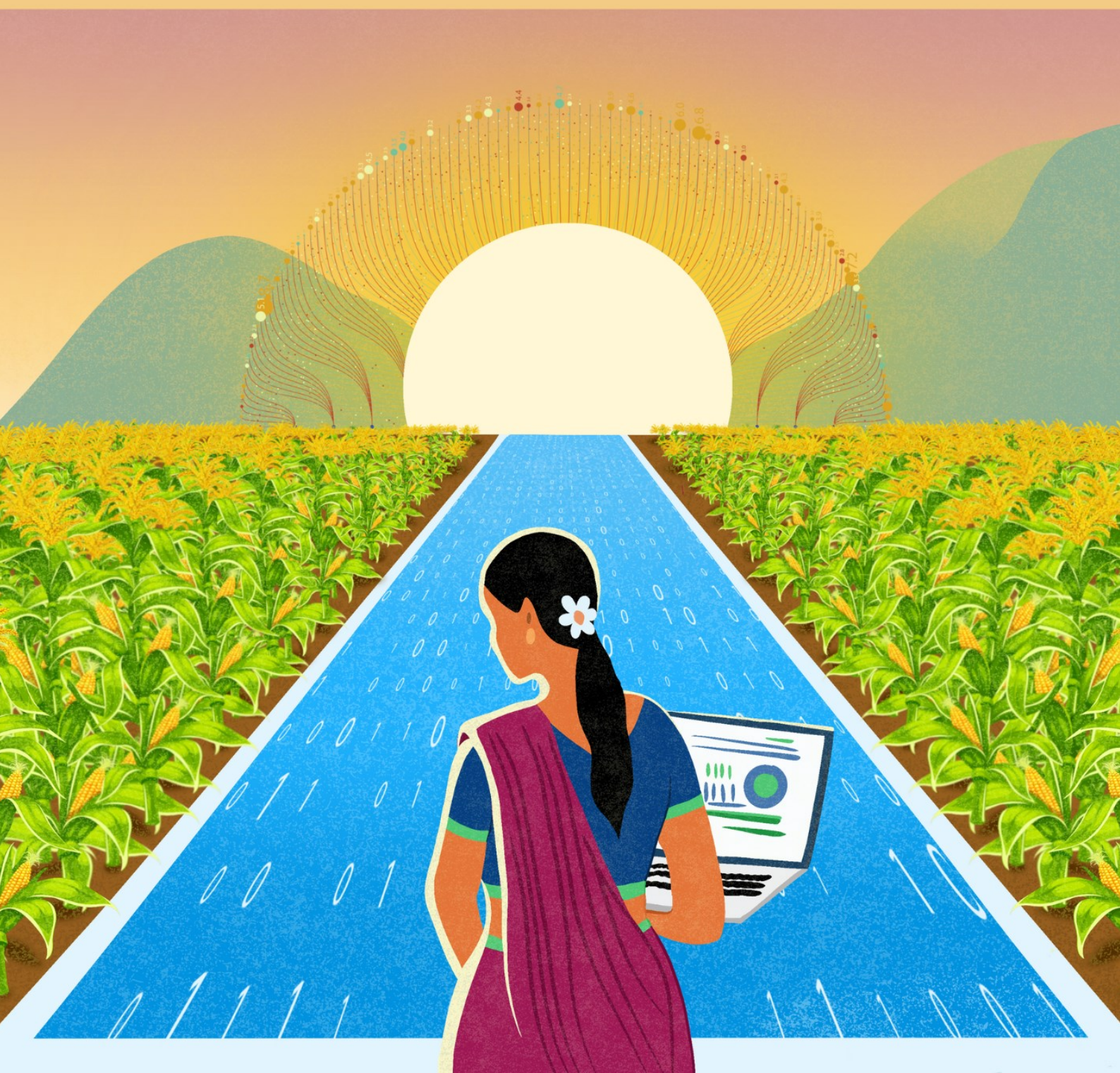# Creating Sustainable Data Cooperatives in the Global South:
Frameworks for Institutional Support

