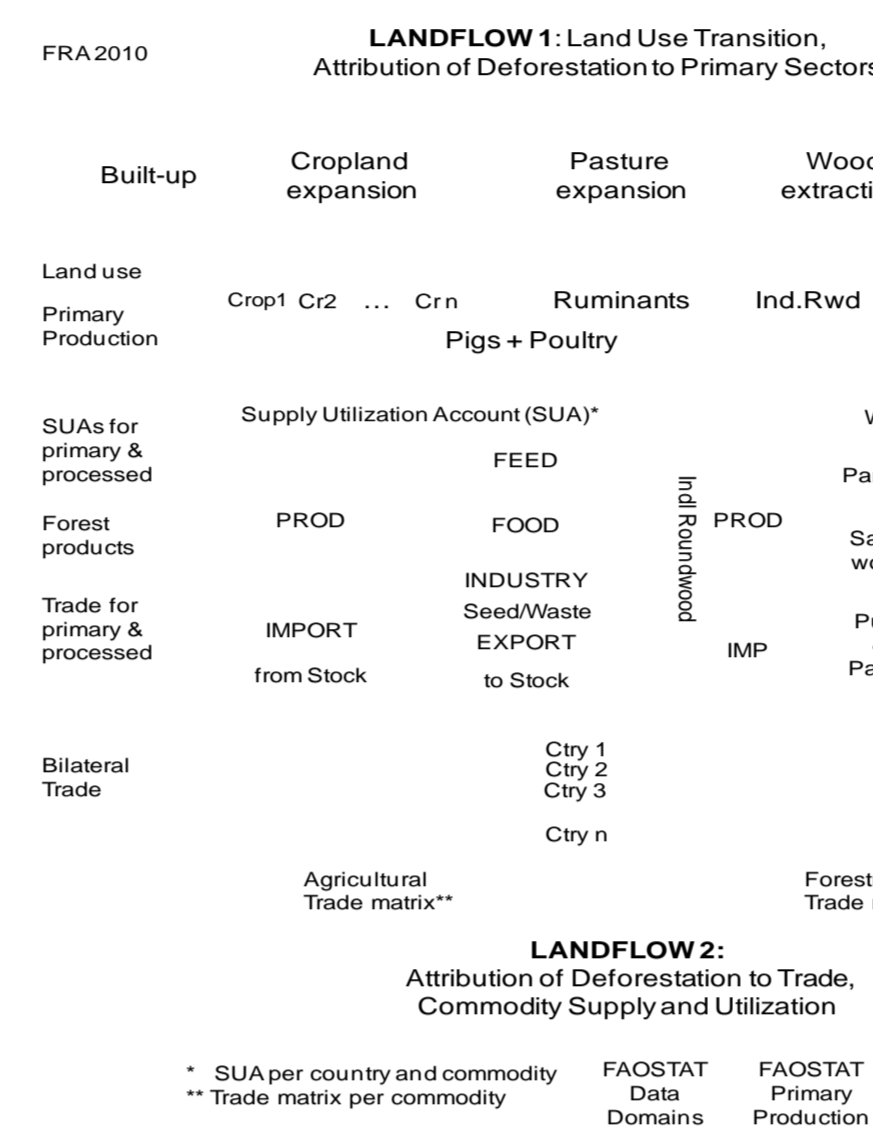


Agricultural trade influences access to and distribution of natural resources

- In a globalized world complex supply chains and trade relations with consumption patterns in one country may cause land use changes including deforestation far away.
- IIASA's global LANDFLOW modeling framework attributes agricultural consumption to land utilization in and outside national boundaries using the large harmonized time series FAOSTAT data published by the UN Food and Agriculture Organization.
- LANDFLOW has been extended and applied to comprehensively analyze the linkage of consumption of imported food and non-food commodities with deforestation.

