

Module 2

Country data profile – India

Guide

India – Agriculture data country profile



This document is a learning resource for the Bill & Melinda Gates Foundation program officers that provides background information on the data policy and wider context for agriculture projects in India, with some additional resources related to Bihar.

This research was produced by Aapti Institute, the Open Data Institute (ODI) and CABI in May 2020.

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Key information

- India's agricultural data comes under the management of various organisations with overlapping jurisdictions. As a result, there is no single portal for the aggregate of agricultural data, as seen in the case of the UN Food and Agricultural Organisation (FAOSTAT) website¹.
- Private entities like Biharstat², Indiatat³ (as part of Datanet India) provide a single-source repository of data with datasets accessible on a paid-only basis.
- Most of the agricultural data is either not available (like district level data) or it is released with delay. Very often, it is not in a standardised format consistent with other data sets.
 - The usage of data collection and database management practices at the lower levels of administration is often coupled with problems of low technological capability.
 - Some of the data sets are not updated, with the latest available data being at least 10 years old. Sometimes the datasets are only available at a national level and the comparable state level data is not available.
- Even if available, data sets are not openly accessible to the public and need specific permission to be obtained from the necessary authorities.
- The central government is pushing many data reforms but without considering the capacity at lower levels of government.
- Geospatial data is not available publicly and the capacity of the state governments in maintaining such data is limited.

¹"FAOSTAT – Food and Agriculture Organization." 11 Jan. 2021, <http://www.fao.org/faostat/en/>. Accessed 22 Jan. 2021.

²"Biharstat." <http://www.biharstat.com/>. Accessed 22 Jan. 2021.

³"Indiatat." <https://www.indiatat.com/>. Accessed 22 Jan. 2021.

Data and technology – capacity and infrastructure

This section provides an overview of the data and technology capacity of the country and infrastructure currently in place.

What is this country's access to technology and internet like?

- 60% of the Indian labor force is currently employed in the agricultural sector⁴, contributing to roughly around 20% of India's GDP⁵. The agricultural sector in India is very labour intensive, with low levels of mechanisation. The agricultural sector in India is also subject to a range of variations: even within states, there is enormous variation in agro-climatic conditions, extent of irrigation, penetration of roads, proximity to markets and the availability of credit from banks.
- The Government of India has adopted a goal of doubling farmers' income by 2022⁶. The NITI Aayog produced a paper in 2015 titled 'Raising Agricultural Productivity and Making Farming Remunerative for Farmers'⁷ outlining the steps to be taken to achieve the same.
- India's economic development has changed from an agricultural-led model to a service sector oriented model, while there is a lack of industrialisation of the manufacturing sector. The service sector contributes around 60% of India's GDP.⁸ Technological penetration is of moderate level with a significant proportion of population still unconnected to the digital economy.
- India is the second largest online market worldwide⁹, and is projected to grow in coming years. There is growing demand for smartphones, paired with rising subscriptions to mobile broadband and migration to the cloud. However there is still a divide between

⁴"Agriculture in India – statistics & facts | Statista." <https://www.statista.com/topics/4868/agricultural-sector-in-india/>. Accessed 11 Jan. 2021.

⁵"Agriculture in India – statistics & facts | Statista." <https://www.statista.com/topics/4868/agricultural-sector-in-india/>. Accessed 11 Jan. 2021.

⁶"doubling farmers income by 2022 – NITI Aayog." https://niti.gov.in/writereaddata/files/document_publication/DOUBLING%20FARMERS%20INCOME.pdf. Accessed 11 Jan. 2021.

⁷"Raising Agricultural Productivity and Making – NITI Aayog." <https://niti.gov.in/node/664>. Accessed 22 Jan. 2021.

⁸"Service Sector in India – Statistics and Overview | Invest India." 16 May. 2019, <https://www.investindia.gov.in/team-india-blogs/service-sector-india-paradigm-shift>. Accessed 11 Jan. 2021.

⁹"Internet usage in India – statistics & facts | Statista." 7 Jul. 2020, <https://www.statista.com/topics/2157/internet-usage-in-india/>. Accessed 11 Jan. 2021.

rural and urban populations where the former lacks widespread adoption.

- According to market research firm techARC, India had 502.2 million smartphone users as of December 2019¹⁰, which means over 77% of Indians are now accessing wireless broadband through smartphones. Samsung, with 34%, led the smartphone-installed base in the calendar year 2019, followed by Xiaomi at 20%, Vivo at 11% and OPPO at 9%¹¹.
- India's total mobile users, including active and inactive users, reached 1,176 million in 2018.¹² The overall teledensity in India is around 91.45%¹³, with huge variations among states. The country is taking steps to leverage its huge market by adapting to technological innovations such as e-governance, e-commerce, mobile banking and other financial services.
- The state governments of India are at times liable to shut down internet access in different parts of the country, citing security concerns amid civil unrest. The internet was shut down 106 times in India in 2019, according to the Internet Shutdown Tracker¹⁴. Of those the longest has been in Kashmir, lasting for more than 200 days¹⁵, owing to a change in the constitutional amendment and the protests that followed. Under Indian laws, the government can direct telecom companies to shut down services or take down sites.
- The state owned telecom company Bharat Sanchar Nigam Limited (BSNL)¹⁶ is the pioneer in the telecom market of India. Indian telecommunication policies were modified to introduce more private telecom players in the market. Several private companies as Bharti Airtel, Reliance Communications, Tata Indicom, Aircel, Vodafone, Idea Cellular joined the Indian market. Reliance Jio launched in

¹⁰ "techINSIGHT – At 502.2 million Smartphone users, its time for" 30 Jan. 2020, <https://techarc.net/techinsight-at-502-2-million-smartphone-users-its-time-for-smartphone-brands-to-turn-towards-services-in-2020/>. Accessed 11 Jan. 2021.

¹¹ "Over 50 crore Indians now use smartphones, 77% on Internet" 30 Jan. 2020, <https://www.thehindu.com/sci-tech/technology/gadgets/over-50-crore-indians-now-use-smartphones-77-on-internet/article30691614.ece>. Accessed 22 Jan. 2021.

¹² "India's active mobile users reached 1,026.37 mn: TRAI" 21 Feb. 2019, <https://www.telecomlead.com/telecom-statistics/indias-active-mobile-users-reached-1026-37-mn-trai-89104>. Accessed 11 Jan. 2021.

¹³ "Information Note to the Press (Press Release NO.2S"/2019" http://www.trai.gov.in/sites/default/files/PR_No.25of2019.pdf. Accessed 22 Jan. 2021.

¹⁴ "Internet Shutdown Tracker." <https://internetshutdowns.in/>. Accessed 11 Jan. 2021.

¹⁵ "Internet Shutdown Tracker." <https://internetshutdowns.in/>. Accessed 11 Jan. 2021.

¹⁶ "BSNL Payment Portal." <https://portal.bsnl.in/>. Accessed 22 Jan. 2021.

2016, it has become the biggest telecom operator in India in terms of subscribers, as well as revenue market share in 2020.¹⁷

- The Telecom Regulatory Authority of India (TRAI) is a statutory body set up by the Government of India. It is the regulator of the telecommunications sector in India with the support of the Ministry of Communications, Department of Telecommunications. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

Is there existing capacity related to data management in this country?

- As part of India's push towards leveraging the technological revolution, the Digital India Scheme¹⁸ under the Ministry of Electronics & Information Technology (Meity) has been involved in projects and initiatives for bringing tech solutions and also empowering citizens by digital literacy programmes.
- Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA) is a scheme to make six core persons in rural areas, across States/ Union Territories (UT), digitally literate. It aims to bridge the digital divide, specifically targeting the rural population including the marginalised sections of society including Scheduled Castes (SC)/Scheduled Tribes (ST), Minorities, Below Poverty Line (BPL), women and differently-abled persons.
- The National Knowledge Network (NKN) project¹⁹ is aimed at establishing a strong and robust Indian network capable of providing secure and reliable connectivity, connecting universities, research institutions, libraries, laboratories, healthcare and agricultural institutions across the country.

¹⁷ "India – wireless subscriber market share by provider 2019" 8 Dec. 2020, <https://www.statista.com/statistics/258797/market-share-of-the-mobile-telecom-industry-in-india-by-company/>. Accessed 11 Jan. 2021.

¹⁸ "Digitalindia | Digital India Programme | Ministry of Electronics" <https://www.digitalindia.gov.in/>. Accessed 22 Jan. 2021.

¹⁹ "Home | National Knowledge Network, Govt. of India." <http://nkn.gov.in/>. Accessed 22 Jan. 2021.

