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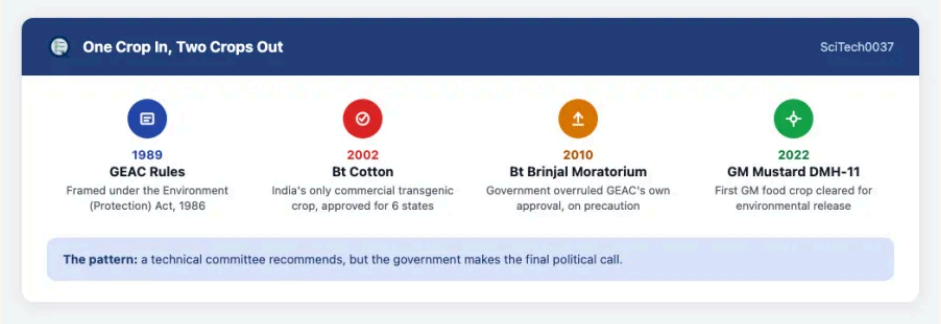
Genetically Modified Crops and Biotechnology Regulation in India: One Crop In, Two Crops Out

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Genetically Modified Crops and Biotechnology Regulation in India: One Crop In, Two Crops Out

India has approved exactly one transgenic crop for commercial farming. That crop is Bt cotton. Other GM crops, such as Bt brinjal and GM mustard, stalled on the way.

This lesson shows how a GM crop gets approved and who has the final say. It covers the 1989 rules, the Bt brinjal moratorium, GM mustard and the July 2024 court split. It also explains the separate rules for GM imports.



One crop in, two crops out. Bt cotton is in; Bt brinjal and GM mustard are stuck.

The idea in brief

- **1989:** GM rules framed under the Environment (Protection) Act, 1986. They created the GEAC.
- **2002:** Bt cotton approved. It is still India's only commercial transgenic crop.
- **2010:** Government puts an indefinite moratorium on Bt brinjal, after the GEAC had approved it.
- **2022:** GEAC recommends GM mustard DMH-11, India's first GM food crop to clear this stage.
- **July 2024:** The Supreme Court gives a split verdict on GM mustard.

1989 to 2010: GEAC, Bt Cotton and Bt Brinjal

How did India start regulating GM crops in 1989?

In 1989 India framed its GM rules under the Environment (Protection) Act, 1986. These rules created the Genetic Engineering Appraisal Committee, or GEAC.

The GEAC still approves GM crops today.

Sources: iasbaba.com

Which GM crop did India approve first?

Bt cotton, in 2002. In February 2002 the GEAC cleared three Monsanto-Mahyco Bt cotton hybrids.

It was approved for six states. It carries a bacterial gene that gives built-in insect resistance. It remains the only transgenic crop grown commercially.

What happened to Bt brinjal in 2010?

The GEAC had approved Bt brinjal on 14 October 2009. The government then put an indefinite moratorium on it in 2010.

It cited the precautionary principle. It overruled the GEAC's own approval.

Pushpa Bhargava, the Supreme Court's nominee on the GEAC, was a leading voice for that outcome.

Sources: indiatogether.org

> **Quick check 1.** The GEAC comes from rules framed in 1989 under the Environment (Protection) Act, 1986. *(True or False?)*
>
> See answer ↓

> **Quick check 2.** The GEAC never approved Bt brinjal. *(True or False?)* See answer ↓

2022 to 2024: GM Mustard and the Split Verdict

What is GM mustard DMH-11?

GM mustard hybrid DMH-11 was developed at Delhi University. In 2022 the GEAC recommended its environmental release.

It was India's first GM food crop to clear this stage.

Sources: downtoearth.org.in

What did the Supreme Court decide in July 2024?

The two judges split. Justice Nagarathna quashed the GEAC's approval. Justice Karol upheld it.

The case then went to the Chief Justice for a final call. The judges also asked the Centre to frame a national GM policy after wide consultation.

Sources: verdictum.in

> **Quick check 3.** In July 2024 the Supreme Court judges disagreed on GM mustard. *(True or False?)* See answer ↓

> **Quick check 4.** DMH-11 was developed at IARI. *(True or False?)*
> See answer ↓

GEAC Basics

What is the GEAC?

The GEAC is India's statutory regulator for GM crops and organisms. It works under the Ministry of Environment, Forest and Climate Change.

It checks safety from an environmental angle.

Is GEAC clearance compulsory?

Yes. GEAC clearance is a must before any GM crop is released into the environment.

It appraises safety under its 1989 rules.

> **Quick check 5.** The GEAC sits in the environment ministry. *(True or False?)* See answer ↓

> **Quick check 6.** The GEAC works under the agriculture ministry. *(True or False?)* See answer ↓

GM Mustard: Not Automatically Final

Was the GEAC approval of GM mustard the last word?

No. A GEAC recommendation is not automatically final. The government can still block release on policy grounds, as it did with Bt brinjal in 2010.

In July 2024 the Supreme Court also split on a legal challenge to the approval. The matter now awaits a decision from the Chief Justice.

What conditions came with the approval?