IT for Change

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Creating Sustainable Data Cooperatives in the Global South:

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IT for Change Research Brief

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1. Introduction

In contemporary discourses surrounding alternative futures in the age of platform capitalism, there is an increasing acknowledgment of data as a shared economic resource.[1] This recognition emphasizes the importance of governing data through a community rights framework.[2] Such a framework, with its emphasis on bottom-up infrastructures, can provide viable means to equitably distribute the collective economic value derived from data while simultaneously providing essential safeguards against the misuse of aggregated data by Big Tech.

Within the agricultural value chain, large technology players have monopolized various parts of the supply chain, including procurement, grading, and distribution.[3] The benefits expounded upon are enjoyed selectively by large farmers who can successfully integrate into a digitalized value chain,[4] often at the expense of relinquishing ownership of crucial agricultural data to major tech corporations. Contrary to grassroots empowerment, the digitalization of agricultural systems is driven by the collaboration of key players in agri-tech rather than local community initiatives. This collaboration is also rapidly expanding in the Global South, exposing numerous marginalized small-scale farmers to a system of surveillance agriculture.[5] In this scenario, not only do these farmers rapidly lose control over their own data, but they also find themselves unable to capitalize on aggregated data,[6] which is often enclosed within the domains of Big Tech companies.

As part of our larger investigation of alternative futures driven by platform cooperatives, we collaborated with the Self-Employed Women's Association (SEWA) Cooperative Federation (hereon, SEWA Federation)[7] to delineate a techno-institutional model for a data cooperative, with ownership and management vested in women farmers. Following up on our initial round of qualitative fieldwork at Vyara and Uchchhal blocks in Gujarat in May 2023, our objective was to broaden the reach of this techno-institutional model by outlining essential institutional frameworks necessary for the effective and sustainable functioning of agricultural data cooperatives in India, and the Global South. With the benefit of a second round of fieldwork, we sought to understand how local agrarian contexts, agricultural supply and value chains, and historical and emerging cooperative models affect digitalization efforts within agricultural cooperatives. Our case study is located in Megha Mandli, an

[1] Papadimitropoulos, E. (2021). Platform capitalism, platform cooperativism, and the commons. *Rethinking Marxism*, *33*(2), pp. 246-262.
[2] Singh, P. J., & Gurumurthy, A. (2020). *Data Sharing Requires a Data Commons Framework Law*. IT for Change. https://itforchange.net/sites/default/files/add/Data%20Sharing%20Requires%20A%20Data%20Commons%20Framework%20Law%20DGN%20Policy%20Brief.pdf.
[3] ETC Group. (2022). *Food Barons 2022: Crisis profiteering, digitalization and shifting power.* Springfield: ETC Group. https://www.etcgroup.org/content/food-barons-2022
[4] Bronson, K., & Sengers, P. (2022). Big tech meets big ag: Diversifying epistemologies of data and power. *Science as Culture*, *31*(1), pp. 15-28.
[5] Stone, G. D. (2022). Surveillance agriculture and peasant autonomy. *Journal of Agrarian Change*, *22*(3), pp. 608-631.
[6] Maschewski, F., & Nosthoff, A. V. (2022). *Big Tech and the Smartification of Agriculture: A Critical Perspective.* The State of Big Tech. https://projects.itforchange.net/state-of-big-tech/big-tech-and-the-smartification-of-agriculture-a-critical-perspective/
[7] SEWA Cooperative Federation. (n.d.). About SEWA Federation. https://www.sewafederation.org/

agricultural cooperative initiated by the SEWA Federation, which supports women-run cooperatives across sectors to reach the market and manage their livelihoods. Additionally, we aimed to identify specific infrastructural challenges that agricultural data cooperatives may encounter.

