Empowering Decisions in
Food, Agriculture, and Land Use:

Scaling up a Collaborative, Resilient and Democratized Ecosystem

The
Food and Land Use
Coalition

India Country Platform

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Executive summary

Food and land use data are indispensable for addressing the challenges of climate change, which disrupt agriculture, threaten food security, and degrade natural resources. India's agriculture sector, comprising small and fragmented landholdings, faces vulnerabilities from climate variability and extreme weather events. Accurate, integrated, and accessible data on natural resources and agriculture are critical to inform policies, optimise resource use, enhance resilience, and achieve sustainable food systems. Such data enable stakeholders to implement precision agriculture, improve decision-making, and foster equitable growth. The availability and quality of data play a pivotal role in shaping strategies for sustainable land use and food security. In India, government bodies such as ISRO, SOI, IMD, and ICAR, along with private agritech firms and international organisations like FAO and NASA, constitute the core producers and providers of vital information. However, data reliability and consistency across these sources remain uneven. Geospatial data often lack sufficient field validation, and tabular formats do not fully capture spatial elements. Many data-gathering initiatives tend to be project-based, compromising long-term continuity when funding cycles end. The absence of robust institutional mechanisms to ensure sustained data collection further weakens the overall data infrastructure and makes it difficult to build upon past efforts effectively. Current gaps in data sharing affect a wide range of stakeholders, including policymakers, farmers, researchers, scientists, and local communities that rely on these datasets for climate research, agricultural planning, and monitoring.

The coexistence of incompatible formats such as tabular and geospatial—and the persistence of institutional silos undermine interoperability. Privacy concerns frequently limit open access, and user-friendly platforms that can simplify the data access process are scarce. As a result, the flow of information is restricted, and crucial insights fail to reach the people and institutions that need them most, impeding progress in the agricultural and environmental sectors. These challenges are further exacerbated by the impacts of climate change on food security and land use. With rainfall patterns becoming increasingly erratic and temperatures on the rise, staple crops are at risk of reduced yields and heightened pest pressures. These environmental stresses directly translate into economic pressures for farmers, who may face declining incomes in the face of unpredictable conditions, as well as for consumers, who encounter elevated food prices and reduced dietary options. Vulnerable populations are most severely affected, intensifying socio-economic disparities and highlighting the urgent need for strategic interventions. To address these mounting issues, real-time geospatial platforms and supportive policy measures have emerged as potential solutions.

Satellite remote sensing is best used to create a national framework for land use mapping and monitoring systems for producing consistent, timely and reliable Land Use and Land Change (LULC) data. Hence, there is need to institutionalise the development of LULC data, crop wise area and production statistics (multilevel) using satellite remote sensing-based nationwide data in very high granularity in regular interval. Machine learning and artificial intelligence algorithms have reduced processing time and increased accuracy levels. There is a need to reconcile the LULC statistics and reporting systems which will support sustainable development and planning policies.

Cloud-based systems can integrate data on soil health, pest risks, and weather patterns, equipping farmers and policymakers with timely, targeted insights that support precision

agriculture. Complementary policy reforms, such as the National Geospatial Policy 2022, can foster cross-sector collaboration and alignment, enabling the creation of centralised, interoperable data-sharing mechanisms. These frameworks should encourage multi-stakeholder engagement and reduce redundancy, enhancing the capacity of all parties to respond proactively to evolving agricultural and climate challenges. The present study highlights the challenges of providing farmers with reliable, necessary, and real-time data from data producers. Immediate priorities include enhancing data accessibility by building centralised platforms that assimilate both geospatial and tabular information for real-time analysis.

Standardising formats and establishing a unified national data repository will facilitate smoother data flows and better coordination among diverse entities. Addressing policy gaps is equally critical. Forming an inter-ministerial committee to oversee data governance can streamline procedures, set clear guidelines for data privacy and access, and reduce the institutional fragmentation that currently hinders effective policymaking. Public-private partnerships should be incentivised to establish and maintain robust geospatial platforms, aligning resources and expertise from different sectors for greater efficiency. Capacity building also requires attention at multiple levels. Skilled professionals, including scientists, analysts, and local extension agents, need training in advanced data analytics and geospatial technologies. Farmers similarly benefit from greater access to real-time advisory systems that can guide decisions on planting schedules, irrigation, and pest management. Investing in research and development will bolster these initiatives.

Developing drought-resistant crop varieties and encouraging the adoption of resource-efficient farming methods can build resilience against extreme weather, while innovation in precision agriculture can accelerate the transition to climate-resilient practices. Finally, fostering collaboration at both national and international scales can amplify the impact of these efforts. Strengthening partnerships for knowledge exchange and capacity development not only accelerates learning but also ensures that global and local data resources are harnessed efficiently to address region-specific challenges. By integrating findings from multiple sources, stakeholders can build comprehensive strategies that reflect both the nuances of local ecologies and broader trends in global food systems. Prioritising these actions will position India to transform its food systems, reinforce resilience, and establish sustainable land use practices capable of withstanding the varied challenges posed by climate change.