- In order to transform India into a ‘Knowledge Economy²⁰’, a Knowledge Management System (KMS) for e-Governance has been envisioned under the Digital India Programme. KMS enables stakeholders to effectively utilize the vast information available from Government organizations. It facilitates access, collaboration and sharing of information and knowledge on e-Governance issues and projects under the Digital India Programme.
- A new Ministry for Skill Development & Entrepreneurship (MSDE) was formed in 2014²¹ to improve the skills of young people to align with the demands of the market. The PMKVY Skill Certification Scheme is the flagship scheme of MSDE. The objective is to enable a large number of Indian youth to take up industry-relevant skill training that will help them in securing a better livelihood. The National Skill Development Corporation has been involved in formulating policies for skill promotion and entrepreneurship as outlined in the National Policy on Skill Development and Entrepreneurship 2015²², of which technological skills are also included.
- The research ecosystem in India presents a significant opportunity for multinational corporations across the world due to its intellectual capital available in the country. India’s Engineering R&D (ER&D) Globalization and Services market reached US\$ 22.3 billion in 2016 and is set to rise to US\$ 38 billion by 2020²³. The Government of India aims to develop India into a global innovation hub by 2020²⁴ on the back of effective government measures taken to provide an enabling environment for growing research and development in India.

²⁰ “Knowledge economy – Wikipedia.” https://en.wikipedia.org/wiki/Knowledge_economy. Accessed 22 Jan. 2021.

²¹ “Ministry of Skill Development and Entrepreneurship – Wikipedia.” https://en.wikipedia.org/wiki/Ministry_of_Skill_Development_and_Entrepreneurship. Accessed 22 Jan. 2021.

²² “National Policy on Skill Development and Entrepreneurship” <http://msde.gov.in/reports-documents/policies/national-policy-skill-development-and-entrepreneurship-2015>. Accessed 22 Jan. 2021.

²³ “Research and Development in India, Research & Development.” 14 Aug. 2017, <https://www.ibef.org/industry/research-development-india.aspx>. Accessed 11 Jan. 2021.

²⁴ “Government aims to make India a global biotech hub by 2020” 21 Mar. 2017, https://www.business-standard.com/article/news-ani/government-aims-to-make-india-a-global-biotech-hub-by-2020-117032100224_1.html. Accessed 22 Jan. 2021.

- India has a number of research institutes involved in a number of industries and disciplines. The majority are state-supported with far fewer private research institutions. The linkages between academia and industry are also missing, impeding the developmental process of India. India often allocates less than 1% of GDP to its R&D initiatives, which is less than the share allocated to the research initiatives among many developed and developing economies of the world.

²⁵ "Languages of India – Wikipedia."
https://en.wikipedia.org/wiki/Languages_of_India.
Accessed 11 Jan. 2021.

²⁶ "Languages of India – Wikipedia."
https://en.wikipedia.org/wiki/Languages_of_India.
Accessed 22 Jan. 2021.

Wider political and technological trends

This section provides an overview of the wider political and technological landscape that may impact data collection and publication.

Has there been any recent political volatility? Could this volatility be linked to land and borders, and therefore potentially impact agriculture data collection and publication?

- India has territorial disputes with almost all of its neighbouring countries. The huge population contains a diverse range of languages, ethnicities and religions. There are around 22 major languages spoken in India²⁵, mostly organised along the administrative divisions of the Indian states, while around 150 minor languages are currently in use²⁶.
- The Indian National Congress (INC) is the long-standing national party, however there are other political parties arising at a national level. There are state-wide political parties which often dominate the state power in their respective regions resulting in frequent tug-of-wars between the Central and the State governments. As such the states bordering the international boundaries are prone to territorial skirmishes most notably, on the western

borders of Punjab, Rajasthan, Gujarat, and Jammu and Kashmir.

- The Kashmir conflict is a territorial conflict²⁷ primarily between India and Pakistan and has been contentious since 1947. In August 2019 the current dispensation of the Indian state put at end to Article 370 of the Indian Constitution²⁸, which gave special status to Jammu and Kashmir, and with it with the power to have a separate constitution, a state flag and autonomy over the internal administration of the state, which led to wide scale protests all over the country.
- The India-Pakistan Border, known locally as the International Border (IB), runs from the Line of Control (LoC)²⁹, which separates Indian-administered Kashmir³⁰ from Pakistan-administered Kashmir³¹, in the north, to the Rann of Kutch³² between the Indian state of Gujarat³³ and the Sindh³⁴ province of Pakistan, in the south. Low-intensity conflicts and border crossings are a frequent occurrence in the region affecting the lives of people on both sides of the border.
- The eight states comprising Northeast India³⁵ are ethnically different to that of the mainland population and people originating from there are often discriminated against in the rest of the country. The region is home to around 200 different tribes³⁶. There have been numerous insurgent conflicts in the region seeking regional autonomy and for the establishment of a ethnicity based state.

²⁷ "Kashmir conflict – Wikipedia." https://en.wikipedia.org/wiki/Kashmir_conflict. Accessed 25 Jan. 2021.

²⁸ "Article 370 of the Constitution of India – Wikipedia." https://en.wikipedia.org/wiki/Article_370_of_the_Constitution_of_India. Accessed 25 Jan. 2021.

²⁹ "Line of Control – Wikipedia." https://en.wikipedia.org/wiki/Line_of_Control. Accessed 25 Jan. 2021.

³⁰ "Kashmir – Wikipedia." <https://en.wikipedia.org/wiki/Kashmir>. Accessed 25 Jan. 2021.

³¹ "Azad Kashmir – Wikipedia." https://en.wikipedia.org/wiki/Azad_Kashmir. Accessed 25 Jan. 2021.

³² "Great Rann of Kutch – Wikipedia." https://en.wikipedia.org/wiki/Great_Rann_of_Kutch. Accessed 25 Jan. 2021.

³³ "Gujarat – Wikipedia." <https://en.wikipedia.org/wiki/Gujarat>. Accessed 25 Jan. 2021.

³⁴ "Sindh – Wikipedia." <https://en.wikipedia.org/wiki/Sindh>. Accessed 25 Jan. 2021.

³⁵ "The North Eastern region of India comprise of eight state" http://www.ncdirindia.org/All_Reports/Reports_Ne/NE2012_2014/Files/Chapter1.pdf. Accessed 25 Jan. 2021.

³⁶ "Tribes of North East India – Travel The Unknown." <https://www.traveltheunknown.com/subregion/north%20east%20india>. Accessed 25 Jan. 2021.

³⁷ "Citizenship (Amendment) Act, 2019 – Wikipedia." [https://en.wikipedia.org/wiki/Citizenship_\(Amendment\)_Act,_2019](https://en.wikipedia.org/wiki/Citizenship_(Amendment)_Act,_2019). Accessed 25 Jan. 2021.

Is there ongoing political tension? Could this tension be linked to land and borders, and therefore potentially impact agriculture data collection and publication?

- The Citizenship Amendment Act (Bill)³⁷ protests, also known as CAA Protest or CAB Protest, occurred after the bill was enacted by the Government of India³⁸ on 12 December 2019³⁹ in an attempt to address issues of illegal immigration. The move sparked widespread national and overseas protests against the act and its associated proposals of the National Register of Citizens (NRC)⁴⁰. The amendment has been widely criticised as a gateway to the legalised discrimination and exclusion of Muslims from Indian citizenship. Protestors demand that it be scrapped and that the nationwide NRC not be implemented.

Has there been any technology recently introduced to the country that could affect the agricultural data landscape? Have any technologies been replaced, or made obsolete or undesirable?

- In December 2019, the Indian Space Research Organisation (ISRO)⁴¹ launched the RISAT-2BR1⁴² radar-imaging earth observation satellite. The program performs remote sensing to support agricultural projects.
- NETRA⁴³, an unmanned aerial vehicle developed by the Defence Research and Development Organisation, can collate remote sensing data, useful in agriculture.
- Two national data centre hubs are in the process of being set up in India to be operational by 2023⁴⁴. One data centre will be situated in Bhopal, Madhya Pradesh and another in Guwahati, Assam⁴⁵. A 1,500-rack

³⁸ "Government of India – Wikipedia." https://en.wikipedia.org/wiki/Government_of_India. Accessed 25 Jan. 2021.

³⁹ "Citizenship (Amendment) Act, 2019 – Wikipedia." [https://en.wikipedia.org/wiki/Citizenship_\(Amendment\)_Act,_2019](https://en.wikipedia.org/wiki/Citizenship_(Amendment)_Act,_2019). Accessed 25 Jan. 2021.

⁴⁰ "National Register of Citizens – Wikipedia." https://en.wikipedia.org/wiki/National_Register_of_Citizens. Accessed 25 Jan. 2021.

⁴¹ "ISRO – Government of India." <https://www.isro.gov.in/>. Accessed 25 Jan. 2021.

⁴² "RISAT-2BR1 – Wikipedia." <https://en.wikipedia.org/wiki/RISAT-2BR1>. Accessed 25 Jan. 2021.

⁴³ "DRDO Netra – Wikipedia." https://en.wikipedia.org/wiki/DRDO_Netra. Accessed 25 Jan. 2021.