Our research points to coherences and deviations in imaginations of digitalization of agricultural cooperatives, as well as the different kinds of invisibilized labor grassroots women members must perform to operationalize and run a digital platform – a process that often remains hidden within utopic narratives of technology development within data capitalism. We also elucidate how specificities in existing social and economic structures often determine and accentuate digitalization practices, located as they are within specific digital, financial, and physical infrastructures, and among specific economic systems.

There is a significant potential for worker-centric digitalization in cooperatives, a model which allows people to have full control over their data, and to set up comprehensive consent mechanisms for the usage of that data through unique data stewardship models. This type of 'right' digitalization will aid the function of agri-value chains, benefit farmers through access to better markets, simplify the workflow of frontline workers, and most importantly, bolster the ability of cooperatives to collectively bargain within the current exploitative techno-agrarian landscape. In this paper, we explicate parts of the SEWA Federation's journey to digitalize, using evidence from observations and interviews to underline the need for cooperatives, collectives, and social enterprises to be active co-designers of applications and their data governance principles to ensure their ideals are not subsumed into the larger juggernaut of techno-solutionism as a means of digitalization.

2. Data Cooperatives in the Global South

Digitalization – the integration of data through digital technologies across the value chain of any sector in an economy for the production of revenue – has significantly changed how value is derived in food systems. The acquisition of large agricultural players by finance and tech giants has enclosed entire agricultural value chains within these monoliths,[8] turning complex webs of relations between agriculturalists, the land, and their markets into data points for the creation and sale of proprietary algorithms.

Against this backdrop, many current explorations around data cooperatives are built around the tenets of the centralization and monetization of data. The prescient need for data cooperatives – a collectivization of data under the premise that economic gains made from pooling data must be enjoyed both by the individual and the community that owns and produces the data – however, has

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[8] GRAIN. (2021). *The Big Tech takeover of agriculture is dangerous.* https://www.aljazeera.com/opinions/2021/2/5/the-big-tech-takeover-of-agriculture-is-dangerous

not been paired with bottom-up approaches that safeguard data generators and workers. In addition to making them susceptible to being scooped up by these monopolistic agri-tech players, top-down approaches to data cooperatives can extrapolate existing oppressive structures into these newer forms of data power. Hence, collectives looking to build data cooperatives driven by an ethic of data rights and community ownership are staring down the barrel of a heavily fragmented ecosystem of alternatives.

Alternatives, especially within agriculture, are built on ramshackle foundations. In India, and broadly across the Global South, the machinery of public infrastructure has been decimated due to constant neo-imperialist incursions through the rapid introduction of vast corporate outposts of big agri-tech players, and dubious restructuring funds dangled on the promise of building entire value chains hospitable to predatory corporate investments. The scarcity of both robust physical and digital infrastructures to support the work of ensuring the economic value of data is equitably expropriated provides a significant challenge to the idea of the equitable and just data cooperatives.

In western India's agriculture sector, a long history of cooperativism has been marred by caste repression,[9] where the interests of cooperatives are disproportionately represented by dominant caste farmers with extensive landholdings. Despite women contributing significantly to agriculture, their voices are often overlooked vis-à-vis cooperative demands. These challenges intensify with decreasing public expenditure on farming,[10] limited access to institutional credit for agricultural activities,[11] and the escalating impacts of anthropogenic climate change.[12] These factors collectively propel agriculture into a precarious state marked by insecurity and indebtedness, causing a steady decline in the share of agriculture in India's GDP and a diminishing presence of agriculturalists in the country.

Against this backdrop, any discourse reimagining cooperativism in the era of data capitalism must address how these intersecting histories of oppression can be mitigated in the collaborative creation of a digitalization truly centered on the communities it serves.

