

4. Seed Sovereignty and Farmers' Rights – Polity

The use of Digital Sequence Information (DSI) is a major point of contention at the 11th session of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in Lima (Peru)

Digital Sequence Information (DSI)

Digital Sequence Information (DSI) refers to genetic sequence data derived from DNA, RNA, proteins, or metabolites, which is stored, shared, and analysed digitally.

Examples include –

1. DNA sequence data (e.g., A–T–G–C sequences)
2. RNA sequence data (e.g., viral genomes)
3. Amino acid sequences of proteins
4. Epigenetic and metabolomic data

DSI enables researchers to study an organism's genetic information without physically accessing biological samples—a major shift in 21st-century biology.

Why DSI matters – It forms the backbone of modern genomics, synthetic biology, precision medicine, and biodiversity research. It makes biological research faster, cheaper, and more accessible globally.

Applications of DSI

A. Genome Mapping & Scientific Research – Enables decoding of entire genomes (plants, animals, microbes), facilitating –

1. Species identification
2. Evolutionary studies
3. Conservation biology

Researchers can access genetic data through public databases like GenBank, ENA, and DDBJ.

B. Drug Discovery & Public Health – Accelerates development of vaccines, diagnostics, and therapeutics. Played a critical role in COVID-19 – Rapid sequencing of the SARS-CoV-2 genome enabled global tracking of variants. Allowed quick development of mRNA vaccines and RT-PCR tests.

C. Agriculture & Crop Innovation – DSI is used to identify genes for –

1. Drought tolerance
2. Pest resistance
3. Higher yields
4. Climate resilience

It supports genome editing technologies (CRISPR), enabling better crop breeding strategies.

D. Biodiversity Monitoring – Helps track endangered species and detect illegal wildlife trade through –

1. Environmental DNA (eDNA)
2. Metagenomics

Enables monitoring of invasive species and supporting conservation policies.

Issues & Concerns Surrounding DSI – Deep Dive

A. Bypassing Benefit-Sharing Obligations – Many countries fear corporations use DSI to avoid compensating biodiversity-rich nations. Example – A company can download a plant's genetic sequence online, develop a commercial product, and avoid sharing benefits because no physical sample was accessed. This undermines benefit-sharing principles of –

1. Convention on Biological Diversity (CBD)
2. Nagoya Protocol on Access and Benefit Sharing (ABS)
3. International Treaty on Plant Genetic Resources for Food & Agriculture (ITPGRFA)

B. Undermining Farmers' and Indigenous Peoples' Rights – Corporations may claim intellectual property (patents) over genetic traits derived from DSI. This could –

1. Undercut farmers' traditional seed rights
2. Misappropriate indigenous knowledge
3. Commercialise genetic resources without consent

UN experts warn this is a new form of “digital biopiracy.”

C. Legal and Governance Gaps – CBD and Nagoya Protocol were designed for physical genetic resources, not digital data. Digital data crosses border instantly and is hard to control. Current treaties struggle to enforce ABS rules on DSI use. Result – A global governance vacuum.

D. Inequitable Access to Genomic Databases – A few countries/corporations—primarily in the Global North—control most sequencing facilities and databases. This creates –

1. Data asymmetry
2. Dependence of developing nations
3. Unequal bargaining power in global biotechnology

E. Limited Benefit-Sharing under ITPGRFA – The Treaty's Multilateral System (MLS) has enabled exchange of millions of seed varieties. However –

1. Monetary benefit-sharing has been minimal
2. Farmers, who are custodians of genetic diversity, have received negligible compensation

DSI risks deepening this inequity.

Why DSI is Contentious for Biodiversity-Rich Nations (like India)

Countries like India possess tremendous agro-biodiversity and medicinal plant wealth, but lack equal genomic infrastructure. If DSI remains unregulated –

1. Biological resources may be digitally exploited without consent
2. Value addition may occur abroad
3. Developing countries remain downstream consumers rather than innovators

Threatens India's farmers' rights under laws like the Protection of Plant Varieties and Farmers' Rights Act (PPVFR Act, 2001).

Way Ahead – Policy & Governance Solutions

A. Developing an International Multilateral Mechanism – A global agreement under the CBD is urgently needed to regulate DSI. Should ensure –

1. Fair & equitable benefit-sharing
2. Access to data for scientific progress
3. Respect for national sovereignty

COP15 discussions have signalled movement in this direction.

B. Balancing Open Access with Equity – Open data accelerates scientific innovation, but unrestricted access leads to exploitation. Need balanced frameworks that –

1. Maintain fair use
2. Protect biodiversity-rich countries
3. Encourage transparent data-sharing with clear rules

C. Strengthening Genomic Infrastructure in Developing Countries – Nations like India need –

1. National genomic repositories
2. Indigenous sequencing technologies
3. Bioinformatics research capacity
4. Digital sovereignty frameworks

5. Helps reduce reliance on foreign platforms.

D. Protecting Farmers' & Indigenous Rights – National ABS laws must explicitly include DSI. Digital use of genetic data should trigger –

1. Benefit-sharing
2. Recognition of custodians
3. Community participation

Prevents corporate appropriation of traditional knowledge.

E. India's National Policy Requirements – India should establish –

1. A national DSI governance framework
2. Guidelines linking digital genetic use with farmers' rights
3. Mechanisms to track DSI flows and commercial use

Ensures conservation and sustainable use of biological resources.

Conclusion

Digital Sequence Information is transforming modern science, enabling breakthroughs in medicine, agriculture, and biodiversity conservation. However, it also raises profound questions of equity, access, digital sovereignty, and benefit-sharing. For biodiversity-rich nations like India, the challenge lies in ensuring that DSI-driven innovation does not become another avenue for biopiracy or corporate monopolisation. Strengthening international treaties, building local genomic capacity, and protecting farmers and indigenous communities are crucial to ensuring that DSI contributes to global sustainable development, fairness, and conservation.

Source – <https://www.downtoearth.org.in/food/digital-genetics-threatens-seed-sovereignty-and-farmers-rights-un-rapporteur-cautions>