LANDFLOW: Data and Methodology



Land use transition model attributes deforestation to main sectors and natural causes. → Deforested land content in primary sector production (by crop type and livestock)

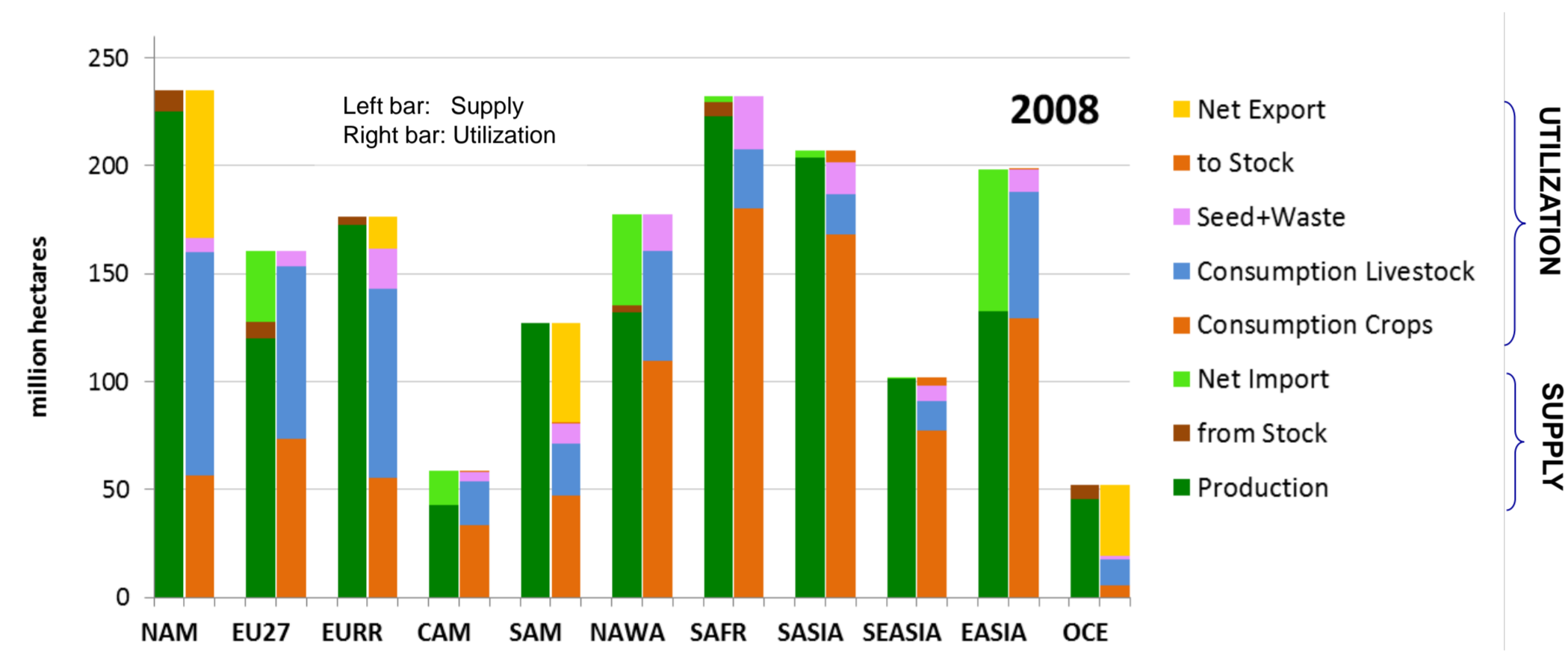
Attribute total land (considering multi-cropping and joint produce) to primary agricultural and forestry products