⁴⁴ "Data centres may prove to be the next big opportunity in India" 23 Oct. 2019, <https://m.economictimes.com/tech/internet/data-centres-may-prove-to-be-the-next-big-opportunity-in-india-/articleshow/71714171.cms>. Accessed 25 Jan. 2021.

⁴⁵ "National Data Centres being set up in Bhopal, Guwahati" 19 Mar. 2020, <https://www.businessinsider.in/business/news/national-data-centres-being-set-up-in-bhopal-guwahati-dhotre/articleshow/74712272.cms>. Accessed 25 Jan. 2021.

data centre facility is planned, including infrastructure for complete operational and management support⁴⁶.

47 Data regulation and laws

This section provides an overview of the general data policy context.

To what extent is there an open data policy or strategy for this country, including open data or data access?

The government of India (GOI) has published the following policies and guidelines around data sharing and management:

- National Data Sharing and Accessibility Policy (NDSAP)⁴⁸: The objective of this policy is to facilitate the access to GOI owned shareable data and information in both human and machine readable forms through a country-wide network permitting wider accessibility and use of public data and information. The NDSAP will apply to all data and information created, generated, collected and archived using public funds provided by GOI directly or through authorized agencies by various Ministries, Departments, Organizations, Agencies and Autonomous bodies. It also provides implementation guidelines.
- New policies and strategies around data sharing and management
 - Personal Data Protection Bill⁴⁹
 - Data Protection Committee report⁵⁰
 - National Open Data Ecosystem⁵¹
 - National Strategy for Artificial Intelligence⁵² (Discussion Paper)
 - India Enterprise Architecture⁵³ (IndEA)
 - Doubling Farmers Income⁵⁴ (DFI)

⁴⁶ "Two new data centers planned for India | News | Institutional Real" <https://irei.com/news/two-new-data-centers-planned-india/>. Accessed 25 Jan. 2021.

⁴⁷ "Two new data centers planned for India | News | Institutional Real" <https://irei.com/news/two-new-data-centers-planned-india/>. Accessed 25 Jan. 2021.

⁴⁸ "National Data Sharing and Accessibility Policy | Department" 2 Sept. 2020, <https://dst.gov.in/national-data-sharing-and-accessibility-policy-0>. Accessed 25 Jan. 2021.

⁴⁹ "Personal Data Protection Bill – MeitY." https://meity.gov.in/writereaddata/files/Personal_Data_Protection_Bill,2018.pdf. Accessed 25 Jan. 2021.

⁵⁰ "Data Protection Committee- Report | Ministry of Electronics" 27 Jul. 2018, <https://www.meity.gov.in/content/data-protection-committee-report>. Accessed 25 Jan. 2021.

⁵¹ "Response to the Consultation Paper on National Open Digital" 31 Mar. 2020, https://cis-india.org/internet-governance/cis_node. Accessed 25 Jan. 2021.

⁵² "National Strategy for Artificial Intelligence – | NITI Aayog." https://niti.gov.in/writereaddata/files/document_publication/NationalStrategy-for-AI-Discussion-Paper.pdf. Accessed 25 Jan. 2021.

⁵³ "India Enterprise Architecture Framework (IndEA)." <http://egovstandards.gov.in/sites/default/files/IndEA%20Framework%201.0.pdf>. Accessed 25 Jan. 2021.

⁵⁴ "Doubling Farmers' Income – | NITI Aayog." https://niti.gov.in/writereaddata/files/document_publication/DOUBLING%20FARMERS%20INCOME.pdf. Accessed 25 Jan. 2021.

- Other relevant resources
 - Open Data License
 - Brief of Open Data
 - Similar to ICAR Data Use license
 - Open Government Data Study
 - The study was carried out by the Centre of Internet and Society outlining benefits of Open Government data (OGD)⁵⁵ and current data practices – followed by status of e-governance, political and administrative environment.
 - The study is supported by some Government case studies.
 - A study carried out on OGD Policies and data Framework including some international case studies along with Open Data Barometer ranking including India.

⁵⁵“Open Government Data – OECD.” <https://www.oecd.org/digital/digital-government/open-government-data.htm>. Accessed 25 Jan. 2021.

⁵⁶“SAARC.” South Asian Association for Regional Cooperation.” https://en.wikipedia.org/wiki/South_Asian_Association_for_Regional_Cooperation. Accessed 25 Jan. 2021.

⁵⁷“UN-GGIM-AP: Home Page.” <https://www.un-ggim-ap.org/>. Accessed 25 Jan. 2021.

Is the country a member of any international organisation, policies or frameworks that promote a specific type of data access, use and sharing?

- The South Asian Association for Regional Cooperation (SAARC)⁵⁶ agreement on Trade in Services, 2010 allows for exceptions to be made in the domestic laws of SAARC countries for measures for the protection of data privacy which might otherwise be contrary to its free trade requirements. It allows SAARC member states to impose restrictions on data exports, and on outsourced data processing to other SAARC member states, in order to protect data privacy.
- The Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP)⁵⁷ is one of the five regional committees of the UN Committee of Experts on Global Geospatial

Information Management. The UN-GGIM-AP aims to promote international collaboration in global geospatial information management and the use of geospatial information for identifying problems and finding solutions for the benefit of Asia and the Pacific region.

- World Intellectual Property Organisation⁵⁸ (WIPO): India is a signatory to the WIPO Convention⁵⁹. WIPO's two main objectives are to promote the protection of intellectual property worldwide; and to ensure administrative cooperation among the intellectual property Unions established by the treaties that WIPO administers.
- The World Trade Organisation Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)⁶⁰ sets down minimum standards for the regulation of many forms of intellectual property (IP) by national governments as applied to nationals of other WTO member nations.

Membership organizations with open access policies include:

- World Bank Access to Information policy is based on the concept that any information held by the bank is publicly accessible including a range of specific indicators and datasets. However, the policy allows for an exception for 'Information Provided by Member Countries or Third Parties in Confidence'.
- UN Food and Agricultural Organisation: FAOSTAT⁶¹ provides free access to food and agriculture data for over 245 countries and territories and covers all FAO regional groupings⁶². Data is subject to national confidentiality policies.

⁵⁸ "WIPO – World Intellectual Property" <https://www.wipo.int/>. Accessed 25 Jan. 2021.

⁵⁹ "India Joins Three Key WIPO International Classification Treaties." https://www.wipo.int/portal/en/news/2019/article_0021.html. Accessed 25 Jan. 2021.

⁶⁰ "WTO | Intellectual property (TRIPS) – gateway – World Trade" <https://wto.org/trips>. Accessed 25 Jan. 2021.

⁶¹ "FAOSTAT – Food and Agriculture" 11 Jan. 2021, <http://www.fao.org/faostat/en/>. Accessed 25 Jan. 2021.

⁶² "Global Food and Agriculture Statistics of FAO (FAOSTAT" <http://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/category/details/en/c/1029516/>. Accessed 25 Jan. 2021.

Agriculture law

The next section gathers any agriculture specific context that would need to be considered for a project.

What types of laws exist in this country that affect agriculture more widely, and any specific area the investment is looking into, and what organisations are involved?

- Draft National Seed Bill (2019)
 - A Seed Bill was introduced in 2004⁶³ for compulsory Registration and Certification of Seeds. It also aimed to repeal the Seed Act of 1966⁶⁴ which is supposed to prevent fake seeds being sold in the market, but the bill was not passed.
 - The Draft National Seed Bill 2019⁶⁵ has been introduced to Parliament to include a more scientific definition on transgenic variety, enhanced farmer rights on seeds and enlisting the services of private firms for evaluating new varieties before seed registration.
- Constitution of Republic of India (1947)⁶⁶
 - Asserts the importance of peoples' rights to full participation in the planning and implementation of environmental policies and development plans.
 - Covers the conservation and sustainable utilization of natural resources for a healthy ecosystem and the well being of the people.
 - Protects and improves the natural environment including forests, lakes, rivers, wildlife and stipulates compassion for living creatures.

⁶³ "seeds bill 2004: for whom? – JStor."
<https://www.jstor.org/stable/43951997>.
Accessed 25 Jan. 2021.

⁶⁴ "THE SEEDS ACT, 1966."
<http://faolex.fao.org/docs/pdf/ind18593.pdf>.
Accessed 25 Jan. 2021.

⁶⁵ "Highlights of the Seed Bill- 2019 – Drishti IAS." 3 Dec. 2019, <https://www.drishtiias.com/daily-updates/daily-news-editorials/seed-bill>.
Accessed 25 Jan. 2021.

⁶⁶ "Constitution of India – Wikipedia."
https://en.wikipedia.org/wiki/Constitution_of_India.
Accessed 25 Jan. 2021.

- Environmental Protection Act (1986)⁶⁷
 - The purpose of the Act is to implement the decisions of the United Nations Conference on the Human Environment.
 - It relates to the protection and improvement of the human environment and the prevention of hazards to human beings, other living creatures, plants and property.

