

UNLOCKING DATA SHARING IN AGRICULTURE

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List of abbreviations and acronyms

| | |
|---------|---|
| AWS | Automated Weather Station |
| B2B | Business to Business |
| B2F | Businesses to Farmers |
| CTA | Technical Centre for Agriculture and Rural Cooperation |
| DBMS | Database Management System |
| DIASCA | Digital Integration of Agricultural Supply Chains Alliance |
| EURAGRI | European Agricultural Research Initiative |
| GDPR | General Data Protection Regulation |
| GIIF | Global Index Insurance Facility |
| GODAN | The Global Open Data for Agriculture and Nutrition |
| GPS | Global Positioning System |
| ICAR | Indian Council of Agriculture Research |
| IFAD | International Fund for Agricultural Development |
| IoT | Internet of Things |
| ISEAL | International Social and Environmental Accreditation and Labelling Alliance |
| ISO | International Organization for Standardization |
| IP | Intellectual Property |
| LEI | Legal Entity Identifier |
| LMIC | Low and Medium Income Countries |
| NFP | Netherlands Food Partnership |
| NGO | Non-Governmental Organization |
| SHF | Smallholder Farmers |
| UID | Unique Identification |
| UNCDF | United Nations Capital Development Fund |



Glossary

Data Analytics: Data Analytics is the science of analyzing raw data to make conclusions about that information.¹

Data Classification: The organization of data based on its level of sensitivity and the impact should that data be used, shared, altered, or destroyed without authorization.²

Data Collector: A person or agency responsible for collection of data.

Data Custodian: An administrator responsible for the appropriate storage, transportation, and access of data as well as the technical environment and database structure.³

Data Governance: A system of policies, people, and processes for defining who within an organization has authority and control over data assets and how those data assets may be used and shared.⁴

Data Management: The practice of collecting, storing, and using data securely, efficiently, and cost effectively.⁵

Data Ownership: Assignment of formal accountability and legal ownership of data—a single piece or set of data. This comes with a list of owner rights and responsibilities.⁶

Data Processing: What you do with the data, including collecting, recording, storing, using, analysing, combining, archiving, deleting, publishing or sharing it.⁷

Data Receivers: Entities that receive farm data to design and develop customized solutions for farmers.

Data Security: Practice of protecting digital information from unauthorized access, corruption or theft throughout its entire lifecycle. It's a concept that encompasses every aspect of information security from the physical security of hardware and storage devices to administrative and access controls, as well as the logical security of software applications. It also includes organizational policies and procedures.⁸

Data Sharing in Agriculture: A scenario where two or more value chain actors (which could include smallholders) share data amongst themselves under a set of binding principles and agreements, allowing for a reduction in the quantum of data collected and a re-use/recycling of already collected data.⁹

Data Standards: Documented agreements on representation, format, definition, structuring, tagging, transmission, manipulation, use, and management of data.¹⁰

Data Steward: A role within an operation focused on high-level policies and procedures for the monitoring, security, and management of data use according to data governance rules related to access, accuracy, classification, and maintaining privacy.¹¹

Open Data: Data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike.¹²

1 [Investopedia](#)

2 [Farmer-Centric Data Governance: Towards a New Paradigm, USAID, 2022](#)

3 Ibid

4 Ibid

5 Ibid

6 Ibid

7 Ibid

8 [IBM](#)

9 Evolving definition

10 [United States Environmental Protection Agency](#)

11 Ibid.

12 [Open Data Handbook](#)



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Disclaimer: The views expressed in this report are of the authors and do not necessarily reflect the views of IDH and members of the Digital Ecosystems Coalition for Empowering Smallholder Farmers

For more information on this report or to learn more about our work in Data Sharing please reach out to borthakur@idhtrade.org or poulomi.mazumdar@intellecap.net



EXECUTIVE SUMMARY

Context setting

Digitized data can be a key enabler in addressing multiple challenges in agriculture with benefits for different stakeholders. To meet food security in times characterized by increasing impacts of climate change on agriculture and supply chain disruptions due to geopolitical tensions, data-driven solutions are being utilized increasingly to optimize the use of inputs, increasing production and productivity and improving access to finance while reducing uncertainties and risks. Given the importance of data in agriculture, there are reasons to believe that data sharing could offer significant potential for improving livelihoods of 570 million¹ smallholder farmers across the globe by enabling farmers' decision making, provision of services, economies of scale and reducing transaction costs by reducing information asymmetries.

In mid-2021 a group of organizations comprising IDH, International Fund for Agricultural Development (IFAD), ISEAL, Netherlands Food Partnership (NFP), Rabo Foundation, and Syngenta Foundation formed a coalition to generate and disseminate evidence on benefits of digitalization and data sharing on smallholder farming. The coalition, named the Digital Ecosystems Coalition for Empowering Smallholder Farmers, focused on the thesis that digital technologies and data sharing will be game changing in accelerating empowerment and transformation in the agricultural sector in low- and middle-income countries. In its efforts towards a more integrated data sharing ecosystem, the coalition undertook research to identify existing gaps and challenges in the ecosystem and develop a roadmap for resolving these challenges. To gather insights on existing data sharing initiatives, gaps and challenges, the coalition organized multiple workshops with stakeholders engaged

in agricultural data sharing to understand their use-cases. They also conducted a validation workshop for deliberating on the findings and recommending a way forward and a one-day virtual learning event.

The coalition was supported by Intellectap Advisory Services Private Limited in documenting the learnings from the use-case workshops, planning and implementation of the validation workshop and the learning event.

This report highlights some of these key learnings especially around (i) the current status of data sharing in agriculture, (ii) the bottlenecks in current data sharing practices; and (iii) pathways for collaboration among ecosystem players to unlock the potential of data sharing for transforming smallholder agriculture.

Status of data sharing in agriculture

Data-sharing in agriculture refers to a scenario where two or more value chain actors (which could include smallholder farmers) share data amongst themselves under a set of binding principles and agreements, allowing for a reduction in the quantum of data collected and a re-use/recycling of already collected data. By streamlining and reducing duplication of data, data sharing can potentially internalize leakages in resources used to manage agricultural data, the benefits from which can be transferred to smallholder farmers in the form of reduced costs of service delivery, or better designed services. Although data sharing has immense potential to transform agricultural systems, currently data sharing ecosystem is in its nascent stage due to the lack of availability of an enabling ecosystem that promotes data sharing among stakeholders and a limited understanding of its business and impact case.

¹ [Mind the gap: Enabling Data-Smart Agriculture for All](#), World Bank Blogs, The World Bank, April 10, 2023



Key findings (from research and use-cases)

Potential incentives for data sharing

Farmers, governments, private sector, donor agencies, foundations and research institutes are the key players in the data and data sharing ecosystem of agriculture. While farmers participate in data sharing to derive benefits from data-driven products/services, private sector players engage in the data sharing ecosystem to customize and improve product /service delivery for farmers and increase their outreach. Players such as governments and donors/foundations primarily use farm data and rely on data sharing for designing evidence-based policies/ programmes and identifying potential areas for impact in agriculture. Research institutions, which play a vital role in agriculture to develop and design public solutions, use data (often from open data platforms) to identify research areas, formulate hypothesis and conduct scientific research for designing solutions for farmers.

Data sharing could offer several incentives to these players. There are examples in which farmers gain access to multiple services by sharing data. These services include (i) crop and weather advisories; (ii) access to inputs, farm machinery, insurance and finance and; (iii) premium prices for high quality produce. Similarly, while, data-custodians earn commissions from service providers for sharing farm data, data receivers, such as financial institutions, input dealers and insurance service providers, gain access to key farm data for delivering customised services to farmers. Further, data sharing provides an opportunity for other service providers to devise end-to-end supply chain solutions and also improve existing services through larger pools of data available for analysis.

Building blocks of the data sharing ecosystem

The study further identifies five key building blocks of data sharing which includes data standards, data collection, data ownership and security, data governance, and open data, all of which are interdependent for their development. Key

findings for each of the building blocks have been highlighted below.

Data Standards

Although data standards are critical for ensuring reliability, reusability and interoperability of data, its usage is limited in the agriculture sector at present. Formats and structures for data collection, storage and management vary across different data sharing initiatives; thereby restricting data integration, interoperability, and reusability. Further, the study highlights the lack of a unique identifier for farmers or land as a key challenge that limits data sharing in agriculture.

Data Collection

Data collection in agriculture occurs primarily through three methods– (i) people facilitated; (ii) mobile based; and (iii) using remote sensing technologies. Even with the increasing use of technology for data collection, people facilitated methods are preferred due to low digital literacy and the capacity of farmers to use digital technologies and share their data using it. Further, there is limited collaboration amongst service providers while collecting similar data sets leading to duplication of efforts. There is also a prevalence of multiple approaches, definitions of data, and methodologies for data collection. Consequently, this affects farm data quality and leads to higher costs of data acquisition.

Data Ownership and Security

Data sharing is facilitated by bi-partite or tripartite contracts. Although the majority of data custodians and receivers obtain consent from farmers, most farmers lack clarity on the purpose of data sharing. Further, the entities that collect and use farm data have greater control over data compared to farmers. This is on account of low digital integration of farmers due to unavailability of a unified platform or support from external parties. Furthermore, limited understanding of farmers on legal aspects and lack of availability of resources to access legal support leaves them vulnerable.

The study highlights that the ecosystem players lack clarity on legal constructs of data sharing as data security and privacy laws vary from



country to country. Although General Data Protection Regulation (GDPR) provides guidance on developing frameworks for data security and privacy, there remains ambiguity on its application in agriculture.

Data Governance

Although there are certain guidelines on data sharing, there is a lack of comprehensive policy and regulatory framework for data sharing. Further, the existing policies and guidelines lack dynamism to match the rate of technology proliferation. In addition to this, the data sharing ecosystem in agriculture has overlooked the role of farmers, who remain central to the data sharing ecosystem in agriculture, making this ecosystem less participatory.

Open Data

The role of governments is predominant as a custodian of open data systems globally. Further, while there is an increasing discourse on open data in agriculture, it is still limited to very few robust open data platforms. Interactions with service providers highlighted that only a few leveraged open data sources and they mostly relied on data collected from farmers.

