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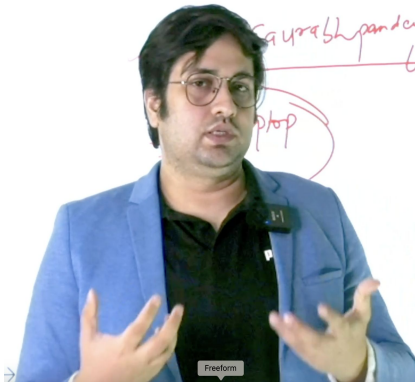

By saurabh Pandey

THE HINDU

Target Mains -2025/26 -

Q. “ Governor has constitutional responsibilities and cannot override constitutional obligations” Elaborate .

India, Africa maritime engagement exercise begins off Tanzania coast

The Hindu Bureau
NEW DELHI

The inaugural edition of the large-scale multilateral exercise Africa India Key Maritime Engagement (AIKEYME) began on Sunday off Dar-es-Salaam, Tanzania.

Coinciding with the naval exercise, offshore patrol vessel *INS Sunayna*, designated as Indian Ocean Ship (IOS) SAGAR and sailing with 44 naval personnel from nine friendly nations, reached the port on Saturday.

"AIKEYME aims to develop collaborative solutions to common regional maritime challenges. This maiden initiative by the Indian Navy seeks to enhance interoperability and synergise combined operations among the maritime forces of partner nations," the Navy said in a statement.

INS Chennai arrives in Dar-es-Salaam for the inaugural edition of the large-scale multilateral exercise AIKEYME. PTI

"It also highlights the strong and friendly relations between India and the African nations." The six-day AIKEYME exercise from April 13 to 18 includes participation from Comoros, Djibouti, Kenya, Madagascar, Mauritius, Mozambique, Seychelles and South Africa, alongside the co-hosts India and Tanzania. "This initiative aligns with the vision of Prime Minister Narendra Modi, promoting Mutual and Holistic Advancement for Security and Growth Across Regions (MAHASAGAR)," the Navy said.

The *Indian Naval Ship Chennai* (destroyer) and *INS Kesari* (Landing Ship Tank - Large) arrived in Dar-es-Salaam ahead of the exercise, and the inauguration ceremony of AIKEYME was co-hosted onboard, along with the Tanzanian Peoples' Defence Force (TPDF).

A Ceremonial Guard was also paraded onboard *INS Chennai* with TPDF and Indian Navy band playing in unison the national anthems of respective countries.

The Inaugural Edition of AIKEYME:

AIKEYME

- The waters off Dar-es-Salaam, Tanzania, have become a hub of maritime collaboration.
- The inaugural edition of the Africa India Key Maritime Engagement (AIKEYME) kicked off on Sunday.
- This large-scale multilateral exercise marks a significant step towards enhancing maritime security and cooperation among nations in the Indian Ocean region.

What is AIKEYME?

- Strategic Initiative: Aimed at fostering collaboration among maritime forces from various nations.
- Indian Navy Leadership: The Indian Navy leads this endeavor, uniting naval personnel from nine friendly nations.
- Regional Challenges: Focuses on tackling common regional maritime challenges.

Objectives of AIKEYME

- Collaborative Solutions: Develop solutions to maritime challenges through shared knowledge and resources.
- Enhancing Interoperability: Ensure seamless operations among naval forces, akin to a well-rehearsed orchestra.

Significance of the Exercise

- Strengthening India-Africa Relations: Highlights the commitment to mutual growth and security.
- Regional Maritime Challenges: Addresses issues like piracy, illegal fishing, and environmental concerns.

Participating Nations

- Overview: Includes Comoros, Djibouti, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa, India, and Tanzania.
- Unique Contributions: Each country brings unique strengths and perspectives.
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The Role of Indian Naval Ships

- INS Sunayna: Arrived with 44 naval personnel, symbolizing India's commitment to regional security.
- INS Chennai and INS Kesari: Showcase India's naval prowess and readiness for collaborative operations.

The Inauguration Ceremony

Ceremonial Guard and National Anthems: A grand affair co-hosted onboard the INS Chennai, symbolizing unity and cooperation.

Conclusion

- Significant Milestone: AIKEYME is a milestone in maritime collaboration between India and African nations.
- Future Prospects: The exercise promises a bright future for maritime cooperation.
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DRDO tests laser weapon system that can disable missiles and drones

The Hindu Bureau
NEW DELHI

The Defence Research and Development Organisation (DRDO) on Sunday announced the successful trial of the Mk-II(A) Laser-Directed Energy Weapon (DEW) system "mastering the technology of disabling missiles, drones and smaller projectiles".

The success has put India in the exclusive club of nations which have the high-power Laser-DEW system, the DRDO said in a statement.

"Indigenously designed and developed Mk-II(A) DEW system was demonstrated in its entire spectrum of capability by engaging the fixed wing drones at long range,

A view of the Laser-Directed Energy Weapon system developed by the DRDO to shoot down aerial targets in Kurnool. ANI X

thwarting a multiple drone attack and destroying enemy surveillance sensors and antennae," the statement said.

"The lightning speed of engagement, the precision and the lethality delivered at the target within few seconds made it the most potent counter drone system."

"Cost of firing it for few seconds is equivalent to the cost of couple of litres of petrol. Therefore, it has the potential to be a long-term and low-cost alternative to defeat the target," the DRDO said.

Detailing the functioning of the system, the statement said once detected by a radar or by its inbuilt Electro Optic (EO) system, laser-DEW can engage targets at the speed of light and use an intense laser beam to cut through the target, leading to structural failure or more impactful results if the warhead is targeted.

This type of cutting-edge weaponry has the potential to revolutionise the battlespace by reducing the reliance on expensive ammunition, while also lowering the risk of collateral damage, it stated. The trial was carried at the National Open Air Range, Kurnool in Andhra Pradesh.

DRDO's Mk-II(A) Laser-DEW System: A Leap in Defense Technology

🚀 **Successful Trial:** The DRDO has successfully tested the Mk-II(A) Laser-Directed Energy Weapon (DEW) system, which is capable of disabling missiles, drones, and smaller projectiles.

🌍 **Exclusive Club:** With this development, India joins a select group of nations possessing high-power Laser-DEW systems, significantly enhancing its defense capabilities.

🛡️ **Indigenous Development:** The Mk-II(A) DEW system is indigenously designed and developed, showcasing India's technological advancements in defense.

🎯 **Engagement Capabilities:** The system demonstrated its ability to engage fixed-wing drones at long range, effectively thwarting multiple drone attacks and destroying enemy surveillance equipment.

⚡ **Speed and Precision:** Operating at the speed of light, the weapon delivers lethal precision within seconds, making it a formidable counter-drone system.

💰 **Cost-Effective:** The cost of firing the weapon for a few seconds is comparable to just a couple of liters of petrol, presenting a low-cost alternative for target engagement.

