CASE STUDY

Building a Neutral Account Aggregator Data Ecosystem for Smallholder Farmers

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Collaborating with farmers starts with coordination and consolidation

Digital Green launched FarmStack in 2021 as a data platform dedicated to fostering coordination and data sharing across the agricultural ecosystem in India and Ethiopia—between farmers and agribusinesses—via a fiduciary model that ensures the data and benefits flow back to the farmer. The Account Aggregator model creates data collaborative ecosystems designed to build agency for farmers. The case study provides insights into data exchange layers, score cards or marketplaces, data ownership, data defragmentation, and value chain development.

Background and main challenges

Meeting the future agricultural needs of a growing global population, as well as bolstering the needs of low- and middle-income countries (LMICs) that rely heavily on agricultural exports to maintain their GDP, requires innovation. Agribusiness and international nonprofits are increasingly introducing new, data-driven tools to meet these challenges by developing new market opportunities, pathways to finance, and more efficient means of production. However, for all the intended benefits of these tools, smallholder farmers struggle to maintain ownership of their data, ensure transparency in its use, and secure a say in how the tools and data return value.

Fragmentation is one such struggle in this rush to collect more agricultural data. There are a plethora of private companies, governments, and non-governmental organizations (NGOs) in this space, all requesting private data from farmers but working independently. With so many actors working in their own silos, this ecosystem of multiple, centralized sources results in farmers answering similar questions multiple times, and their resulting fatigue erodes their trust in these systems, especially when the result is products and services that do not live up to their stated benefits.

This diminishing trust is exacerbated by products and services that do not provide genuine value to farmers, largely manifested when those farmers have not given enough input. As Digital Green notes, "[w]ith little coordination between these actors, farmers are given information and services that they didn't demand and can't use and are forced to make decisions about who they can trust."[1]

Even when consent is given by farmers to companies, consent forms do not include information about the possible negative effects that may arise, and most are not aware that their data would be sold to third parties.[2] External actors fail to adequately take into account the persisting digital divide among these communities, where benefits are found in the networks they cannot access, via devices they do

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1. Digital Green. (2020), Co-creating an Industry Standard for Sharing Agricultural Data Globally.
2.E.g., civil society organizations in India expressed concerns about a recently signed memorandum of understanding between Microsoft and the Ministry of Agriculture to access the data of millions of farmers without their consent.

not own, or in technical processes they cannot understand. Relatedly, engagement may happen with farmers individually, rather than at a farmer organization (FO) or cooperative level, where data could not only be collected more efficiently but existing power dynamics could be respectfully acknowledged. All these pitfalls speak to instances where farmers are promised access to tools and services to aid them in production, market insights, and access to finance, for example. Subsequently, farmers lose agency over their data.

Other challenges related to the case study environment

- Data consumers (agribusinesses, small and mid-market enterprises [SMEs], and farmers alike) lack a trusted, scalable solution to rely on farmer data rather than their own.

- Other challenges include the fact that much of the data is of poor quality, data across governments suffers from a lack of interoperability and consistency, and inherent bias of enumerators.[3]

- There is a need for a single market of available digital technologies and services to allow SMEs with new applications to reach a large number of farmers and create a space where farmers are supported to select the most suitable solution.

- In India, casual workers in the agricultural sector have the lowest levels of digital literacy, at 13%. This is 24% for those who earn a regular salary, and 26% for those who are self-employed. These are extremely low numbers in comparison to the non-agricultural sector.[4]

- This lack of literacy in India results in an information asymmetry, which limits the negotiation position of farmers, and in turn exacerbates the already existing power imbalance between big business and farmer communities.[5] Farmers also have little to no access to grievance redressal mechanisms to address harms and hold companies and data processors accountable.[6]

How are problems solved?

FarmStack, developed by U.S.- and India-based nonprofit **Digital Green**, uses a decentralized data sharing protocol to foster coordination across the agricultural ecosystem while protecting privacy, security, and control over how data is used. FarmStack ensures that smallholder farmers see an equal and positive return for sharing their data with companies, and they can more easily share their data in exchange for useful insights into new skills, understanding impact, aggregating data towards collective bargaining, and gain introductions to new finance and market opportunities, all while maintaining privacy and security as they retain control over their data.

3. Chamuah A. Bajpai H. (2022) Towards Responsible Data Practices for Machine Learning in India: Health & Agriculture, p. 35. Digital Futures Lab, Goa.
4. NITI Aayog, The digital dream: Upskilling India for the future.
5. Ram Mohan, G. (2020). Farm Organisations Flag Privacy Concerns, Seek Withdrawal of Agristack by Centre. The Wire.
6. Sahai, S. (2019). Farmers have little to no access to grievance redressal mechanisms to address harms and hold companies and data processors accountable. Hindustan Times.