Challenges in the data sharing ecosystem

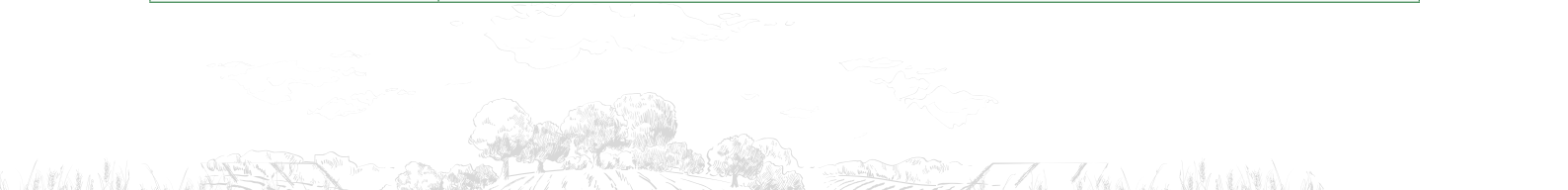
The data sharing ecosystem in agriculture has several challenges that deter it from scaling. The key challenges in the data sharing ecosystem of

agriculture include: (i) absence of comprehensive and dynamic policies and regulations to manage and mitigate risks; (ii) limited understanding on the motivation and incentives for different ecosystem players to participate; (iii) limited collaboration among ecosystem players for developing data standards; (iv) lack of capacities of stakeholders to improve quality and reliability of data; (v) lack of capacity and understanding amongst farmers to share data using technology; (vi) lack of common methodologies and guidelines for data collection; (vii) high cost of data collection and acquisition; (viii) lack of understanding among data collectors on the purpose of data collection affecting the quality of data; (ix) absence of a user centric approach in data sharing; (x) lack of digital public infrastructure for data exchanges; (xi) lack of a business case for open-data systems; and (xii) lack of evidence on the business and impact case of data sharing.

Way forward

To address the existing challenges, there is a need for more concerted efforts from all stakeholders in the data sharing ecosystem in agriculture. Some of the key recommendations to address the persistent challenges include

| | |
|---------------------------|--|
| Data Standard | <ul style="list-style-type: none"> Standardizing meta data structure and data dictionary for common use across the agriculture sector to promote interoperability Mitigating multiplicity of IDs and duplication in data collected by diverse agencies |
| Data Collection | <ul style="list-style-type: none"> Standardizing methodologies for data collection to improve quality and reliability of data Strengthening capacities of data collectors to improve quality of data |
| Data Ownership & Security | <ul style="list-style-type: none"> Ensuring data privacy and security to mitigate misuse of farm data Reducing complexities around data-sharing agreements for ease in negotiation and understanding of farmers |
| Data Governance | <ul style="list-style-type: none"> Ensuring interoperability across policy and regulatory frameworks Ensuring meaningful participation of farmers in data governance structures |
| Open Data | <ul style="list-style-type: none"> Improving ease in identifying and accessing data that is already available at the ecosystem Reducing high costs of data acquisition by promoting the development and use of open-data systems |





CHAPTER 1

**ABOUT THE
STUDY**

Introduction to the digital ecosystems coalition for empowering smallholder farmers

In mid-2021 a group of organizations comprising IDH, International Fund for Agricultural Development (IFAD), ISEAL, Netherlands Food Partnership (NFP), Rabo Foundation, and Syngenta Foundation formed a coalition to generate and disseminate evidence on benefits of digitalization for smallholder agriculture and food security. The coalition was based on the thesis that digital technologies would be game changing in accelerating empowerment and transformation in the agricultural sector in low- and middle-income countries.

Through this work, the coalition recognized data sharing as a pivotal driver for bringing systemic changes in digital transformation

of agriculture and food systems. It is based on the hypothesis that in order to achieve comprehensive digital transformation in agriculture, it is imperative to establish a robust data-sharing ecosystem that ultimately empowers smallholder farmers by providing them access to a wider array of services at affordable costs. The development of such an ecosystem requires collaborative efforts among service providers and formulation of viable business cases for data sharing among stakeholders. By fostering collaboration and establishing compelling incentives, the coalition aims to foster a thriving data-sharing ecosystem that brings mutual benefits to involved parties.

This report was commissioned to identify key action points for promoting data-sharing in agriculture and build a discourse around the topic. It followed a four step approach.

Figure_1: Four Step Action Approach



Objectives of the report

The report highlights:

1. Current status of data sharing in agriculture;
2. Key building blocks required to develop a robust data sharing ecosystem; and
3. Recommendations to scale data sharing in agriculture.

Chapter plan

The report has been divided into five sections (illustrated below), including this section.

Figure_2 : Chapter Plan





CHAPTER 2

**UNDERSTANDING
THE DATA
SHARING
ECOSYSTEM IN
AGRICULTURE**

Setting the context

Digitized data can be a key enabler in addressing multiple challenges in agriculture. For farmers, data can strengthen their capacity to adopt improved agronomic practices, reduce the cost of cultivation, improve productivity, and reduce vulnerabilities. Data can further support inputs and service providers (private sector) in expanding their outreach and establishing deeper engagements with farmers through improved operational efficiencies and customised product/service offerings. For governments and other development sector stakeholders, data has the potential to enhance the evidence base for programme and policy design and ensure efficient service delivery, leading to equitable and stronger agriculture and food systems. With increasing impacts of climate change on agriculture and supply chain disruptions due to geopolitical tensions, data-driven solutions are

livelihoods of 570 million¹ smallholder farmers across the globe by enabling farmers’ decision making, provision of services, economies of scale and reducing transaction costs by reducing information asymmetries. Provisions of these data-driven services are primarily dependent on the aggregation of data. Hence, data sharing in agriculture could potentially benefit service providers by reducing the costs of service delivery by reducing duplication of data collection efforts. Further, the availability of aggregated data for better predictive models would enable more farmer centric solutions and reduce cost of innovation.

In this chapter, we have highlighted the existing status of data sharing in agriculture through a literature review of over 21 initiatives focussing on geographies such as Africa (Ethiopia, Kenya Ghana amongst others), Asia (India, Korea, Japan and others) and Europe (France and others)

Figure_3 : Institutions/Platforms Covered in Secondary Research



being utilized increasingly to optimize the use of inputs, increasing production and productivity and improving access to finance while reducing the uncertainties and risks associated with it. The use of smartphones, remote-sensing and other data-driven services has been enabling smallholders’ access to information, inputs, credit and markets across the globe.

Given the importance of data, there are reasons to believe that data sharing in agriculture can offer significant potential for improving

Players in the Ecosystem

The key players in the data sharing ecosystem in agriculture include farmers, governments, private sector (that engages with smallholder farmers), donor agencies, foundations and research institutes that collect, aggregate and analyse agriculture and food systems data. The key players and their roles within the data sharing ecosystem have been highlighted below:

- **Farmers:** Farmers remain central to the data sharing ecosystem. They are likely to engage

1 [Mind the gap: Enabling Data-Smart Agriculture for All](#), World Bank Blogs, The World Bank, April 10, 2023

in the data-sharing space to derive benefits from data-driven products/services created using their farm data. Some of the ways in which farmers benefit from data sharing include improved decision-making, access to market information, enhanced crop management and mitigation of risks from weather related events. Across countries like India, several Farmer Producer Organizations (FPOs) engage in data collection, processing and management on behalf of organizations that provide them data-driven products/ services.

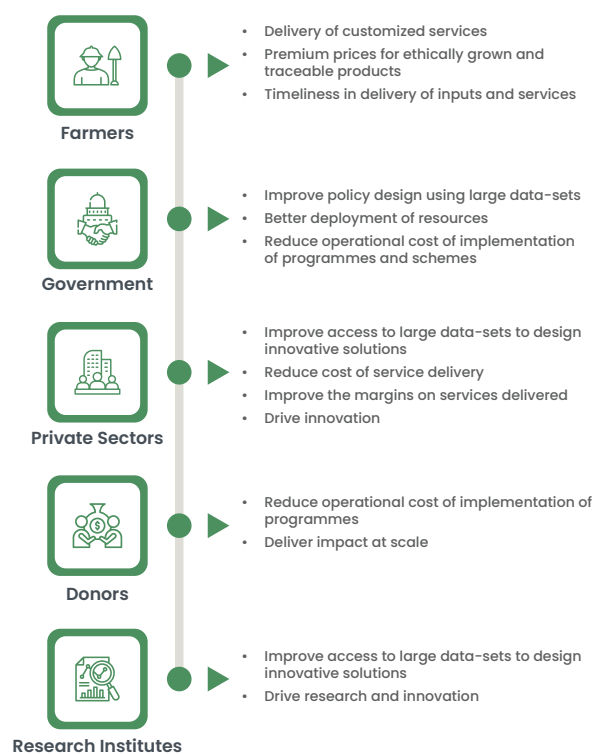
- Governments:** Governments engage in collecting and utilizing data with the primary focus on informed policy-making and optimizing resource management in agriculture. Using farm data, governments gather insights on key trends and challenges in agriculture to design policies for targeted population. Further, data is also leveraged for understanding the impact of existing policies and regulations on farmers and making course corrections to improve the efficiency of programme delivery.
- Private Sector:** Private sector players include agri-businesses, equipment manufacturers, and technology providers who collect and receive farm data. Private sector players gather data from various sources on aspects such as area of cultivation, crops grown, varieties grown, crop cycle, quantity produced, crop management practices amongst others. The data is collected through sensors, satellites, drones and farm-based equipment or directly from the farmers. Techniques such as machine learning and artificial intelligence are deployed for data analysis and deriving insights. The data is used for optimizing their supply chain and product /service delivery customisation and improvement.
- Donors/Foundation:** Data enables donors and foundations in evidence-based decision making, identifying potential areas of impact, assessing the viability of programmes and return on investments, and identifying potential risks in programme implementation.