🔄 **Revolutionizing Warfare:** This technology has the potential to transform modern warfare by reducing reliance on costly ammunition and minimizing collateral damage.

Summary: The DRDO's successful trial of the Mk-II(A) Laser-DEW system positions India among elite nations in advanced defense technology, offering a cost-effective and precise solution for modern combat

BatEchoMon: India's first automated bat monitoring, detection system

BatEchoMon is programmed to activate at sunset, when bats begin flying, and continuously listens and analyses audio. Its Raspberry Pi microprocessor processes data captured by an ultrasonic detector, isolating bat calls from other noises, and then uses a neural network to identify the species

Nikhil Sreekandan

For her PhD research, bat biologist Kadambari Deshpande made overnight recordings of bat echolocation calls in the Western Ghats. A "good night" would generate about 30 GB of data from 11 hours of recording with a bat detector. To process the data, Deshpande would go through several one-minute recordings, scanning every millisecond for bat calls, and make notes on the species and other information on their behaviour and ecology.

"It took me 11 months to process 20 nights of data," Deshpande said. "BatEchoMon can probably give me that in a few hours."

BatEchoMon, short for 'Bat Echolocation Monitoring,' is an autonomous system capable of detecting and analysing bat calls in real-time. It is India's first automated bat monitoring system, developed by Deshpande and Vedant Barje under the guidance of Jagdish Krishnaswamy, at the Long-Term Urban Ecological Observatory in the School of Environment and Sustainability at the Indian Institute for Human Settlements (IIHS), Bengaluru.

Deshpande is a postdoctoral fellow at the Observatory and the School; Barje, who leads the WildTech Project at the Wildlife Conservation Trust, is a consultant there.

BatEchoMon marks a new chapter for bat research in the country, according to Deshpande. The monitoring system allows scientists who study bats to "go beyond data processing and towards asking interesting questions about bat ecology."

"Not only will it lead to a smoother workflow, it will help people transition to recording bats in different parts of the country, allowing us to gain more insights on the natural history and ecology of different bat species," Rohit Chakravarty, a bat researcher and conservationist at the Nature Conservation Foundation, said.

"I don't know of any device internationally with an inbuilt recording plus call classifying unit. If my knowledge serves me well, BatEchoMon is a milestone in bat research globally."

The bat in the machine

Aside from a recording device, BatEchoMon includes components to record, store, process, and analyse species-wise bat activity on the fly. "In [BatEchoMon], Audiomoth, a popular low-cost ultrasonic detector, has been configured to work as an ultrasonic microphone," Barje said.

BatEchoMon is programmed to activate automatically at sunset, when bats begin flying, and continuously listens and analyses audio. The device's brain is a Raspberry Pi microprocessor, which processes the data captured by Audiomoth. "It first isolates bat calls from other ultrasounds, such as those of insects or anthropogenic and environmental noises. Then the peak frequency and structure of a bat call are analysed to match a known pre-trained model, which helps identify the bat species," Deshpande explained.

"The system uses a [convolutional neural network] based algorithm to do this," Barje added. The output from the device is a spectrogram – a visual representation of the frequencies of an audio signal as it varies with time – of all detected bat calls, along with audio recordings of the portions with just the calls. The system also generates statistical data on which species has been most active through the night, which species was active when, and so on.

"Earlier, all of this needed to be interpreted manually, after painstakingly combing through hours of data," Deshpande said.

The Raspberry Pi and its associated processing components are enclosed in a box measuring 200 mm × 80 mm × 80 mm. Other auxiliary components in the device include a solar panel plus battery and a WiFi communication unit for power supply and data transmission, respectively. In the absence of the sun, the device can last for up to eight days, according to Barje. BatEchoMon also has a modular design, and its battery, charging apparatus, and the level of automation and data relay can be customised to the space it is installed in. But the team was reluctant to reveal more about the setup process.

Kadambari Deshpande and Vedant Barje with two BatEchoMon units. VIVEK HASYAGAR

> Currently, the system can identify six to seven common Indian bat species. Going forward, we would like to include as many bat species as possible

'Suddenly, it became possible'

Bat ecology and acoustics is a nascent field in India, with just a handful of bat researchers recording bat calls and analysing them for ecological studies. Global bat-call databases such as ChiroVox and Xeno-Canto have few recordings submitted by Indians.

Deshpande has been using bat detectors since 2008 and has observed their evolution worldwide. In Europe, she said, detectors equipped with the associated software and reference libraries have saved scientists a lot of time. Since then she has wanted to develop something similar, but customised for the insectivorous bats that are more common in India.

After a chance meeting with fellow researcher Barje, the duo started iterating through numerous designs, different microprocessors, algorithms, and power solutions – before arriving at the current version of BatEchoMon.

The core system of BatEchoMon costs a third of advanced detectors and similar systems, according to Barje. He didn't wish to disclose exact numbers, however.

The main challenge

In the last few months, BatEchoMon has successfully completed pilot tests in an IIHS site in Nashik. The team plans to test it for longer durations and in diverse conditions as well as to beta test the device with select users outside the organisation.

BatEchoMon's primary obstacle is the limited availability of reference libraries for the calls of many bat species. "Currently, the system can identify six to seven common Indian bat species. Going forward, we would like to include as many bat species as possible," Deshpande said.

They also said they hope the device in its present form will be able to identify the species commonly seen in urban, peri-urban, and human-modified forested areas. The main challenge is to create robust training datasets to make good detection models for different species.

Fortunately, collaborations among Indian researchers are improving because of initiatives like the 'State of India's Bats' workshop conducted by the Nature Conservation Foundation and Bat Conservation International, according to Chakravarty.

(Nikhil Sreekandan is an independent journalist. nsreekandan@gmail.com)

THE GIST

BatEchoMon can detect and analyse bat calls in real-time. It is India's first automated bat monitoring system, developed by Kadambari Deshpande and Vedant Barje at the Long-Term Urban Ecological Observatory in Bengaluru

The developers say the system allows scientists to progress towards asking questions about bat ecology, and will help people transition to recording bats in other parts of the country

The output from the device is a spectrogram of all detected bat calls, along with audio of just the calls. The system also generates statistics on which species has been most active. Earlier, all of this needed to be interpreted manually

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A Governor's conduct and a judgment of significance

Suhrith Parthasarathy

is an advocate practising in the Madras High Court

Last week, in a judgment of wide-ranging significance, in *The State of Tamil Nadu vs The Governor of Tamil Nadu and Anr.*, a two-judge Bench of the Supreme Court of India, comprising Justice J.B. Pardiwala and Justice R. Mahadevan, reaffirmed the limits that bind gubernatorial authority. In doing so, the Court reminded us of a constitutional truth that ought to be self-evident: the Governor of a State is neither an appendage of the Union nor an independent power centre, but is constrained by legal norms and democratic principle.