The Act is an ‘umbrella’ legislation designed to provide a framework for central government coordination of the activities of various central and state authorities established under previous laws, such as the Water Act⁶⁸ and the Air Act⁶⁹.

- Environment Impact Assessment ⁷⁰(1994)
 - Environment Impact Assessment (EIA) is a formal process used to predict the environmental consequences of any development project. Environment Impact Assessment in India is statutory, backed by the Environment Protection Act in 1986⁷¹, which contains various provisions on EIA methodology and process.
 - EIA looks into various problems, conflicts and natural resource constraints which may not only affect the viability of a project but also predict if a project might harm the people, their land, livelihoods or environment.
 - Though the reports are available to the public, the local participation in the consulting process is low.
- Protection of Plant Varieties and Farmers’ Rights Act (2001)⁷²
 - Establishes an effective system for the protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants.

⁶⁷“Environment Protection Act, 1986 – Wikipedia.” https://en.wikipedia.org/wiki/Environment_Protection_Act_1986. Accessed 25 Jan. 2021.

⁶⁸“The Water (Prevention and Control of Pollution) Act, 1974.” <https://indiankanoon.org/doc/867156/>. Accessed 25 Jan. 2021.

⁶⁹“Air (Prevention and Control of Pollution) Act – Wikipedia.” [https://en.wikipedia.org/wiki/Air_\(Prevention_and_Control_of_Pollution\)_Act](https://en.wikipedia.org/wiki/Air_(Prevention_and_Control_of_Pollution)_Act). Accessed 25 Jan. 2021.

⁷⁰“THE ENVIRONMENTAL IMPACT ASSESSMENT ...” 4 May. 1994, <http://extwprlegs1.fao.org/docs/pdf/ind4656.pdf>. Accessed 25 Jan. 2021.

⁷¹“Environment Protection Act, 1986 – Wikipedia.” https://en.wikipedia.org/wiki/Environment_Protection_Act_1986. Accessed 25 Jan. 2021.

⁷²“Protection of Plant Varieties and Farmers’ Rights Act, 2001 ...” https://en.wikipedia.org/wiki/Protection_of_Plant_Varieties_and_Farmers%27_Rights_Act_2001. Accessed 25 Jan. 2021.

- Recognizes and protects the rights of farmers in respect of their contributions made at any time in conserving, improving and making available plant genetic resources for the development of new plant varieties.
- Accelerates agricultural development in the country, protects plant breeders' rights; stimulates investment for research and development both in the public & private sector for the development of new plant varieties.
- Facilitates the growth of seed industry in the country which will ensure the availability of high quality seeds and planting material to farmers.
- Scheme for Conservation, Development and Sustainable Management of Medicinal Plants
 - Supports cultivation of medicinal plants which is the key to integrity, quality, efficacy and safety of the AYUSH systems of medicines by integrating medicinal plants in the farming systems, offer an option of crop diversification and enhance incomes of farmers.
 - Supports cultivation following the Good Agricultural and Collection Practices (GACPs)⁷³ to promote standardization and quality assurance and thereby enhance acceptability of the AYUSH systems globally and increase exports of value added items like herbal extracts, phyto-chemicals, dietary supplements, cosmeceuticals and AYUSH products.

⁷³ "Good Agricultural Practices (GAPs) – National Medicinal" https://www.nmpb.nic.in/sites/default/files/publications/Good_Agricultural_Practices_GAPs_Booklet-Part-I.pdf. Accessed 25 Jan. 2021.

⁷⁴ "Model Agriculture Land Leasing Act 2016 — Vikaspedia." <https://vikaspedia.in/agriculture/policies-and-schemes/crops-related/model-agriculture-land-leasing-act-2016>. Accessed 25 Jan. 2021.

- Model Agriculture Land Leasing Act (2016)⁷⁴
 - Legalises land leasing to promote agricultural efficiency, equity and power reduction. This will also help in much needed productivity improvement in agriculture as well as occupational mobility of the people and rapid rural change.
 - Through this act, the landlord can legally lease the land with mutual consent for agriculture and allied activities.
- Fertilizer Control Order,(1957/1985)⁷⁵
 - The objectives of the FCO are to protect the interests of the farmers as well as that of genuine traders and manufacturers from exploitation by unscrupulous elements. The order ensures the availability of fertilizers of the right quality and at the right time by regulating their quality, price, distribution and sale.
- Plant Quarantine (Regulation of Import into India) Order (2003)⁷⁶
 - Plant quarantine is a government endeavour enforced through legislative measures to regulate the introduction of planting material, plant products, soil and living organisms. In order to prevent inadvertent introduction of pests and pathogens harmful to the agriculture of a region and, if introduced, prevent their establishment and further spread.
 - The Directorate of Plant Protection, Quarantine and Storage (DPPQS)⁷⁷ under the Ministry of Agriculture is responsible for enforcing quarantine regulations and for quarantine inspection and disinfestation of agricultural commodities.
 - National Bureau of Plant Genetic Resources (NBPGR)⁷⁸, the nodal institution for

⁷⁴ "Fertilizer (Control) Order, 1985 – Latest Laws." <https://www.latestlaws.com/bare-acts/central-acts-rules/consumer-laws/the-essential-commodities-act-1955/fertilizer-control-order-1985/>. Accessed 25 Jan. 2021.

⁷⁵ "The PQ Order, 2003." <https://plantquarantineindia.nic.in/PQISPub/pdffiles/pqorder2015.pdf>. Accessed 25 Jan. 2021.

⁷⁶ "Directorate of Plant Protection, Quarantine" <http://ppqs.gov.in/>. Accessed 25 Jan. 2021.

exchange of plant genetic resources (PGR)⁷⁹ has been empowered under the PQ Order to handle quarantine processing of germplasm including transgenic planting material imported for research purposes into the country by both public and private sectors.

- Biological Diversity Act (2002)
 - India enacted the Biological Diversity Act in 2002⁸⁰ to regulate the access to genetic resources and protection of biodiversity. This act provides for the establishment of statutory bodies such as National Biodiversity Authority, State Biodiversity Boards, National and State Biodiversity Funds and a Biodiversity Management Committee.
- Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act (2006)⁸¹
 - The recognised rights of the forest dwelling Scheduled Tribes and other traditional forest dwellers include the responsibilities and authority for sustainable use, conservation of biodiversity and maintenance of ecological balance.
- Remote Sensing Data Policy (RSDP) (2011)⁸²
 - The Government reserves the right to select and permit agencies to acquire and distribute satellite remote sensing data in India. The Department of Space decides on the procedure for granting permission for dissemination of such data and for the levy of necessary fees.
 - Information on crop statistics is required for planning and decision making purposes, such as distribution and storage of food grains, government policies, pricing, procurement and food security.

⁷⁸ "National Bureau of Plant Genetic Resources." <http://www.nbgr.ernet.in/>. Accessed 25 Jan. 2021.

⁷⁹ "Plant genetic resources – Wikipedia." https://en.wikipedia.org/wiki/Plant_genetic_resources. Accessed 25 Jan. 2021.

⁸⁰ "Biological Diversity Act, 2002 – Wikipedia." https://en.wikipedia.org/wiki/Biological_Diversity_Act_2002. Accessed 25 Jan. 2021.

⁸¹ "The Scheduled Tribes and Other Traditional Forest Dwellers" [https://en.wikipedia.org/wiki/The_Scheduled_Tribes_and_Other_Traditional_Forest_Dwellers_\(Recognition_of_Forest_Rights\)_Act_2006](https://en.wikipedia.org/wiki/The_Scheduled_Tribes_and_Other_Traditional_Forest_Dwellers_(Recognition_of_Forest_Rights)_Act_2006). Accessed 25 Jan. 2021.

⁸² "Indian Remote Sensing Data Policy 2011 | HimalDoc." <https://lib.icimod.org/record/8866>. Accessed 25 Jan. 2021.

- Remote sensing data provides many advantages over conventional methods, particularly in terms of timely decision-making mechanisms, spatial depiction and coverage, and cost effectiveness.
- Satellite data is used in addressing many critical aspects, such as crop area estimation, crop yield and production estimation, crop condition, basic soil information, cropping system studies and experimental crop insurance.
- Key governmental and quasi-governmental authorities are
 - Indian Farmers Fertiliser Cooperative Limited (IFFCO)⁸³
 - National Bureau of Soil Survey and Land Use Planning (NBSS LUP)⁸⁴
 - Soil and Land use survey of India⁸⁵
 - Water Resources Information System (WRIS)⁸⁶
 - Ministry of Rural Development⁸⁷
 - National Academy of Agricultural Research Management⁸⁸
 - AgMarknet⁸⁹
 - National Bank for Agriculture and Rural Development⁹⁰
 - National Seed Association of India⁹¹
 - Indian Space Research Organisation⁹²
 - Ministry of Food Processing Industries⁹³
 - Agricultural & Processed Food Products Export Development Authority⁹⁴
 - Ministry of Statistics and Programme Implementation⁹⁵
 - The Fertiliser Association of India⁹⁶
 - Ministry of Finance⁹⁷
 - ICAR-Indian Agricultural Statistics Research Institute (IASRI)⁹⁸

⁸³ "IFFCO." <http://www.iffco.in/>. Accessed 25 Jan. 2021.

