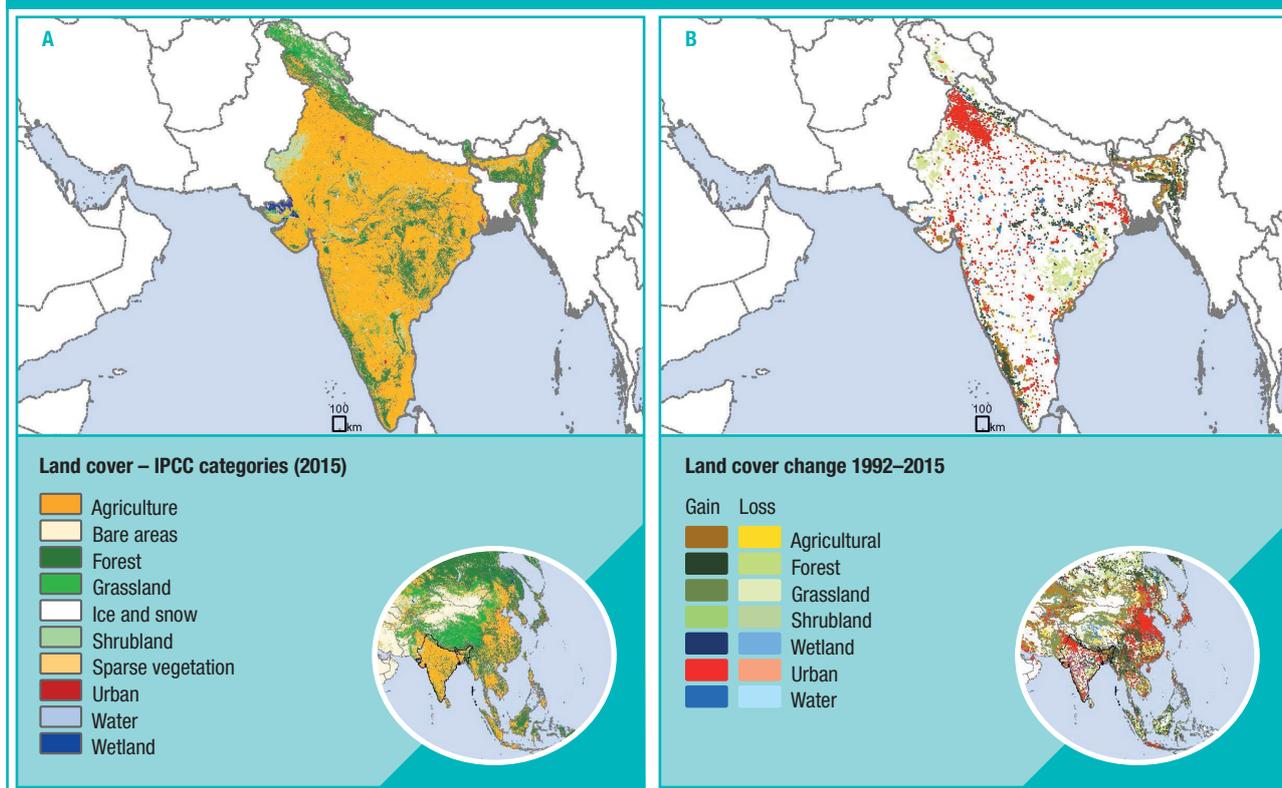


India – Country profile

Context

- With 60% of total land area, agriculture dominates the Indian landscape (Figure 1A). The agricultural sector provides 45% of employment and contributes 16% of gross domestic product. Today, India is the world’s largest producer of milk, pulses and jute, and ranks as the second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton. The country is also one of the leading producers of spices, fish, poultry, livestock and plantation crops.ⁱ
- India is one of the world’s eight Vavilov centres of origin of cultivated plants, with high genetic diversity for at least 172 domesticated species, including many legumes (e.g. chickpea, pigeon pea), vegetables (e.g. eggplant, cucumber), tubers (e.g. taro, yam), fruits (mango, citron, tamarind), spices and dyes.ⁱⁱ The Protection of Plant Varieties and Farmers’ Rights Authority of India identifies up to 22 different agrobiodiversity hotspots in the country. Hundreds of species and varieties of crops and domesticated animals have originated here and are the result of thousands of years of farmers’ selection and breeding efforts.ⁱⁱⁱ
- India hosts one of the world’s four largest national genebanks at the National Bureau of Plant Genetic Resources (NBPGR), and more than 400,000 plant accessions are reported in the World Information and Early Warning System (WIEWS) on Plant Genetic Resources for Food and Agriculture.
- Only 20% of young children (6–23 months old) in India consume a minimum diet diversity.^{iv} Among adults, the mortality rate attributable to inadequate diets is 310 per 100,000 people.^v
- Significant risks to agrobiodiversity include rapid population growth and urbanization (Figure 1B), pollution, invasive species, unsustainable use of natural resources, climate change, pests and diseases.^{vi}