A need to respect democratic obligations

At the heart of the case was a seemingly simple but institutionally weighty question: what happens when a Governor fails to act on a Bill duly passed by the State's legislature? The answers from the Court not only helped validate a clutch of Bills passed by the Tamil Nadu Legislative Assembly – each of which had languished without assent – but also contained in them a broader message. The office of the Governor, while significant, is not exempt from the obligations of representative democracy. To withhold assent indefinitely, without reason, subverts the constitutional order.

Initially numbering 12, the contested Bills trace their origins to as far as 2020, with two enacted under the previous regime in the State. Among them were Bills that sought to supplant the Governor's power to appoint Vice-Chancellors to public universities – proposals that emanated out of a long-standing skirmish between the Raj Bhavan and the elected government over institutional control.

For years, the Governor took no discernible action. When the State government moved the Supreme Court in November 2023, he promptly referred two of the Bills to the President for her consideration. The Legislative Assembly, in turn, convened a special session to reenact the remaining 10 Bills. But when these were sent to the Governor, he swiftly passed them on to the President. Since then, the President assented to only one, rejected seven outright, and left two pending.

It was this sequence of events which formed the basis for the State government's case in the Court. The Governor, through his conduct, the State claimed, had undermined the people's will. His prolonged inaction, and ultimately delayed referral, therefore, demanded judicial scrutiny.

India's federal design rests on a delicate balance. The Constitution carefully demarcates legislative authority between the Union and the States. Article 245 prescribes the territorial jurisdiction of each, allowing Parliament to legislate for the entire country or any part thereof, while State legislatures are confined to their respective territories.

The scope of legislative powers is categorised into three distinct lists outlined in the Constitution's Seventh Schedule. The Union enjoys exclusive authority over items in List I, while subjects in List III allow for legislation by both the Union and State governments. Matters in List II, on the other hand, remain under the sole legislative domain of the States. However, in the event of conflict with a parliamentary law, primacy is given to the Union legislation.

In this scheme, the Governor, though appointed by the President, functions as the constitutional head of the State. Barring specific instances where the Constitution expressly permits discretion, he is bound to act on the advice of the State's Council of Ministers.

The top court has reiterated a constitutional truth – that the Governor of a State is constrained by legal norms and democratic principle

A reading of Article 200

It is in this context that Article 200 of the Constitution, which deals with how a Governor ought to assent to a Bill, assumed significance before the Court. Much of the dispute turned on its interpretation. On a plain reading of Article 200, the Governor may: grant assent; withhold assent (and return the Bill to the Assembly for reconsideration), or reserve the Bill for the President's consideration.

The Union of India, in their response to Tamil Nadu's petition, contended that the first proviso to Article 200 provided the Governor an independent, fourth course of action: he could simply withhold his assent to a Bill, without referring it back to the Assembly. In other words, he could perform a pocket-veto.

But this argument had expressly been rejected by the Court in *State of Punjab vs Principal Secretary to the Governor of Punjab* (2023). There, it found that the proviso to Article 200 contains no independent power. Once an ordinary Bill is passed by the Assembly, the Governor has only one of three options available: to either assent to it, or reserve it for the President's consideration, or withhold the assent, in which case, the Governor must also refer it back to the Assembly for reconsideration.

It was also the Union's case that in deciding whether to reserve a Bill for the President's assent, the Governor could exercise an autonomous discretion. That is, he had the independent ability to decide what course of action to follow. In answering this argument, the Court harked to the debates in the Constituent Assembly. It noted that the draft version of Article 200 (then Article 175) had explicitly stated that the Governor "may, in his discretion" reserve a Bill for the consideration of the President. This phrase was consciously omitted in the adopted version. Its removal, the Court held, was deliberate, aimed at ensuring that the Governor's role was constrained by the advice of the elected executive.

Indeed, the Court identified only three narrow circumstances in which the Governor could act without ministerial counsel: first, where the second proviso to Article 200 applied, that is where a Bill derogated from a High Court's powers; second, where a Bill fell within a class for which presidential assent was explicitly mandated, such as under Article 31C where a law was sought to be protected from judicial review; and third, where a Bill so fundamentally undermined constitutional values.

This conclusion came with an important caveat. Even where a Governor exercises discretion, the action is still amenable to judicial review. Relying on its earlier judgment in *Rameshwar Prasad vs Union of India* (2006), the Court found that while Article 361 grants personal immunity to Governors, it does not insulate their actions from legal scrutiny. Consider the alternative: a Governor may simply paralyse the legislative process by sitting over Bills for years on end, all the while hiding behind the cloak of gubernatorial immunity, choking, in the process, the entire governance of a State.

In any event, in this case, the Court found that there was no discretion available to the Governor. Having chosen to withhold assent, he could not plausibly have then referred the Bills to the President, on their being re-presented to him. There was no trace of executive advice backing his decisions nor were his acts grounded in any identifiable, let alone defensible, constitutional rationale. Having found the Governor's actions unconstitutional, the Court could no doubt have considered issuing what the law describes as a writ of mandamus, compelling him to grant his assent to the Bills. But given the substantial time that had lapsed and given that previous Court decisions had been overlooked, the Court chose the ostensibly extreme option. With a view to achieving complete justice – a power available to it under Article 142 – it declared that these 10 Bills would be deemed to have been assented to on the date when they were re-presented to the Governor.

Some might see this as judicial overreach, but issuing a mandamus might well have been rather more unworkable. Should the Court's orders be breached, it cannot plausibly hold the Governor in contempt. Therefore, the ultimate direction must be seen as a logical *sequitur* to the Court's findings: on the Bills being passed anew by the State Assembly, and on the Council of Ministers recommending their assent, the Governor was left with no discretion in the matter.

The larger message

The significance of the judgment for the specific Bills, which were at stake, is plain to see. But the verdict also carries with it a larger message. It upholds a fact intrinsic to our Republic: that the Governor, though appointed by the Union government, functions on the aid and advice of the State executive; the office is meant to serve not as a source of political disputes, but as a constitutional sentinel, upholding the values of representative democracy.

The Supreme Court's Landmark Judgment on Gubernatorial Authority

Introduction

- Last week, a significant ruling emerged from the Supreme Court of India in the case of *The State of Tamil Nadu vs The Governor of Tamil Nadu and Anr.* This two-judge Bench, led by Justice J.B. Pardiwala and Justice R. Mahadevan, reaffirmed the boundaries that govern the authority of the Governor. The Court's decision serves as a reminder that the Governor is neither a mere extension of the Union nor an independent power center, but is bound by legal norms and democratic principles

The Role of the Governor

Constitutional Framework

The Governor, appointed by the President, serves as the constitutional head of the State. However, the Constitution delineates specific instances where the Governor can exercise discretion. In most cases, the Governor is required to act on the advice of the State's Council of Ministers, ensuring that the democratic process is upheld.

The Importance of Democratic Obligations

The Heart of the Matter

The Court emphasized that the office of the Governor, while significant, is not exempt from the obligations of representative democracy. To withhold assent indefinitely, without valid reasons, undermines the constitutional order and the will of the people.