FarmStack creates data ecosystems that build agency for the farmers as the drivers of this network. Built on open protocols that facilitate secure and trusted data exchange, FarmStack merges disparate data from different actors and different collection methods into cohesive, coherent data, more easily disseminated to farmers, and allows the farmers themselves to dictate distribution and access. Consolidating data is only one piece of the puzzle, however. FarmStack works with farmers, governments, and private institutions to develop their governance model, collaboratively designing and implementing a data strategy with equal input from all. The end result allows the platform operator to function as a steward, where the platform facilitates agreed-upon terms and conditions. The operator can manage their own data sharing network by onboarding partners and giving them the ability to govern their data.

Because farmers are not homogenous, it is important to segment them at the national, regional, and farmer collective levels in order to maximize value for all. The nature of the application is not limited to one outcome, but can take multiple tracks based on understanding the intrinsic and extrinsic value for beneficiaries. For example, some farmers may benefit from seeing their own data toward improving crop yield, accessing their loan and grant applications, or new markets and market prices. To support this approach, FarmStack introduces features that demonstrate value to the wider ecosystem.

Data ownership and control. As Digital Green began working with farmers to help collect and manage their data, they realized that much of what was captured was not digitized. In cases where it was, that work was done by private companies, and the resulting digital data—the farmers' personal data—was locked away from farmers, who were also unclear on how it was used and potentially shared. As part of the FarmStack platform, the Ag Data Wallet provides farmers the means to store their personal data digitally and provides a user interface to help farmers to understand the benefits of data sharing and ways to control it.

Consent management. With their personal data held within the Ag Data Wallet, FarmStack also includes a consent management system, allowing farmers to easily manage requests for their data and selectively allow access where they see fit. Every time their data is shared, farmers get a notification of the event, with whom it was shared, the purpose, and if they want, how they can stop sharing at any time.

Data governance and stewardship. As farmers now have agency and control of their data, the platform permits a data steward to bring much of this level of control to the aggregate data of farmer collectives to work together with external actors. Appointing a data steward to oversee their collective data, FarmStack allows for creating usage policies to codify the types of data protection rules for data consumers. This includes setting and enforcing rules on personally identifiable information (PII), data localization, and encryption to create a baseline for access. The steward does not have access to individual data, but is able to expose aggregate data for consumers. Stewards are also able to audit the network for misuse of data. Validation of data supports the adoption and sustainability of interventions. Directly building the capacity of data stewards within farmer organizations to maintain, validate, audit, and use data as an asset demonstrates to private companies and government offices that the data is trustworthy.

The Data Hub feature helps an organization, from a FO to a government, run an agricultural data exchange network. The information about farmer groups, details about their data, and information on

how to access it is made available to different actors that can provide input or financial services. Now stakeholders can explore what data is available and auditable before requesting it.

A farmer-centered design approach that understands and adapts to feedback and incentives is key to adoption of new practices. Feedback mechanisms collect actionable data to enable realignment to individual and community needs. Digital Green can leverage their community videos and social networks via facilitated group discussions. This also enables collective learning on digital literacy, management of data, and other assets. Farmer feedback enables constant iteration and returns on investment. Also on the Connect Online Connect Offline platform, gender disaggregated data and farmer feedback is tracked, which informs the next iteration of videos and helps curate new content. As such, FOs can capture value in many ways, and each is best positioned to decide for themselves where to focus, based on their stage of growth and maturity.

Scorecards, delivered over WhatsApp, allow farmers to see the value of their data, and be incentivized to digitize. This helps to bring in other actors who see value in this data and offer services or returns for it. One critical way to drive productivity increases and growth is via investment in collective assets (such as collection centers and processing equipment). Many of these assets have the added benefit of increasing member climate resilience and delivering ecosystem services. By quantifying their impact and yield, and having that data in a digital, shareable format, this not only strengthens their group power in the market, but also elevates the voice of the farmer in the agricultural ecosystem and better positions them for new grants and markets.

Marketplace. Naturally, farmers translating their personal and aggregate data into new opportunities to leverage additional capital to increase market economies is an attractive incentive. Answering this, Digital Green is currently trialing a marketplace functionality, accelerating data sharing and allowing farmers to leverage their collective assets to raise capital from philanthropic investors who accept a lower financial return in exchange for the positive impact outcomes achieved by farmer groups. Seeing funding as an entry point, farmer groups generate and share data assets about their members and operations, such as location, crop quantities, and harvest date, in order to participate in the funding marketplace. Capital raised by investors is then used to purchase shared assets requested by farmers and make them available to farmer groups on flexible payment terms that match their actual cash flows with the goal of paying off ownership over the course of a few seasons.
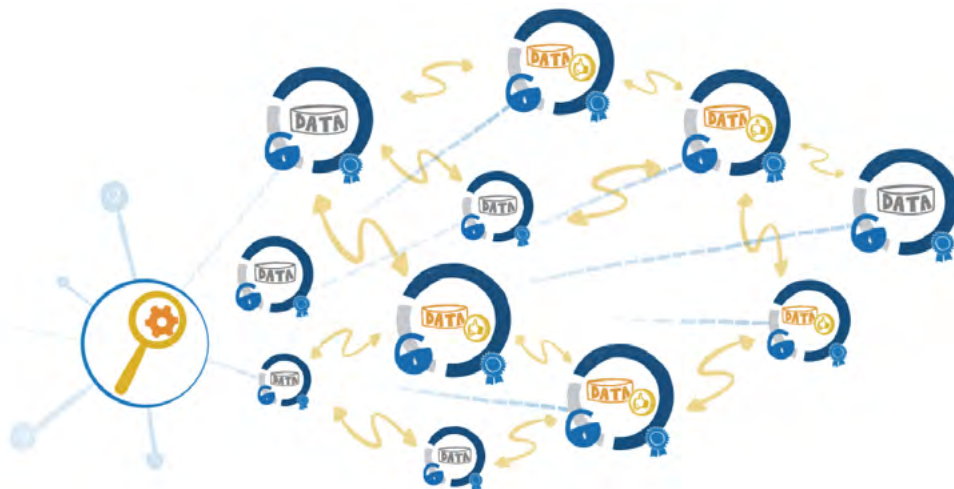
Important factors for an enabling environment