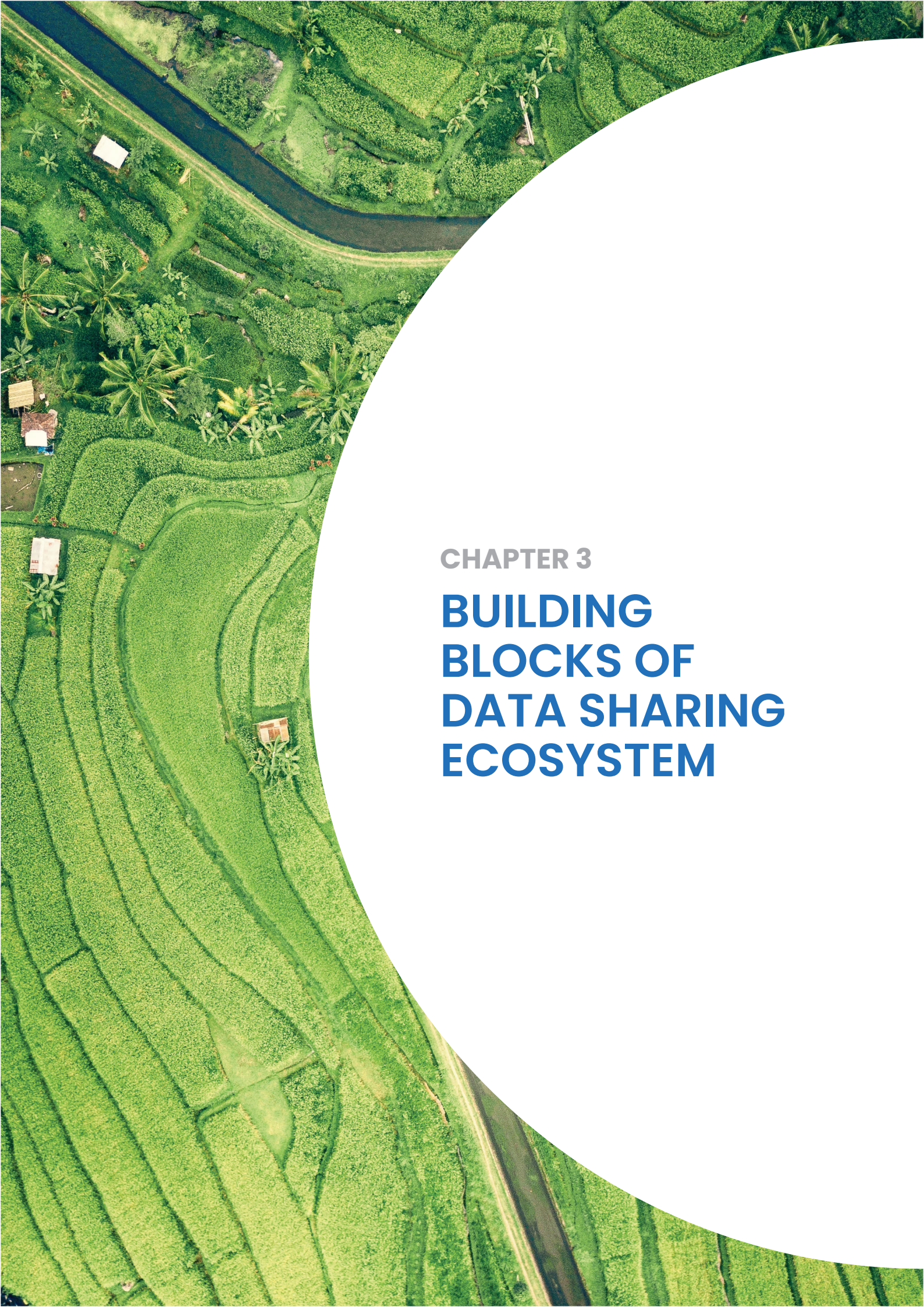
- Research Institutions:** Research institutions engage in collecting and utilizing farm data to generate advance agriculture knowledge and develop innovative solutions. Using farm data, research institutions such as Indian Council of Agriculture Research (ICAR), European Agricultural Research Initiative (EURAGRI), and others identify research areas, formulate hypothesis, and conduct scientific research to design solutions that can address the challenges in agriculture. Further, research institutes leverage and analyse farm data to design targeted solutions for optimizing use of inputs, developing crop improvement and breeding programmes, and developing improved agronomic practices.

Potential incentives for data sharing

Data sharing in agriculture has the potential to offer incentives for all players in the ecosystem. The potential incentives for data sharing for each player have been illustrated in the figure below:

Figure_4 : Potential Incentives for Data Sharing for Ecosystem Players





CHAPTER 3

**BUILDING
BLOCKS OF
DATA SHARING
ECOSYSTEM**

The research team identified 5 key building blocks of the data sharing ecosystem (illustrated in Figure 5). These blocks are interdependent and

include data standards, data collection, data ownership and security, data governance, and open data.

Figure_5 : Building Blocks of Data Sharing Ecosystem



Data standards

Data standards are a set of agreed-upon conventions, formats, and structures that facilitate efficient sharing of agricultural data among different stakeholders. Data standards are critical building blocks for ensuring reliability, reusability, interoperability of data, and its integration across systems and applications.

Importance of data standards

Adherence to data standards is crucial for effective data management and exchange. The importance of data standards for data sharing has been elaborated below:

Improves quality and reliability of data

The usage of standardized formats for data collection, storage, and management and structures for data management enables service providers to ensure that data meets quality criteria such as accuracy, completeness, and consistency. Further, having standardized formats and structures facilitates identification and rectification of errors prior to sharing of data and ensures trust amongst stakeholders.

Enables interoperability and integration of data

The use of data standards enables interoperability and integration of data from various sources, systems, platforms and applications. Data standards facilitate efficient data integration by providing guidelines and formats for organizing and presenting data in a consistent manner, making it easier to combine data from multiple

sources such as weather stations, soil databases, satellite imagery and farm management systems. Integration of data enables generating detailed insights and comprehensive analyses on aspects related to agricultural practices, crop productivity, and agriculture input and production management.

Facilitate information exchange among stakeholders

Data standards facilitate the exchange of information and knowledge amongst key stakeholders by ensuring interoperability and integration of data from diverse sources and systems. As a result of the enhanced exchange of information and knowledge, the opportunities for collaboration improve, and synergies between ecosystem players are established which allow them to collectively address challenges in agriculture.

Current status

Currently, the usage of data standards is limited within the agriculture sector. Since service providers in agriculture independently implement their initiatives, there exist multiple, methodologies, registries, and formats for data collection and sharing. The prevalence of multiple registries and diverse meta-data templates across initiatives limits data integration and its reusability. While collection and sharing of transaction and productivity related data points have been standardized to an extent, there is limited evidence on the standardisation of data points at a sectoral level.

Various global initiatives have focused on establishing data standards for data sharing in agriculture. For instance, the [Digital Integration of Agricultural Supply Chains Alliance \(DIASCA\)](#), has been focused on developing digital standards for product traceability along supply chains to improve the interoperability of data and facilitate information exchange within supply chains. Further, the [Commonwealth Agricultural Bureau](#) (CABI) collaborated with the [Open Data Institute](#) (ODI) to launch a Data Sharing Toolkit for improving access to information on soil health, agronomy, and fertilizers in Sub-Saharan Africa

and South Asia. As part of the collaboration, CABI developed a metadata template that would serve as a guide for grantees to facilitate data sharing. The template follows Findable, Accessible, Interoperable, and Reusable (FAIR) principles. The template provides guidance for standardizing data collection and management.¹ Further, it provides guidance on defining a common identifier, establishing usage rights and restrictions and metadata that could be used for describing data points, thereby establishing a base for good data sharing practices.

¹ Module 7, How to Create Data Inventory, Checklist, 2021, <https://www.datasharingtoolkit.org/wp-content/uploads/2021/03/CA-BI-Mod7-3-01-Checklist.pdf>





Challenges

Lack of a common identifier

Identifiers are important components of data standards that help in classifying and referencing data points. At present, different initiatives have been using different identifiers. The lack of a common identifier is a prominent challenge since it limits interoperability and exchange of data. In India, Aadhar is primarily used as a proof of identity. It is a 12-digit individual identification number issued by the Unique Identification Authority of India. Having Aadhar as a common identifier in India enables the National and State Governments to provide subsidies, financial assistance, and other services in a targeted and cost effective manner using the unique identification number. There are examples from other countries where service providers use mobile numbers as the common identifier.

Cost and complexity of processes

There exists limited awareness of FAIR principles, data standard frameworks, and willingness among stakeholders to adopt data standards. Lack of willingness is also triggered by the perception where cost of adoption outweighs the benefits of standardization.

Conflicting interests, preferences, or requirements among different ecosystem players

Different players in the data sharing ecosystem have different interests, preferences, or requirements for data sharing, hence, the development and implementation of data standards frameworks require consensus of different players. Since there are no collaborative platforms that bring all ecosystem players together, there remain challenges in developing common standards and frameworks.

Key aspects of discourse for promoting data standards

Some of the key aspects of discourse to address the challenges highlighted above are:

- Developing a unique identifier for standardization and interoperability of data;
- Sensitizing stakeholders on the benefits of adoption of data standards and building their capacity to develop and ensure adherence to standards;
- Developing a governance and policy framework for developing data standards for adoption and wider usage and
- Fostering greater collaboration amongst stakeholders for developing sectoral data standards frameworks.

Data collection

Data collection refers to the process of gathering and recording relevant data and information pertaining to various aspects of agricultural activities. Data collection in agriculture involves gathering information on aspects including but not limited to (i) land use and productivity; (ii) value chain specific data; (iii) market and prices data; (iv) hydrological data; (v) soil data; and (vi) disease and pest management. There are primarily three methods of data collection – (i) people facilitated; (ii) mobile based; and (iii) using remote sensing technologies. The preference of method(s) and approaches for data collection is based on the purpose, scale, and availability of resources.

Importance of data collection

Data collection holds immense potential for informing decision making, improving production, and farm incomes, and promoting sustainable practices. Having common approaches for data collection can increase the efficiency of data sharing initiatives. It ensures that when data is shared, quality is maintained, and the resultant analyses drawing from the aggregated data is accurate. In service coalitions (a group of

complementary organizations working together to serve smallholder farmers), co-investment in data collection can optimize data collection costs amongst coalition members.

The importance of data collection is highlighted below:

Enables delivery of customized services for farmers

Data collection enables availability of key data-sets required to design and customize of products/ services based on farmers need. Quality of data is a key enabler in efficient designing of services and subsequent sharing of data.

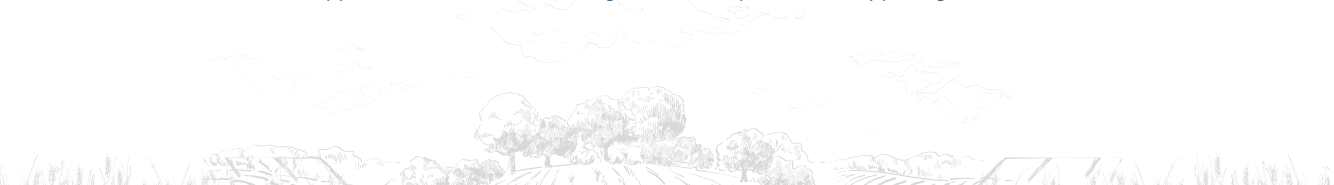
Informs decision making

Since data collection facilitates provision of various data driven services to farmers, it enables them to make informed farm management related decisions. Further, governments use data as a tool to make informed decisions regarding policies and regulations for agriculture. For instance, GeoFarmer—an interactive application is being used across East and West Africa and Latin America for real time monitoring of agriculture projects. This application has enabled farmers to make informed decisions about their crops and improved farm management practices.

Enables monitoring and early detection

Data collection using digital and smart devices such as sensors, cameras, satellite, drones, and Global Positioning System (GPS) facilitate monitoring and early detection of diseases and pests in agriculture. Data collection on variety of crops grown, diseases and pest incidences, and others related aspects enable tracking and identifying potential issues at an early stage and timely actions to mitigate risks in agriculture. International Institute for Semi-Arid Tropics (ICRISAT) has been maintaining a database of pest and disease images of 30 crops¹ in India. Using this data, ICRISAT has been able to guide farmers on best practices for reducing pest and disease occurrences.

1 [Mobile App for Pest and Disease Management of Crops](#), ICRISAT Happenings Newsletter



Enables research and innovations

Use of innovative technologies is crucial to improve farm management practices and farm production and productivity. Hence, data collection becomes an important tool for agricultural research institutes that undertake development of new and innovative technologies in agriculture.