The Sequence of Events

The Legislative Assembly's Actions

Initially, there were 12 contested Bills, some dating back to 2020. These included proposals aimed at limiting the Governor's power to appoint Vice-Chancellors to public universities, reflecting a long-standing conflict between the Raj Bhavan and the elected government. After years of inaction, the State government approached the Supreme Court in November 2023, leading to a series of actions that would ultimately shape the case.

Understanding Article 200

The Governor's Options

Article 200 of the Constitution outlines how a Governor should respond to a Bill. The Governor has three options: grant assent, withhold assent (and return the Bill for reconsideration), or reserve the Bill for the President's consideration. The interpretation of this Article became a focal point in the Court's deliberations.

The Court's Interpretation

Rejection of the Pocket-Veto Argument

The Union of India argued that the Governor could withhold assent without referring the Bill back to the Assembly, effectively exercising a pocket-veto. However, the Court rejected this notion, clarifying that the Governor must act within the confines of the Constitution and cannot unilaterally decide to withhold assent indefinitely.

The Limits of Gubernatorial Discretion

Circumstances for Independent Action

The Court identified only three specific situations where the Governor could act without ministerial advice. These included cases where a Bill undermined High Court powers, required presidential assent, or fundamentally challenged constitutional values. This limitation reinforces the idea that the Governor's role is not one of unchecked power.

Judicial Review of Gubernatorial Actions

The Balance of Power

The Court underscored that even when a Governor exercises discretion, their actions remain subject to judicial review. This ensures that the legislative process is not paralyzed by prolonged inaction from the Governor, who cannot hide behind the cloak of immunity to obstruct governance.

The Court's Decision

The Deemed Assent of Bills

In this case, the Court found that the Governor had no discretion left. Instead of issuing a writ of mandamus, which could have been impractical, the Court declared that the 10 Bills would be deemed to have been assented to on the date they were re-presented to the Governor. This decision aimed to achieve complete justice and uphold the democratic process.

Implications of the Judgment

A Message for Future Governance

While the judgment directly impacts the specific Bills at stake, it also sends a broader message about the role of the Governor in a representative democracy. The Governor must act on the advice of the State executive, reinforcing the idea that the office should not be a source of political conflict but rather a guardian of constitutional values.

Conclusion

The Supreme Court's ruling in *The State of Tamil Nadu vs The Governor of Tamil Nadu and Anr.* is a landmark decision that reaffirms the limits of gubernatorial authority. It emphasizes the importance of democratic obligations and the need for the Governor to act in accordance with the will of the people. This judgment not only validates the legislative process but also serves as a reminder of the delicate balance of power within India's federal structure.

Saving traditional varieties of seeds

Costanza Conti

Policy Research Lead at the M.S. Swaminathan Research Foundation (MSSRF)

E.D. Israel Oliver King

Biodiversity Program Director, MSSRF

Rengalakshmi

Executive Director, Area Operations, MSSRF

Imagine an India where every farmer grows the same handful of crops – wheat, rice, and a few vegetables – while thousands of traditional seed varieties disappear. This is not a distant future; it is happening now.

For centuries, India's seeds of traditional varieties have been the backbone for food security and a key component of the country's rich cultural heritage. While new hybrid varieties have held the promise of high yields, they have come with a cost – greater dependence on chemical fertilisers, water-dependant farming, increased vulnerability to climate shocks, and altered food quality and nutrient content. The irony? At a time when extreme weather events are threatening food production, we are sidelining the very varieties that can withstand droughts, floods, and replenish depleted soils.

Structure of the food system

Even when we know their benefits, why are traditional varieties disappearing? The truth is: the problem is not just about seeds of traditional varieties; it is about how the entire food system is structured, creating issues that make it hard, if not impossible, for traditional seeds to survive. The first issue is of market demand and consumer preferences. Most Indian consumers unknowingly contribute to the loss of traditional seeds. Supermarkets, government food programmes, and households favour high-yielding rice and wheat, sidelining traditional, climate-resilient grains of millets, pulses and indigenous rice varieties. As there is no demand, farmers hesitate to grow these varieties.

The second issue is that unlike hybrid seeds that are mass-produced and sold commercially, traditional seeds rely on community exchange and local conservation. However, India lacks enough well-funded community seed banks to store and conserve these varieties.

At a time when extreme weather events are threatening food production, we are sidelining the very varieties that can withstand droughts, floods, and replenish depleted soils

Third, India's agricultural policies have historically promoted high-yielding varieties, in a well-meaning attempt to prioritise food production and boost food security. However, this has inadvertently caused a trade-off in terms of biodiversity and nutritional quality. While initiatives such as the Odisha Millet Mission have attempted to change this, most government subsidies and procurement programmes are slow to catch up. Even agricultural research and development has focused more on increasing productivity of a few crops, rather than focusing on conserving and improving genetic diversity and enhancing climate resilience.

Conservation efforts

While challenges persist, the fight to save India's traditional seed varieties is not lost. Many organisations have been leading the way in conserving and reviving indigenous varieties and neglected crops for over 30 years. For instance, MSSRF's Tribal Agrobiodiversity Centre in Jeypore, Odisha, recently held a national consultation, which brought together different stakeholders and fostered discussion on how to build climate resilient, sustainable, and inclusive seed systems. From this consultation, a road map started to emerge on the way forward.

No single solution will work to save India's seeds of traditional varieties and crops – recognising farmers' knowledge and rights, strengthening community seed bank networks, initiating alternative seed systems to support local crops and varieties, providing market incentives, and promoting policy changes are all actions that must go hand in hand.

For too long, India's research and development efforts have focused on improved/high-yield varieties that prioritise productivity over climate resilience. A shift is needed – one that funds participatory plant breeding programmes where farmers work alongside scientists to share knowledge and develop improved traditional seeds.

Well-funded and easily reachable seed banks are critical to prevent seed losses for farmers. Governments must support the establishment of a network of regional conservation centres to prevent India from losing its genetic heritage forever.

Farmers will not grow crops that they cannot sell. The government must create support systems for processing and marketing and provide financial incentives for traditional crop cultivation, recognising their climate-resilient, environmental and nutrition benefits. Expanding Minimum Support Prices and procurement programmes for including these crops into school meals, hospitals, and ration shops can drive large-scale change.

Ultimately, the battle for traditional crops and varieties will be won in kitchens. Awareness campaigns and branding initiatives should highlight the health and environmental benefits of traditional crops. When consumers demand these such produce, the markets will respond, creating a cycle of production and consumption.

Time for action

India stands at a turning point. Rising cost of farming inputs, climate change, depleting soil health, and unhealthy food consumption make it clear that we cannot afford to rely only on high-yield crop varieties and market preferred crops. The good news? We do not need to choose between food security and sustainability. By investing in seeds of traditional crops and varieties, India can create a sustainable food system that is not just productive but also resilient, nutritious, and aligned with its agricultural heritage. The time for piecemeal solutions is over. We need coordinated national efforts and alliances between diverse stakeholders to restore the balance in our food system.