⁸⁴ "National Bureau of Soil Survey and Land Use planning." <https://www.nbsslup.in/>. Accessed 25 Jan. 2021.

⁸⁵ "Soil and Land Use Survey of India." <https://slusi.dacnet.nic.in/>. Accessed 25 Jan. 2021.

⁸⁶ "Water Resources Information System (WRIS) | Central Water" 20 Jun. 2019, <http://cwc.gov.in/water-resources-information-system-wris>. Accessed 25 Jan. 2021.

⁸⁷ "Ministry of Rural Development." <https://rural.nic.in/>. Accessed 25 Jan. 2021.

⁸⁸ "Naarm." <https://naarm.org.in/home/>. Accessed 25 Jan. 2021.

⁸⁹ "Agmarknet." <https://agmarknet.gov.in/>. Accessed 25 Jan. 2021.

⁹⁰ "NABARD – National Bank For Agriculture And Rural" <https://www.nabard.org/>. Accessed 25 Jan. 2021.

⁹¹ "NSAI – homepage." <https://nsai.co.in/>. Accessed 25 Jan. 2021.

⁹² "ISRO – Government of India." <https://www.isro.gov.in/>. Accessed 25 Jan. 2021.

⁹³ "Ministry of Food Processing Industries." <https://mofpi.nic.in/>. Accessed 25 Jan. 2021.

⁹⁴ "APEDA." <http://www.apeda.gov.in/>. Accessed 25 Jan. 2021.

⁹⁵ "Ministry of Statistics and Program Implementation" <http://mospi.nic.in/>. Accessed 25 Jan. 2021.

⁹⁶ "The Fertiliser Association of India." <https://www.faidelhi.org/>. Accessed 25 Jan. 2021.

⁹⁷ "Home | Ministry of Finance | Gol." 19 Nov. 2020, <https://finmin.nic.in/>. Accessed 25 Jan. 2021.

⁹⁸ "Indian Council of Agricultural Research – Wikipedia." https://en.wikipedia.org/wiki/Indian_Council_of_Agricultural_Research. Accessed 25 Jan. 2021.

At a high level, what are the respective roles of the public, private and third sector in the agriculture sector?

- At present, extension services⁹⁹ (application of scientific research and new knowledge to agricultural practices through farmer education) are being provided mainly by the public sector through a two tier system. At the central level, Indian Council of Agriculture Research (ICAR)¹⁰⁰ is the nodal institute for agriculture research and extension while at the state level, the State Agricultural Universities (SAU)¹⁰¹ facilitate agriculture extension via the Krishi Vigyan Kendra (KVKs)¹⁰² and Agriculture Technology Management Agency (ATMA)¹⁰³ at the district level. Besides the existing public extension service system, there are several private players, civil-society organisations including farmer-based organisations, and NGOs that play a major role in financing and providing extension services.
- Agricultural Extension Systems¹⁰⁴ in the private sector are mostly delivered by input dealers, that is those dealing or supplying farm 'inputs', such as those marketing seeds, fertilisers, pesticide and farm machinery. There are about 280,000 input dealers across the country, compared to approximately 142,000 sanctioned posts of extension workers (of which on an average 30% remain unmanned)¹⁰⁵. This gives an idea of the reach and importance of the input dealer as a source of technical advice to farmers.
- Some NGOs, such as Professional Assistance for Development Action (PRADAN)¹⁰⁶, Bharatiya Agro-Industries Federation (BAIF)¹⁰⁷ and Action for Food Production (AFPRO)¹⁰⁸ are actively involved in promoting extension activities in more than one state.

⁹⁹ "Agriculture Extension System in India – Indian Council for" <https://icrier.org/pdf/Agriculture-Extension-System-in-India-2018.pdf>. Accessed 25 Jan. 2021.

¹⁰⁰ "Welcome to ICAR | भारतीय कृषि...." <https://icar.org.in/>. Accessed 25 Jan. 2021.

¹⁰¹ "State Agricultural Universities | भारतीय कृषि – ICAR." <https://icar.org.in/content/state-agricultural-universities-0>. Accessed 25 Jan. 2021.

¹⁰² "KVK Portal – ICAR." <https://kvk.icar.gov.in/>. Accessed 25 Jan. 2021.

¹⁰³ "Agricultural Technology Management ... – TNAU Agritech Portal." https://agritech.tnau.ac.in/atma/atma_intro.html. Accessed 25 Jan. 2021.

¹⁰⁴ "Agricultural extension – Wikipedia." https://en.wikipedia.org/wiki/Agricultural_extension. Accessed 25 Jan. 2021.

¹⁰⁵ "Agriculture Extension System in India – Indian Council for" <https://icrier.org/pdf/Agriculture-Extension-System-in-India-2018.pdf>. Accessed 25 Jan. 2021.

¹⁰⁶ "PRADAN." <https://www.pradan.net/>. Accessed 25 Jan. 2021.

¹⁰⁷ "BAIF Development Research Foundation: Home." <https://baif.org.in/>. Accessed 25 Jan. 2021.

¹⁰⁸ "Action for Food Production | Celebrating 54 years in the" <http://www.afpro.org/>. Accessed 25 Jan. 2021.

- Organized user groups such as commodity groups, farmer interest groups, farmer clubs, women farmer groups and other special interest groups. also play small but important roles in extension in niche regions and areas.
- Consecutive governments have prioritized agriculture to make it a profitable venture. Unlike mechanised agricultural practices, Indian agriculture is mainly composed of numerous small farmers cultivating in small plots of land with limited resources.
- Though the Economic Liberalisation policy of India in 1991¹⁰⁹ gave way to the free flow of agricultural products and several associated policies such as credit, the sector is still affected by limited players in fertiliser distribution and seed distribution.
- The agriculture sector in India is expected to generate better momentum in the next few years due to increased investments in agricultural infrastructure such as irrigation facilities, warehousing and cold storage. In addition, the growing use of genetically modified crops will likely improve the yield for Indian farmers.

¹⁰⁹“Economic liberalisation in India – Wikipedia.”
https://en.wikipedia.org/wiki/Economic_liberalisation_in_India. Accessed 25 Jan. 2021.

¹¹⁰“India – Wikipedia.”
<https://en.wikipedia.org/wiki/India>. Accessed 25 Jan. 2021.

Who is involved in or shapes the collection, use and sharing of agriculture data in this country?

- All the Indian government agencies listed above are involved in agricultural data collection, use and sharing in the country.
 - Ministry of Agriculture and Farmers Welfare is the body for formulation and administration of the rules, regulations and laws related to agriculture in India¹¹⁰. The three broad areas of scope for the Ministry are agriculture, food processing¹¹¹

and co-operation. consisting of three departments

- Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW)¹¹²
 - Department of Agricultural Research and Education (DARE)¹¹³
 - Department of Animal Husbandry, Dairying and Fisheries (DAHD&F)¹¹⁴
- The Indian Council of Agricultural Research (ICAR)¹¹⁵ is an autonomous organisation under the Department of Agricultural Research and Education (DARE)¹¹⁶. It is the apex body for coordinating, guiding and managing research and education in agriculture, including horticulture, fisheries and animal sciences. With 101 ICAR institutes and 71 agricultural universities spread across the country, this is one of the largest national agricultural systems in the world¹¹⁷.
- In 1998, the Indian Government, with the support of the World Bank, introduced the Agriculture Technology Management Agency (ATMA)¹¹⁸ under the Innovation in Technology Dissemination (ITD)¹¹⁹ component of the National Agricultural Technology Project (NATP)¹²⁰. It was first introduced in 28 districts in seven states from 1998 to 2003 under the guidance of MANAGE (National Institute of Agricultural Extension Management)¹²¹.
 - Farmer cooperatives
 - State governments
 - District administrations
 - Major multilateral and bilateral organisations providing funding and technical assistance include:
 - United Nations Development Programme (UNDP)¹²²

¹¹¹ "Food Processing." <https://www.foodprocessing.com/>. Accessed 25 Jan. 2021.

¹¹² "Department of Agriculture, Co-operation and Farmers Welfare" https://en.wikipedia.org/wiki/Department_of_Agriculture,_Co-operation_and_Farmers_Welfare. Accessed 25 Jan. 2021.

¹¹³ "Department of Agricultural Research and" <http://dare.nic.in/>. Accessed 25 Jan. 2021.

¹¹⁴ "Department of Animal Husbandry & Dairying | Government of" <https://dahd.nic.in/>. Accessed 25 Jan. 2021.