primary products enter TRADE

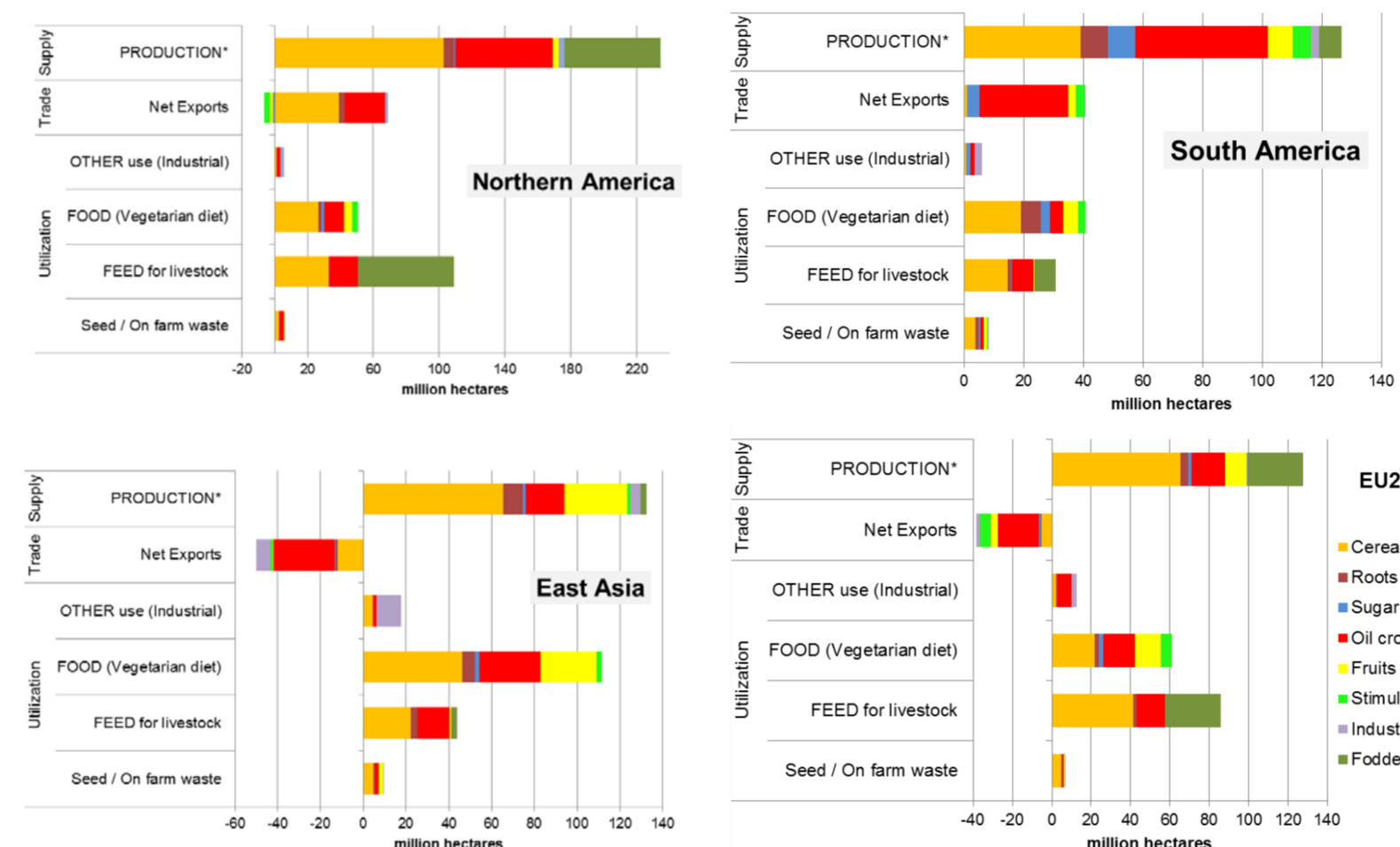
Tracking total land and deforested land from primary production via trade and joint products to final utilization.

→ Database (per country, per year): Total land and deforested land in supply and utilization

Regional CROPLAND utilization for consumption and traded agricultural commodities



Cropland area associated with regional supply and utilization of crop and livestock products