- Countries with inadequate or non-existent data protection, privacy rights, and related policies hamper the adoption of data governance at the project level. One should consider the broader enabling environment (i.e, network connectivity, device ownership, literacy, etc.). For example, in India, there is a strong digital network, but few legislative frameworks. Ethiopia is roughly the opposite. Kenya is a combination of these. In all instances, existing legislation provides a foundation on which to implement local governance effectively.

- Putting data back into the hands of smallholder farmers is critical to creating more effective, efficient, and comprehensive data sharing, but it is only a part of the solution. Farmers as data providers should be able to codify the types of data protection rules for data users. They can set the base rules, for example, on personal data, data localization, and encryption.

- Explicit attention to gender equity can bring measurable positive impact to crop yields and higher sales at market. One USAID-led analysis notes that "providing the information to only the female co-head as opposed to providing it to only the male co-head increases the likelihood that she independently sells maize by 4 percentage points."[7] Digital Green describes its platform in part as "gender responsive technology" that acknowledges gender-based barriers and supporting government efforts to directly support women's farmer cooperatives.

- In India, the government has the ambition to develop a national platform called Agristack to consolidate information about farmers, their lands, products, and financial data; make it available to a wide audience to further innovations; and address a wide range of issues. This could provide for a quick and cheap way to collect data and avoid relationship and partnership building. As of writing, no official documentation has been shared about the ownership of Agristack, the data storage, or any consultative process for assessing this platform before its rollout.

- The Indian government has a vision for an Agristack, which should consolidate information about farmers, their lands, production details, and financial data, and make it available to a wide range of stakeholders to develop data-driven innovations.

- India does not have a personal data protection law, as the Personal Data Protection Bill (PDP Bill) remains in the Parliament. The government published the revised report of the Committee of Experts on Framework for Non Personal Data Governance (NPDR) in December 2020. However, this report has conjured a lot of criticism, and a lot of work needs to be done.

- Government and large businesses have taken advantage of this impasse, causing a massive uptake of farmers' data extractivism, without considering the data rights or compensation to the community. This leads to a gradual erosion of user agency.

7. IFPRI. (2020.) Providing Information to Empower Women in Agriculture Evidence from Uganda.

Facts and figures

The Food and Agriculture Organization of the U.N. (FAO) states that global food production must increase by 70% prior to 2050 to feed the world's growing population.[8]

- Digital agriculture is one means to achieve this. Between 2016 and 2019, Africa's agtech sector grew by 44% year-on-year, with the continent registering the highest number of agtech services in the developing world, reaching over 33 million smallholder farmers.
- The implementation of the African Continental Free Trade Agreement (AfCFTA) is expected to boost intra-African trade by 49%, further driving demand for fresh produce across borders.[9]

What was the impact?

Where Digital Green is working with farmers in India and Ethiopia, they produced farmer-to-farmer extension videos for smallholder farmers. Working with over 50,000 extension agents, farmers demonstrate the different agricultural methods they use and how to apply them through this visual storytelling. The videos, available in over 20 different languages, have proven to be highly effective by reaching over 2.3 million smallholder farmers—73% of whom are women.[10]

What lessons can be learned?

- Creating a data exchange for the sake of merging data—assuming more and combined data makes for better information—does not guarantee a commensurate value for farmers for the level of effort. While the opportunity exists to merge and build new data and knowledge products from various sources of otherwise previously inaccessible data, much of it is static, historical, and made from a variety of data collection methodologies. Additionally, how it is labeled, stored, and described likely and considerably varies.

- While FarmStack is designed to aid in this process, the process is still highly technical and time-intensive, and thus should require a good understanding of how that effort contributes to greater, positive impact for farmers.

8. FAO, (2019). Global agriculture towards 2050. FAO High Level Expert Forum—How to Feed the World in 2050, Rome, Italy.
9. ITWeb. (2021). Africa's agtech growth a major opportunity for tech service providers.
10. OpenTEAM. (2022). Protecting Farmers' Data Sovereignty Through FarmStack.