[9] Lerche, J. (2014). *Indian Capitalism in Development,* p. 55.
[10] Kapil, S. (2022). *Declining trend: Public spend on Indian agriculture has shrunk in a decade.* DownToEarth. https://www.downtoearth.org.in/news/agriculture/declining-trend-public-spend-on-indian-agriculture-has-shrunk-in-a-decade-83079
[11] Dsouza, R. (2020). *Improving access to Agricultural credit: New perspectives*. Observer Research Foundation. https://www.orfonline.org/research/improving-access-to-agricultural-credit-new-perspectives
[12] Dhas, A.P. (2009). *Agricultural Crisis in India: The root cause and consequences.* Munich Personal RePEc Archive. https://mpra.ub.uni-muenchen.de/18930/1/MPRA_paper_18930.pdf

3. Locating our work with the SEWA Federation

In order to build cogent policy recommendations arising from our research, it is crucial to understand the context within which our insights are rooted.

Our research project is borne out of a collaboration with the SEWA Federation. The organization works to support informal women workers' efforts to build independent cooperatives across a range of sectors. In India, "women's cooperatives were less than 2% of the total number and their membership comprised less than one half per cent of the total membership in cooperatives in the country".[13] In traditional agricultural cooperatives, the few women members are often edged out of decision-making processes despite historically engaging in a majority of the labor.[14] In contrast, the SEWA Federation model of cooperatives places the usage, management, and ownership of institutions in the hands of women informal economy workers. This model allows women to build bargaining power in marketplaces, providing those who labor with the decision-making power to control the appropriation of their labor.

3.1 History of Megha Mandli

Our research is embedded firmly in the work of one land-based cooperative of women farmers. The Tapi Jilla Megha Adivasi Kheti Utpadak SEWA Sahkari Mandli, or Megha Mandli, is a cooperative comprised entirely of women farmers belonging to Adivasi communities of five blocks in Tapi district of south Gujarat: Nizar, Songadh, Valod, Vyara, and Uchchhal. The establishment of Megha Mandli began with a scoping activity by SEWA Federation staff members in 2009. Pramilaben,[15] a resident of the block, had reached out to the SEWA staff members for support to avail MGNREGA entitlements.[16]

Apart from the requirement to facilitate labor entitlements, a need was also felt to raise awareness of sickle-cell anemia in the region, and therefore, the fledgling collective received further support from the Lok Swasthya SEWA Mandli, a state-level healthcare cooperative supported by the SEWA Federation.

Megha Mandli was formally registered in 2014, focusing on livelihood, healthcare, and financial services. After multiple rounds of needs assessments alongside the team, the Mandli intensified support for shareholders' livelihoods and they began their interventions into the agricultural supply chain around 2018. These interventions were focused on addressing the shareholder-farmers' largest

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[13] International Labour Organization. (2018). *Advancing cooperation among women workers in the informal economy: The SEWA way.* https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---coop/documents/publication/wcms_633752.pdf

[14] Duguid, F., & Weber, N. (2021). *Gender equality and women's empowerment in co-operatives.* International Co-op Alliance. https://genderequality.coop/sites/default/files/2021-11/Women%26amp%3BCoops%20Literature%20Review.pdf

[15] Names of interviewees have been changed throughout this paper in accordance with our research protocols.

[16] The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is a social security scheme that guarantees 100 days of wage employment in a fiscal year to adults residing in rural areas. The guarantee provides 'unskilled' manual labor to all eligible citizens.

issues: isolation from markets, and inability to obtain stable lines of credit. The Mandli established a seed procurement service to address these challenges. Hypothetically, the collective power of the Mandli and its role as an intermediary would:

1. Allow it to strike better deals with seed suppliers, allowing cultivators to avail competitive pricing.

2. Create institutional support systems for farmers, and act as a provisional grievance mechanism if farmers' seeds fail to germinate or are diseased, allowing them to demand that seed suppliers respond to them.