FIGURE 1 – Major land use (A) and changes in major land use (B)



Source: Adapted from: A) European Space Agency, 2017;^{vii} B) Nowosad, et al., 2019.^{viii}

Agrobiodiversity Index results

- India scores medium for **status** of agrobiodiversity (Figure 2A). Available genetic resources for future options contribute most to this score, followed by agrobiodiversity in production systems and agrobiodiversity in markets and consumption. This trend highlights the potential to increase sustainable use of available genetic resources.
- The **progress** score, summarizing commitment and actions scores, is also medium (Figure 2B). While commitments to enhancing the management

of agrobiodiversity across the three pillars are present in different policies, evidence of actions to implement these commitments is low. The progress score indicates an enabling environment for conservation and use of agrobiodiversity that can support public and private investments in agrobiodiversity-based efforts and innovations. However, actions to perform on this commitment are lagging behind.

- Compared to the 10-country average scores, India outperforms on progress and in particular on its overall commitment to better managing agrobiodiversity for multiple goals. The status score is just below average.

FIGURE 2 – Overview of Agrobiodiversity Index scores for India

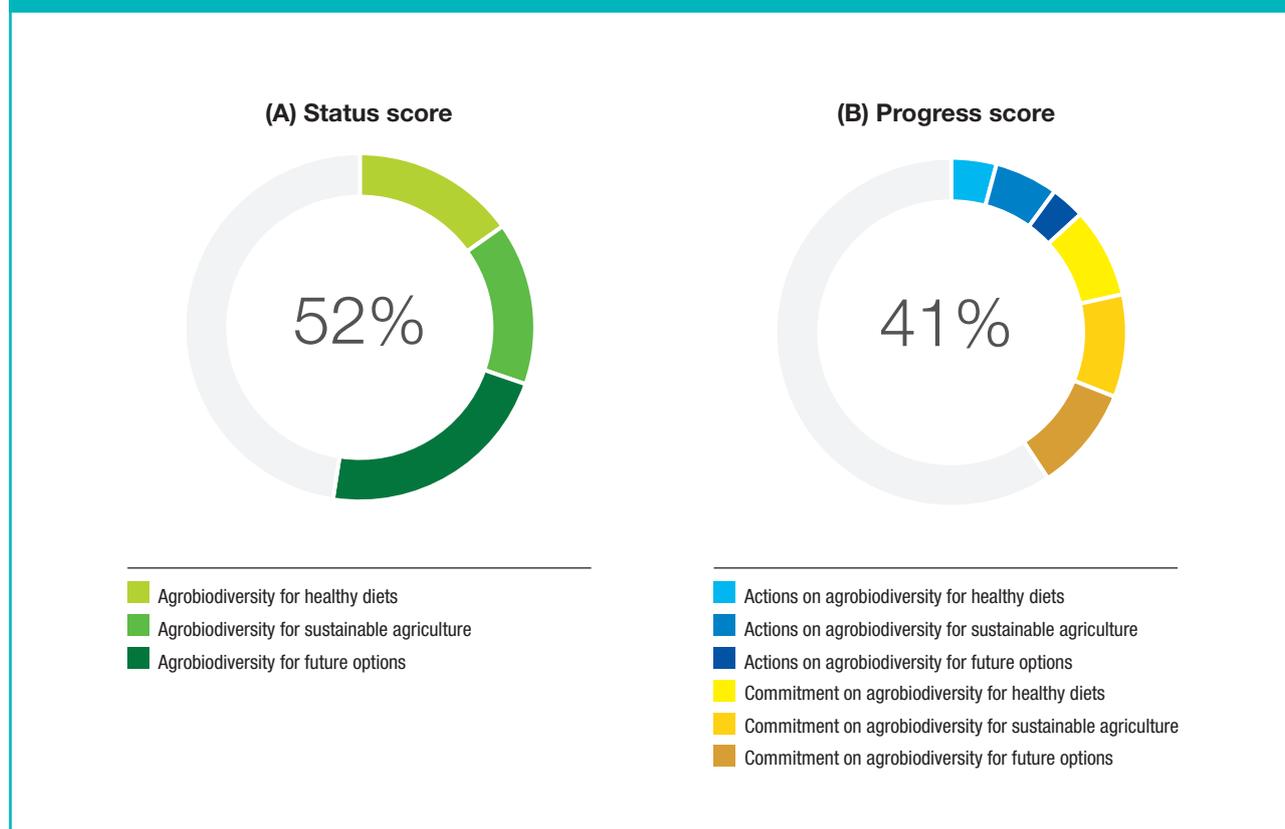


TABLE 1 – Overview of the Agrobiodiversity Indicator scores per pillar for India

		Pillar 1	Pillar 2	Pillar 3
		Agrobiodiversity in markets and consumption for healthy diets	Agrobiodiversity in production for sustainable agriculture	Agrobiodiversity in genetic resource management for future options
Commitment	Level of commitment to enhancing consumption and markets of agrobiodiversity for healthy diets	50		
	Level of commitment to enhancing production and maintenance of agrobiodiversity for sustainable agriculture		57	
	Level of commitment to enhancing genetic resource management of agrobiodiversity for current and future use options			58
Actions	Consumption and market management practices supporting agrobiodiversity	25		
	Production practices favouring agrobiodiversity		25	
	Production diversity-based practices		45	
	Genetic resource management practices supporting agrobiodiversity			19
Status	Species diversity	79	72	93
	Varietal diversity			94
	Functional diversity	14		
	Underutilized/local species	43		13
	Soil biodiversity		37	
	Pollinator biodiversity			
	Landscape complexity		27	