Current status




Literature review provides evidence on adoption of digital technologies such as sensors, drones, satellite imagery, and mobile applications for data collection by various private players. Data collection using digital technologies mainly occur through two approaches that (i) involve greater participation of farmers; and (ii) rely on digital technologies such as sensors, drones, satellite imagery and Automated Weather Stations purely. The example of initiatives where there is a greater engagement of farmers includes that of Fairfood. Fairfood deploys a mobile-based application to collect data points on basic profile of farmers, the quantities of agriculture commodity sold and prices received by them. While the basic profile is fed by an intermediary, farmers use the mobile-based applications to update information on quantities of agriculture commodity sold and prices received. Whereas, service providers such as Skymet collect weather-based data using technologies such as satellites, drones and Automated Weather Stations (AWS) for providing weather forecast, other forecast solutions and risk monitoring services in agriculture. Although, the adoption of technologies has increased for

data collection, service providers still depend on people facilitated data collection methods. This is mainly due to low digital literacy and capacity of smallholders to use and share their data using digital technologies. Reliance on traditional methods increases the cost of data collection. Further, a large number of service providers leverage government data platforms to a small extent for procuring contextual data. As a result, the total cost of data acquisition remains high for service providers

Even with increased collaboration amongst service providers, data collection is largely being taken up in siloes. Service providers depend on their network agencies or foundations to collect data. As a result, there exist multiplicities in methodologies, approaches and formats used by different service providers for data collection. Further, majority of NGOs or data collection agencies face bandwidth constraints and rely on simple data collection tools. This is mainly because these NGOs and data collection agencies have limited access to finance and lack capacity to understand and adopt diverse data collection methodologies.

The literature review also highlights how relevant data collection has enhanced engagement between the farmers and service providers across the value chain, helped private players better understand the needs of farmers and ensure responsive product/service delivery. Some of the on-going initiatives that are adopting innovative methods of data collection are highlighted in Figure 6 below:

Figure_6 : On-going Initiatives with Innovative Data Collection Methods

| Service provider | Type of data collected | Data collection method | Services enabled |
|---|---|--|--|
|  | Weather-based data | Satellites; Drones; AWS lightning sensors; People facilita | Weather and crop advisory; Access to Insurance |
|  | Basic data of farmer, quantity sold, prices received by farmers | People facilitated app | Traceability in supply chains |
|  | Carbon emission | Satellite imagery; App based data collection | Carbon emission reduction |



Challenges

Lack of common methodologies and guidelines for data collection

The ecosystem currently witnesses limited adoption of consistent methodologies, measurement units and guidelines for data collection, thereby leading to inconsistencies, errors, and gaps in data.

Lack of capacity of data collectors

Currently, data collectors lack the necessary skills and expertise to gather precise and dependable data. Further, their understanding of the purpose of data collection is limited, leading to inaccuracies and inconsistencies in the data. Additionally, the significance of gender-related data is often disregarded during data collection. This is driven by lack of understanding on how gender disaggregated data can enhance the relevance and effectiveness of programmes.

High cost of data collection

Since data collection is largely happening in siloes, service providers utilize their own network of agents for large scale data collections. As a result, cost of data collection remains extremely high.

Key aspects of discourse for promoting data collection

Some of the key aspects for discourse to address the existing challenges and promoting the building block include:

- Enabling wider usage of digital methods for data collection to reduce cost and errors;
- Developing standard guidelines and methodologies for ensuring consistency and accuracy in data collection;
- Building capacity of data collectors through training programmes for developing their understanding on processes and purpose for data collection;
- Facilitating co-investment in data collection activities reduce the efforts and costs of data collection.

Data ownership and security

Data ownership refers to legal rights and control over agricultural data and defined processes for recognising the entity who owns the data, data sharing and conditions for access and utilization of data. Data security refers to the 'practice of protecting digital information from unauthorized access, corruption or theft throughout its entire lifecycle'.¹

With increasing proliferation of data-driven services and technologies in agriculture, it is estimated that by 2050, 4 million² data points will be generated on an average farm per day. This increased proliferation would require greater efforts from the ecosystem players in defining and establishing the processes/mechanisms to ascertain the ownership and data protection during data collection, usage and sharing.

Importance of data ownership and security

The importance of data ownership and security is highlighted below.

Safeguarding farmers' rights, access and control on farm data

Data ownership and security plays a critical role in safeguarding interests of smallholders. Greater control and agency of farmers over their data ensures their active participation in data sharing; thereby leading to improved quality of farm data. Besides this, data ownership by farmers improves their negotiation power and enables them in accessing customized services. Further, data security measures enable protection of farm data against unauthorized access, misuse and theft.

Protection of intellectual property

Although farm data has not been classified as Intellectual Property (IP), the data generates IP by enabling data-driven services.³ Data ownership and security enables intellectual property protection through recognition and incentivizing creativity and ingenuity of service providers through exclusive rights. The intellectual property protection also motivates service providers to invest in research and development, thereby driving innovation in the agriculture sector.

Current status

Data sharing in agriculture largely happens through bi-partite or multi-party contracts and consent from farmers for using their data. Furthermore, the control and ownership of data lies with the entity that collects and uses data with limited efforts to inform the farmers on the purpose of data collection. Lack of transparency

1 [Why is Data Security Important?](#), IBM (accessed on June 23, 2023)

2 [On-Farm Data Security: Practical Recommendations for Securing Farm Data](#), Frontiers, June 21, 2022

3 [Farmer-Centric Data Governance: Towards a New Paradigm](#), USAID, Bill & Melinda Gates Foundation, DAI, Development Gateway, Athena Infonomics, 2022

about the value of generated data coupled with limited understanding on legal aspects and availability of resources to access legal support has limited the realization of data sharing benefits for the farmers.

Presently, there is a lack of availability of regulatory framework on data security and limited adoption of security measures. Further, the data security and privacy laws vary from country to country. There is limited clarity among ecosystem players on legal constructs of data sharing especially when the country for data origin and usage are different. Increased usage of the Internet of Things (IoT) and remote sensing technologies for data collection has further aggravated security related concerns.

The European Union's GDPR is considered as one of the toughest privacy and security laws and has set precedence for countries developing frameworks around data security and privacy. The GDPR 'imposes obligations onto organizations anywhere, as long as they target or collect data related to people in the EU'.¹ However, there remains ambiguity on its application in data sharing in agriculture.

Blockchain technologies that encrypt data and disable its manipulation and misuse have emerged as a critical technology for ensuring privacy and user control. There are examples of service providers, such as TraceX² in India, that are harnessing the potential of blockchain technology to digitize end to end processes in agriculture value chains thereby driving transparency.

1 [What is GDPR, the EU's new data protection law?](#), GDPR.EU (accessed on June 23, 2023)

2 TraceX is a blockchain-powered food traceability platform working towards building Climate Resilient Sustainable supply chains for the future.



Challenges

Lack of regulatory frameworks on contracts regarding data ownership

Although data sharing in agriculture occurs through contracts, there is a lack of availability of frameworks or guidance on contracts and legal rights for data ownership in agriculture. Once data is shared by farmers, they have limited control and access over the data shared by them. Further, data security and privacy laws vary from country to country leading to concerns of misuse and unauthorized access of data.

Lack of a collaborative platform

Since a large number of data-services providers in LMICs are foreign owned, there exists a trust deficit between farmers and service providers. While farm data is used by service providers for designing services for farm use, farmers are often excluded in the design phase. As a result, farmers lack understanding regarding the purpose of data sharing. Further, there are no intermediary organizations or platforms between farmers and service providers that facilitate negotiations, create their awareness, and build trust among them.



Key aspects of discourse for promoting data ownership and security

Some of the key aspects for discourse to address the existing challenges and promoting the building block include:

- Developing legal and policy frameworks around data sharing and security to safeguard stakeholders' rights and data from misuse;
- Designing and implementing awareness campaigns for farmers around informed consent;
- Engaging data stewards as a third party between farmers and service providers for building trust amongst stakeholders; and
- Promoting use of technologies and smart contracts for data sharing that provide automatic governance rights to stakeholders to enhance data security.

Data governance

Data governance refers to 'diverse arrangements, including technical, policy, regulatory or institutional provisions, that affect data and their cycle (creation, collection, storage, use, protection, access, sharing and deletion) across policy domains and organisational and national borders.'¹ Data governance frameworks are critical for establishing guidelines on data collection to sharing. The proliferation of data-driven services in agriculture has made the role of data governance crucial. Establishing a data governance mechanism for agriculture would trigger efforts towards developing frameworks around data ownership, and security and ensure transparency in data sharing.

Importance of data governance

The critical role of data governance in enabling the data sharing ecosystem has been highlighted below:

Enabling the data sharing ecosystem

Data governance frameworks enable governments to establish principles, policies, and rules for data management and sharing. It is a critical tool for governments to monitor the data sharing ecosystem and accommodate interests of diverse stakeholders.

Safeguarding the interests of stakeholders

Since data governance frameworks define roles, responsibilities, and incentives of different players in the data sharing ecosystem within agriculture, it benefits all stakeholders. Such frameworks enable creation of mechanisms that strengthen farmers' rights by creating legal frameworks on data sharing agreements. It also benefits service providers through increased data sharing opportunities.

Current status

At present, the data sharing space is restrictive and fragmented with limited control and ownership of farmers over their data.² Although the data sharing ecosystem is governed by certain ground rules and policies, the existing policies are not comprehensive and lack dynamism to match the pace of the ever-evolving data sharing ecosystem at present. To cater to the interests and preferences of diverse stakeholders, there exist multiple policies and guidelines for different domains of data; different domain being (i) personal domain which relates to identified or identifiable individual; (ii) private domain which covers proprietary data and (iii)

1 [Why Data Governance Matters](#), Organization for Economic Cooperation and Development (accessed on June 24, 2023)

2 [Farmer-Centric Data Governance: Towards a New Paradigm](#), USAID, Bill & Melinda Gates Foundation, DAI, Development Gateway, Athena Infonomics, 2022



public domain that includes data not covered under Intellectual Property Rights (IPRs).¹

With the growing use of technologies and data-driven services, the volume of data generated and shared has been increasing. The expanding data

sharing ecosystem along with the presence of multiple parties has led to both risks and benefits. At present, the existing policies and guidelines on data sharing lack dynamism to manage and mitigate these risks while leveraging its benefits.

¹ [Going Digital Guide to Data Governance Policy Making](#), Organization for Economic Cooperation and Development (accessed on June 24, 2023)





Challenges

Absence of a user centric approach in data sharing

The purpose and approaches of data sharing vary across players and programmes leading to trade-offs between incentivizing and empowering farmers and affecting farmers' interest. Furthermore, there is limited adoption of a participatory approach that includes farmers in designing and implementing data sharing initiatives.

Lack of capacity and understanding of the risks and benefits of data governance

Although governments across the globe have defined certain ground rules for data sharing through policies and regulations, there exists multiplicity in policies and regulations to cater to the interests of various stakeholders and different domains of data. The limited technical capacity of policymakers to design a comprehensive policy that covers all aspects of data sharing is one of the prominent hurdles in designing a data governance framework. Further, the absence of a risk and benefit sharing mechanism limits collaboration amongst different ecosystem players. Risk sharing mechanisms define the compensation and penalties for parties entering the agreements in the event of misuse of data.

