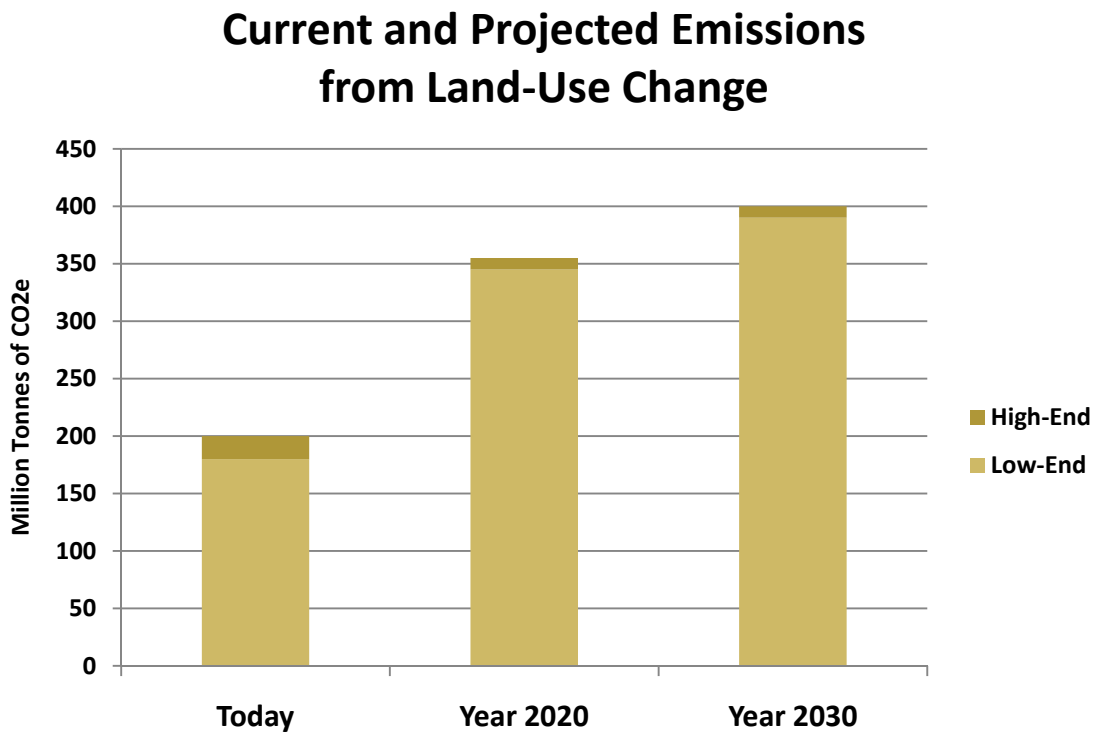
3. DRC and PNG

DRC: overview

LUCF emissions from the Democratic Republic of Congo could become significant: projections are for ~0.4 Gt CO_2e by 2030, on par with current Amazon emissions

- The average deforestation rate in the DRC dropped from 0.4% in 1990-2000 (532K ha/yr) to 0.2% in 2000-2005 (319K ha/yr), due to internal conflict
- As the region stabilizes, it has become an important development target for China

Year	Hectares
1990	140.5
2000	135.2
2005	133.6



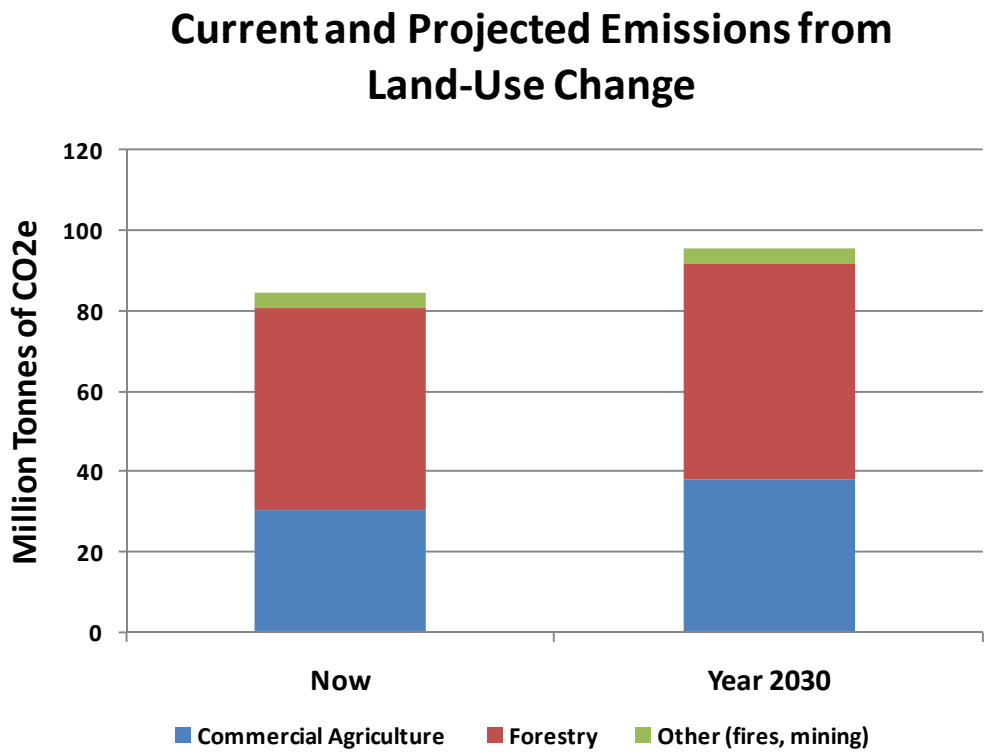
Data source: FAO ForeSTAT, private analysis