Note: All scores are scaled from 0–100. The colour scheme was changed on 1 August 2019 to reflect more accurately the scores

Leading practices

- **Commitment to sustainable use and conservation of agrobiodiversity for healthy diets:** Across policies, India has expressed specific commitments to sustainably using and conserving its agrobiodiversity to contribute to healthy diets, sustainable agriculture, and current and future options. India has also developed locally adapted food-based dietary guidelines that promote food diversity, and has made available national food composition tables at species and, in some cases, variety level.
- **Species diversity:** India scores high in terms of species diversity across all three pillars: in markets and consumption, in production and in genetic resource management. This is paired with integrated crop–livestock systems, which characterize about 82% of India's agricultural land. Such integrated systems contribute to more closed and efficient nutrient cycles, soil fertility and crop diversification.

Areas for improvement

- **Natural vegetation in agricultural land:** Only 27% of agricultural land includes at least 10% of natural vegetation (Figure 5A), suggesting that integration between agriculture and nature can be improved. For example, agroforestry is estimated to be present on only 7% of agricultural land. Recognizing this issue, India has adopted a National Agroforestry Policy, backed with a capital outlay of US\$450 million for four years (2017 to 2020),^{ix} which is expected to have a positive impact on agroforestry and natural vegetation in agricultural land.
- **Agrobiodiversity for healthy diets:** In India, more than 50% of dietary calories come from major staples. Legumes and whole grains reach adequate levels, but average diets fall short of vegetables, fruits and some animal-based products.^x This contributes to 7,149 disability-adjusted life years per 100,000 population, attributable to inadequate diets. The high levels of agrobiodiversity resources can help to address this.
- **Genetic resource management practices:** While 401,727 plant accessions are stored *ex situ* and reported in WIEWS, only 0.8% of useful wild plants are conserved *ex situ* and about 24% *in situ*.

- **International reporting on agrobiodiversity:** India has submitted a detailed country profile to the FAO *State of the World's Biodiversity for Food and Agriculture 2019* and reports on a regular base in WIEWS, but only for 55% of the indicators.