3. Provide lines of credit based on the trust engendered by the cooperative structure.

At the end of 2022, the Mandli in conversation with SEWA Federations' Enterprise Development Team (EDT) further narrowed their intervention to strengthen the Mandli's input services for paddy, okra, pigeon pea, and poultry. By intensifying the input services for a restricted group of produce, the EDT has attempted to support the Mandli's digitalization in a slow and thoughtful manner.

3.2 Organizational structure of Megha Mandli

In order to understand the institutional frameworks that agricultural data cooperatives can implement, we must understand how the existing governance structure of the cooperative impacts efforts to digitalize. For Megha Mandli, the federated structure of the cooperative determines the structure of work and decision-making. The heart of Megha Mandli's federated structure is the village-level farmer group, or the *khedut mandal.* Each farmer in the mandal pays a one-time fee of about INR 110 to become a shareholder of the Mandli, and avail the services, advisories, and support offered. The khedut mandal is the locus through which issues regarding farming, government entitlements, finances, etc., are discussed and advisories disseminated. Every mandal in a particular village is helmed by an *Aagewan* (a woman who comes forward), or a frontline worker.[17] Each Aagewan is selected from their particular village and she manages the village-level functioning of the Mandli. She is responsible for conveying information both from the Mandli to the shareholders and vice versa. In addition, she is the access point for activities like household surveys, seed sales, member training, etc. Each Aagewan is supported by a *Sankalit Sathi* (those who bring together), who is usually chosen from the existing pool of Aagewans. One Sankalit Sathi is assigned to work among 10 villages.[18] She is typically a more experienced Aagewan, and in addition to the duties of managing the procurement and disbursal of

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[17] Throughout this research brief, we often refer to Aagewans and Sankalit Sathis as frontline workers. Our intention is not to erase the nuanced responsibilities of these positions: they not only carry labor-time differences, but significant historical and cultural connotations. Our identification of these workers as frontline workers is an attempt to highlight the ways in which their roles are being rapidly and incrementally modified in the process of digitization and digitalization.

[18] International Labour Organization. (2018). *Advancing cooperation among women workers in the informal economy: The SEWA way.* https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---coop/documents/publication/wcms_633752.pdf

services to farmers in her area, she also acts as an aggregator of issues presented to her by Aagewans. She brings these issues up to the larger Mandli in meetings and provides solutions to Aagewans for them to discuss and take up in the mandal. The final arm of the cooperative's structure is the *Kaarobari (*board member*)*. The Mandli usually has five Kaarobaris, one for each of the blocks that the Mandli works in. The Kaarobaris are elected from the pool of Sankalit Sathis, and they are the most prescient link between the Mandli and the SEWA Federation. The Kaarobaris set the agenda for the Mandli's future and work closely with the SEWA Federation teams who support them to clarify their agenda. The information gleaned from these interactions is then disseminated across the Sankalit Sathis and Aagewans, to the village level.

While this federated structure holds true across the entirety of the Mandli, our field sites were confined to the blocks of Vyara and Uchchhal. We must contextualize the unique socio-historical and agrarian histories of these two regions to understand their specific challenges to digitalization.

3.3 The field site: Vyara and Uchchhal blocks

Vyara and Uchchhal, both agricultural regions primarily cultivating paddy, also grow pulses such as black gram and pigeon pea; millets, including pearl millet and finger millet; and commodity crops like cotton, sugarcane, and castor bean. Additionally, a few vegetables like okra, chillies, and gourds are cultivated.

Tapi district's socio-cultural profile is diverse, encompassing members of historically marginalized tribes. The Mandli includes members of the Gamit, Chaudhari, Vasava, and Kokani tribes, particularly residing in and around Tapi district.

Vyara block, the focal point of the Mandli's activities and the site of some of our interviews with Aagewans and farmers, serves as the urban and administrative hub of the district. This location facilitates numerous connections to merchants and traders involved in buying and selling agricultural produce and allied products. Vyara's centrality is further emphasized by hosting regional government offices, including the Gujarat State Seeds Corporation and the Beej Nigam. The Agricultural Produce Market Committee (APMC) in Vyara acts as a gateway to larger markets in Surat, Ahmedabad, and Mumbai.