¹¹⁵ "Indian Council of Agricultural Research – Wikipedia." https://en.wikipedia.org/wiki/Indian_Council_of_Agricultural_Research. Accessed 25 Jan. 2021.

¹¹⁶ "Department of Agricultural Research and" <http://dare.nic.in/>. Accessed 25 Jan. 2021.

¹¹⁷ "About us | भारतीय कृषि अनुसंधान ... – ICAR." <https://icar.org.in/content/about-us>. Accessed 25 Jan. 2021.

¹¹⁸ "Agricultural Technology Management Agency (ATMA): A" 27 Sept. 2019, <https://mpr.ub.uni-muenchen.de/45549/>. Accessed 25 Jan. 2021.

¹¹⁹ "Farmers' Perception on Innovations in Technology" <https://www.extensioneducation.org/index.php/jee/article/download/111/74>. Accessed 25 Jan. 2021.

¹²⁰ "09. The National Agricultural Technology Project (NATP) The" <http://eagri.org/eagri50/AEXT191/lec09.pdf>. Accessed 25 Jan. 2021.

¹²¹ "MANAGE." 27 Oct. 2020, <https://www.manage.gov.in/>. Accessed 25 Jan. 2021.

¹²² "UNDP – United Nations Development" <https://www.undp.org/content/undp/en/home.html>. Accessed 25 Jan. 2021.

¹²³ "International Fund for Agricultural" <https://www.ifad.org/>. Accessed 25 Jan. 2021.

- International Fund for Agricultural Development (IFAD)¹²³
- Food & Agricultural Organisation (FAO)¹²⁴,
- The World Bank¹²⁵
- International Crop Research Institute for The Semi Arid Tropics (ICRISAT)¹²⁶
- International Food Policy Research Institute (IFPRI)¹²⁷
- International Water Management Institute (IWMI)¹²⁸
- Department for International Development (DfID)¹²⁹
- Netherlands Development Corporation¹³⁰
- Other international NGOs also provide support and technical assistance including Aga Khan Foundation¹³¹, Greenpeace¹³², African Bamboo¹³³, One Acre Fund¹³⁴, Promethean Power Systems¹³⁵, World Concern International¹³⁶ and ACORD International¹³⁷. Multiple local NGOs providing regional support.
- International academic research institutions/ organisations:
 - Asia Pacific Association of Agricultural Research Institutes (APAARI)¹³⁸
 - Centre for Agriculture and Biosciences International (CABI)¹³⁹
 - Center for International Forestry Research (CIFOR)¹⁴⁰
 - Consultative Group on International Agricultural Research (CGIAR)¹⁴¹
 - Food & Agricultural Organisation (FAO)¹⁴²
 - International Center for Agricultural Research in Dry Areas (ICARDA)¹⁴³
 - International Center for Living Aquatic Resources Management (ICLARM)¹⁴⁴

¹²⁴“Food and Agriculture Organization of the” <http://www.fao.org/home/en/>. Accessed 25 Jan. 2021.

¹²⁵“World Bank Group.” <https://www.worldbank.org/>. Accessed 25 Jan. 2021.

¹²⁶“Overview – ICRISAT.” <https://www.icrisat.org/overview/>. Accessed 25 Jan. 2021.

¹²⁷“IFPRI.” <https://www.ifpri.org/>. Accessed 25 Jan. 2021.

¹²⁸“International Water Management Institute” <https://www.iwmi.cgiar.org/>. Accessed 25 Jan. 2021.

¹²⁹“DFID India – GOV.UK.” <https://www.gov.uk/world/organisations/dfid-india>. Accessed 25 Jan. 2021.

¹³⁰“Netherlands Development Cooperation – Wikipedia.” https://en.wikipedia.org/wiki/Netherlands_Development_Cooperation. Accessed 25 Jan. 2021.

¹³¹“Aga Khan Foundation – Wikipedia.” https://en.wikipedia.org/wiki/Aga_Khan_Foundation. Accessed 25 Jan. 2021.

¹³²“Greenpeace – Wikipedia.” <https://en.wikipedia.org/wiki/Greenpeace>. Accessed 25 Jan. 2021.

¹³³“African Bamboo: Homepage.” <https://www.african-bamboo.com/>. Accessed 25 Jan. 2021.

¹³⁴“One Acre Fund.” <https://oneacrefund.org/>. Accessed 25 Jan. 2021.

¹³⁵“Promethean Power Systems.” <https://coolelectrica.com/>. Accessed 25 Jan. 2021.

¹³⁶“World Concern.” <http://worldconcern.org/>. Accessed 25 Jan. 2021.

¹³⁷“About ACORD.” <https://www.acord.org/acord-about/acord-about>. Accessed 25 Jan. 2021.

¹³⁸“APAARI.” <https://www.apaari.org/>. Accessed 25 Jan. 2021.

¹³⁹“Centre for Agriculture and Bioscience International – Wikipedia.” https://en.wikipedia.org/wiki/Centre_for_Agriculture_and_Bioscience_International. Accessed 25 Jan. 2021.

¹⁴⁰“CIFOR.” <https://www.cifor.org/>. Accessed 25 Jan. 2021.

¹⁴¹“CGIAR – Wikipedia.” <https://en.wikipedia.org/wiki/CGIAR>. Accessed 25 Jan. 2021.

¹⁴²“Food and Agriculture Organization of the” <http://www.fao.org/home/en/>. Accessed 25 Jan. 2021.

¹⁴³“ICARDA.” <https://www.icarda.org/>. Accessed 25 Jan. 2021.

¹⁴⁴“WorldFish – Wikipedia.” <https://en.wikipedia.org/wiki/WorldFish>. Accessed 25 Jan. 2021.

¹⁴⁵“World Agroforestry Centre – Wikipedia.” https://en.wikipedia.org/wiki/World_Agroforestry_Centre. Accessed 25 Jan. 2021.

- International Center for Research in Agroforestry (ICRAF)¹⁴⁵
- International Center for Tropical Agriculture (CIAT)¹⁴⁶
- International Crop Research Institute for The Semi Arid Tropics (ICRISAT)¹⁴⁷
- International Food Policy Research Institute (IFPRI)¹⁴⁸
- International Institute of Tropical Agriculture (IITA)¹⁴⁹
- International Livestock Research Institute (ILRI)¹⁵⁰
- International Maize & Wheat Improvement Center (CIMMYT)¹⁵¹
- International Network for Improvement of Banana & Plantain (INIBAP)
- Biodiversity International (IPGRI)¹⁵²
- International Potato Center (CIP)¹⁵³
- International Rice Research Institute (IRRI)¹⁵⁴
- International Water Management Institute (IWMI)¹⁵⁵
- Asia-Pacific Association of Agricultural Research Institutions¹⁵⁶
- International Seed Testing Association¹⁵⁷

¹⁴⁶“International Center for Tropical Agriculture – Wikipedia.” https://en.wikipedia.org/wiki/International_Center_for_Tropical_Agriculture. Accessed 25 Jan. 2021.

¹⁴⁷“International Crops Research Institute for the Semi-Arid Tropics.” https://en.wikipedia.org/wiki/International_Crops_Research_Institute_for_the_Semi-Arid_Tropics. Accessed 25 Jan. 2021.

¹⁴⁸“IFPRI.” <https://www.ifpri.org/>. Accessed 25 Jan. 2021.

¹⁴⁹“International Institute of Tropical Agriculture” <http://www.iita.org/>. Accessed 25 Jan. 2021.

¹⁵⁰“International Livestock Research Institute.” <https://www.ilri.org/>. Accessed 25 Jan. 2021.

¹⁵¹“CIMMYT. International Maize and Wheat Improvement Center.” https://en.wikipedia.org/wiki/International_Maize_and_Wheat_Improvement_Center. Accessed 25 Jan. 2021.

¹⁵²“Biodiversity International – Wikipedia.” https://en.wikipedia.org/wiki/Biodiversity_International. Accessed 25 Jan. 2021.

¹⁵³“International Potato Center.” <https://cipotato.org/>. Accessed 25 Jan. 2021.

¹⁵⁴“International Rice Research Institute (IRRI).” <https://www.irri.org/>. Accessed 25 Jan. 2021.

¹⁵⁵“International Water Management Institute” <https://www.iwmi.cgiar.org/>. Accessed 25 Jan. 2021.

¹⁵⁶“Asia – Pacific Association of Agricultural Research Institutions” <http://www.fao.org/family-farming/detail/en/c/416586/>. Accessed 25 Jan. 2021.

¹⁵⁷“International Seed Testing Association – ISTA.” <https://www.seedtest.org/>. Accessed 25 Jan. 2021.

¹⁵⁸“Soil Health Card.” <https://soilhealth.dac.gov.in/>. Accessed 25 Jan. 2021.

Have there been any high profile failures or successes related to the collection, use and sharing of agriculture data?