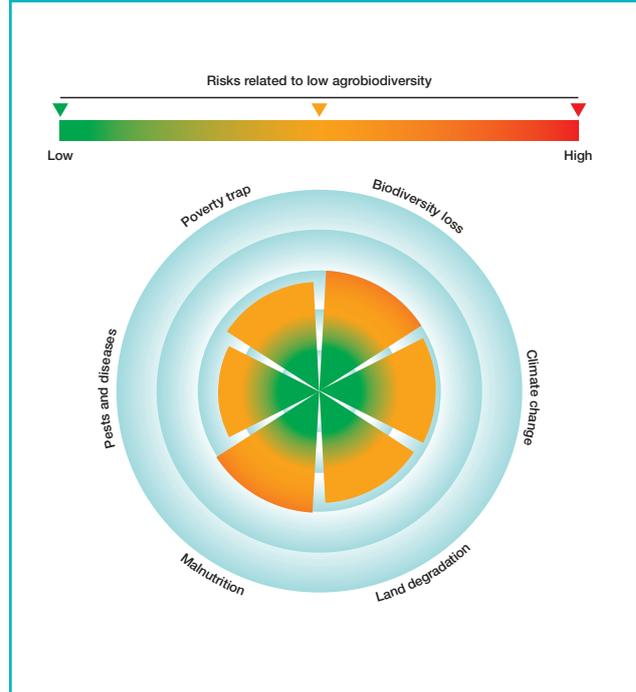
Notable findings

- **Intensification and diversified production systems:** While India has invested heavily in agricultural intensification, in general, India's agricultural production systems remain diverse in terms of crop and livestock species. On 66% of India's agricultural land, more than ten crops are harvested on an annual basis. There is also strong crop–livestock integration, as observed on more than 80% of India's agricultural land. Out of 122 crops with global datasets, 80 – about 65% – are reported to be harvested in India. Despite the relatively high species diversity in production and supply, the majority of dietary calories (57%) come from major grains, and health risks attributable to inadequate diets are high. There is potential to leverage the vast amount of agrobiodiversity to help improve dietary quality in the country.
- **Soil biodiversity:** Recognizing the degradation of soil quality as a result of excessive use of agrochemicals, inappropriate agricultural practices, climate change, and repeated floods among other causes, the Indian government established the National Bureau of Agriculturally Important Microorganisms in 2001 and has a strong commitment to improving soil health and soil biodiversity.^{xi}
- **Home gardens:** While global statistics on home gardens and related agrobiodiversity are lacking, studies in India indicate home gardens are an important and widespread practice supporting farmers' agrobiodiversity.^{xii}

Risk assessment

Agrobiodiversity status and limited actions to manage agrobiodiversity lead to relatively high levels of risks across all six areas (Figure 3). This is partly explained by the low scores for actions in support of sustainable use of agrobiodiversity. Contributing to the particularly high risk for malnutrition is the large proportion (57%) of dietary calories provided by staples, and the high number of disability-adjusted life years attributable to dietary risks (7,149 per 100,000 in 2017) related to diets that are too low in healthy foods (such as fruits, vegetables, legumes, whole grains, nuts) or too high in unhealthy foods (such as sugar-sweetened beverages, processed meat).^{xiii} Contributing to the high risk of biodiversity loss is the low score for the comprehensive conservation of useful wild plants: only 0.8 % of useful wild plants are adequately conserved *ex situ* and 24.3% *in situ*.^{xiv}