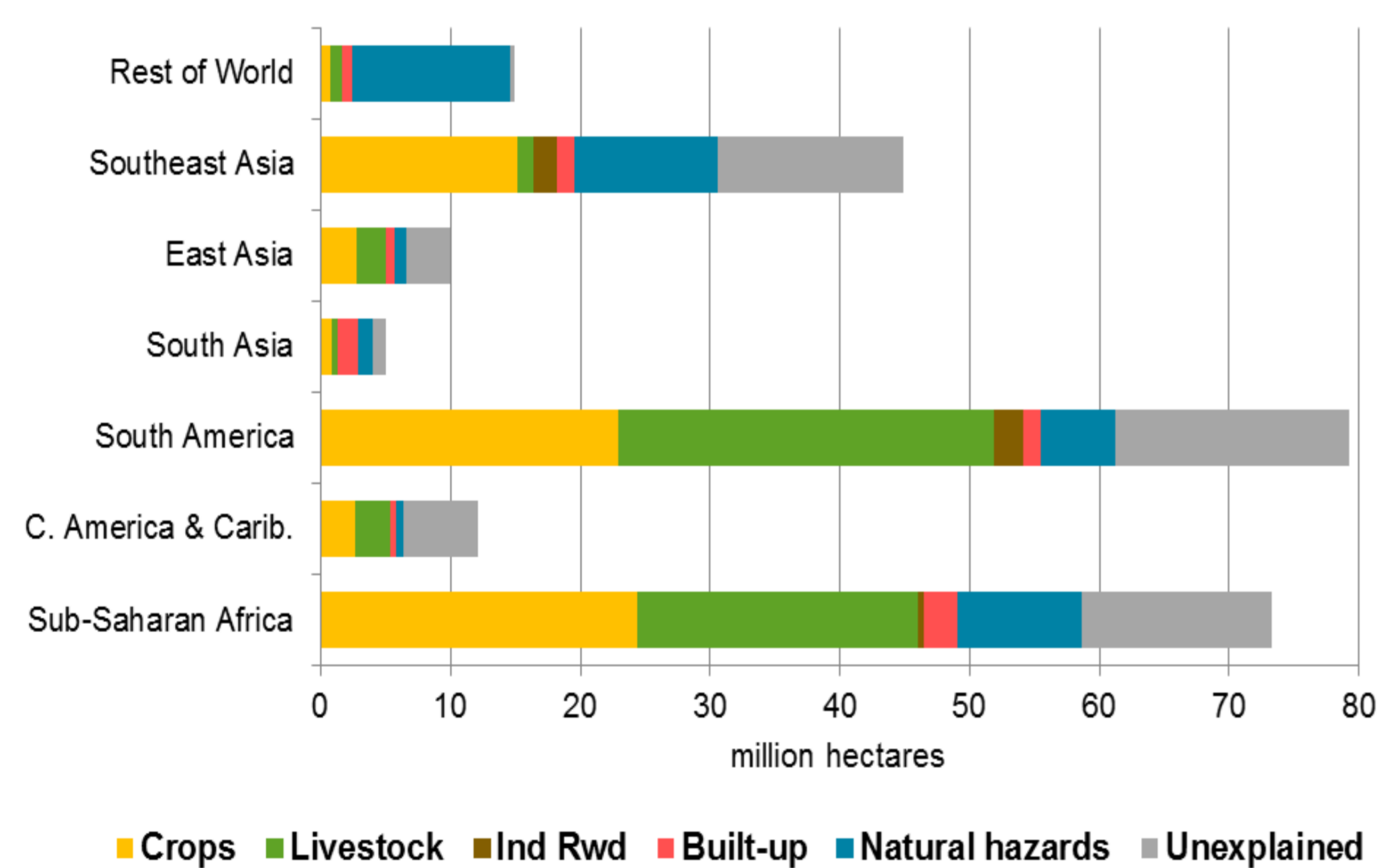


Cropland utilization, by crop group for selected regions, 2008

- Today almost one fifth of the global 1.5 Mha cropland is used for commodities entering trade with an increasing trend (18% in 2008 and 12% in 1990). The largest net exporters of embodied cropland include North America, South America and Oceania. Main net importers are East Asia, North Africa & Western Asia, the European Union and Central America. (left chart)
- Half of global cropland is used for vegetarian diets, one third for feed production, 8% for industrial uses (e.g. cotton, rubber, oil crops for industry) and 7% relate to seed production and on farm waste. The chart in the middle highlights regional variations in the pattern of cropland utilization.