PNG: overview

Very little projected forest conversion in Papua New Guinea over the next 20 years

- From 1990 to 2005, deforestation and degradation occurred at a rate of ~0.5% (or 140K ha) per year
- This rate is unlikely to grow substantially. It is expected to rise from ~80 Mt CO2e today to ~90 Mt in 2030

Year	Hectares
1990	31.5 million
2000	30.1 million
2005	29.4 million



Data source: FAO ForeSTAT, private analysis

Primary Findings
Leakage

CEA California Environmental Associates

Leakage is the critical complicating factor

Even successful reductions of land use conversion for a given crop in a given area will be offset by market adjustments. For example, reduced peat conversion for palm oil in Indonesia will be offset by:

1. Other commodities that convert the *same land:* e.g. pulp and paper or smallholder agriculture converting peat forests in Indonesia
2. ILUC: Reduced supply of the commodity will trigger increased production and land conversion in other countries: e.g. African or Central American palm oil production
3. ILUC: Reduced supply of the commodity will trigger land conversion for the production of *other* commodities globally: e.g. Brazilian soy or European rapeseed

The direct competition (#1) depends on land policy and competing uses on a country-by-country basis.

Indirect effects (#2 and #3) are determined by the nature of the global commodity market: ILUC estimates have a large range, but must be assumed to be non-trivial

CEA California Environmental Associates

Leakage estimates vary – see ILUC debate

1. The ability of other commodities to convert the *same land* depends on an assessment of the local politics
2. ILUC estimates are a contentious issue; assessments of the marginal elasticity of land use are opaque, and there is no consensus
    1. EPA RFS 2010 – opaque but calculated ILUC impacts as presumably less than 30%. Also looked at CARB, UK Gallagher Review (2008) meta-assessment, FAPRI assessment of pasture: no useable numbers
    2. Searchinger (2008) estimated that 84% of the land used for US corn ethanol production would be replaced by land in other parts of the world. Specifically:
        1. 26% in Brazil
        2. 20% in the US
        3. 13% in Africa
        4. 11% in India
        5. 10% in China
        6. 5% in Latin America
        7. 3% in Indonesia
        8. 12% Rest of World

> "We simply assumed that new cropland in the future would reflect the patterns of new cropland in the 1990s, roughly split between forest and grassland/savannahs. That pattern inherently reflected the various forces pushing land in one direction or another. Although the future is always somewhat unpredictable, the best potential additional cropland for the world consists mostly of tropical forests, and there is good reason to believe carbon-rich lands will provide much of the world's new cropland and pasture to replace agricultural lands diverted to biofuels." (Searchinger, 2009).

CEA California Environmental Associates

Addressing leakage

Leakage does not apply equally across all commodities

- Leakage effects should be *less* when:
  - The habitat protection measures don't substantially change the quantity of the commodity produced
  - The campaign focuses on the most carbon-rich habitats
  - There is a relatively low yield of the commodity in the producing region
  - The purchasing power of major buyers is applied across the commodity globally

No change in overall supply
Shift to lower carbon acreage
Shift to higher yield producers
Pressure reduces overall demand

- Leakage effects should be *greater* when:
  - Habitat protection measures substantially reduce the supply of an internationally traded commodity
  - The habitat is less carbon rich than other producing frontiers
  - The region affected has a relatively high yield
  - The purchasing power engaged is relatively small or regional
  - Illegal trade is a significant factor

Significant supply decrease and price jump
Shift to comparable habitat types
Shift to lower yield producers
Pressure applied spottily
Illegal production

Primary Findings
Global Demand Strategies

CEA California Environmental Associates

1. Damage control on biofuel mandates: ILUC

- Biofuels are expected to drive a substantial share of the increased cropland over the coming decades, anywhere from 20-80%
- Biofuels markets are artificial because they are stimulated by government mandates and subsidies – this allows governments great control over market development

CEA California Environmental Associates

2. Trade policy could be used to heighten concern in the middle of the supply chain: Lacey Act and Illegal Timber Regulation