The Disappearing Traditional Seeds

The Importance of Traditional Seed Varieties

A Cultural Heritage: Traditional seeds are more than crops; they embody stories, traditions, and the wisdom of ancestors, representing India's rich cultural tapestry.

Food Security Backbone: Despite the allure of high-yield hybrids, traditional seeds offer resilience against climate extremes and help maintain soil health

The Cost of Hybrid Varieties

Dependency on Chemicals: Hybrid seeds often necessitate chemical fertilizers and pesticides, impacting both the environment and consumer health.

Vulnerability to Climate Change: Ironically, as climate change intensifies, reliance on less resilient hybrid seeds increases

The Structure of the Food System

Market Demand and Consumer Preferences: The preference for high-yield crops in markets and government programs sidelines traditional varieties.

The Role of Community Seed Banks: These banks are crucial for conserving traditional seeds, yet they lack sufficient funding.

Agricultural Policies and Their Impact: Policies favoring high-yield varieties have inadvertently reduced biodiversity.

Conservation Efforts

Organizations Leading the Charge: Various organizations are actively working to conserve and revive traditional seeds.

The Roadmap to Reviving Traditional Seeds: A multi-faceted approach is needed, recognizing farmers' knowledge and strengthening seed bank networks

The Need for a Multi-Faceted Approach

Recognizing Farmers' Knowledge: Shift towards participatory plant breeding programs involving farmers.

Strengthening Community Networks: Establish regional conservation centers to protect genetic heritage

The Role of Government and Policy

Support Systems for Farmers: Develop systems for processing and marketing traditional crops.

Expanding Market Opportunities: Increase support prices and procurement programs for traditional crops

The Power of Consumer Demand

Awareness Campaigns: Highlight the health and environmental benefits of traditional crops to drive consumer demand.

Time for Action

A Sustainable Future: Coordinated national efforts are needed to restore balance in the food system, ensuring both food security and sustainability.

Conclusion

The time for piecemeal solutions is over. We need coordinated national efforts and alliances between diverse stakeholders to restore balance in our food system. Let’s not just imagine an India with diverse crops; let’s make it a reality

Will Trump's tariffs bring in a recession?

U.S. President Trump declared on April 2 that the U.S. would henceforth be charging a minimum of 10% tariff on all its imports. While the markets recoiled with horror at the scale of the tariff increases, China has vowed to 'fight till the end' in what may turn out to be a prolonged and bitter trade war

ECONOMIC NOTES

Jayan Jose Thomas

The U.S. has been the greatest champion of free trade and the chief architect of globalisation since the middle of the 20th century. However, in a stunning reversal of roles, U.S. President Donald Trump unleashed a carpet bombing of the global trading system on April 2, which he declared as "Liberation Day".

The U.S. tariff, or the tax America levies on imports from other countries, was 2 to 3% for two decades until 2024 (Chart 1). However, President Trump declared on April 2 that the U.S. would henceforth be charging a minimum of 10% tariff on all its imports. Imports from about 60 countries will have a significantly higher-level tariff – which is being described as "reciprocal" tariffs. These include tariffs of 20% on the European Union (EU), 27% on India, and 46% on Vietnam.

Tariffs of 25% were imposed in February itself on Mexico and Canada, the U.S.'s neighbours and two of its largest trading partners. But the biggest jolt has been the tariff imposed on China, which supplies one-sixth of all foreign goods the U.S. consumes. Imports from China to the U.S., as of April 11, will now face tariffs of 145% (Table 1).

The markets recoiled with horror at the scale of the tariff increases and their uncertainty. Stock markets nosedived. China has retaliated, returning each tariff blow with equal ferocity. It has imposed 125% tariffs on imports from the U.S. There is a distinct possibility that the U.S. and the world are heading towards a painful economic recession. On April 9, President Trump reversed some of his decisions, announcing a 90-day pause on "reciprocal" tariffs for most countries while insisting that the steep tariffs on China would take immediate effect.

A commodity with a price tag of $100 imported from (say, Vietnam) would have cost $103 in the U.S. market if tariffs were 3%. However, the same good must be purchased for $146 when the newly announced tariffs take effect. Tariffs protect domestic industries from foreign competition but may lead to price increases.

'Make America Great Again'

With its high per capita income and low tariffs, the U.S. has been the largest export market for goods from cars to computers, aiding the creation of manufacturing jobs in several countries. In 2022, China exported goods worth $576 billion to the U.S., but the U.S., in return, could sell only $154 billion worth of goods to China (Table 2). Overall, the U.S. had a trade deficit of $1,311 billion, or 5% of its gross domestic product (GDP), in 2022. America has managed to continue buying more from the world than what it sells because of the dollar's position as the dominant international currency. That is primarily thanks to China, which continues to back dollar-denominated assets, storing significant portions of its large export surpluses in U.S. treasury bonds. Such a mutually beneficial relationship between the two largest economic powers has been the key driver of the globalisation of trade and finance since the 2000s.

However, globalisation creates inequalities not only in the developing but also in the developed world. In the U.S., sectors such as steel and automobiles have been among the most hit by import competition.

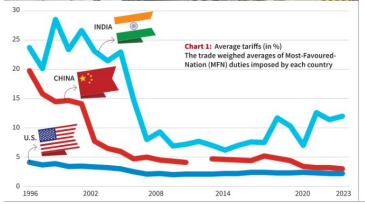


Chart 1: Average tariffs (in %)
The trade weighed averages of Most-Favoured-Nation (MFN) duties imposed by each country

Table 1: U.S. tariffs on selected countries and their export-GDP ratios

	U.S. tariffs (%), as of April 9, 2025	Exports as % of GDP
India	**27***	**21.8**
China	145	19.7
Canada	25	33.4
Mexico	25	36.0
Vietnam	46*	87.2
South Korea	26*	44.0

*Yet to take effect due to the 90-day pause

Table 2: U.S.'s trade with major trading partners in 2022 (in $ billion)

Partner Name	Export	Import	Trade Balance
All countries	2,062	3,373	-1,311
China	154	576	-422
Mexico	324	459	-135
Canada	355	447	-92
Japan	80	154	-74
Germany	73	150	-78
Vietnam	11	136	-124
South Korea	71	121	-49
India	**47**	**91**	**-44**
United Kingdom	77	65	13
Thailand	16	63	-47

Sources: World Integrated Trade Solution (WITS), The World Bank, World Trade Organization STATS, WTO, World Development Indicators, The New York Times.

Trade disruptions ahead: Gantry cranes stand as containers stack below at Brani Terminal, operated by the PSA (Port of Singapore Authority) International Pte, Singapore on April 12. GETTY IMAGES

The resentment of the workers in these sectors – many of whom are white, middle-aged men – has been one of the factors that helped propel Mr. Trump to the U.S. presidency in 2016 and again in 2024. President Trump has promised to revive U.S. manufacturing, protecting it from competitors who, in earlier years, were allowed to "rip off" America with their imports.