Agricultural expansion has been a major cause of deforestation

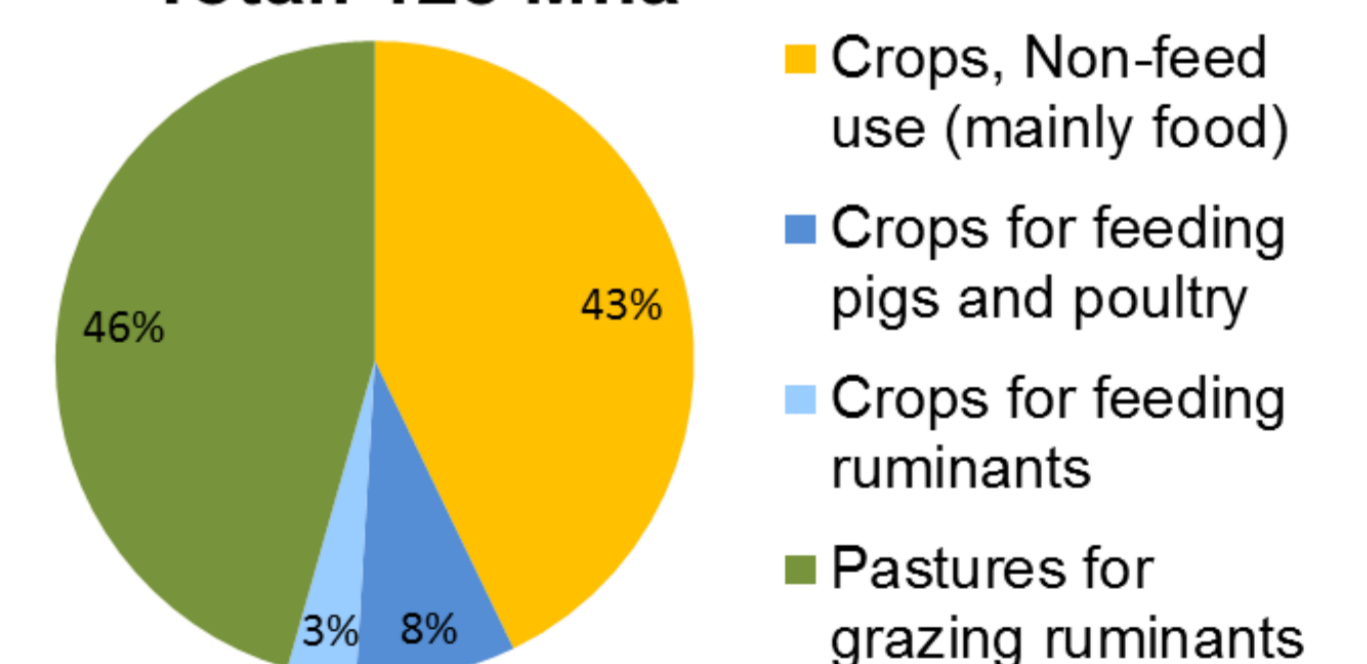
Regional forest losses by main sectors, 1990 – 2008 (cumulative)