- US and EU buy little of the main commodities directly, but our buyer power increases indirect purchase of manufactured goods are included
- Trade policies like the Lacey Act and EU's contemplated Illegal Timber Regulation can be applied down the supply chain
  - Complicating the lives of middlemen countries (e.g. China) may prove to be an effective way to build additional political support for reform
  - This tool depends on illegality in the chain (true for cattle, possibly for pulp and paper or palm oil depending on the interpretation of conflicting domestic laws)
  - Though amendment to the Lacey Act covers "plant material," it is unclear if it is broadly applicable to agricultural commodities
  - It may be possible to secure stronger standards in the EU Illegal Timber Regulation (e.g. prohibition on trade of illegal product)
- This approach may warrant further research, including legal and WTO implications
  - Could the Lacey Act be applied to non-timber products? Could better resources be secured for the Lacey Act at DOJ? Could test cases in Indonesia be identified?
  - Could FLEGT negotiations be expanded to the next tier of important deforesting countries?

CEA California Environmental Associates

3. Opportunity for further engagement by multinational corporations, particularly the investment community and main brands in the retail, agribusiness, and consumer product sectors

- Opportunity to engage international brands that work in multiple agricultural supply chains around the world, to enhance all bottom-up campaigns
  - A dozen international retailers (Wal-Mart, Carrefour, Metro)
  - Major agricultural companies (Cargill, ADM, Bunge)
  - Major consumer products companies (Unilever, Nestle, Kraft)
- Expanded engagement of banks, including Equator Banks, World Bank, and national and private banks in previously disengaged countries is also important
- General shareholder activism campaigns at the main multinational corporations is possible
- Roundtables and other gatherings are forums to discuss solutions and cultivate engagement

CEA California Environmental Associates

4. Long term vision

- In the long run, the deforestation *rate* doesn't matter. The permanent protection of carbon rich lands is what matters
- The market's longer term role is to transition from targeted moratoriums to a top down approach. The core question then is how do we encourage whole countries to adopt a REDD+ system. E.g. Countries with proven success in REDD+ could achieve favored nation status of some kind either through trade laws or through purchasing standards of major brands. Poor performing countries may find *all* of their exports boycotted by progressive companies

Appendices

Appendix 1

CEA California Environmental Associates

Interview list

Charlotte Streck	AD Partners
John Carter	Alianca da Terra
Roberto Smeraldi	Amigos da Terra - Amazônia Brasileira
Neil Franklin	APRIL
Frances Seymour	CIFOR
Janet Pritchard	ClientEarth
Tim Grabiel	ClientEarth
David Kaimowitz	Ford Foundation
Peter Riggs	Ford Foundation
Steve Rhee	Ford Foundation
Marcus Colchester	Forest Peoples Programme
Alex Garcia Wylie	Greenpeace
Bustar Maitar	Greenpeace
Marcelo Furtado	Greenpeace
Marcelo Marquesini	Greenpeace
Paulo Adario	Greenpeace
João Shimada	Groupo Andre Maggi
Christopher Wells	Grupo Santander Brasil
Bob Schneider	IFC
Beto Verissimo	Imazon
Osvaldo Stella	IPAM
Paulo Moutinho	IPAM
Fernando Galletti de Queiroz	Minerva
Frank Merry	Moore Foundation
Luis Soloranzo	Moore Foundation

CEA California Environmental Associates

Interview list, con't

Barbara Bramble	National Wildlife Federation
Brian Murray	Nicholas Institute
Jacob Scherr	NRDC
Dan Zarin	Packard Foundation
Jamie Dean	Packard Foundation
Walt Reid	Packard Foundation
Matt Arnold	PriceWaterhouse Coopers
Lafcadio Cortesi	Rainforest Action Network
Leila Salazar-Lopez	Rainforest Action Network
Mike Brune	Rainforest Action Network
Alwin Kopse	Roundtable on Sustainable Biofuels
Chip Fay	Samdhana Institute
Ketut Deddy Muliastra	SEKALA
Charles Wiriawan	Sinar Mas
Timotheus Lesmana	Sinar Mas
Rezal Kusumaatmadja	Starling Resources
David Cleary	TNC
Lex Hovani	TNC
Wahjudi Wardojo	TNC
Art Klassen	Tropical Forest Foundation
Jan-Kees Vis	Unilever
Ricardo Machado	Universidade de Brasília
Alfred Nakatsuma	USAID
Yuri Feres	Wal-Mart
Chris Barr	Woods & Wayside International, Inc.
Andrea Cattaneo	Woods Hole Research Center

CEA California Environmental Associates

Interview list, con't

Dan Nepstad	Woods Hole Research Center
Adriana Moreira	World Bank
Garo Batmanian	World Bank
Beth Gingold	WRI, POTICO project
Moray McLeish	WRI, POTICO project
David McLaughlin	WWF
Jason Clay	WWF
Mark Eckstein	WWF
Michael Stuewe	WWF
Rod Taylor	WWF Indonesia
Cherie Li-Jii Tan	WWF Singapore
Tasso Azovedo	