Without a doubt, President Trump is playing with fire. With the higher tariffs, prices of most goods, especially consumer goods, will move upward, inflicting pain on ordinary Americans. It is doubtful if American firms can lift their production capabilities to serve at least a part of the demand created for them by making imports costlier.

China's gamble

China has vowed to "fight till the end" in what may turn out to be a prolonged and bitter trade war. Such bravado is backed by the fact that China has been quietly preparing for such a showdown for over a decade, gradually reducing its dependence on the U.S. economy. The proportion of exports to GDP has declined steeply in China, from 35% in 2012 to 19.7% in 2023. As a proportion of its total exports, China's exports to the U.S. have fallen, too, from 21% in 2006 to 16.2% in 2022. China has invested hugely in science, technology, and innovation, particularly in artificial intelligence and electric cars. This has been done partly in response to the U.S.'s restrictions on technology transfer to China. China bypassed U.S. tariffs earlier by shifting production to its East Asian neighbours (especially Vietnam), with which it built deep economic networks.

India's options

President Trump calls India a 'tariff king', referring to the marked increase in India's tariffs since 2018 (Chart 1). The biggest chunk of India's exports is sold to the U.S. ($91 billion in 2022), and they are critical for meeting the country's large import bill. Therefore, any reduction in India's export earnings following tariff escalation will be keenly felt. At the same time, as exports form a relatively small share (21.8%) of its GDP, the impact of the tariff increases may be less in India than in many other countries (Table 1). Also, there has been no increase in tariffs on pharmaceuticals and services, two of India's major export items to the U.S.

The narrowness of its manufacturing capabilities is the biggest hurdle for India. Tariff protection and the Production Linked Incentive Scheme have not been sufficient to revive this sector. India needs a clear-cut industrial policy and a resurgence in investments to escape the unfolding global turmoil.

Jayan Jose Thomas is a Professor of Economics at the Indian Institute of Technology (IIT) Delhi.

THE GIST

- With its high per capita income and low tariffs, the U.S. has been the largest export market for goods from cars to computers, aiding the creation of manufacturing jobs in several countries.
- From now on, imports from about 60 countries will have a significantly higher level tariff — which is being described as "reciprocal" tariffs. These include tariffs of 20% on the European Union (EU), 27% on India, and 46% on Vietnam.
- President Trump calls India a 'tariff king', referring to the marked increase in India's tariffs since 2018.

The U.S. and Global Trade: A Shift in Paradigm

Introduction to U.S. Free Trade

- The United States has historically been a champion of free trade, shaping the global economy since the mid-20th century.
- Recent developments have challenged this narrative, altering the U.S.'s role in globalization.

Historical Context of U.S. Trade Policies

- The U.S. maintained low tariffs (2-3%) for decades, facilitating trade and establishing dominance in the global market.
- A significant shift occurred on April 2, when President Trump announced a new era of tariffs, diverging from traditional free trade policies.

The Trump Administration's Tariff Strategy

The Announcement of “Liberation Day”

President Trump declared a minimum 10% tariff on all imports, marking a bold policy shift and challenging the global trading system.

Overview of New Tariffs

New tariffs targeted imports from 60 countries, with varying rates:

- European Union: 20%
- India: 27%
- Vietnam: 46%
- China: 145%

Impact on Global Markets

Market Reactions to Tariff Increases

The announcement led to market chaos, with stock prices plummeting due to uncertainty and fears of a trade war.

The Ripple Effect on Global Trade

China retaliated with 125% tariffs on U.S. imports, escalating tensions and raising concerns about a potential global recession.

The U.S.-China Trade War

Tariffs Imposed on China

The tariffs affected a wide range of goods, increasing consumer prices significantly (e.g., a $100 product could cost $146).

China's Response and Retaliation

China vowed to "fight till the end," preparing for a prolonged trade war by reducing U.S. dependence and investing in technology.

The Effects on U.S. Economy

Domestic Industries and Consumer Prices

Tariffs aim to protect domestic industries but often result in higher consumer prices. The ability of American manufacturers to meet demand remains uncertain.

The Trade Deficit Dilemma

Despite tariffs, the U.S. continues to run a trade deficit, raising questions about the long-term sustainability of this strategy.

Globalization and Its Discontents

Inequalities in Developed and Developing Nations

Globalization has led to inequalities, affecting industries like steel and automobiles in the U.S., resulting in job losses and economic discontent.

The Future of U.S. Trade Policy

India’s Position in the Trade Landscape

India faces challenges and opportunities as it navigates the new trade environment, with a significant portion of exports going to the U.S.

Challenges and Opportunities for India

India's narrow manufacturing base is a hurdle, but with strategic policies and investments, it could strengthen its position globally.

Conclusion

The U.S. is on a tumultuous journey, shifting from a free trade champion to a protector of domestic industries. The global economic landscape is being reshaped, with far-reaching implications.

Splash of joy

Beating the heat: People take part in the first day of the annual water festival, also known as 'Thingyan', in Naypyitaw, Myanmar, on Sunday. The holiday is an occasion for merrymaking during what is usually the hottest time of the year. AP

Thingyan

- Thingyan, also known as the Myanmar New Year, is a festival that usually occurs in middle of April.
- Celebrated over a period of four to five days, Thingyan culminates in the New Year.
- The dates of Thingyan are calculated according to the Myanmar calendar

How will genetic mapping of Indians help?

In the global genomics landscape, how well is the ethnolinguistic and sociocultural diversity of India captured? Which are the groups that have been included? Who have been left out? Which language groups did the study cover? How will it help the government devise health policy?

R. Prasad

The story so far:

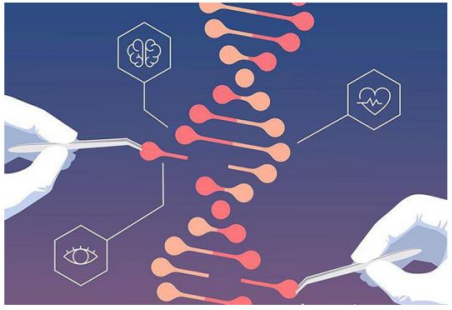
The preliminary findings of the GenomeIndia project, which attempted to study whole genomes of 10,000 healthy and unrelated Indians from 83 population groups, were published in the journal *Nature Genetics* on April 8. After excluding two populations, the published findings are based on the genetic information of 9,772 individuals – 4,696 male participants and 5,076 female participants.

Understanding Indian genetic variations can ensure tailor-made policy and healthcare

When was it launched?

The 10,000-human genome study was launched in January 2020 with funding from the Department of Biotechnology. Blood samples and associated phenotype data such as weight, height, hip circumference, waist circumference and blood pressure were collected from 20,000 individuals representing 83 population groups – 30 tribal and 53 non-tribal populations – spread across India. Of the 20,000 individuals, DNA samples from 10,074 individuals were subjected to whole genome sequencing, but later two populations were excluded.

