



Agricultural Expansion Threatens Biodiversity

For Prelims: [Biodiversity](#), [Chytridiomycosis](#), [Western Ghats](#), [Biodiversity Hotspot](#), [Wetlands](#), Nadukani-Moolamattom-Kulamavu Tribe, [Ecosystem](#), [Monoculture](#), [IUCN](#), [Precision Agriculture](#), [Intercropping](#).

For Mains: Agriculture as a threat to biodiversity, Sustaining biodiversity along with agriculture.

[Source: DTE](#)

Why in News?

Recently, a study found that **agricultural expansion** is putting **frog populations at risk** in the **Western Ghats**.

- It is part of the **broader issue** of agricultural expansion **threatening biodiversity** and causing **habitat loss**.

What are the Key Findings of the Study?

- **Impact of Agricultural Expansion:** Paddy fields and orchard expansion threaten frog population with paddy fields showing the **lowest frog diversity** and mango and cashew orchards housing the **fewest frogs overall**.
- **Decline of Rare Frog Species:** Rare species, such as the [CEPF Burrowing Frog \(Minervarya cepfi\)](#) and the [Goan Fejervarya \(Minervarya gomantaki\)](#), were **scarce** in altered agricultural habitats.
- **Global and Local Amphibian Decline:** About **40.7% (8,011 species)** of amphibians worldwide are classified as **threatened** due to habitat destruction, pollution, climate change and diseases like [chytridiomycosis](#).
 - The [Western Ghats](#), a [biodiversity hotspot](#) with 252 amphibian species (226 frogs), is facing **habitat loss** and declining frog populations.
- **Reasons for Decline:**
 - **Loss of Microhabitats:** Important microhabitats like **rock pools**, which protect **frog eggs and tadpoles** during dry spells, are being threatened by [agricultural practices](#).
 - **Wetland Destruction:** Agricultural and urban expansion is **destroying wetlands** crucial for frog reproduction.
 - **Agricultural Runoff:** Agricultural runoff with **pesticides and fertilizers** harms water quality, endangering sensitive frog populations.
 - **Climate Change:** Frogs' sensitivity to even minor environmental changes makes them **vulnerable to climate change** and human disturbances.

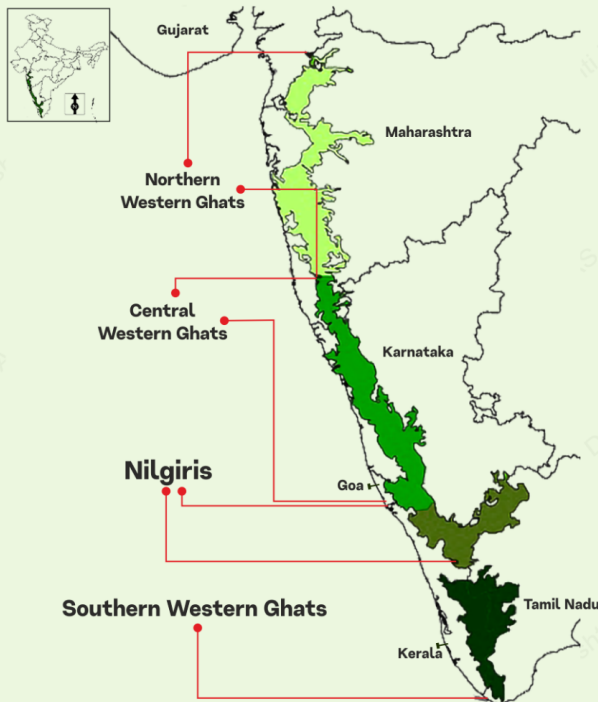
Note: Frogs hold **cultural importance** in Indian communities, symbolizing **rain and fertility**. E.g.,

- In **Assam**, **Bhekuli Biya** (frog marriage) is practised as a means of **invoking rain**.
- In **southern India**, frog marriage is known as **Mandooka Parinaya** for **invocation for rain**.

- In **Uttar Pradesh**, frog marriage is practised in places like **Sonebhadra, Gorakhpur, and Varanasi**.
- **Nadukani-Moolamattom-Kulamavu tribes** of **Kerala** harvest the **pig-nose purple frog** for food during the monsoon season.

Western Ghats

One of the four biodiversity hotspots of India; recognised as a UNESCO WHS (2012)



Rivers (originating)

- **West-flowing:** Periyar, Bharathappuzha, Netravati, Sharavathi, Mandovi
- **East-flowing:** Godavari, Krishna, Kaveri, Tunga, Bhadra, Bhima, Malaprabha, Ghataprabha, Hemavathi, Kabini

Endemic Species

- Nilgiri tahr (IUCN Status - EN)
- Lion-tailed macaque (IUCN Status - EN)

Imp Protected Areas

- Biosphere Reserves - Agasthyamala and Nilgiri
- NP - Silent Valley, Bandipur, Eravikulam, Wayanad-Mudumalai, Nagarhole
- TR - Kalakad-Mundanthurai, Periyar