Scheduled Caste (SC) and Scheduled Tribe (ST) communities comprise 85.78% of Vyara's population, as per the 2011 census.[19] Our discussions with the cooperative's frontline workers and allied farmers highlighted the diverse socio-cultural profile reflected in the distribution of land holdings across the block. Vyara's agricultural lands encompass large-holder farms and marginal land holdings. According

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[19] Gujarat Social Infrastructure Development Society. (2015). *District Human Development Report.* https://www.im4change.org/docs/7718-Tapi_DHDR_May_2016.pdf

to the 2015-2016 Gujarat state agricultural census, 48.4% of all landholdings in Vyara were considered to be marginal, below one hectare. About 24.4% of all landholdings were between one-two hectares, and the remaining landholdings were above two hectares.[20] Further, almost 91.6% of the total area of marginal landholdings is held by SC/ST owners, and 90.3% of medium-to-large land is held by SC/ST owners.

Despite challenges related to contested access to water due to local infrastructural issues and socio-political conflicts, Vyara, overall has not faced significant "issues with water" with about 44.36% of the share of irrigated areas.[21] Functional pipe irrigation systems, public borewells, and tubewells exist, and initiatives to establish additional channels for farmer access to water are underway, albeit with limited successes. Respondents in Vyara unanimously identified paddy and pulses as the staple crops in the block. Larger farmers, equipped with private borewells and pipe irrigation, also cultivate okra in substantial quantities. Notably, okra has replaced sugarcane as the highest-value crop in the past eight to 10 years. The overwhelming economic impact of okra is evident in the Vyara APMC, where a dedicated auction for the crop takes place daily, attracting farmers from Vyara and adjacent districts to sell their okra harvest.

Uchchhal, our other field site, hugs the Maharashtra border. Our focus in Uchchhal was specifically on a few villages established as part of the resettlement process following the construction of the Ukai dam in 1972. This 10-year-long process to build a dam across the Tapti river required the resettlement of 13,101 families across 170 families, as per official record.[22] The resettlement process often involved compensating families for the loss of their landholdings with a combination of cash and land. Subsequent division of smaller land holdings among family members over the 50-odd years since resettlement has resulted in minuscule plots for each farmer. This factor has also recently prompted some individuals to clear forest lands to expand cultivable agricultural areas. However, discussions with frontline workers and Mandli-affiliated farmers revealed that despite these challenges there's a prevailing belief that the soil in the Uchchhal-Nizar region is robust and capable of supporting the growth of most crops.

Additionally, during our fieldwork, we observed that the infrastructure of Uchchhal was not as built up as in Vyara, possibly owing to the recency of the resettlement. Access to water through irrigation, public borewells, and tubewells remains limited. Consequently, farming in Uchchhal and the nearby

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[20] Patel et al. (2020). *Agriculture Census: 2015-16*. Government of India.
https://dag.gujarat.gov.in/images/directorofagriculture/pdf/Agriculture-Census-2015-16-Part-I-eng.pdf
[21] SEWA Federation. (2020). *Tapi District Farmers' Mapping Study.* https://www.sewafederation.org/wp-content/uploads/2021/02/Tapi-Farmers-Mapping-Study-SEWA-Federation.pdf
[22] Raje, G. (2005). *Remembering Displacement: Hunger and Marginalisation in*
three resettled villages of south Gujarat. The University of Warwick. https://wrap.warwick.ac.uk/1194/1/WRAP_THESIS_Raje_2005.pdf

Nizar block heavily relies on rainfall, leading to the cultivation of drought-resistant and water-scarce crops, particularly millets.