CEA California Environmental Associates

Data Sources

- Amigos da Terra, “Time to Pay the Bill”, 2009
- Associacao Brsileira das Industrias Exportadora de Carne (ABIEC)
- Brasil Censaro Agropecuario, 2006
- Dumortier et al. 2010. Modeling the effects of pasture expansion and yield increase on emissions from land-use change. Working Paper 10-WP 504. Iowa State University.
- Environmental Defense, Bank Track
- EPA 2010
- FAO, FAOStat
- FAO Global Forest Assessment, 2005
- Greenpeace, “Slaughtering the Amazon”, 2009.
- Greenpeace, “Eating up the Amazon”, 2006.
- Houghton, R.A. 2008 CarbonFlux to the Atmopshere from Land-Use Changes: 1850 – 2005
- Instituto Brasileiro de Geografia e Estatistica (IBGE), Censo Agropecuario, 2006.
- Oil World Commodity Update, December 2009.
- ILUC literature: EPA, Searchinger, FAPRI/CARD, Gallagher Review
- IMAZON
- Indonesia Chamber of Commerce
- Indonesia Ministry of Agriculture
- IPCC LULUCF reports
- IPNE

CEA California Environmental Associates

Data Sources, cont.

- Pathways to a Low-Carbon Economy for Brazil (McKinsey)
- McKinsey Global Cost Curve 2.0
- Nature “Modelling conservation in the Amazon basin” 2005
- Searchinger 2008
- Science, Nepstad et. al., “The End of Deforestation in the Brazilian Amazon”, December 2006.
- USDA Foreign Agricultural Service, Product, Supply and Distribution Online database USDA Foreign Agricultural Service “Brazil Semi-Annual Livestock Report, 2009” USDA FAS Product Supply, and Distribution Online
- USDA Foreign Agricultural Service, Brazilian Ministry of Agriculture’s Ten Year Projections, 2008.
- USDA FAS PSDOnline, Oil World, Oil World "Soybeans, Oil & Meal" commodity update, Dec. 2009
- US EPA “Global Anthropogenic Emissions of Non-CO2 Greenhouse Gases 1990-2020”, 2006.
- Wetlands International, “The Global Peatland CO_2 Picture”, 2009.
- WL | Delft Hydraulics, “PEAT-CO2”, 2006.
- WRI, Climate Analysis Indicators Tool (CAIT) Version 7.0

Back-up slides

CEA California Environmental Associates

Glossary

BAPPENAS – Indonesia's land planning agency
BAU – Business as Ususal
BNDES – Brazilian Development Bank
BSI – Better Sugarcane Initiative
CAIT – Climate Analysis Indicators Tool
CARB – California Air Resource Board
CITES – The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPO – crude palm oil
FAPRI – Food and Agriculture Policy Research Institute
FFD – Forest Footprint Disclosure
FLEGT – Forest Law Enforcement, Governance and Trade
FSC – Forest Stewardship Council
ILUC – Indirect Land Use Change
IPCC – Intergovernmental Panel on Climate
PA – Protected Area
RAN – Rainforest Action Network
RFS – Renewable Fuel Standard
RSB – Roundtable on Sustainable Biofuels
RSPO – Roundtable on Sustainable Palm Oil
RTRS – Roundtable on Responsible Soy

Peat overview—global

CEA California Environmental Associates

Rank	Country	Peat (000 ha)	% global	% peat total area	Rank (by stock)	2008 peat C (Mton)	Peat C (ton/ha)	2008 peat emissions (Mton)	2008 degrading peat (000s ha)	2008 emissions (ton/ha)	Possible future emissions (Mton)	% future emissions technically possible
1	Russia	137,569	34%		2	137,555	999.9	161	7,160	22.4	453,103	31%
2	Canada	113,393	28%		1	154,972	1,366.7	5	182	25.3	510,477	35%
3	Indonesia	26,550	7%	13.9%	3	54,016	2,034.5	500	12,500	40.0	177,930	12%
4	USA	22,381	6%		4	29,167	1,303.2	67	1,324	50.8	96,077	7%
5	Finland	7,943	3%		8	5,294	666.5	50	6,325	7.9	17,438	1%
6	Sweden	6,562	2%		9	5,000	761.9	15	1,308	11.5	16,470	1%
7	Papua NG	5,992	2%	12.9%	5	5,983	998.5	20	500	40.0	19,708	1%
8	Brazil	5,473	2%		6	5,440	994.0	12	300	40.0	17,920	1%
9	Peru	4,999	1%		25	998	199.6	0	10	40.0	3,288	0%
10	China	3,350	1%		10	3,224	962.4	77	2,712	28.4	10,619	1%
11	Sudan	2,991	1%		14	1,980	662.0	4	100	40.0	6,523	0%
12	Norway	2,969	1%		11	2,230	751.2	5	530	10.2	7,344	1%
13	Malaysia	2,669	1%	8.1%	7	5,431	2,035.2	48	1,200	40.0	17,890	1%
14	Mongolia	2,629	1%			751	285.6	45	1,510	29.8	2,474	0%
15	Belarus	2,235	1%		19	1,305	583.8	41	1,805	22.9	4,299	0%
	All other	33,651	9%		N/A	32,345	N/A	248	5,172	47.9	106,545	7%
	TOTAL	**381,355**	**100%**	**3.0%**		**445,691**	**1,168.7**	**1,298**	**42,638**	**30.4**	**1,468,105**	**100%**