Lack of a collaborative platform

Collaboration among different stakeholders, including government agencies, research institutions, and private sector players, is necessary to establish effective data governance models. Presently, a collaborative platform that brings together different ecosystem players is absent.

Key aspects of discourse for promoting data governance

Some of the key aspects for discourse to address the existing challenges and promoting the building block include:

- Promoting participative designing of data systems, that include farmers, to enhance farmers' understanding on the purpose of data sharing;
- Enabling governments to develop frameworks and policies for data governance by incorporating local contexts; and
- Establishing a collaborative platform for ecosystem players to participate and deliberate for developing data governance frameworks.

Open data

Open data refers to data-sets that can be accessed, used, and re-distributed. Open data often includes weather data, data on seed genetics, data on environmental conditions, and soil data. Broadly, there are two types of open data – (i) raw data sets obtained from government sources and (ii) data sets collected by the private sector and shared on open data platforms. Combined usage of both types of data sets by service providers enables effective provisioning of services.

Importance of open data

Open data is an important building block that enables wider data sharing by promoting transparency and collaboration, within the agricultural community. The importance of open data has been highlighted below:

Enables decision making

Open data enables efficient and effective decision-making at multiple levels. Governments and regulatory bodies utilize open data to develop evidence-based policies, monitor agricultural systems, and evaluate the impact of interventions.

Promotes accountability and transparency

Open data promotes accountability and transparency by allowing ease in monitoring and assessing the performance of agricultural systems, enabling effective tracking of interventions, and holding organizations or institutions accountable for their actions

Reduces costs of data acquisition

Open data could be leveraged by service providers for acquiring contextual data sets. Further, it could enable service providers to develop applications, tools, and services that address specific challenges at reduced costs.

Current status

Although open data offers immense potential for resolving key challenges in agriculture, presently there is limited discourse on leveraging it for provisioning data-driven services. [The Global Open Data for Agriculture and Nutrition](#) (GODAN) initiative focuses on promoting development of policies for open data across organizations and countries. Through its work, GODAN has built a network of partners that includes national governments, donors, non-governmental institutions, and private sector organisations and supported several open data initiatives. Furthermore, GODAN and its have been engaged in developing FAIR guidelines for open data across three countries.

At present, governments are key stakeholders that act as a custodian of open data systems globally. One of the prominent examples of open data initiative includes the [Agri Stack](#), a digital foundation set up by the Government of India (GoI) that brings together different stakeholders in the agriculture ecosystem. It is being developed to enable easier access to affordable credit, high quality farm inputs, advisories, and market information for farmers. The Government of Japan's open data initiative, [WAGRI](#), has been building the "Agricultural Data Collaboration Platform" for bringing together ecosystem players at a unified platform for updating, using, and sharing agriculture data.

Since governments are the key players in the agriculture ecosystem, the data- collected by them on aspects such as soil profiles, irrigated area, daily rainfall, elevation, forest cover, and financial data amongst others is available on

open data platforms. These data points are used by governments for designing policies and service delivery in a targeted manner. Leveraging of open data by private sector players is currently limited.





Challenges

Lack of digital public infrastructure

Access to internet and digital public infrastructures are prerequisites in developing open data systems. Limited internet access, connectivity gaps, and inadequate technological infrastructure, especially in emerging economies, pose challenges for accessing and using open data.

Heterogeneity in schema/format of data

Integrating and harmonizing large data sets from diverse sources, formats, and systems pose significant challenges in establishing open data systems. Data from different sources vary in terms of accuracy, completeness, and consistency. The lack of standardized data formats, metadata, and data validation processes hinders data interoperability and usability.

Lack of a business case

Although data points may be perceived as cheap, the costs of collecting and integrating data sets are often overlooked. Further, the perception of open data being 'free' acts as a barrier in establishing its business case. While certain data points remain free to be accessed, the availability and accessibility of other data points depend on the business models of the data providers. As the business case for open data is yet to be established, there is lack of sustainable funding mechanisms to support its development.

Key aspects of discourse for promoting open data

Some of the key aspects for discourse to address the existing challenges and promoting the building block include:

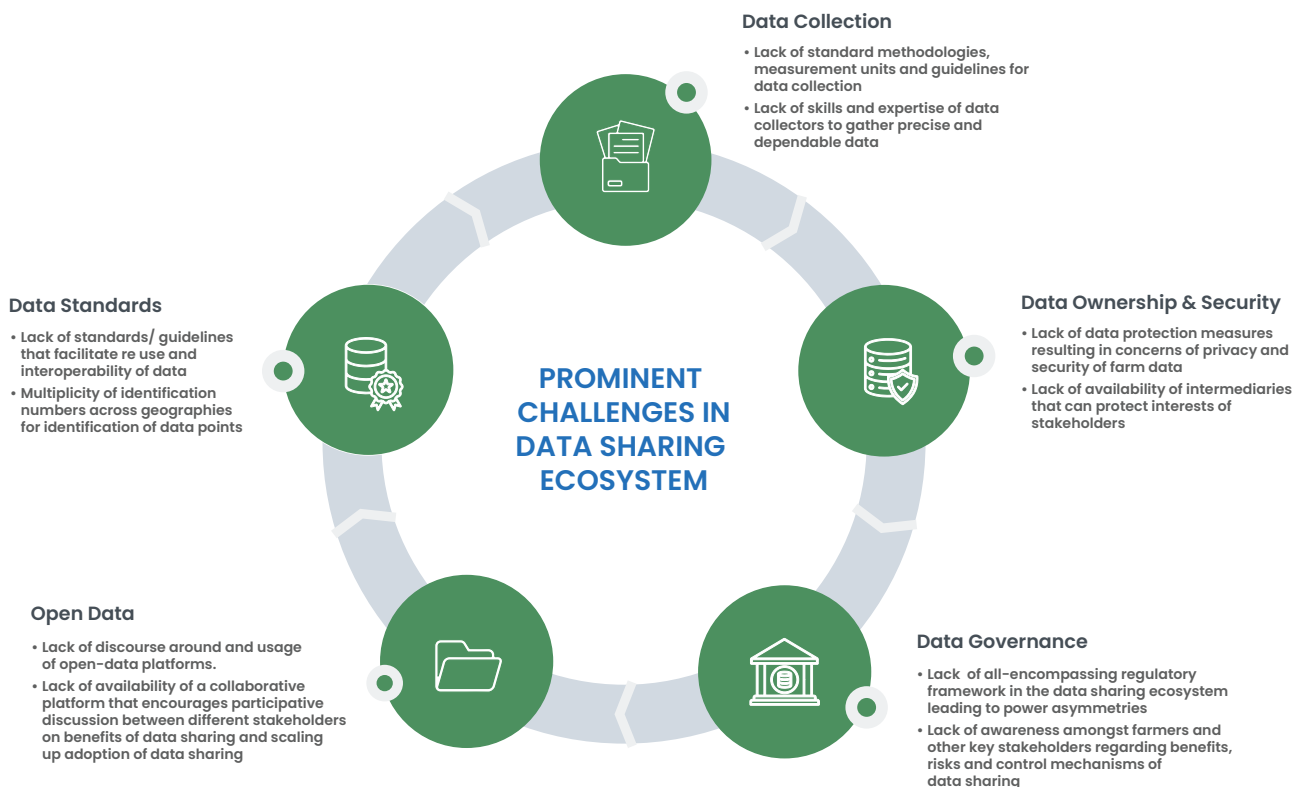
- Developing a platform for agriculture data exchange to connect stakeholders in the data sharing ecosystem;
- Establishing sustainable business models for open data;
- Standardizing and sanitizing data formats for integration of large data-sets;
- Developing unique identification for data-sets- (i) identification of farmers; (ii) identification of land and (iii) identification for dynamic data that include data-sets such as crop grown by farmers;
- Leveraging blended financing mechanisms for developing open data systems;
- Improving awareness of farmers for ensuring their meaningful participation through consent; and

- Enabling greater collaboration between stakeholders in the ecosystem to ensure active participation and awareness of stakeholders.

Summary

Although data sharing has immense potential to enable development of data-driven services that benefit the smallholders, presently the players in the data sharing ecosystem in agriculture are operating in siloes with restrictive sharing through contracts or agreements. Further, inclusion of farmers, who remain central to the data sharing ecosystem, has so far been overlooked as a critical factor in making this ecosystem more cohesive and participatory. The persistent and prominent challenge that hinders unlocking the potential of data sharing in agriculture is highlighted in the figure below:

Figure_7: Prominent Challenges in Building Blocks of Data Sharing





CHAPTER 4

**USE-CASES OF
DATA SHARING
IN AGRICULTURE:
LEARNING FROM
THE FIELD**

As a part of the research, the team also identified six use-cases of data sharing and identified

learnings from each use-case. The description of the themes and the use-cases is provided below.

Figure_8: Use-cases and Services Ecosystem for Farmers



Table 1 The use-cases and partners identified for the study

| SL.No | Use-case | Partners | Geography |
|-------|---|--|-------------------|
| 1 | Access to input/advisory and extension services | Akellobanker and United Nations Capital Development Fund (UNCDF) | Uganda |
| 2 | Access to input/advisory | Syngenta Foundation, Light Castle Partners - Soluta Ag, Solidaridad | Bangladesh, Kenya |
| 3 | Access to insurance | Agriculture and Climate Risk Enterprise Ltd.(ACRE) | Kenya |
| 4 | Traceability | Verstegen and Fairfood | Indonesia |
| 5 | Access to finance | Sammunati, NetafimAgricultural Financing Agency (NAFA), Arya.ag, Ergos, Agrostar | India |
| 6 | Cross-Cutting | Heifer International | Global |

Access to insurance

About the use-case: Acre as partner

The penetration of agricultural insurance in Africa, as in case of other countries in global south remains low despite efforts by the insurance service providers. In Sub-Saharan Africa, only 3 percent of the population are insured while the agricultural insurance penetration remains less than 1 percent. While there are insurance

products such as parametric insurance products¹ to cater to the specific needs of farmers and to encourage smallholder farmers to access micro-insurance at affordable terms, adoption continues to be low. Some of the challenges that have been identified include lack of transparency,

¹ The term parametric insurance describes a type of insurance contract that insures a policyholder against the occurrence of a specific event by paying a set amount based on the magnitude of the event, as opposed to the magnitude of the losses in a traditional indemnity policy.

affordability, availability of farmer financial/credit history and awareness on agricultural insurance.¹

In this context, ACRE Africa works as an insurance service provider and engages with local insurers and other stakeholders in the agricultural insurance value chain.