The GenomeIndia project is a collaborative effort of 20 institutions. The genome sequencing was carried out by the Centre for Brain Research at IISc Bengaluru, the Centre for Cellular and Molecular Biology in Hyderabad, Institute of Genomics & Integrative Biology in Delhi, National Institute of Biomedical Genomics in Kolkata, and Gujarat Biotechnology Research Centre in Gandhinagar.



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How were diverse samples collected?

A median of 159 samples from each non-tribal group and 75 samples from each tribal group chosen were collected from 83 population groups that inhabit over 100 distinct geographical locations to estimate the relatively rare mutations that are important to understand complex diseases. The samples were taken from unrelated individuals to ensure accurate estimation of mutation frequencies across groups. Three to six parent-child pairs were included in each population group to uncover de novo mutations (mutations that occur randomly in a child but not seen in parents).

Genomes of five tribes across India – Tibeto-Burman tribe, Indo-European tribe, Dravidian tribe, Austro-Asiatic tribe, and a continentally admixed outgroup – were sequenced. Genomes of three non-tribes – Tibeto-Burman non-tribe, Indo-European non-tribe, and Dravidian non-tribe – were also sequenced. Since language is an established proxy for genetic diversity in the Indian population, sampling was done to appropriately represent the four large major language families as well – Indo-European, Dravidian, Austro-Asiatic and Tibeto-Burman. However, the four ancient populations living in the Andamans, dating back 65,000 years ago, and two relatively modern populations from about 5,500 years ago, were not included.

What do the preliminary findings reveal?

In total, 180 million mutations have been found from the individuals sequenced; while 130 million variations are in the non-sex chromosomes (22 pairs of autosomes), 50 million mutations are in the sex chromosomes X and Y. It should not be surprising that 180 million mutations were found. The reason: the human genome has three billion base pairs of DNA and the genome of 9,772 individuals were sequenced. Most importantly, the 9,772 individuals belong to 83 distinctly different endogamous groups. Of that, the non-coding regions in the genome, which have DNA sequences that do not directly code for proteins, comprise 98%. A large number of the 180 million variants found in the sequenced genomes of 9,772 individuals are very likely to be present in the non-coding regions.

Polymorphisms or variations in the non-coding regions of the human genome, particularly the mutations that are evolutionarily conserved, will help in tracing evolutionary history. Tracing evolutionary history becomes important as many of the "contemporary Indian populations have originated from a few founding groups and have maintained distinct identities through centuries of endogamy."

What is the significance of the mutations in endogamous groups?

Endogamy is highly prevalent in all the 83 population groups under study, though the degree varies. As a result of the centuries-long practice of endogamy, population-specific unique variations, including distinct disease-causing mutations with amplified frequencies, are likely to be seen within specific groups. While the global genomic landscape is predominantly Eurocentric, and other genome projects have documented genetic diversity, India, with its prolific and distinct endogamous populations, has been severely underrepresented in these studies. The study is therefore important for having captured the genetic diversity of "one of the highly underrepresented populations in the global genomics landscape". Genetic mutations found associated with endogamous population-specific diseases will help the government to come up with targeted public health policies.

What are the medical implications?

The 130 million variations identified are expected to spur studies that aim to determine the possible roles of population-specific genetic mutations in various diseases. Understanding genetic variations can pave the way for precision medicine, ensuring treatments and interventions tailor-made for Indian genetic profiles. The data on variants associated with diseases will enable the development of affordable, genomics-based diagnostic tools, facilitating early detection, and prevention and management of diseases in India.

The GenomeIndia Project: Unraveling the Genetic Diversity of India

Introduction to the GenomeIndia Project

- The GenomeIndia project is a pioneering initiative aimed at exploring the genetic diversity of the Indian population.
- Launched to study the whole genomes of 10,000 healthy and unrelated Indians.
- Recent preliminary findings were published in *Nature Genetics* on April 8.
- A significant step towards understanding the genetic makeup of a nation known for its rich diversity.

Launch and Funding of the Project

- Officially launched in January 2020 with funding from the Department of Biotechnology.
- Aimed to collect blood samples and phenotype data from 20,000 individuals across 83 population groups.
- Included both tribal and non-tribal populations to showcase India's vast genetic tapestry.

Timeline of Events

- Collaborative effort involving 20 institutions.
- Genome sequencing carried out by centers like the Centre for Brain Research at IISc Bengaluru and the Centre for Cellular and Molecular Biology in Hyderabad.

Key Findings from the Preliminary Study

Overview of Genetic Mutations

- Identified 180 million mutations among sequenced individuals.
- 130 million variations in non-sex chromosomes; 50 million in sex chromosomes X and Y.
- Highlights immense genetic diversity in the Indian population.

Non-Coding Regions and Their Importance

- 98% of mutations found in non-coding regions.
- Crucial for understanding evolutionary history and tracing lineage.

Medical Implications of Genetic Variations

Precision Medicine and Its Future in India

- 130 million variations pave the way for research into population-specific genetic mutations.
- Can lead to the development of precision medicine tailored to Indian genetic profiles.

Conclusion

- The GenomeIndia project is a monumental step in understanding India's genetic diversity.
- Contributes to the global genomic landscape and lays groundwork for improved public health strategies and precision medicine in India.

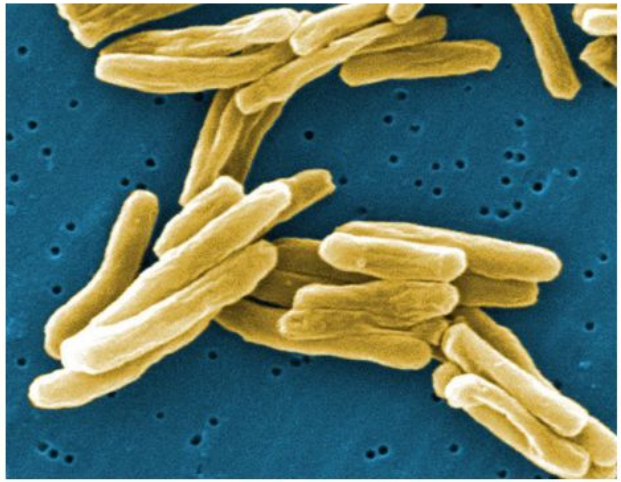
Quicker, inexpensive indigenous TB test developed

R. Prasad

Researchers at the Thiruvananthapuram-based Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) have developed and tested a novel, cost-effective, real-time LAMP (rt-LAMP) assay for early diagnosis of TB. Much like GeneXpert and Truenat, the rt-LAMP assay too is a molecular test with high sensitivity and specificity. The rt-LAMP assay was able to detect TB DNA even when only 10 copy numbers were present per microlitre in a sample.

The main handicap that prevented the use of LAMP for TB diagnosis so far was the inability of using any dye, as dyes generally inhibit reaction leading to false negatives. Researchers at SCTIMST have overcome this challenge by turning to a fluorescent dye Syto 16, which is routinely used in labs for studying cells and other biological samples. And unlike RT-PCRs that require three different temperature settings to complete a test, the rt-LAMP test works at a single temperature. Since a fluorescent dye is used, the amplification can be measured not at the end of the run but every minute.