Note: peat emissions exclude emissions from peat fires, which are estimated to generate 400 Mton of carbon per year
Source: Wetlands International, The Global Peatland CO2 Picture ,2009

Indonesia—concession areas by commodity

CEA California Environmental Associates

(000s ha)	Logging			Timber (pulp & paper)			Palm oil		
	Area	Peat area	% peat/total	Area	Peat area	% peat/total	Area	Peat area	% peat/total
Kalimantan	12,422	445	4%	2,727	310	11%	5,026	1,473	29%
Sumatra	2,360	630	27%	3,354	1,183	35%	4,951	1,249	25%
Papua	9,590	1,369	14%	1,404	499	36%	361	79	22%
TOTAL of 3	**24,372**	**2,443**	**10%**	**7,485**	**1,992**	**27%**	**10,338**	**2,801**	**27%**
	% total	**% peat**		**% total**	**% peat**		**% total**	**% peat**	
Kalimantan	**23%**	**8%**		**5%**	**5%**		**9%**	**25%**	
Central Kali	28%	5%		2%	2%		18%	41%	
East Kali	31%	13%		6%	9%		6%	16%	
West Kali	11%	12%		7%	11%		6%	5%	
South Kali	16%	0%		6%	0%		7%	3%	
Sumatra	**5%**	**9%**		**7%**	**17%**		**11%**	**18%**	
D.I. Aceh	11%	5%		6%	0%		6%	40%	
North Sum	3%	1%		5%	0%		3%	18%	
Riau	8%	13%		16%	20%		22%	23%	
Jambi	8%	9%		5%	2%		17%	8%	
South Sum	1%	1%		10%	29%		5%	6%	
West Sum	8%	11%		1%	2%		22%	23%	
Papua	**23%**	**18%**		**3%**	**7%**		**23%**	**1%**	

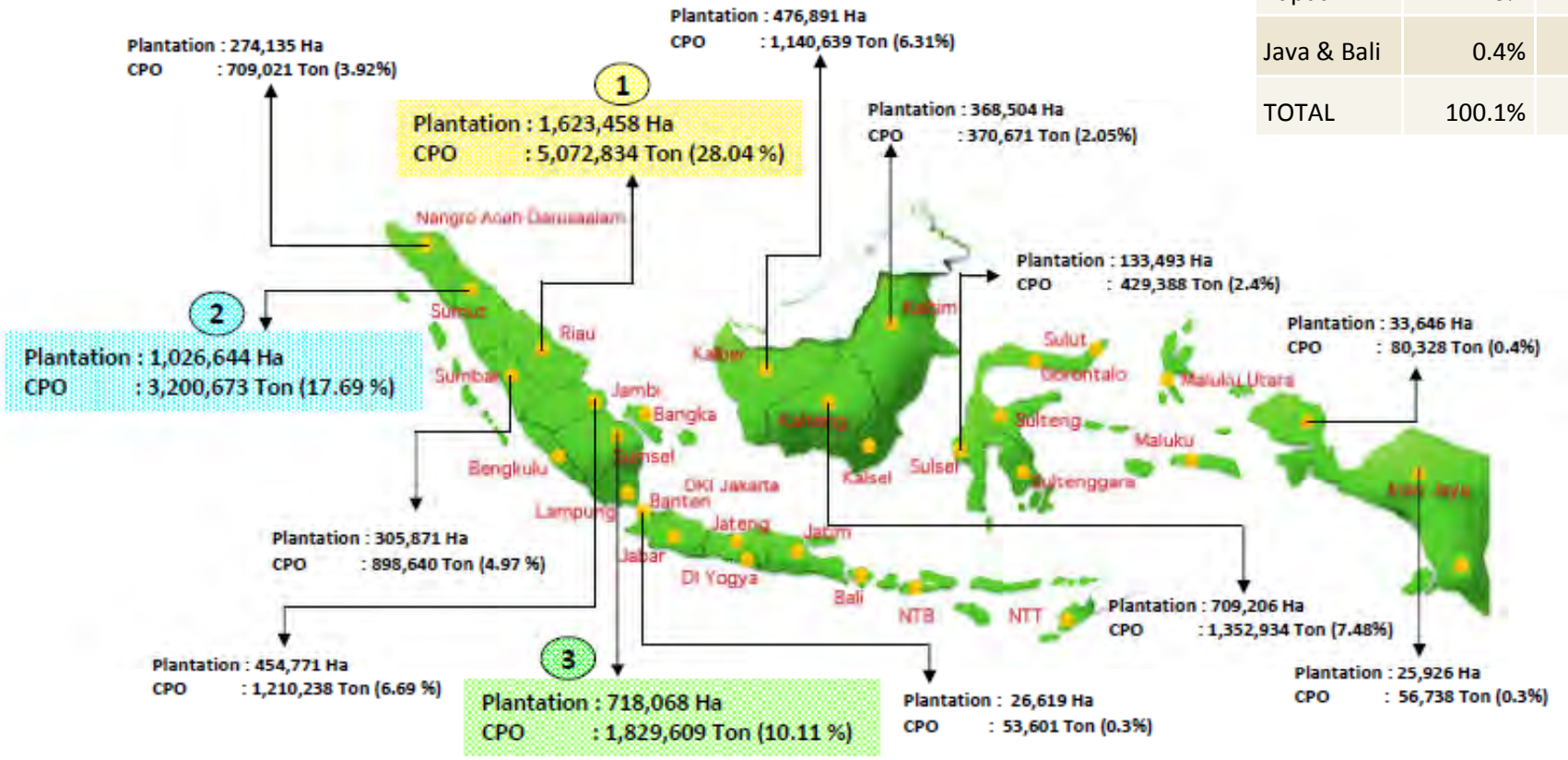
Source: Delft Hydraulics, Peat CO2 assessment of CO2 emissions from drained peatlands in SE Asia, 2006