About ACRE Africa

ACRE Africa, the brand name of Agriculture and Climate Risk Enterprise Ltd. (ACRE), links farmers to insurance products so that they can confidently invest in their farms. The company is registered as an insurance surveyor in Kenya, and an insurance agent in Rwanda and Tanzania. ACRE Africa has designed micro insurance products and identified distribution channels to benefit stakeholders throughout agricultural value chains. It currently operates with more than 2 million farmers across Kenya, Rwanda, Tanzania, Zambia and Nigeria.

Application of data sharing in the use-case

ACRE supports insurance enterprises in monitoring and settlement of claims of farmers. Further, it engages with individual farmers, farmer cooperatives, agribusinesses, agricultural Non-Governmental Organizations (NGOs), and microfinance institutions and supports them in accessing their claims through data sharing models. Using farm data, it has developed a common data monitoring system for all the stakeholders

Value proposition for key stakeholders for data sharing in the use-case

- **Farmers:** ACRE primarily enables access to insurance services for farmers/farmer groups. Along with insurance services, farmers receive crop advisory services from ACRE, based on the data provided by them. Crop advisories are provided through USSD and SMS. Further, the advisories are

customized based on weather patterns in the region.

- **Data Custodians:** ACRE on-boards and shares relevant data of farmers with its partner insurance companies for which it receives payment of fees/commission from its partner insurance companies.
- **Data Receivers:** Insurers have access to a large pool of farmers who are willing to purchase customised insurance products. They also get support from ACRE for gathering KYC data and claim information which reduces the cost of collecting the data or develop a last mile distribution system.

Access to inputs, finance and extension services

About the use-case: Akellobanker as partner

In Uganda, agricultural productivity of smallholders is hindered due to limited access to essential resources such as inputs, extension services, information, farm mechanization, and capital. This has led to the dependence on traditional farming techniques and tools, which not only contribute to low productivity but also have adverse environmental impacts. The availability and access of these services pose challenges for smallholder farmers as they often cannot afford modern production tools due to limited capital. Furthermore, agricultural service providers, including input dealers, extension workers, and farm equipment hire and lease companies, struggle to effectively engage with smallholder farmers who are in the greatest need of their services due to geographical dispersion of farmers



About Akellobanker

Akellobanker was formed in 2016 with primary focus of facilitating access to input. However, they

¹ [ACRE Africa - Blockchain](#)

also enable access to financial services, extension services and insurance. They provide bundled services to farmers through digital technologies and capture farmer data at the farm, input, off-taker/buyer and co-operative levels. This platform facilitates easy access to farm inputs, experts-extension services, agro-advisory services, tools, and equipment for farmers while providing an option for farmers to share and hire equipment on credit, making these resources more accessible and affordable. They currently engage with farmers from 100 cooperatives across Uganda with the number of members in each of the cooperative ranging from 300 to 6,000.

Application of data sharing

To address the challenges of productivity and access to agriculture inputs and services, Akellobanker developed an analytics-based machine learning platform that operates as both a business-to-business (B2B) and business-to-consumer (B2C) solution to facilitate farmers in accessing agricultural inputs and extension services.

Further, farmers are able to make payments digitally through its mobile-based application. Akellobanker also facilitates farmers to access insurance and other financial services. Farmers can choose and access either of the services or products listed in the mobile based application.

Value proposition for key stakeholders for data sharing

- **Farmers:** Farmers are able to access multiple services like inputs, financial products and services, insurance service, solar pumps etc. using the platform.
- **Data aggregatorsCustodians:** Akellobanker owns the data as per the agreements. It earns a commission from the service providers to access farmer information from the platform.
- **Data Receivers:** Financial service providers are able to access information on the crops cultivated, time of harvesting and based on it they assess the ability of the farmers to repay the loans. Input dealers are able to identify the input requirements of the farmers and provide quick service.

Access to inputs

About the use-case: Syngenta foundation and Lightcastle partners (Soluta Ag) as partners

Smallholder farmers, often facing challenges with limited land and agronomic knowledge, rely on traditional farming practices passed down through generations. Additionally, accessing various services necessary for their farming needs, such as accessing inputs, advice, farm machines, and market access, involves dealing with multiple service providers that lack coordination amongst them. Further, due to small scale of their operations along with low production volumes make it challenging for them to connect with large agribusiness companies and traders who prioritize larger quantities. To address these challenges, the Syngenta Foundation for Sustainable Agriculture (SFSA) has developed an inclusive business model called the "Farmers' Hub." This model serves as a centralized commercial service platform, providing smallholders with access to quality inputs, agricultural machinery, markets, financial services, and knowledge resources. By offering these comprehensive services in one place, the Farmers' Hub aims to increase farm productivity and ensure fair prices for smallholders.¹

Recognizing the absence of a data-driven approach throughout the agriculture value chain, SFSA, in collaboration with Lightcastle Partners, launched Soluta Ag. This mobile-based digital platform enables entrepreneurs to track daily transactions while providing real-time monitoring capabilities for SFSA and the Farmers' Hub network managers. By leveraging data, Soluta Ag facilitates data-driven investment decisions, enables timely access to market information for farmers, streamlines cash

¹ [Syngenta Foundation – Farmer Hubs](#)

transactions for agri-entrepreneurs, optimizes inventory management, and enables transparent value chain profiling. Embracing a data-driven approach has the potential to enhance efficiency, transparency, and overall performance within the agriculture value chain, benefiting all stakeholders involved.



About Soluta Ag

In a collaborative effort, Syngenta Foundation Bangladesh and LightCastle Partners (LCP) have introduced an innovative solution called “Soluta Ag” to address the challenges faced in the farm-to-fork journey. This mobile-light ERP Plus solution was launched in 2017 with the aim of enhancing the operational efficiency of rural agri-enterprises through a hyper-local approach known as “eFarmersHub/eHub”. Soluta Ag combines a mobile app and web dashboard, designed to function in areas with limited access capacity and connectivity, catering to rural youth entrepreneurs, agribusiness companies, corporations, investors, and development partners.

The platform offers various features, including real-time analytics of business profit-loss, inventory management, marketplace insights, customer management, credit notifications, and agri-advisory services. It also has offline capability, ensuring uninterrupted access to critical data. By leveraging individual and collective data analytics, Soluta Ag facilitates evidence-driven decision-making for both smallholders and businesses, empowering rural entrepreneurs and top-level executives alike. The intellectual property of Soluta Ag is owned by Syngenta Foundation, while LightCastle collaborates on its technical development and commercialization nationwide. Currently, in Bangladesh, over 350 Farmers’ Hub owners, 5 Network Managers, 15 agri-entrepreneurs, and an agribusiness company utilize Soluta Ag, connecting more than 200,000 smallholder

farmers and 3,000 traders.

Application of data sharing

The initiative enables farmers to access inputs through a mobile-based application. Further, Soluta Ag supports farmers in managing their farm operations and provides them access to crop and business advisory services along with market linkages.

Value proposition for Key stakeholders for data sharing

- **Farmers:** The platform enables farmers to access a wide range of services such as advisory support, inputs, finance, and markets. By leveraging the platform, farmers can capture and analyze their operational information, empowering them to make data-driven decisions regarding crop cultivation. This comprehensive approach allows farmers to unlock multiple services and optimize their farming practices for specific crops.
- **Data Custodians:** The platform allows data custodians such as Syngenta Foundation to have an oversight of the operations of member farmers and enables them to provide the necessary support to improve farming operations.

Access to traceability

About the use-case: Fairfood and Verstegen as partners

Traceability is a critical foundational element of food safety. However, traceability has been a concept that has varied in its significance across different supply chains, particularly in the business-to-business (B2B) segments where transaction volumes are high. However, end-to-end traceability has not received much attention. The assumption thus far has been that consumers are indifferent to the origin of a product as long as it offers value for money. However, traceability encompasses more than just knowing the product’s origin; it also entails understanding its journey through the entire supply chain. The ability to track all products and materials within a

company is vital for day-to-day operations and for effectively managing crises, such as product recalls.¹

The success of food supply chains relies not only on the efficient movement of goods but also on the effective capture and sharing of data with multiple stakeholders. This enhances the traceability, transparency, and accountability of the supply chain, benefiting both farmers and consumers. The market for food traceability is projected to reach USD 22,274.1 million by 2025, reflecting its growing importance.² With the vision of establishing a transparent food system built on the pillars of traceability and connectivity, Fairfood was launched. Fairfood aims to create a food system that is transparent, accountable and traceable, delivering benefits throughout the supply chain for both farmers and consumers.



About Fairfood

Fairfood is an enterprise that works to accelerate the change towards a sustainable food system. They do this by developing innovative solutions that enable businesses to improve their responsible business practices. Their key solution is the Trace platform which, based on blockchain technology, is trying to develop a fully transparent product chain of Indonesian nutmeg. Ultimately, this transparency should give the farmer and consumer greater involvement. The farmer strengthens her or his position by gaining new knowledge about the value chain, while the consumer gains insight into price agreements and quality claims. Fairfood is working with over 500 nutmeg farmers in the North Sulawesi region of Indonesia for Verstegen, a trader of purest herbs and spices across more than 30 countries and a partner for nutmeg traceability with Fairfood.

Application of data sharing

Fairfood enables traceability in the nutmeg value chain. By enabling traceability, while the quality of nutmeg procurement is ensured farmers also receive premium prices for their produce.

Value proposition for key stakeholders for data sharing

- **Farmers:** Fairfood enables traceability in nutmeg value chain through its data-driven services. By building trusts with farmers, Fairfood could improve the quality of nutmeg; thereby enabling higher prices for farmers. Further, Fairfood enables market linkage of farmers with large corporates and international market players. In addition to these services, farmers receive continuous feedback from Fairfood on improving quality of produce.
- **Data Custodians:** Fairfood receives fees for the traceability services from companies. Fairfood is also developing corporate facing API and trying to access other data points from other service providers using API which could help them provide more ecosystem level services for farmers.
- **Data Receivers:** Local Exporters and corporates like Verstegen receive ensured supply of nutmegs that meet their standards. This provides them a longer outlook of supply and leads them to invest further in their business, thereby scaling their operations







Access to financial services

In order to assess the current state of data sharing for access to finance among stakeholders in the agriculture value chain, our exploration focused on enterprises that offer products and services to farmers, as well as financial institutions that develop financial solutions to facilitate access to finance for farmers. The objective was to understand how data sharing practices within these stakeholder groups can support farmers in adopting various products and services, ultimately ensuring their access to essential financial services.