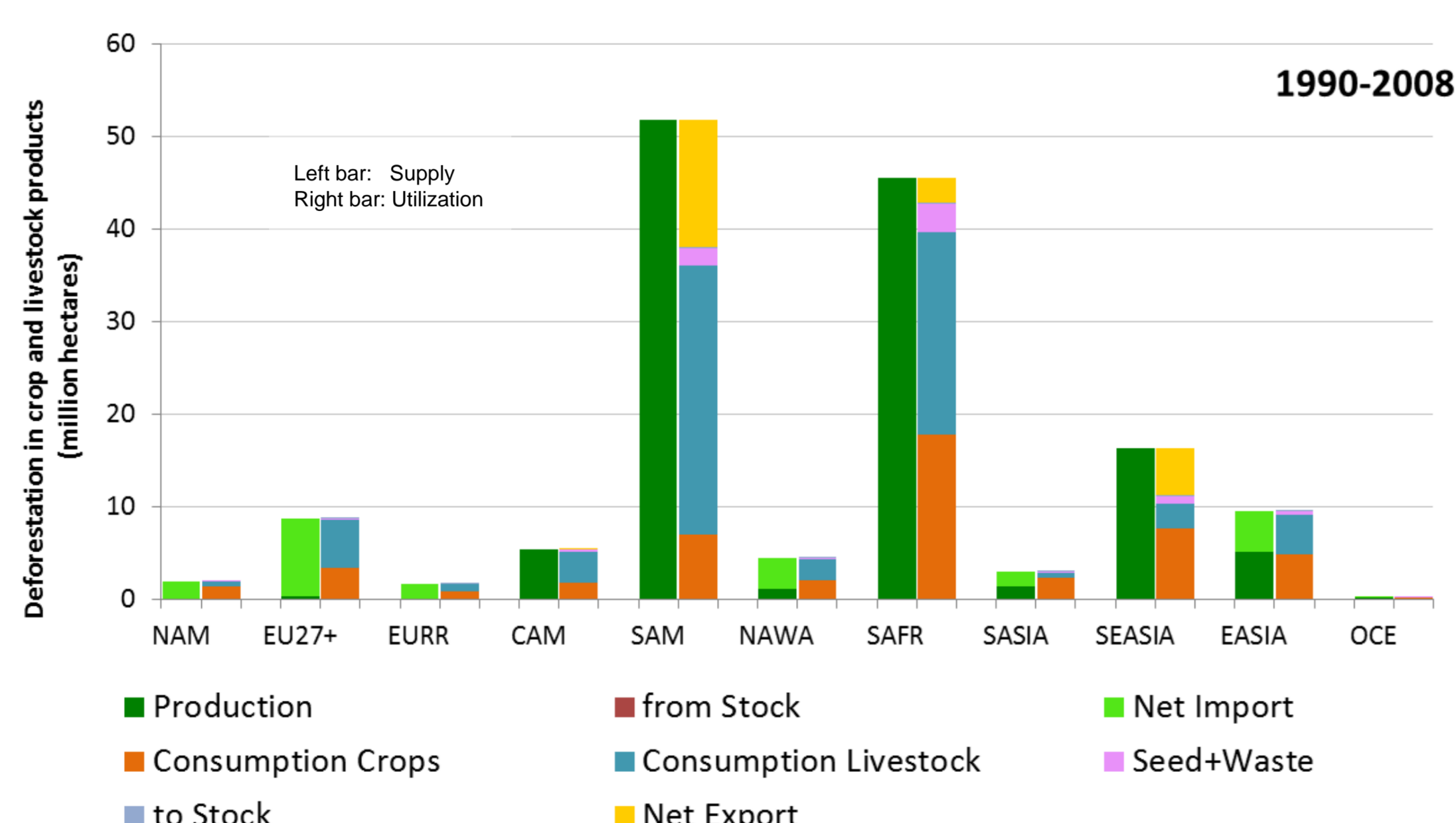
- The FAO Forest Resource Assessment 2010 reports for 1990-2008 a net decrease in global for area of -123 Mha. Taking into account afforestation and natural forest expansion, the gross forest loss amounts to -239 Mha.
- In this period more than half of total gross forest losses or -128 Mha was directly or indirectly related to the agricultural sector by expanding cropland (left chart, in yellow) and pastures for ruminant livestock grazing (left chart, in green).
- At the global level more than half of deforestation associated with agricultural products concerns the livestock sector dominated by pasture expansion for ruminant livestock production (right chart).