Imp Passes

- Thal Ghat Pass (Kasara Ghat)
- Bhor Ghat Pass
- Palakkad Gap (Pal Ghat)
- Amba Ghat Pass
- Naneghat Pass
- Amboli Ghat Pass

Significance

- Hydroelectricity production
- Influences Indian monsoon weather patterns
- Carbon sequestration (neutralise ~4 MT of carbon every year)
- One of the 8 global hottest hotspots of biodiversity (due to richness in species and endemism)
- Rich in iron, manganese and bauxite ores, timber, pepper, cardamom, oil palm and rubber
- Sizeable indigenous population (including PVTGs)
- Important tourism/pilgrimage centres

Major Threats

- Mining, Industrialisation
- Massive extraction of forest produce
- Human-wildlife conflict, encroachment, illegal hunting
- Livestock grazing, deforestation
- Large hydropower projects
- Climate change

Imp Committees

- Gadgil Committee (2011) (Western Ghats Ecology Expert Panel)
 - » Recommendation: All of WG be declared as Ecological Sensitive Area (ESA) with only limited development allowed in graded zones.
- Kasturirangan Committee (2013)
 - » Recommendation: Instead of whole, only 37% of the total area of WG be brought under ESA + complete ban on mining, quarrying and sand mining be imposed in ESA.

Names

- Sahyadri - northern Maharashtra; Sahya Parvatham - Kerala

Diverted views about Mt. type

- View 1: Block Mt. formed due to down warping of a part of land into Arabian Sea
- View 2: Not true mt. rather the faulted edge of Deccan Plateau

Major Rocks

- Basalt, granite gneiss, khondalites, metamorphic gneisses, crystalline limestone, iron ore

Geographical Extent

- Satpura (in north) to the end of TN at Kanyakumari (in south)

Mt. Ranges

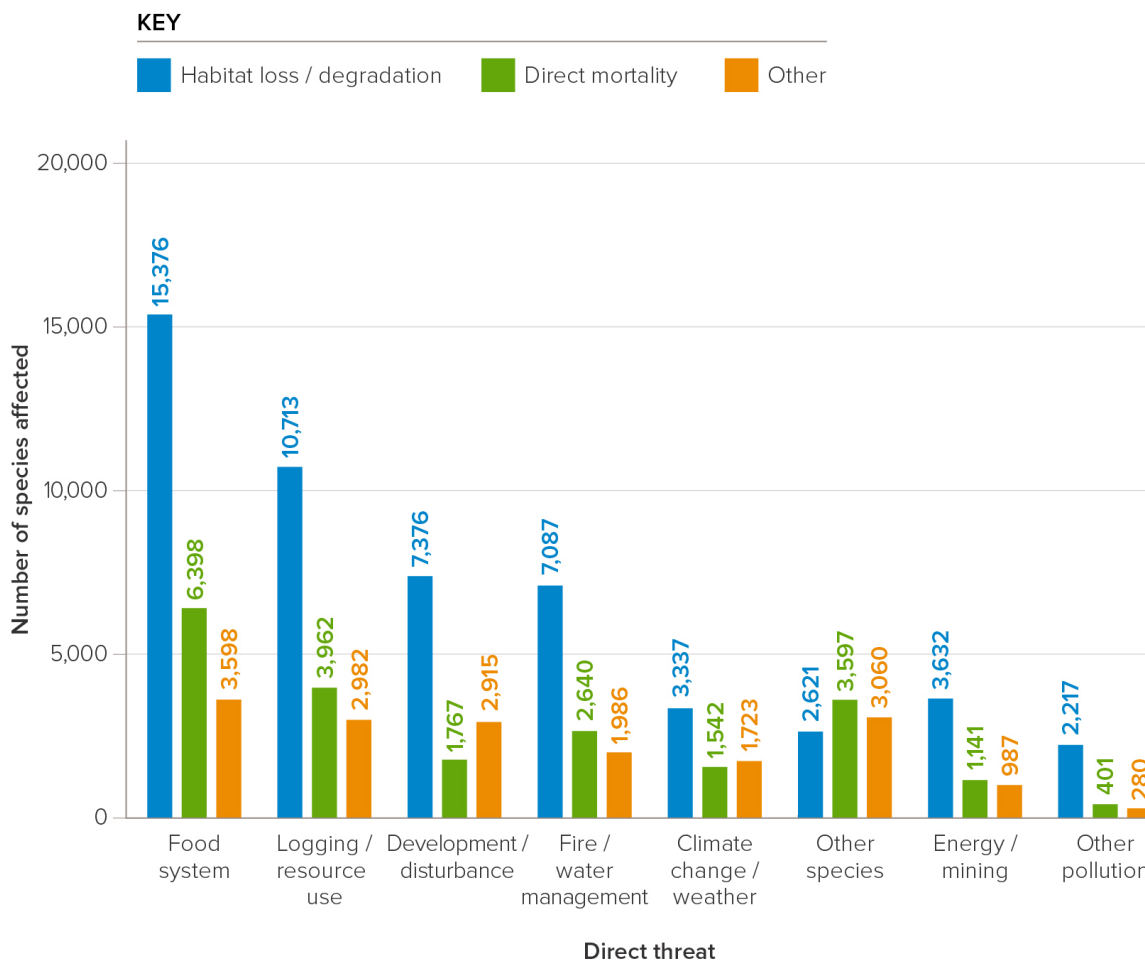
- Nilgiri ranges, Shevaroy and Tirumala range
- Highest peak - Anamudi (Kerala)



How Agricultural Expansion Threatens Biodiversity?