1 [FAO](#)

2 [Allied Market Research](#)

Table 2 List of partners identified for Access to Finance use-case testing

| Name of the Organization | Solution | Geography | Data Sources | Scale (Number of farmers engaged/ Loan book) |
|---|---|-----------|-----------------------------|---|
| Data Providers | | | | |
|  Agrostar | Access to finance and inputs | India | DE and AE | 18,000,000 |
|  Ergos | Access to finance and India warehousing | India | AE | 150,000 |
|  Arya.ag | Access to finance and India warehousing | India | AE | 700,000 |
|  Agribora | Access to finance and inputs | Kenya | TE | 1,500,000 |
| Data Receivers | | | | |
|  Netafim Agricultural financing Agency Pvt. Ltd(NAFA) | Access to finance | India | DE and through partnerships | USD 29.8 Mn (INR 247 crore) |
|  Samunnati Financial Intermediation and Services Private Limited | Access to finance | India | DE and through partnerships | USD 106.1 Mn (INR 879 crore) |

Application of data sharing

Application of Data sharing for finance in agriculture is still in its early stages, with enterprises primarily offering two types of support to financial institutions. Firstly, enterprises provide a comprehensive credit score based on the risk assessment of farmers. This credit score assists financial institutions in evaluating the creditworthiness of farmers and making informed lending decisions. Secondly, enterprises offer support in developing farmer profiles and facilitating Know Your Customer (KYC) processes. This assistance ensures that financial institutions have access to accurate and up-to-date information about farmers, enabling smoother onboarding processes and enhanced due diligence procedures. Although data sharing for finance is currently in its nascent stage, these efforts are laying the foundation for more effective

and efficient financial services in the agricultural sector.

Majority of enterprises leverage the data they collect to offer tailored solutions to farmers or for making data-driven decisions internally.

Value proposition for key stakeholders for data sharing

- **Farmers:** Data sharing enables farmers, especially smallholders, access to financial services such as crop or farm equipment loans. Data sharing could further empower farmers by enabling better loan terms, access to tailored financial products and de-risking services like crop insurance. By sharing their data, farmers can improve their credit worthiness and gain access to low cost capital.

- **Data Custodians:** Data custodians significantly benefit from data sharing with financial service providers through improved service fees based on quality of farm data; thereby enhancing their revenue generation. Through enhanced opportunity for developing better data analytics and risk management models, data custodians could enable service providers to create innovative financial products and tap into the potential of unbanked farmers, expanding their markets and relevance.
- **Data Receivers:** Financial institutions, as data receivers, realize substantial advantages from data sharing with farmers. Access to comprehensive data on farmers' financial profiles and credit histories equips them to make well-informed lending decisions. This informed decision-making reduces credit risk and decreases default rates, ultimately safeguarding the institution's investments. Furthermore, data sharing streamlines the loan origination process by reducing documentation requirements and underwriting costs. It grants financial institutions the ability to create tailor-made financial products and services designed to meet the specific needs of distinct farmer segments; thereby enhancing customer satisfaction and fostering customer loyalty.
- **Streamline Supply Chains:** Data plays a crucial role in ensuring the best fit match between buyers and sellers of agricultural products. It also helps in streamlining the supply chain and optimizing market transactions, thereby benefiting both farmers and buyers. Further, it provides relevant information to financial institutions to assess the credit risk of the farmers.
- **Lower Cost of Services:** In terms of access to finance, one specific example is the loan application process with Samunnati. With the objective of sensitizing farmers on the terms and conditions and ensure transparency, farmers receive personal calls post submission of loan application. The data sharing practices and enhanced collaboration with the other ecosystem players has enabled Samunnati to offer lower interest rates to farmers, thereby providing an incentive in the form of reduced borrowing costs.

Opportunities for partners in data sharing

- **Digitalize Supply Chains:** There is a growing demand from buyers of farm produce for data, tracing food from its source to its final purchase. With the rising momentum on traceability efforts, opportunity lies in devising a solution that provides an end-to-end, near-real-time view of their supply chain. Data-sharing technologies such as blockchain have the potential for providing a useful solution for digitalization of entire supply chain.
- **Improve Collaboration amongst Stakeholders:** Owing to diverse business models of stakeholders and complexities associates with the supply chain, a one-size-fits-most solution may not accommodate the requirement of diverse stakeholders. The stakeholders therefore, should make efforts to collaborate and encourage data sharing amongst them.
- **Leverage Open Data:** The concept of open data presents an opportunity to reduce duplication of efforts and improve data accessibility. Open data sharing can unlock

Summary of learnings from the use-case workshops

Incentives or value proposition for key stakeholders for data sharing

- **Premium Prices for Farmers:** By enabling traceability, the farmers are able to meet the standards set by international market players. As a result, there is an improvement in the quality of farm produce and farmers getting premium prices (about 20–30% higher) for their produce. Additionally, service providers can explore adoption of the concept on sustainability scoring for farms based on their sustainability practices. This rating system can promote sustainable agriculture practices and incentivizes farmers to adopt these practices.

valuable opportunities for collaboration, analysis, and innovation in the agricultural sector.

Challenges in realizing the opportunities for data sharing

- **Lack of Motivation for Data Sharing:** Owing to lack of motivation, stakeholders are often reluctant to share their data, hindering the realization of the potential opportunities. Further, lack of understanding among data collectors on the purpose of data collection and its relevance limits usability of data.
- **Lack of Willingness to Share Data:** As organizations strive to gain a competitive edge, there exists lack of willingness to share data. Further, many verticals within the agriculture sector are still not mature enough to fully embrace data sharing. Limited progress on establishing relevant frameworks and infrastructure to handle

large-scale data sharing, also poses challenges in realizing the full potential of data-driven opportunities.

- **Lack of Capacity of Farmers to Use Technology:** A significant number of farmers in the agricultural sector are not technologically savvy due to lack capacities to effectively utilize data-driven services. They would require assistance and adequate capacity building to effectively utilize data-driven solutions, further complicating the implementation of data sharing initiatives.

In this context, there is an urgent need to create an enabling ecosystem for data sharing in agriculture. This would require creating incentives for data sharing, designing appropriate regulatory frameworks, fostering collaboration while managing competition, and providing adequate training and technical assistance to ensure widespread adoption of data sharing practices in the agriculture sector.





CHAPTER 5

WAY FORWARD

Enabling ecosystem for data sharing

As outlined in previous chapters, in order to address the challenges in the data sharing ecosystem in agriculture and to enable wider data sharing amongst the players, there is a need for a more concerted effort from all the stakeholders in the data sharing ecosystem in agriculture. This chapter provides key recommendations along with proposed sectoral action points for enabling wider data sharing in agriculture. These recommendations would guide the ecosystem players including governments, DFIs, donor organizations/foundations, enterprises

collecting and receiving data, and others players engaged in the data sharing ecosystem of agriculture in making data sharing more inclusive.

Prioritized recommendations based on a voting exercise

After creating a long-list of action points for promoting data sharing, we conducted a voting exercise along with sector stakeholders to identify top recommendations. The following table highlights the top 5 recommendations that participants in the voting exercise shortlisted while the long-list of recommendations follow:

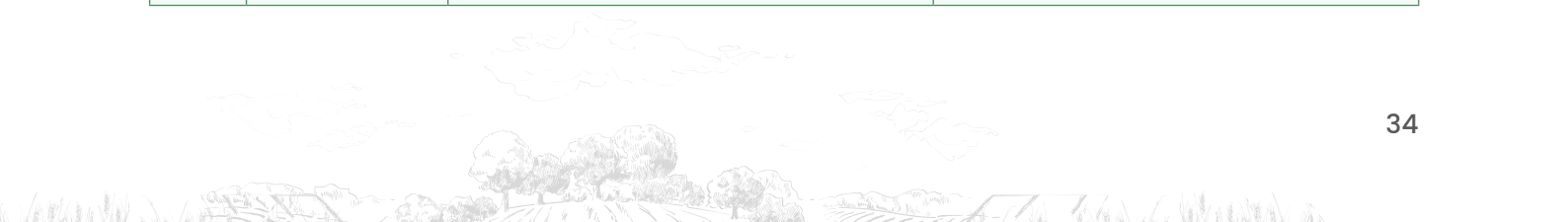
Table 3 Top five action points highlighted in the validation workshop

| Priority No | Action points |
|-------------|--|
| 1 | Develop a metadata structure, data dictionary, data standards, and a smallholder profile and support its implementation at an industry level |
| 2 | Develop standard modules on methodology and best practices on data collection and support data collection intermediaries with training |
| 3 | Pilot pre-competitive collaboration models for sectoral data collection |
| 4 | Develop country specific UIDs that can be leveraged by sector stakeholders |
| 5 | Develop a robust data-visibility platform (including for open data) that highlights data available with different stakeholders |

Long list of recommendations

Table 4 Key recommendations and proposed sectoral action points

| S. No | Building Block | Recommendations | Proposed Sectoral Action Points |
|-------|----------------|--|---|
| 1 | Data Standards | Standardize meta data structure and data dictionary for common use across the industry to promote interoperability | Develop a metadata structure, data dictionary, and data standards and support its implementation at an industry level |
| 2 | | Reduce inconsistencies in smallholder farmer profiles | Develop a standard smallholder profile encompassing data points required for delivering different services |
| 3 | | Mitigate multiplicity of IDs and duplication in data collected by diverse agencies | Develop country specific UIDs that can be leveraged by sector stakeholders |



| S. No | Building Block | Recommendations | Proposed Sectoral Action Points |
|-------|---------------------------|---|---|
| 4 | Data Collection | Ensure interoperability and comparability of data through standardized approaches | Develop standard modules on methodology and best practices on data collection |
| 5 | | Strengthen capacities of intermediaries to ensure quality in data collection | Organize training programmes for capacity building of data collection intermediaries |
| 6 | | Standardize methodologies for data collection and reduce the cost of data collection due to lack of collaborations amongst sectoral players | Pilot pre-competitive collaboration models for sectoral data collection |
| 7 | Data Governance | Ensure meaningful participation of farmers in data governance structures for improved data quality | Build and test participative data governance structure/ mechanism/ frameworks for stakeholders especially involving farmers |
| 8 | | Ensure interoperability across frameworks and create an enabling environment for the data sharing ecosystem to flourish | Collaborate with the government to ensure increased adoption of data governance standards by industry |
| 9 | Open Data | Reduce high costs of data acquisition by leveraging open-data systems | Identify and support governments in developing appropriate open-data systems that complement private sector needs |
| 10 | | Standardization of data collection and sharing processes across open data platforms to improve its accessibility amongst stakeholders | Provide stakeholders with a robust mapping of open-data systems and make them more accessible |
| 11 | | Ensure interest of all stakeholders are considered while data sharing and ownership | Create awareness within communities on aspects related to farm data collection, control, sharing and use |
| 12 | Data Ownership & Security | Ensure data privacy and security to mitigate misuse of farm data by those collecting and receiving the data | Develop tools for robust data protection, including encryptions and secure data storage amongst others |
| 13 | | Reduce complexities around data-sharing agreements for ease in negotiation and understanding of farmers, thereby safeguarding farmers' rights | Develop templated data-sharing agreements which protect interests of participating entities |
| 14 | | Engage data stewards as a neutral entity to safeguard interests of different stakeholders within the data sharing ecosystem | Identify and include data stewards as intermediaries to streamline data sharing |
| 15 | | Improve ease in identifying and accessing data that is already available at the ecosystem | Develop a data-sharing technology platform that streamlines data-sharing between partners |
| 16 | | Improve collaboration among stakeholders in the data sharing ecosystem to maximize adoption of data sharing in the agriculture sector | Develop a robust data-visibility platform that highlights data available with different stakeholders |