Palm oil – Indonesia regional significance

Plantation Area and CPO Production - 2008

- Plantation Area : ± 7 Mio Hectare
- CPO Production : ± 18 Mio Ton

	Plantation (ha)		Processing plants	
Sumatra	76.4%	349	83.3%
Kalimantan	20.2%	57	13.6%
Sulawesi	2.1%	8	1.9%
Papua	1.0%	5	1.2%
Java & Bali	0.4%	?	?
TOTAL	100.1%	419	100.0%



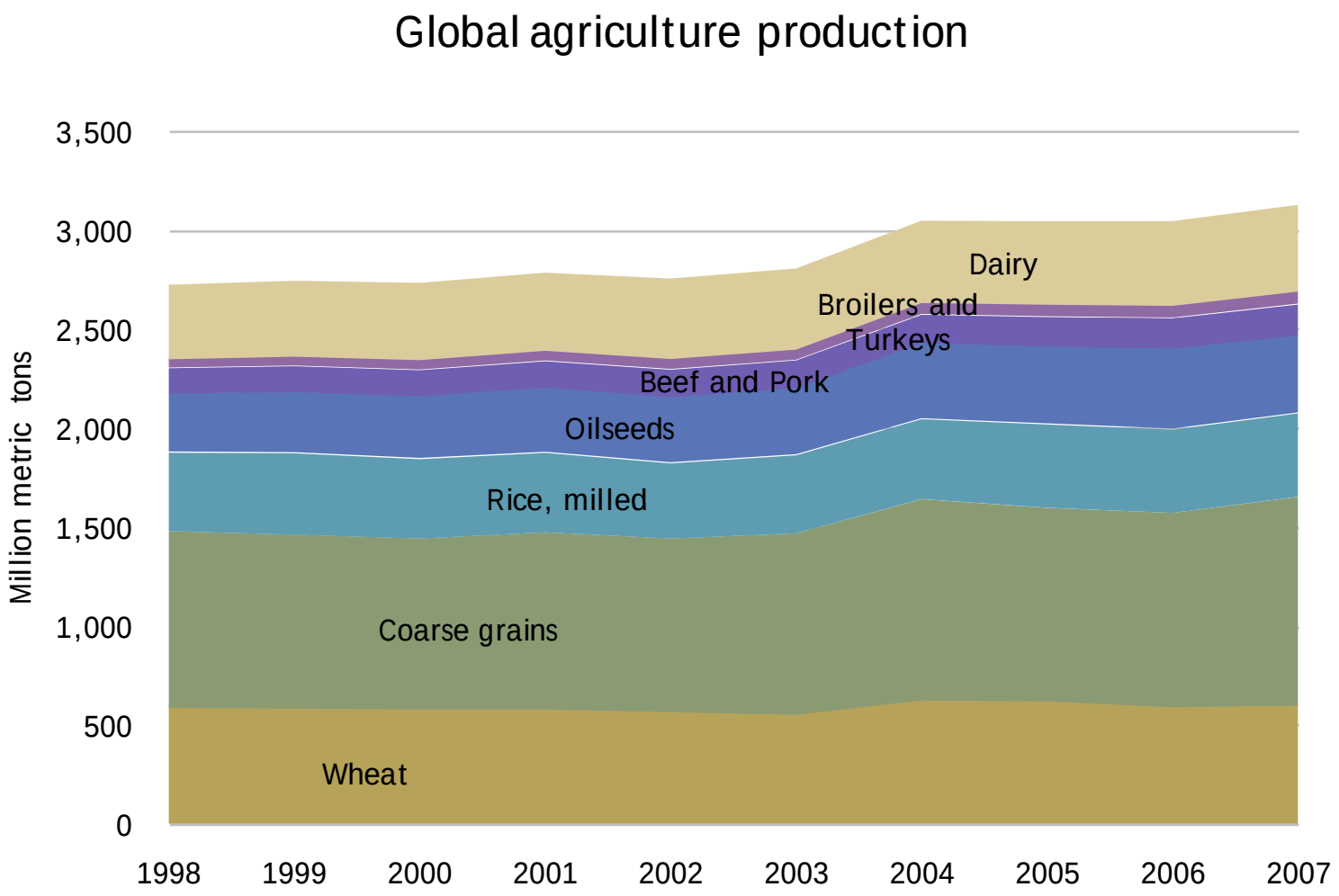
Source: Indonesia Ministry of Agriculture and Forestry, MPOB