FIGURE 3 – Increased risks related to low agrobiodiversity levels in India

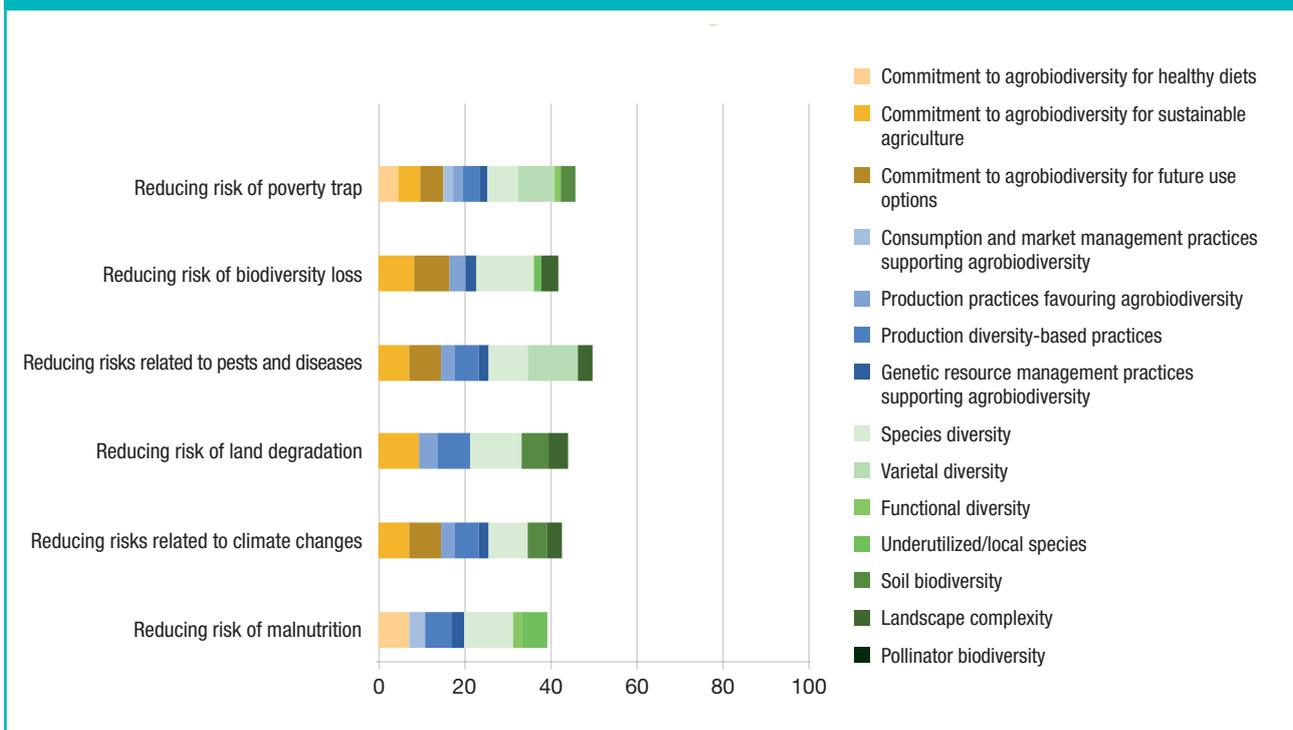


Resilience building

Reversing the risk assessment, the existing agrobiodiversity and related actions and commitment help build resilience to various risks (Figure 4). Current

agrobiodiversity management in India contributes most significantly to managing risks related to pests and diseases.

FIGURE 4 – Contributions of Agrobiodiversity Index indicators to resilience building in India



Note: All scores are scaled to a maximum of 100. Colours indicate relative scores of individual agrobiodiversity indicators that contribute to building resilience for that specific risk area. No data available for pollinator biodiversity.