- India’s unique program, Soil Health Card¹⁵⁸ was launched in 2015 to assess the nutrient status of every farm holding in the country. The objective was to issue soil health cards to farmers every two years so as to provide a basis to address nutritional deficiencies in fertilization practises. Soil testing reduces cultivation cost by application of the right quantity of fertilizer. It ensures additional

income to farmers by increase in yields and it also promotes sustainable farming.

- The Central Research Institute for Dryland Agriculture (CRIDA)¹⁵⁹: ICAR prepared district level Agriculture Contingency Plans in collaboration with state agricultural universities using a standard template to tackle aberrant monsoon situations leading to drought and floods, extreme events (heat waves, cold waves, frost, hailstorms, cyclone) adversely affecting crops, livestock and fisheries (including horticulture). A total of 614 district agriculture contingency plans¹⁶⁰ are placed in the 'farmer portal' of the Ministry of Agriculture and Farmers Welfare¹⁶¹, Government of India.
- Launch of Farmer Portal¹⁶² as a one stop shop for meeting all informational needs relating to agriculture, animal husbandry and fisheries production, sale and storage. The portal will help the farmer access relevant information on specific subjects around their village, block, district or state. This information will be delivered in the form of text, SMS, email, audio and video in the language they understand.

Are there any developments, pressures or opportunities not specific to the sector that may affect the collection, use and sharing of agriculture data, and any specific area the investment is looking into?

- COVID-19 has imposed travel restrictions across the world and in country lockdowns. Data collection will be severely affected while the pandemic lasts. The economic resources and institutional capacity required to fight the virus may also impact on future project implementation.

¹⁵⁹ "Welcome to CRIDA."

<http://www.icar-crida.res.in/>.

Accessed 25 Jan. 2021.

¹⁶⁰ "(PDF) District Agricultural Contingency Plans for Managing" 20 Jul. 2016, https://www.researchgate.net/publication/305442784_District_Agricultural_Contingency_Plans_for_Managing_Weather_Aberrations_and_Sustainable_Agriculture.

Accessed 25 Jan. 2021.

¹⁶¹ "Ministry of Agriculture & Farmers' Welfare –

Wikipedia." https://en.wikipedia.org/wiki/Ministry_of_Agriculture_%26_Farmers%27_Welfare.

Accessed 25 Jan. 2021.

¹⁶² "Farmer Portal." <https://farmerportal.dawnmeats.com/carcaseweb/>. Accessed 25 Jan. 2021.

- Low levels of use of digital systems among the government administrations might hamper access to data. There is also general hesitation among government officials to provide access to data.

Bihar specific information

This section provides additional information specific to the Bihar region.

What are the agricultural laws and regulations in Bihar?

- Bihar Prevention And Control Of Agricultural Pests, Diseases And Noxious Weeds Act, 1953 & Bihar Prevention and Control of Agricultural Pests, Diseases and Noxious Weeds Rules, 1955¹⁶³ – Act and rules providing for the framework for notifying and the steps to be taken to control the agricultural pests, diseases and weeds.
- Bihar Irrigation Act, 1997¹⁶⁴ – An act to provide for and consolidate the law relating to irrigation embankment, drainage, levy and assessment of water rates.
- Bihar Goshala Act, 1950¹⁶⁵ & Bihar Goshala Rules, 1953¹⁶⁶ – An act to provide for better management and control of Goshalas, protective shelters for cattle, in the state of Bihar.
- Bihar Preservation And Improvement of Animals Act, 1955¹⁶⁷ - An act to provide for the preservat Animal & Fisheries Resources Departmention¹⁶⁸ and improvement of certain animals in the state of Bihar.
- Bihar Agriculture Land (Conversion for Non-Agriculture Purposes) Act, 2010¹⁶⁹ – To regulate the conversion of agricultural land to non-agriculture purposes.

¹⁶³."Bihar Prevention and Control of Agricultural Pests, Diseases" <http://www.bareactslive.com/BIH/bh618.htm>. Accessed 25 Jan. 2021.

¹⁶⁴."Untitled – India Code." https://indiacode.nic.in/bitstream/123456789/5140/1/irrigation_act_1997.pdf. Accessed 25 Jan. 2021.

¹⁶⁵."Bihar Goshala Act, 1950 – India Code." https://www.indiacode.nic.in/handle/123456789/6669?view_type=browse&sam_handle=123456789/2515. Accessed 25 Jan. 2021.

¹⁶⁶."Bihar Goshala Act, 1950 – Bare Acts – Live." <http://www.bareactslive.com/BIH/BH279.HTM>. Accessed 25 Jan. 2021.

¹⁶⁷."Bihar Preservation and Improvement of Animals Act, 1955." 17 Feb. 2020, <http://www.bareactslive.com/BIH/bh615.htm>. Accessed 25 Jan. 2021.

¹⁶⁸."Animal & Fish Resources." <http://fisheries.ahdbihar.in/>. Accessed 25 Jan. 2021.

¹⁶⁹."fof/k foHkkx &&&&&& vflklwp uk 16 vizh y 2010 la0" [http://udyog.bihar.gov.in/All_in_one_doc_file/Bihar%20Agriculture%20Land%20\(Conversion%20for%20non-agriculture\)20160223060857268.pdf](http://udyog.bihar.gov.in/All_in_one_doc_file/Bihar%20Agriculture%20Land%20(Conversion%20for%20non-agriculture)20160223060857268.pdf). Accessed 25 Jan. 2021.

- Bihar Agricultural University Act, 2010¹⁷⁰ – An act to establish and incorporate an University for the Development of Agricultural and Allied Sciences in the State of Bihar.
- Bihar Consolidation of Holdings and Prevention of Fragmentation (Amendment) Act, 1981¹⁷¹ & Bihar Consolidation of Holdings and Prevention of Fragmentation Rules, 1958¹⁷² – An act to provide for the consolidation of holdings and prevention of fragmentation.
- Bihar Irrigation and Flood Protection (Betterment Contribution) Act, 1959¹⁷³ & Bihar Irrigation and Flood Protection, (Betterment Contribution) Rules, 1961¹⁷⁴ – An act to provide for the levy of betterment contribution on certain lands in the State of Bihar.
- Bihar Self-Supporting Cooperative Societies Act, 1996¹⁷⁵ – An act to provide for the voluntary formation of Cooperative Societies as accountable, competitive, self-reliant business enterprises, based on thrift, self-help and mutual aid and owned, managed and controlled by members for their economic and social betterment.
- Bihar Agricultural Credit Operations and Miscellaneous Provisions (Banks) Act, 1977¹⁷⁶ – An Act to make provisions to facilitate adequate flow of credit for agricultural production and development through banks and other institutional credit agencies.

¹⁷⁰."Bihar Agricultural University Act, 2010 – Bare Acts – Live." <http://www.bareactslive.com/BIH/BH490.HTM>. Accessed 25 Jan. 2021.

¹⁷¹."Bihar Consolidation of Holdings and Prevention ... – Latest Laws." <https://www.latestlaws.com/bare-acts/state-acts-rules/bihar-state-laws/bihar-consolidation-of-holdings-and-prevention-of-fragmentation-amendment-act-1981/>. Accessed 25 Jan. 2021.

¹⁷²."Bihar Consolidation of Holdings and Prevention of ..." <http://www.bareactslive.com/BIH/BH099.HTM>. Accessed 25 Jan. 2021.

¹⁷³."Bihar Irrigation and Flood Protection (Betterment Contribution" <http://www.bareactslive.com/BIH/BH367.HTM>. Accessed 25 Jan. 2021.

¹⁷⁴."Bihar Irrigation and Flood Protection, (Betterment Contribution" <http://www.bareactslive.com/BIH/BH371.HTM>. Accessed 25 Jan. 2021.

¹⁷⁵."Bihar Self-Supporting Co-operative Societies Act, 1996." <http://www.bareactslive.com/BIH/BH131.HTM>. Accessed 25 Jan. 2021.

¹⁷⁶."The Bihar Agricultural Credit Operations and Miscellaneous" <https://indiacode.nic.in/bitstream/123456789/7679/1/biharagriculturalcreditoperationsandmiscellaneousprovisionsbanksact-1977.pdf>. Accessed 25 Jan. 2021.

¹⁷⁷."Directorate of Economics And Statistics,Ministry Of Agriculture" 25 Sept. 2020, <https://eands.dacnet.nic.in/>. Accessed 25 Jan. 2021.

¹⁷⁸."Ministry of Planning (India) – Wikipedia." [https://en.wikipedia.org/wiki/Ministry_of_Planning_\(India\)](https://en.wikipedia.org/wiki/Ministry_of_Planning_(India)). Accessed 25 Jan. 2021.

¹⁷⁹."Government of Bihar." <https://state.bihar.gov.in/>. Accessed 25 Jan. 2021.

What are the major data sources in Bihar for agriculture?

- The Directorate of Economics and Statistics¹⁷⁷, Department of Planning and Government¹⁷⁸, Government of Bihar¹⁷⁹, releases crop estimates for area, production and productivity in respect of principal crops of food grains, oilseeds, sugarcane, fibers and important commercial and horticulture crops.