Empirical data on certification

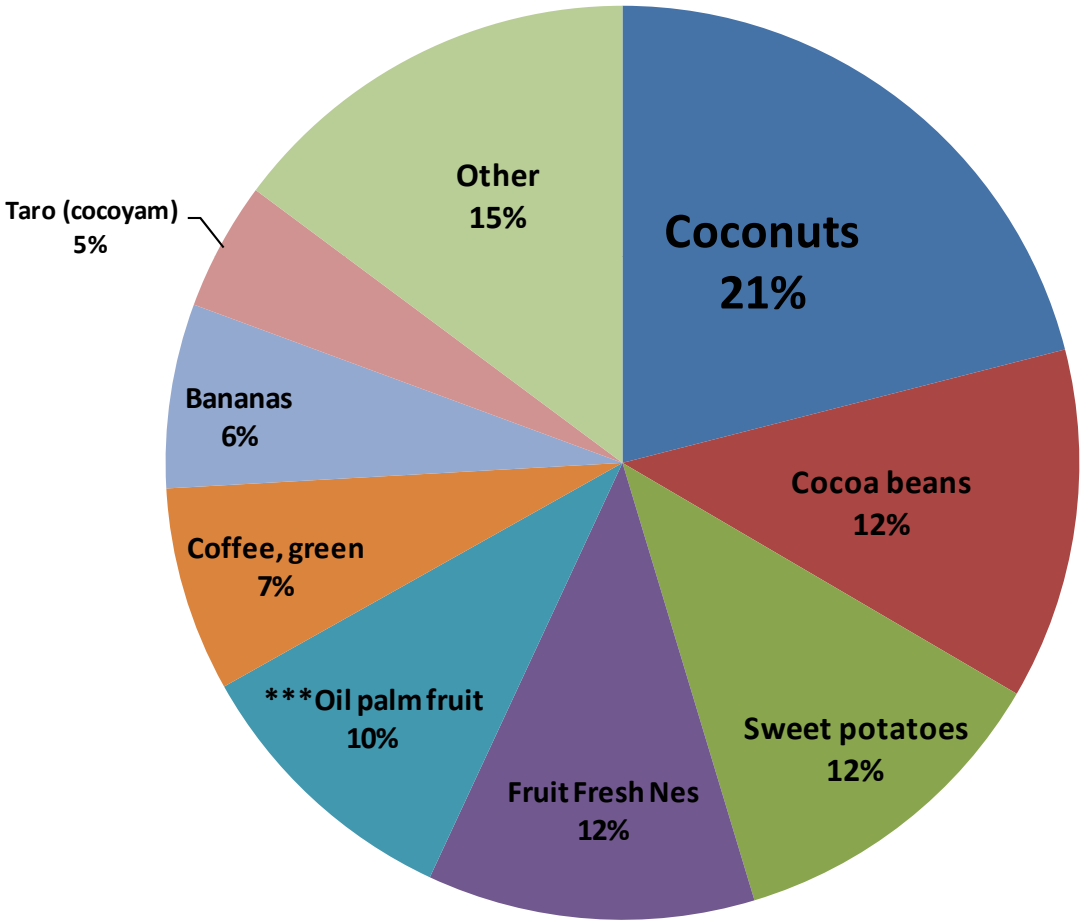
- Certification penetrations typically less than 1% of the commodity.
- Higher penetrations found in niche categories: e.g. coffee
- All certifications remain dependent on philanthropic $
- Growth rates remain high – the jury is still out on ultimate limits.
- B2B more broadly adopted than consumer-facing labels