"With six primers used for amplification compared with two in the case RT-PCRs, the rate of amplification is high, and hence results of positive samples can be obtained in 10-20 minutes," says Dr. Anoopkumar Thekkuveettil from SCTIMST and the corresponding author of a paper published in *Scientific Reports*. "Since all six primers need to bind to the DNA for amplification to begin, the rt-LAMP assay has very high specificity." Since no probe is used unlike in the case of RT-PCR tests, and as the dye and primers are inexpensive, the rt-LAMP test becomes highly affordable.



The rt-LAMP assay is a molecular test with high sensitivity and specificity. CDC/ RAY BUTLER, MS

The assay was tested on 350 presumptive pulmonary TB sputum samples. The rt-LAMP kit was evaluated against a microbiological reference standard (MRS), GeneXpert, and smear test. The study was conducted from October 2019 to March 2020 and from January 2023 to March 2024. The rt-LAMP assay demonstrated slightly higher sensitivity and specificity than the GeneXpert assay. Compared with MRS, rt-LAMP showed 89.36% sensitivity and 94.06% specificity.

"The rt-LAMP assay kit has been developed as an open platform system which allows existing RT-PCR machines to be repurposed for TB diagnosis. This can be done by programming an existing RT-PCR machine to run at one temperature setting instead of three," Dr. Anoopkumar says. "It is possible to process up to 96 or 384 tests in a single run. Thus the assay facilitates high throughput testing, allowing for a large number of patient samples to be processed in a single run."

"The technology has been licensed to industry, has received approval from CDSCO, and is currently being validated by ICMR. The WHO Health Technology Access Pool program is currently evaluating the technology and is waiting for ICMR validation," he says.

With nearly 79% of presumptive TB cases in India diagnosed using sputum smear microscopy and only 21% tested using molecular assay as recently as 2023, India continues to over-rely on smear microscopy for TB diagnosis.

Despite an increase in molecular testing facilities from 5,090 in 2022 to 6,496 in 2023, it is nowhere close to meeting the National Strategic Plan 2017-2025 of reducing the reliance on smear microscopy.

LAMP (rt-LAMP) assay

- **Researchers at the Thiruvananthapuram-based Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) have developed and tested a novel, cost-effective, real-time LAMP (rt-LAMP) assay for early diagnosis of TB.**
- **Much like GeneXpert and Truenat, the rt-LAMP assay too is a molecular test with high sensitivity and specificity. The rt-LAMP assay was able to detect TB DNA even when only 10 copy numbers were present per microlitre in a sample.**

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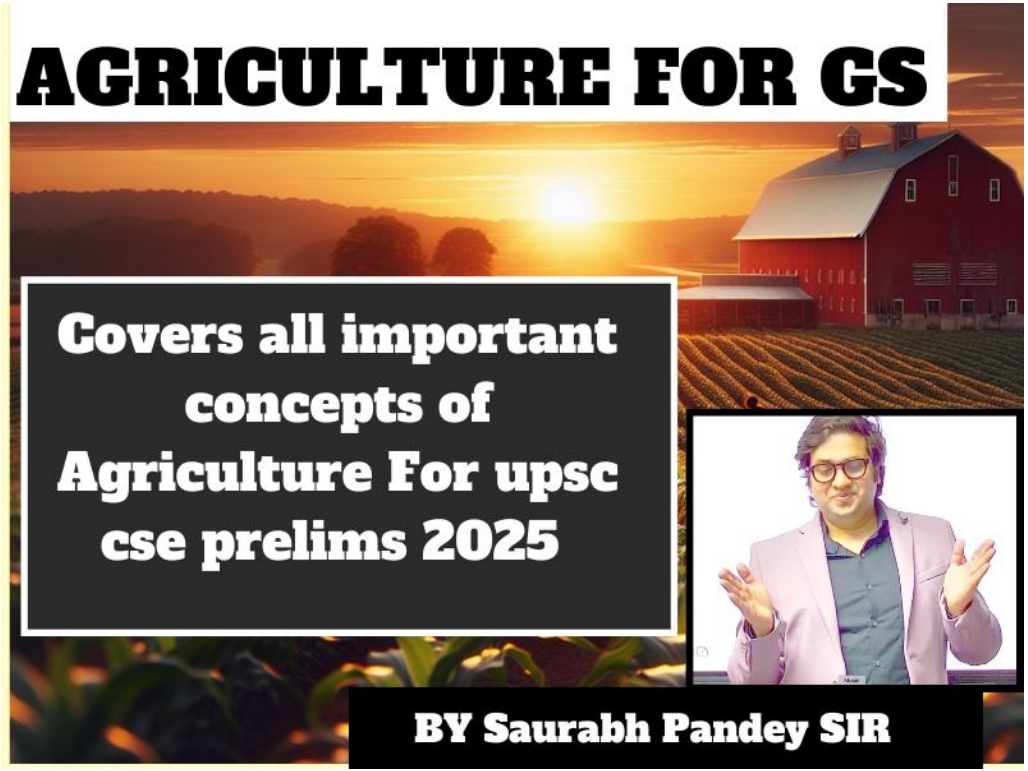
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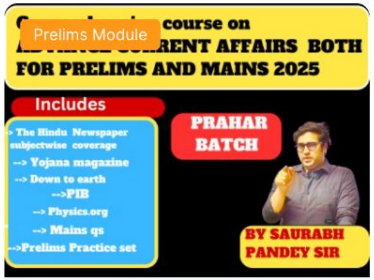

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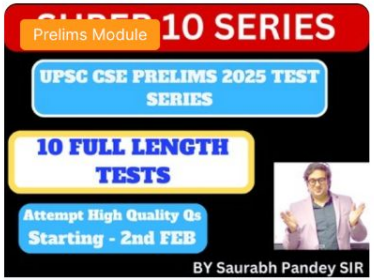

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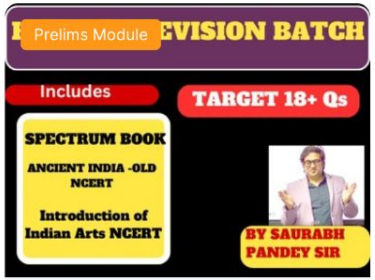

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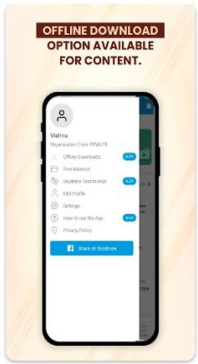

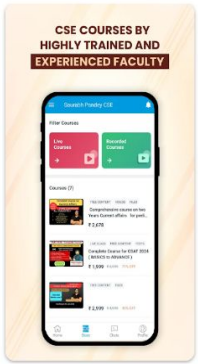

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