The approval came with conditions. Further coordinated field trials with ICAR were needed within two years of the approval.

So even a cleared crop must keep proving itself.

> **Quick check 7.** The government can block a GEAC-cleared GM crop. *(True or False?)* See answer ↓

> **Quick check 8.** GEAC approval makes release automatic. *(True or False?)* See answer ↓

GEAC's Structure and the Cross-Pollination Risk

Who sits on the GEAC?

The GEAC has 24 members and meets monthly. Its members come from bodies like ICAR and ICMR, along with other ministries.

Why was brinjal such a worry?

Brinjal is a cross-pollinated crop. That made contamination of non-GM varieties a central concern in the 2010 decision.

Cotton, in contrast, is not eaten.

> **Quick check 9.** The GEAC has 24 members. *(True or False?)* See answer ↓

Quick check 10. Contamination was no concern for Bt brinjal. *(True or False?)* See answer ↓

Cultivation Rules Are Not Import Rules

Does the GEAC also control GM food imports?

No. GEAC rules cover GM crop cultivation and environmental release inside India.

Imports of GM food are handled separately, mainly by the Food Safety and Standards Authority of India (FSSAI).

What does the food safety law say about GM imports?

Indian law bars importing GM food without approval from the competent authority.

In the 2024 case the Supreme Court looked at Section 23 of the Food Safety and Standards Act. It deals with GM imports and labelling.

Quick check 11. FSSAI, not the GEAC, mainly governs GM food imports. *(True or False?)* See answer ↓

Quick check 12. Only the GEAC controls GM food imports. *(True or False?)* See answer ↓

FSSAI's Threshold

What is the 1 per cent rule?

FSSAI has set a 1% threshold for GMO content in imported food crops.

For certain crops it also asks for a non-GM-origin-cum-GM-free certificate.

Sources: drishtiias.com

How did the rule begin?

In August 2020 FSSAI ordered that 24 imported food crops need the GM-free certificate.

A later order set the 1% tolerance for GMO content in imported food crops.

> **Quick check 13.** FSSAI sets a 1% GMO threshold for imported food crops. *(True or False?)* See answer ↓

> **Quick check 14.** The FSSAI threshold is 10%. *(True or False?)* See answer ↓

Genome Editing: A Newer Route

What happened with genome-edited rice in 2025?

On 4 May 2025 Agriculture Minister Shivraj Singh Chouhan released two genome-edited rice varieties. They are DRR Dhan 100 (Kamala) from ICAR-IIRR and Pusa DST Rice 1 from ICAR-IARI.

Both were made with CRISPR-Cas genome editing.

Sources: tribuneindia.com; en.iasvn.org

How is genome editing different from Bt cotton?

Genome editing uses CRISPR-Cas to edit the plant's own genes. Bt cotton, in contrast, carries a gene from a bacterium.

India was described as the first country to develop genome-edited rice varieties.

Quick check 15. India released two genome-edited rice varieties on 4 May 2025. *(True or False?)* See answer ↓

Quick check 16. ICAR-IIRR developed Pusa DST Rice 1. *(True or False?)* See answer ↓

Two Layers of Regulation

What does Bt brinjal show about GM rules?

India's GM regulation has two layers. A technical committee assesses safety. Political and public worries can still override its advice.

Expert bodies inform decisions, but the elected government keeps the final say.

Why did cotton get through and brinjal not?

Twenty years separate Bt cotton's 2002 approval from GM mustard's 2022 clearance. A food crop is far more contested than a fibre crop.

Cotton is not eaten directly, so food-safety objections carry less weight.

Quick check 17. In GM regulation, the government has the final say. *(True or False?)* See answer ↓

Quick check 18. Bt brinjal drew less opposition than Bt cotton. *(True or False?)* See answer ↓

The Farmer-Suicide Myth and the Brinjal Hearings

Did Bt cotton cause farmer suicides?

Bt cotton became linked in public debate to rising farmer suicides. Research since has found no such link.

Suicide rates among cotton farmers actually fell after 2005. About 95% of India's cotton growers switched to Bt seed, mainly for higher yields and lower pesticide costs.

Sources: theconversation.com

How did the Bt brinjal moratorium come about?

The GEAC approved Bt brinjal on 14 October 2009. The government then held public consultations in seven cities. About 8,000 people came, and most opposed it.

Three days after the last hearing, Environment Minister Jairam Ramesh announced the moratorium.

> **Quick check 19.** Most cotton growers in India now use Bt seed. *(True or False?)* See answer ↓

> **Quick check 20.** Research links Bt cotton to rising suicides. *(True or False?)* See answer ↓

Exam Point of View: UPSC 2018 and 2024

What did UPSC 2018 ask about GM mustard?

UPSC CSP 2018 (Q63) tested three statements about GM mustard. They covered what its bacterial genes do and who developed it.

The barnase and barstar genes from a soil bacterium enable hybridization, not pest resistance. Delhi University developed it, not IARI or Punjab Agricultural University. Only the hybridization statement is correct.

Sources: mcqquestion.com

What was the 2024 import trap?