- **Deforestation:** Conversion of forests into farmland is the **leading cause of habitat decline**.
 - The area of primary forest worldwide has **decreased by over 80 million hectares since 1990** resulting in habitat destruction, **fragmentation**, and eventual extinction.

- **Habitat Destruction:** Between **1962 and 2017**, approximately **340 million hectares** of new cropland and **470 million hectares** of natural ecosystems were converted into pastures globally leading to the destruction of **critical ecosystems**.
- **Monoculture:** Large-scale agricultural practices like **cattle ranching, soy, and palm oil cultivation** replaces previously diverse ecosystems with **monocultures** and domesticated animals like **cows, goats, sheep, and pigs**.
- **Overuse of Chemicals:** Industrial agricultural practices, especially the overuse of **pesticides, fertilizers, and chemicals** pollute **groundwater** and **water systems**, affecting both aquatic and terrestrial species.
- **Reduced Carbon Storage:** Cropland stores significantly **less carbon** compared to the original forests or vegetation.
 - Land-use changes could release **17 gigatons of CO2 in the long-term**, worsening the climate crisis and threatening biodiversity by disrupting ecosystems.
- **Extinction Risks:** Around **13,382 species** of the **25,000 identified as threatened by the IUCN** are **endangered** primarily due to agricultural land clearing and degradation.
 - In addition, some **3,019 species** are affected by **hunting and fishing**, and **3,020 by pollution** from the food system.
- **Isolation of species:** Agricultural expansion **fragments habitats**, isolating ecosystems and increasing species' extinction risk due to **inbreeding, resource scarcity, and limited mobility**.



How Agricultural Expansion and Biodiversity Protection Can Be Balanced?

- **Closing yield Gaps:** In many **low-income countries**, yields have **stagnated** despite growing food demand, leading to **increased land clearing**.
 - Closing the yield gap in **tropical countries with high biodiversity** is crucial to meet food demands without encroaching further on natural ecosystems.

- **Yield gap** is the difference between **current and potential yields**.
- **Sustainable Intensification:** **Precision agriculture** reduces pollution, emissions, and land use by optimizing fertilizer use, helping farmers **maintain high yields with fewer environmental costs**.
- **Diversified Farming Systems:** Practices like **intercropping** (growing multiple crops together) or using **cover crops** can **increase productivity** without additional chemical inputs, enhancing soil fertility and pest control.
- **Land-Use Planning:** Strong **land-use planning** and **zoning policies** that protect areas of **high ecological value** can direct agricultural growth while protecting sensitive ecosystems.
- **Healthier Diets:** Diets that are more **plant-based** and less reliant on resource-intensive **meat production** require less cropland and have a lower environmental impact. E.g., **seafood** is a healthier alternative to red meats.
- **Reducing Food Waste:** Reducing food loss and waste by half could **reduce global food demand by 15%**, and thus the need for **230 million hectares** of additional cropland.

Conclusion

- **Agricultural expansion** poses significant threats to biodiversity, exemplified by the decline in frog populations in the Western Ghats. However, sustainable practices like **closing yield gaps, precision agriculture, diversified farming, and proper land-use planning** can help balance food production with biodiversity protection, ensuring both environmental and food security.

Drishti Mains Question:

Q. How does agricultural expansion contribute to biodiversity loss, and what steps can be taken to mitigate this impact?

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. With reference to the circumstances in Indian agriculture, the concept of “Conservation Agriculture” assumes significance. Which of the following fall under the Conservation Agriculture? (2018)

1. Avoiding the monoculture practices
2. Adopting minimum tillage.
3. Avoiding the cultivation of plantation crops
4. Using crop residues to cover soil surface
5. Adopting spatial and temporal crop sequencing/crop rotations

Select the correct answer using the code given below:

- (a) 1, 3 and 4
- (b) 2, 3, 4 and 5
- (c) 2, 4 and 5
- (d) 1, 2, 3 and 5

Ans: (c)

Q. Which of the following can be threats to the biodiversity of a geographical area? (2012)

1. Global warming
2. Fragmentation of habitat

3. Invasion of alien species
4. Promotion of vegetarianism

Select the correct answer using the codes given below:

- (a) 1, 2 and 3 only
- (b) 2 and 3 only
- (c) 1 and 4 only
- (d) 1, 2, 3 and 4

Ans: (a)

Mains

Q. How does biodiversity vary in India? How is the Biological Diversity Act, 2002 helpful in the conservation of flora and fauna? (2018)

Q. The effective management of land and water resources will drastically reduce the human miseries. Explain. (2016)

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