1. Research Administration & Funding in India - Economy

Delays in the Department of Biotechnology's (DBT) Biocare Programme, leaving 75 women scientists without sanction letters or salaries, highlight flaws in India's research administration.

BioCARe Programme (Biotechnology Career Advancement and Re-orientation for Women Scientists)

Overview - The BioCARe Programme is an initiative by India's Department of Biotechnology (DBT) under the Ministry of Science and Technology, aimed at supporting unemployed or career-interrupted women scientists in biotechnology and allied fields.

Launch Year - The programme has been operational since 2011.

Objective - To empower women scientists by providing them opportunities to pursue independent research and career advancement in biotechnology, especially those in early-career stages or returning from a professional break.

Target Group - Women scientists below 40 years of age. Women who have experienced career breaks due to family or caregiving responsibilities.

Grant Support - Funding ranges from ₹40–60 lakh for 3–5 years. Covers salary, contingency, manpower, and equipment grants to facilitate independent research.

Research Scope - Projects must be in biotechnology and allied disciplines aligned with national priorities.

Institutional Support - Grants are hosted in universities, national laboratories, and R&D institutions.

Significance -

1. Addresses the "leaky pipeline" problem in STEM.
2. Encourages women in leadership roles in scientific research.
3. Enhances India's biotechnology research capacity through inclusive participation.

State of Research and Innovation in India

Gross Expenditure on R&D (GERD) - India spends 0.64% of GDP on R&D (2020–21), significantly below the global average of 1.79%, and far behind countries like USA (2.8%), South Korea (4.2%), and Israel (5.56%).

Private Sector Contribution - Only 37% of GERD comes from private industry in India, compared to 68–75% in countries like USA and China, reflecting heavy reliance on government labs.

Applied vs Basic Research - Only 13% of R&D funding goes to applied research, limiting innovation and commercialisation, while a large share supports basic and strategic research, particularly in defence and space.

Human Capital - India has 15 researchers per lakh population, compared to 111 in China and 825 in Israel. Women constitute just 14% of R&D workforce, below the global average (~30%).

Research Output - India contributes 4.8% of global scientific publications, roughly a quarter of the output from China and USA.

Global Innovation Index - Ranked 39th in 2024, indicating moderate progress but considerable scope for improvement.

Status of Women in Indian Research

Workforce Participation - Women make up only 14–18% of R&D workforce in India.

High Dropout Rates - Despite forming 43% of science graduates, a small fraction continue in active research.

Positive Trends - Share of women researchers increased from 13.9% (2000–01) to 18.7% (2016–17). Participation in extramural projects increased from 13% to 25% (2019–20).

Underrepresentation - Women constitute 16.7% of STEM faculty, 10% at top research institutes, and lead 25% of R&D projects.

Challenges -

1. **Leaky Pipeline -** Dropouts post-graduation due to family/care responsibilities.

2. **Career Interruptions -** Limited re-entry opportunities after breaks.
3. **Leadership and Funding Gaps -** Fewer women as Principal Investigators, slower access to grants/fellowships.

Structural and Cultural Barriers - Gender bias, male-dominated STEM culture, weak mentorship.
Importance of Inclusion - Gender-diverse teams produce higher-quality, innovative science. Ensures equitable growth and socially relevant research. Enhances global reputation of Indian institutions. Women leaders act as role models for younger generations in STEM.

Other Schemes Supporting Women in Science

1. **WISE–KIRAN (DST) -** Fellowships, training, and grants across career stages.
2. **WOS-A -** Career re-entry support for women after breaks.
3. **BioCARe (DBT) -** Grants ₹40–60 lakh to women scientists in biotech.
4. **SERB–POWER -** Mitigates funding disparities in science and engineering.
5. **CURIE Programme -** Strengthens R&D infrastructure in women-only universities.
6. **Additional Initiatives -** Vigyan Jyoti, Indo-US Women in STEMM, DST scholarships, ACM-W Grad Cohort, IIT Kanpur mentoring programs.

Importance of Timely Funding - Scientific research is time-sensitive, with experiments relying on seasonal cycles, biological processes, and collaborator availability. Delays weaken credibility, risk talent loss, and affect international collaborations. Early funding ensures equity for women and underrepresented researchers and aligns with national priorities like healthcare, agriculture, energy, biotech, climate, and AI.

Challenges in India's R&D Ecosystem

Low Investment - Only 0.64% of GDP.
Government-Centric R&D - Heavy reliance on public sector funding.
Weak Academia–Industry Linkages - Limited collaboration reduces innovation.
Brain Drain - Over 85,000 Indian-origin researchers work abroad.
Fragmented Ecosystem - Research spread across CSIR, DRDO, ISRO, universities.
Infrastructural Limitations - Lack of modern labs, high-performance computing, mentorship.
Unbalanced Priorities - Defence and space dominate funding; emerging technologies underfunded.
Technology Transfer Hurdles - Bureaucratic delays impede commercialization.
Administrative Inefficiency - Complicated grant procedures, Treasury Single Account delays.
Policy Concerns - Preference for belief-based themes over evidence-based research undermines credibility.

Positive Policy Reforms & Budgetary Announcements

ANRF (2023) - Allocates ₹2,800 crore annually for early-stage research in private institutions.
Union Budget 2025–26 - ₹20,000 crore for private sector-driven frontier R&D (AI, space, advanced manufacturing).
Sunrise Technologies Fund - ₹1 Lakh crore corpus, 50-year interest-free loan to boost private R&D.
ISRO Private Contracts - Encourages private sector participation in space research.
MeitY AI Initiative - 18,693 GPUs for AI research at nominal rates.
Other Schemes - Vigyan Dhara, Rashtriya Vigyan Puraskar, VAIBHAV Fellowship, SERB, AIM, BIRAC, NMQTA.

Global Best Practices

DARPA (USA) - Flexible, project-driven model producing transformative technologies.
Horizon Europe (EU) - €95 billion programme promoting interdisciplinary and equity-focused research.
South Korea & Israel - Tax incentives and strong venture capital ecosystems.
Japan - University autonomy in research fund utilisation.
Stanford–Silicon Valley Model - Strong academia–industry synergy yet to be replicated in India.

Public Funding for Private Research

Rationale - Bridges the gap with global leaders, encourages patenting, commercialization, and aligns research with market needs.

Benefits - Faster results, economic growth, better training, risk diversification, and societal knowledge spillovers.

Way Forward

Raise GERD to 1% of GDP by 2030 and 2% in the long term. Strengthen ANRF with efficient program management. Increase applied research spending for commercialization. Promote industry–academia collaboration via CoEs, innovation corridors, and research clusters. Introduce legal and financial reforms for PPP in R&D. Incentivize talent retention, early-career researchers, and improve research infrastructure. Enhance diversity and inclusion for women, rural, and marginalized researchers. Expand incubators and startups in AI, biotech, green technologies, and quantum computing.

Conclusion

India's R&D ecosystem must reflect justice, equality, and fraternity. Promoting inclusive, innovative, and evidence-based research is key to achieving technological self-reliance while supporting equitable national development.

Source - https - //www.thehindu.com/sci-tech/science/women-biotech-scientists-await-funds-for-research/article69989176.ece