Certification	Product Scope	Label Established	Sales or Acreage	Market Share	Consumer or B2B?	Organization Budget
Aquaculture Certification Council	Farmed shrimp: basa, catfish, salmon, trout	2003	Unpublished	<1%	B2B	<$0.5 million
Better Sugar Initiative	Sugarcane	Under development	-	-	B2B	Unknown (~1 FTE)
FairTrade	Many: esp. bananas, cotton, coffee, chocolate	1980s	>$2.3 billion	<1% 3.3% US Coffee	Both	$4 million (for FLO alone)
Food Alliance	Many agricultural commodities	1997	5.1 million acres	<1%	Both	$0.5 million
Forest Stewardship Council	Forest products	1993	730,000 km2	<1%	Both	$5.5 million
Friend of the Sea	Seafood	2005	Minimal	<1%	Consumer	~1 FTE
LEED	Buildings	1993	14,000 projects, 1 billion ft2	<1%	Consumer	$10 million
Marine Aquarium Council	Aquarium fish	2001	Minimal	~0%	Consumer	$1.3 million
Marine Stewardship Council	Wild seafood	1997	~3 million tons	~7%	Consumer	$2 million
Organic	All agricultural commodities	1970s	~4 million acres (US)	~0.5% (US), ~4% (EU)	Consumer	N/A
Protected Harvest	Stonefruit, strawberries, grapes, potatoes,	2001	~35,000 acres	<1%	B2B	<$0.5 million
Rainforest Alliance	Bananas, Coffee, Chocolate, Tea, Forestry,	1987	>$1 billion	15% bananas 12% tea, 2%	Consumer	$15 million
Roundtable on Responsible Soy	Soy beans	Under development	-	-	B2B	Unknown
Roundtable on Sustainable Palm Oil	Palm oil	Under development	-	-	B2B	Unknown
SCS Standards	All agricultural commodities	Under development	-	-	Unknown	None
Utz Certified	Coffee	1997	185,000 mt 400,000 acres	0.035	B2B	$1.5 million

Global agricultural production

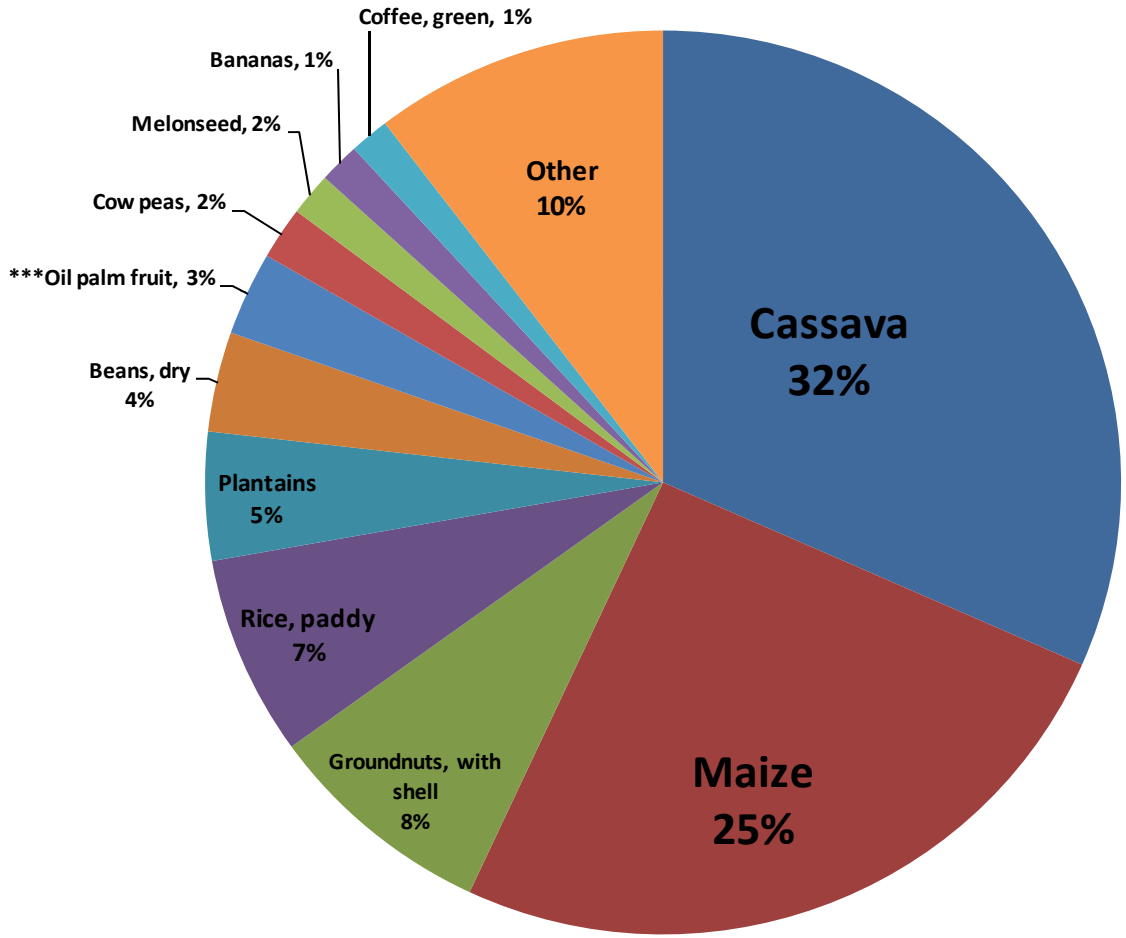


PNG – Agricultural Production by Area (2008)



Source: FAO ForeSTAT

DRC – Agricultural Production by Area (2008)



Source: FAO ForeSTAT