Indicator trends

Spatial trends

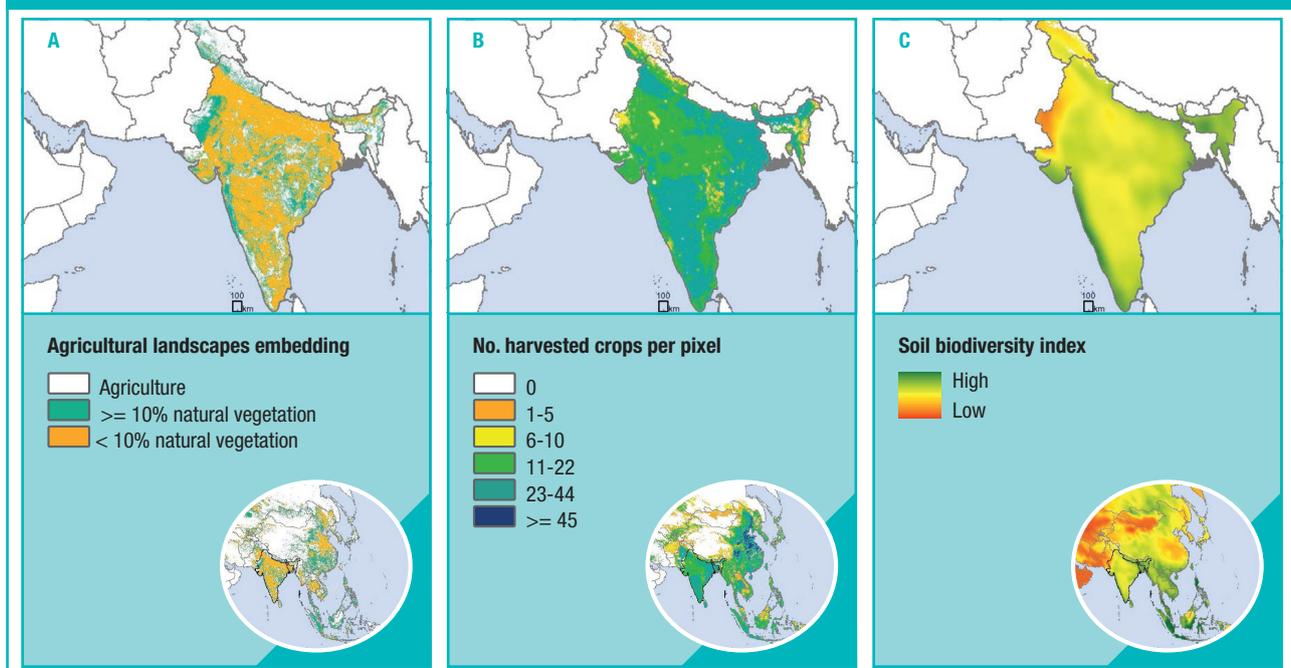
In India, only 27% of agricultural land contains a minimum of 10% of natural or semi-natural vegetation (Figure 5A), suggesting that there is little integration of agriculture with the surrounding environment. A minimum percentage of natural or semi-natural vegetation in agricultural landscapes is important to provide ecosystem services such as pollination, soil fertility, water retention and biodiversity habitat. Management of natural land within agricultural landscapes is strongly encouraged for agricultural and environmental sustainability. It is therefore very promising that India has adopted a National

Agroforestry Policy since 2014, and it will be important to monitor changes in agroforestry and natural vegetation in agricultural land as the policy is implemented.

India is highly diverse, and diversified production systems are found across the country. On 66% of the agricultural land, more than ten crops are harvested on an annual base across seasons, with some exceptions in areas in Rajasthan, Chhattisgarh, Himachal Pradesh and Uttarakhand where crop diversity is lower (Figure 5B).

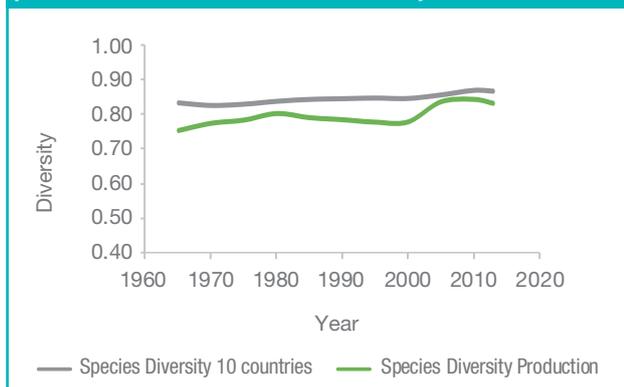
Risks for low soil biodiversity are observed across the country but particularly in the northwestern areas of Rajasthan and Punjab (Figure 5C). Recognizing soil health issues related to unsustainable agricultural practices and overuse of fertilizers and pesticides, the Indian government has established the National Bureau of Agriculturally Important Microorganisms in 2001 and has since had a strong commitment to improving soil health and soil biodiversity.^{xv}

FIGURE 5 – Spatial trends in agrobiodiversity indicators for sustainable agriculture, including A) agricultural land with >10% natural or semi-natural vegetation; B) number of harvested crops per pixel, and C) soil biodiversity index



Source: Adapted from: A) European Space Agency, 2017; B) Monfreda et al., 2008;^{xvi} C) European Soil Data Center, 2016.^{xvii}

FIGURE 6 – Temporal trends in species diversity in production in India (Shannon diversity index)



Source: FAO^{xviii}

Temporal trends

Species diversity in production in India has generally remained stable from 1965 to 2000, with some peaks in the 1980s (Figure 6). The increase in species diversity from 2000 to 2005 could be explained by an improved commitments in agricultural policies to enhancing conservation and use of agrobiodiversity, while recognizing some of the tradeoffs of the grain-focused Green Revolution. This increase levels off around 2005, and slightly declines again more recently.

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