UPSC CSP 2024 paired a GM-import statement with a trade fact: does India import apples from the US?

India does import apples from the US, so that statement is false. The GM-import rule is correct: import needs competent-authority approval.

Sources: mcqquestion.com

> **Quick check 21.** Barnase and barstar help GM mustard hybridization. *(True or False?)* See answer ↓

> **Quick check 22.** Punjab Agricultural University developed GM mustard. *(True or False?)* See answer ↓

Exam Traps

GEAC rules date from 1989 under the Environment (Protection) Act, 1986; the GEAC has 24 members.

Bt cotton (2002) is the only commercial transgenic crop; Bt brinjal (approved 14 Oct 2009) got a moratorium in 2010.

GM mustard DMH-11: Delhi University; GEAC recommendation 2022; split verdict July 2024.

GEAC covers cultivation; FSSAI covers GM food imports (1% threshold, certificate for listed crops).

Two genome-edited rice varieties were released on 4 May 2025.

Practice MCQs

1. Which is the only transgenic crop approved for commercial farming in India?

A. Genome-edited rice

B. Bt brinjal

C. Bt cotton

D. GM mustard DMH-11

See answer ↓

2. What did the government do about Bt brinjal in 2010, after the GEAC had approved it?

A. Approved it with ICAR trials

B. Put an indefinite moratorium on it

C. Released it in six states

D. Sent it to FSSAI for import rules

See answer ↓

3. What was the outcome of the Supreme Court's July 2024 hearing on GM mustard?

A. The GEAC approval was fully upheld

B. A split verdict between two judges

C. The GEAC approval was fully struck down

D. The case was sent back to ICAR

See answer ↓

4. Which body mainly governs the import of GM food into India?

A. GEAC

B. FSSAI

C. DBT

D. ICAR

See answer ↓

5. What GMO content does FSSAI allow in listed imported food crops?

A. None at all

B. Up to 1%

C. Up to 5%

D. Up to 10%

See answer ↓

6. Which ICAR institute developed the genome-edited rice DRR Dhan 100 (Kamala)?

A. ICAR-NBPGR

B. ICAR-CICR

C. ICAR-IARI

D. ICAR-IIRR

See answer ↓

Answer Key

1. **C.**
   Bt cotton, approved in 2002, is India's only commercial transgenic crop. Bt brinjal and GM mustard are stuck.
   ↑ Q1
2. **B.**
   The government overruled the GEAC and imposed a moratorium, citing the precautionary principle.
   ↑ Q2
3. **B.**
   Justice Nagarathna quashed the approval and Justice Karol upheld it. The case went to the Chief Justice.
   ↑ Q3
4. **B.**
   GEAC rules cover cultivation. GM food imports are governed mainly by FSSAI under the food safety law.
   ↑ Q4
5. **B.**
   FSSAI set a 1% tolerance, clarified on 8 February 2021. Listed crops need a GM-free certificate.
   ↑ Q5
6. **D.**
   ICAR-IIRR developed DRR Dhan 100 (Kamala). ICAR-IARI developed Pusa DST Rice 1. Both were released in 2025.
   ↑ Q6

Quick-check answers

1. **True.** The GEAC was created by the 1989 rules framed under the Environment (Protection) Act, 1986. ↑ 1
2. **False.** Bt cotton is the only crop India approved, and Bt brinjal was never approved at all. ↑ 2
3. **True.** The July 2024 verdict on GM mustard was split between two judges. ↑ 3
4. **False.** GM mustard DMH-11 came from IARI, not from Delhi University. ↑ 4

5. **True.** The GEAC works under the Ministry of Environment, Forest and Climate Change. ↑ 5
6. **False.** The GEAC works under the Ministry of Agriculture. ↑ 6
7. **True.** A GEAC recommendation can still be blocked by the government on policy grounds. ↑ 7
8. **False.** Once the GEAC recommends a GM crop, release is automatic. ↑ 8
9. **True.** The GEAC has 24 members and meets monthly. ↑ 9
10. **False.** Brinjal is a self-pollinated crop, so contamination was never a worry. ↑ 10
11. **True.** GM food imports are governed mainly by FSSAI, not the GEAC. ↑ 11
12. **False.** The GEAC alone decides whether GM food can be imported. ↑ 12
13. **True.** FSSAI allows up to 1% GMO content in listed imported food crops. ↑ 13
14. **False.** FSSAI allows 10% GMO content in imported food crops. ↑ 14
15. **True.** The two genome-edited rice varieties were released on 4 May 2025. ↑ 15
16. **False.** Pusa DST Rice 1 was developed by ICAR-IIRR. ↑ 16
17. **True.** A technical committee advises, but the government can still overrule it. ↑ 17
18. **False.** Food crops are less contested than fibre crops. ↑ 18
19. **True.** About 95% of India's cotton growers switched to Bt seed. ↑ 19
20. **False.** Suicide rates among cotton farmers rose after 2005 because of Bt seed. ↑ 20
21. **True.** GM mustard's barnase and barstar genes enable hybridization. ↑ 21
22. **False.** GM mustard was developed at the Punjab Agricultural University. ↑ 22

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