- The Department of Revenue and Land Reforms¹⁸⁰, Government of Bihar, maintains and updates land records, undertakes surveys and demarcation of land.
- The Department of Agriculture, Government of Bihar¹⁸¹ compiles data on fertilisers, rainfall, crop damages and various other data related to agriculture.
- The Flood Management Information System¹⁸², Water Resources Department, Government of Bihar¹⁸³ improves the technical and institutional capacity for flood management, introducing the extensive use of modern information technologies developing and implementing a comprehensive flood management information system in priority areas.
- Bihar Infrastructure Mapping, Geomatics Oriented Application Model compiles geospatial data. Some information on irrigation works are available publicly while others are available on a login basis.

¹⁸⁰ "Revenue and Land Reforms Department – Government of Bihar." <https://state.bihar.gov.in/lrc/>. Accessed 25 Jan. 2021.

¹⁸¹ "Department of Agriculture, Government of Bihar." <https://dbtagriculture.bihar.gov.in/krishimis/>. Accessed 25 Jan. 2021.

¹⁸² "fmis.bih.nic.in." <http://www.fmis.bih.nic.in/>. Accessed 25 Jan. 2021.

¹⁸³ "Water Resources Department, Government of Bihar, India." <http://wrd.bih.nic.in/>. Accessed 25 Jan. 2021.

¹⁸⁴ "Welcome to Bameti – Bihar Agriculture Management" <https://bameti.org/>. Accessed 25 Jan. 2021.

Who are the major stakeholders for agriculture in Bihar?

- The Bihar Agricultural Management and Extension Training Institute¹⁸⁴ (BAMETI) is a state level institution which is autonomous with greater flexibility in structure and functioning and are responsible for organizing need based training programmes for the project implementation functionaries of different line departments as well as the farming community.
- Bihar State Seed and Organic Certification Agency. The objective of seed certification is to develop and operate such a mechanism or arrangement through the various phases of seed production, processing, storage and handling.

- The state has two agricultural universities¹⁸⁵, five agricultural colleges, one horticulture college, one agriculture engineering college, one dairy technology college and one veterinary college. The Bihar Agricultural University¹⁸⁶ and the Dr. Rajendra Prasad Central Agricultural University¹⁸⁷ undertakes various measures to implement extension programmes and training of farmers.
- Bihar Rajya Beej Nigam Limited (BRBN)¹⁸⁸ consolidates and further improves quality seed production in the state with a view to effectively implement the National Seed Project¹⁸⁹ in Bihar.

¹⁸⁵ "Bihar – | NITI Aayog." <http://niti.gov.in/writereaddata/files/Bihar.pdf>. Accessed 25 Jan. 2021.

¹⁸⁶ "Bihar Agriculture University." <https://www.bausabour.ac.in/>. Accessed 25 Jan. 2021.

¹⁸⁷ "Dr. Rajendra Prasad Central Agricultural" 7 Oct. 2020, <https://www.rpcau.ac.in/>. Accessed 25 Jan. 2021.

¹⁸⁸ "BRBN." <http://brbn.bihar.gov.in/>. Accessed 25 Jan. 2021.

¹⁸⁹ "National Seed Project – P009703 – World Bank Projects." <https://projects.worldbank.org/en/projects-operations/project-detail/P009703>. Accessed 25 Jan. 2021.

¹⁹⁰ "Welcome to ICAR | भारतीय कृषि...." <https://icar.org.in/>. Accessed 25 Jan. 2021.

¹⁹¹ "Department of Agricultural Research and" <http://dare.nic.in/>. Accessed 25 Jan. 2021.

¹⁹² "The National Agricultural Research System (NARS) – NARO." <https://www.naro.go.ug/data/smenu/4/NARS.html>. Accessed 25 Jan. 2021.

¹⁹³ "ICAR Institutions, Deemed Universities, National Research" <https://icar.org.in/node/119>. Accessed 25 Jan. 2021.

Resources

Collect here all the useful places to use when updating the country profile.

ICAR

- The Indian Council of Agricultural Research (ICAR)¹⁹⁰ is the apex body for planning, promoting, coordinating and undertaking research and its application in agriculture and allied sciences in the country. It is funded by the Government of India (GOI) through the Department of Agricultural Research and Education (DARE)¹⁹¹ in the Ministry of Agriculture. It is the nodal agency of the National Agricultural Research System (NARS)¹⁹² comprising Central and State Agricultural Universities, Central Universities and affiliated colleges of agriculture, and other organizations – public and private, national and international – dealing with agricultural research.
- Under ICAR¹⁹³ are:
 - 4 universities
 - 65 Institutes
 - 14 National Research Centres
 - 13 Directorates/Project Directorates

- ICAR has produced policies around data sharing and management as follows:
 - **Guidelines for Data Management in ICAR institutions**
 - Ensure a uniform procedure that provides academic flexibility to accommodate independent scientifically validated views is followed in all ICAR institutes while ensuring accountability of the authors for the information published.
 - Prioritization, Monitoring and Evaluation (PME) Cells, being established in each ICAR Institute/Unit, and aim to encourage proper and judicious allocation of research resources, based on priority, using analytical tools, and tracking the implementation and progress and ensuring accountability, transparency and objectivity in the system.
 - **Guidelines for IPM and Technology Transfer**
 - Even though the ICAR has established the institutional mechanisms for technology management and transfer, these activities require professional inputs and a very different set of skills from those which the scientists of ICAR as a Research and Development (R&D) organization are expected to possess.
 - Agrinnovate India Limited¹⁹⁴ (AgIn) a registered company owned by the Government of India in DARE¹⁹⁵ has been established. It aims to work on the strengths of ICAR and promote the development and spread of R&D outcomes through IPR protection, commercialization and forging partnerships both in and outside the country for the public benefit.

¹⁹⁴ "Agrinnovate India Limited."
<http://www.agrinnovateindia.co.in/>.
Accessed 25 Jan. 2021.

¹⁹⁵ "Home | Department of Agricultural Research and Education" <http://dare.nic.in/>.
Accessed 25 Jan. 2021.

- **Open Access Policy**
 - The DKMA ¹⁹⁶ to function as nodal agency for implementation of the ICAR Open Access policy.
 - Each ICAR institute to set up an Open Access Institutional Repository.
 - All the meta-data and other information of the institutional repositories are copyrighted with the ICAR.
 - These are licensed for use, re-use and sharing for academic and research purposes. Commercial and other reuse requires written permission.
- **Data Use License**
 - ICAR Data use license covers – Terms & Conditions of Use of data, Indemnity and Exemptions
- **Quality Research Data Acquisition Guidelines**
 - Lays down guidelines on different ways to improve quality of research data
 - This would ensure collected research data can be validated, reused and results could be replicable in scientific research
- **Krishi ¹⁹⁷ – Knowledge based Resources Information Systems Hub for Innovations in agriculture**, is an initiative of Indian Council of Agricultural Research (ICAR) to bring its knowledge resources to all stakeholders at one place. The portal is being developed as a centralized data repository system of ICAR consisting of technology, data generated through experiments, surveys, and observational studies, geo-spatial data, publications, and Learning Resources.
- ICAR also conducts workshops around data management to review the progress made and discuss the way forward for implementation of

¹⁹⁶ "Directorate of Knowledge Management in Agriculture ... – ICAR." https://icar.org.in/content/directorate_of_knowledge_management_in_agriculture. Accessed 25 Jan. 2021.

¹⁹⁷ "icar-krishi." <https://krishi.icar.gov.in/>. Accessed 25 Jan. 2021.

ICAR Research Data Repository for Knowledge Management.] Click here ¹⁹⁸ to access the latest proceedings.

- A large number of data sets are available on Open Government Data Platform India (OGD)¹⁹⁹. It was felt that there is a need to integrate between KRISHI ²⁰⁰ Portal and OGD ²⁰¹platform. In this regard, a meeting may be organized with the team responsible for development of the OGD platform to harvest and sync open data available in two platforms.

¹⁹⁸."Proceedings of Third National Workshop of Officer ... – icar-krishi." 15 Mar. 2019, https://krishi.icar.gov.in/PDF/PROCEEDINGS_OF_THIRD_NATIONAL_WORKSHOP_OF_OFFICER_INCHARGE_Approved12022019.pdf. Accessed 25 Jan. 2021.

¹⁹⁹."Open Government Data (OGD) Platform, India | National ..." <https://www.nic.in/projects/open-government-data-ogd-platform-india/>. Accessed 25 Jan. 2021.

²⁰⁰."icar-krishi." <https://krishi.icar.gov.in/>. Accessed 25 Jan. 2021.

²⁰¹."Data Gov." <https://data.gov.in/>. Accessed 25 Jan. 2021.

Data Sharing Toolkit



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datasharingtoolkit.org

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