Embodied deforestation by use categories of agricultural products, Cumulative 1990-2008

Total: 128 Mha

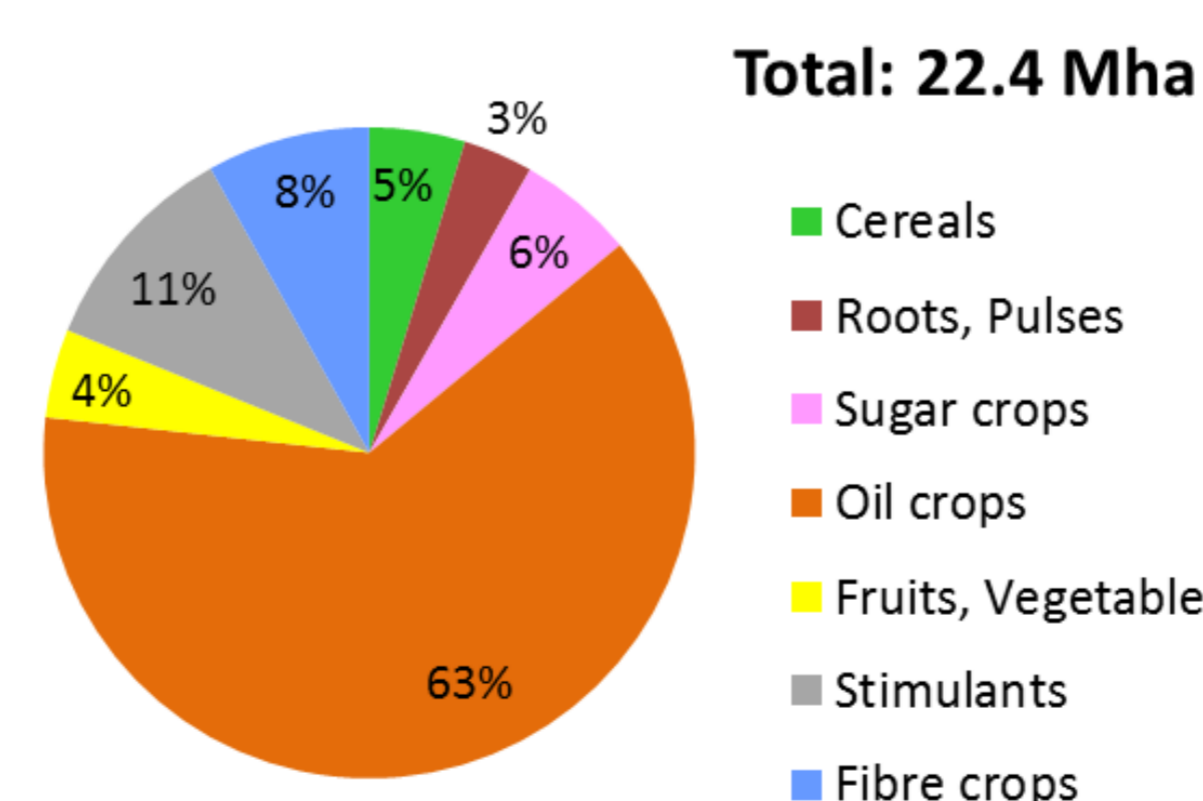


Embodied deforestation in trade, supply and utilization of crop and livestock products



Cumulative deforestation in supply, utilization and trade of agricultural products

Supply is the sum of: Production (indicating deforestation attributed to agricultural expansion in the particular region, total is 127 Mha) + Net Imports (of embodied deforestation in agricultural products). **Utilization** is the sum of: Consumption Crops & Crop products + Consumption Livestock products + Net Exports (of embodied deforestation in agricultural products)



Distribution of the cumulative deforestation for cropland in traded crop commodities, by crop group, 1990 - 2008

Total cumulative (1990-2008) embodied deforestation in traded agricultural products, comprising of: (million hectares)	
Cropland embodied in traded crops (food, feed, fiber)	22.4
Cropland embodied in traded livestock products (feed)	1.5
Pasture embodied in traded livestock products	4.8

- For 1990-2008, we estimate that regional trade of agricultural products involved 29 Mha or 23% of total deforestation attributed to agriculture.
- Main agents in causing deforestation include South America and Southeast Asia as producers and net exporters of embodied deforestation in traded agricultural products and the EU27+ and East Asia as consumers and net importers.
- Oil crops, mostly soybeans and oil palm, have played an outstanding role in causing and transmitting deforestation to other regions.

Source: IIASA LANDFLOW calculations based on FAOSTAT data (download 2011)

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