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- [FAO](#)
- [Allied Market Research](#)
- [Fairfood](#)



ANNEXURES

Annexure 1: List of participants in the use-case workshops

| # | Participant Name | Collaborating Organizations | Use-case type |
|----|-----------------------------|--|-------------------------------------|
| 1 | Marten Van Gils | Fairfood and Verstegen | Data Sharing for Traceability |
| 2 | Josje Spierings | | |
| 3 | Evert Jan Verschuren | | |
| 4 | Lillian Waithaka | ACRE–Africa and Rabobank | Data Sharing for Insurance |
| 5 | Reuben Saina | | |
| 6 | Benson | | |
| 7 | Annette Nantumbwe | UNCDF and Akellobanker | Data Sharing for Access to Inputs |
| 8 | Jane Onyait | | |
| 9 | Stephen Waiswa | | |
| 10 | David Gill | Heifer | Data Sharing for Extension services |
| 11 | Rasel Rana | Syngenta Foundation and LightCastle Partners | Data Sharing for Access to Inputs |
| 12 | Islam Bijon | | |
| 13 | Mustafa Hamid | | |
| 14 | Nitin Banthia | Ergos | Data Sharing for Access to Finance |
| 15 | Avaiarasi Shanmuga Sundaram | Samunnati | |
| 16 | Raj Vallabhaneni | | |
| 17 | Prabhat Chaturvedi | NAFA | |
| 18 | Pradeep Singh | | |
| 19 | Devraj Arya | Agrostar | |
| 20 | Sunil Jain | | |
| 21 | Hirendra Ravat | | |
| 22 | Prasanna Rao | Arya | |
| 23 | Kizito Odhiambo | Agri Bora | |

Annexure 2: agenda and list of participants during the validation workshop

Agenda of the workshop

A validation workshop was organized on May 23, 2023 with the following agenda:

- Validation of findings from the use-case workshops and secondary research;

- Identifying persistent challenges in the data sharing ecosystem in agriculture; and
- Voting for prioritizing recommendations for way forward

Participants

Annexure 3: The learning event

A one day virtual learning event, 'Data Sharing in Agriculture: Unlocking Its Potential for Smallholder

| # | Participant Name | Designation and Name of the Organization |
|----|---------------------|---|
| 1 | Ajaykumar CP | Manager, Intellectap Advisory Private Limited |
| 2 | Albert Boogard | Head Smallholder Solutions at Rabo Partnerships, Rabobank |
| 3 | Anna Ignatiadi | Program Manager Innovation, Rabobank |
| 4 | Anne Rappoldt | Program Manager Innovation, Rabo Foundation |
| 5 | Annette Nantumbwe | Digital Agriculture Analyst, UNCDF |
| 6 | Benson Njuguna | Business Transformation Manager, ACRE-Africa |
| 7 | Leon Wakoli | Lead Software Developer, Solidaridad Network |
| 8 | Mario Kunz | Smallholder Digital Solutions Lead, Syngenta Foundation for Sustainable Agriculture |
| 9 | Marten Van Gils | Tech Director, Fairfood |
| 10 | Phaniel Ayuka | Software Engineer, International Institute of Tropical Agriculture (IITA) |
| 11 | Poulomi Mazumdar | Senior Associate, Intellectap Advisory Private Limited |
| 12 | Rahul Agrawal | Director and Partner, Intellectap Advisory Private Limited |
| 13 | Renee Corstens | Product Owner, Rabobank |
| 14 | Sander de Jong | Managing Director, Fairfood |
| 15 | Shanoo Saran | Co-Head, Co-Head, Smallholder Solutions at Rabo Partnerships, Rabobank |
| 16 | Sheila Senathirajah | Senior Manager, Innovations, ISEAL Alliance |
| 17 | Shreejit Borthakur | Technology Lead and Senior Innovation Manager, IDH-The Sustainable Trade Initiative |

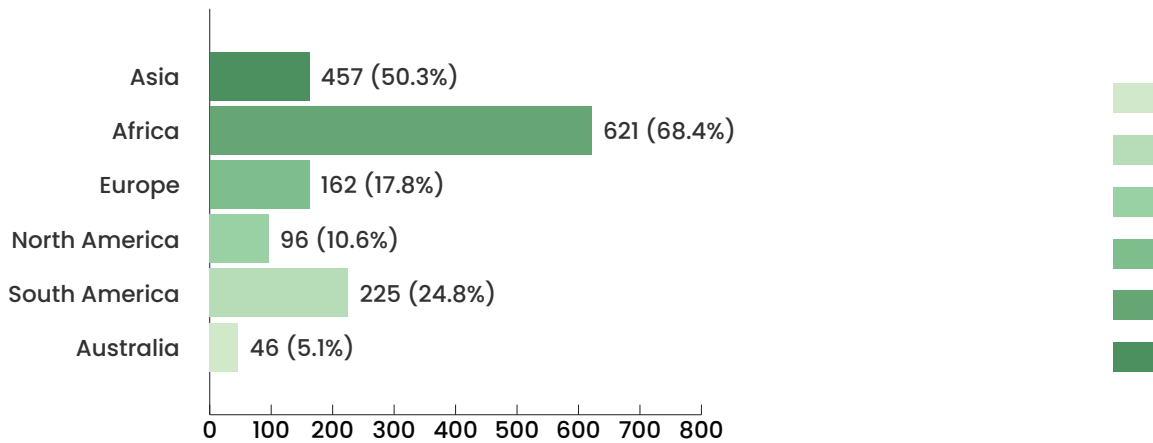
Farming', was organized on May 31, 2023 which included 8 sessions on diverse themes. The event had participation from over 900 attendees

from over 70 countries spanning across South Asia, South-East Asia, East and West Africa and amongst others.

Highlights from the learning event

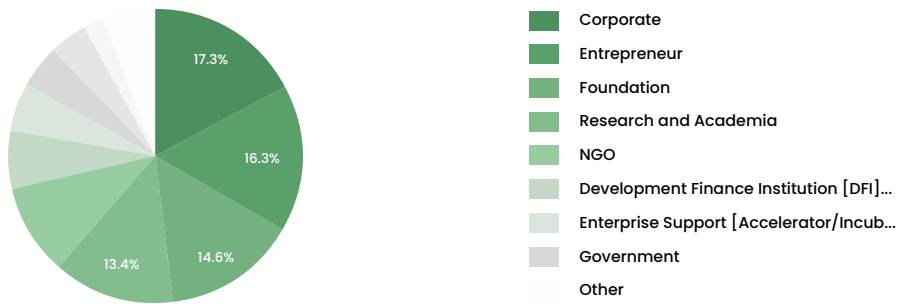
Which Region(s) does your work focus on? [Select all that apply]

908 Responses



What Best Describes your Organization?

908 Responses



Gender

908 Responses



Session details

| # | Session Title | Session Format | Speakers | Moderator |
|---|---|---|---|--|
| 1 | From Data Silos to Data Sharing: Maximizing the Value of Your Data in Agriculture | Fireside Chat | <ul style="list-style-type: none"> Sanjiv Rangrass, Co-founder, The Agri Collaboratory Jasmer Dhingra, Director-Programs (India), IDH-The Sustainable Trade Initiative Anna Ignatiadi, Program Manager Innovation, Rabo Bank | Santosh Singh, Managing Director, Intellectcap Advisory Services Pvt Ltd |
| 2 | Uniting for Agricultural Data: A Coalition for Collective Learning | Panel Discussion with Questions and Answers | <ul style="list-style-type: none"> Albert Boogaard, Head Smallholder Solutions, Rabobank Brenda Gunde, Global Senior Technical Specialist for ICT4D, IFAD Iris van der Velden, Global Director, Innovations and Insights at IDH; Sheila Senathirajah, Senior Manager, Innovations, ISEAL Simon Winter, Executive Director, Syngenta Foundation | Shreejit Borthakur, Senior Innovation Manager, IDH |
| 3 | Back to the Basics: Data Standards and the Smallholder Profile | Panel Discussion with Questions and Answers | <ul style="list-style-type: none"> Jildemarie Brouwer, Agriculture Lead & Data expert, Akvo; Francis A. Obirikorang, Agrocenta; Nagaraj Subrahmanya, Chief Risk Officer, Avanti finance; Leon Wakoli, Lead Software Developer, Solidaridad Network | Renee Corstens, Product Owner, Rabobank |
| 4 | Harvesting Insights: Data Collection Methods for Modern Agriculture | Presentations | <ul style="list-style-type: none"> Yogesh Patil, Chief Executive Officer, Skymet Jochum De Groot, Product Owner for Data Collection Tool, Acorn Marten Van Gils, Tech Director, Fairfood Thomas Vaassen, Founder and Chief Executive Officer, Meridia Drew Wheadon, Senior Associate, Tetrattech, ECAAS | Poulomi Mazumdar, Senior Associate, Intellectcap Advisory Private Limited |
| 5 | Safe and Secure: Ensuring Data Security and Sovereignty for Farmers | Panel Discussion with Questions and Answers | <ul style="list-style-type: none"> Lindsay Moore, Chief Executive Officer, DevelopMetrics Srivatsa Sreenivasarao, Chief Executive Officer, TraceX Technologies Claire Rhodes, Chief Executive Officer, Producers Direct | Rahul Agrawal, Director and Partner, Intellectcap Advisory Private Limited |

| # | Session Title | Session Format | Speakers | Moderator |
|---|--|---|---|--|
| 6 | The Power of Together: Learning from Innovative Models on Data-Sharing | Presentations | <ul style="list-style-type: none"> Amit Salunkhe, Head of Sales, Satsure Benson Njuguna, Business Transformation Specialist, ACRE-Africa Mustafa Hamid, Business Consultant, LightCastle Partners Vineeth Singh, Chief Technology Officer, Digital Green | Shreejit Borthakur, Senior Innovation Manager, IDH |
| 7 | Open-Data Open Opportunities: The Role of Public Private Partnerships | Panel Discussion with Questions and Answers | <ul style="list-style-type: none"> Rajeev Chawla, Strategic Advisor and Chief Knowledge Officer, Ministry of Agriculture & Farmers Welfare; Sriram Bharatam, Founder Kuza; Benjamin Kwasi Addom, Lead the Digital Agriculture/Fisheries at the Commonwealth Connectivity Agenda for Trade and Investment | Brenda Gunde, Global Senior Technical Specialist for ICT4D, IFAD |
| 8 | From the Ground Up: Redesigning Data Governance with Farmers in Mind | Panel Discussion with Questions and Answers | <ul style="list-style-type: none"> Josh Woodard, Senior Digital Advisor, USAID Jonathan van Geuns, Consultant Rajesh, Board Member, Kshema General Insurance Limited | Deepa Karthykeyan, Founder, Athena Infonomics |



SEPTEMBER 2023



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