3.4 Digitalization of Megha Mandli

Despite the diversity of these regions, the profile of the women farmers we interviewed falls broadly into the category of small and marginal subsistence farmers.[23] Although the utilization of merely this categorization does not adequately represent the spatial and caste dynamics within Tapi district, it provides a shorthand to annotate cultivation, and the buying and selling practices of over 80% of farmers in India,[24] contextualizing the rural agrarian political economy of land and agriculture in our analysis: season-on-season buying of input, production at a near subsistence level that requires wage labor for income supplementation, and emerging practices of migration within families to peri-urban areas, where workers (often male) work as informal workers within and outside of agriculture. While, for example, some of the farmers we interviewed never sold their produce in the market, others sold anywhere from 20-30% of their crops and cultivated certain crops for sale only, subsistence farming being one of the primary goals of cultivation. The challenges of linkages to the market, of being unable to barter for better output prices, and the consistent tension of agriculture being a sustainable means to bringing in money are all intensified by our interlocutors' position as small and marginal farmers.

It is in the backdrop of this context that the SEWA Federation has engaged in various digitalization schemes and projects to support the function of Megha Mandli. In particular, our research is focused on Megha Mandli's current pilot with digitalizing parts of supply chain management, done in collaboration with external technology partners[25] through a social enterprise model.

The Mandli has used a digital platform to complete order management and procurement for two crop cycles in 2023. Its current pilot application is a Farmer Producer Organization (FPO) management app, which has been nominally modified to serve Megha Mandli's requirements. The app is run on each worker's personal smartphone, as there is currently no scheme in place for frontline workers to be provided a smartphone to conduct their duties over the app.

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[23] Press Information Bureau. (2019). *Categorisation of farmers.* Government of India. https://pib.gov.in/Pressreleaseshare.aspx?PRID=1562687

[24] Ministry of Agriculture and Farmers Welfare. (2019). *Agriculture Census 2015-2016.* Government of India. https://agcensus.nic.in/document/agcen1516/T1_ac_2015_16.pdf

[25] The SEWA Federation's data cooperative pilot involves multiple stakeholders in the form of consultants, IT for Change being their knowledge and research partners. The current application/s being piloted has been designed by a registered non-profit that works to offer digital solutions to small FPOs and agricultural cooperatives across the Global South. In this research brief, they've been referred to as tech/digital partners.

Currently, the Mandli uses a lite digital application to carry out the following activities:

1. Conduct a needs-assessment survey of the types and quantities of season-dependent crops, i.e., paddy and okra, that are cultivated at the individual farmer-level. The app used by the Mandli is used specifically to streamline their seed procurement process, and tackle the challenge of unpredictable demand generation.

2. Onboard and keep track of all buyers of the Mandli's input products.

3. Conduct stock management/record crops available at the time of survey.

4. Conduct stock management/record actual stocks, where the application is used to inform frontline workers on how many quintals/kilos of seeds are left for sale. This is dependent on timely updation by frontline workers.

The Mandli had undergone one cycle of this process, partly using the app for the procurement of paddy seed while the customization of the application for the Mandli's specific needs was underway. The initial survey of seeds was carried out through 'KoBo toolbox',[26] an open-source platform that can be used for the collection and management of survey data.

As part of the seed survey, all Aagewans and Sankalit Sathis were provided access to this survey through an online link shared over WhatsApp. The survey collected data on paddy seed requirements of shareholder and non-shareholder farmers aggregated at an individual- and village-level: this included the quantity of seeds required, the type of paddy variety, and the area of land that has been allocated for paddy cultivation. With sensitive data on identity and land being collected, the technology partners highlighted concerns about the data being collected and stored over Google Sheets through KoBo, and simultaneously began re-developing an existing app-based platform from their suite of apps for the upcoming sale and future surveys. This app had initially been launched in another state as a business-to-consumer (B2C) app to connect farmers with aggregators and individual buyers.

In the new app as well, the demand survey and sale of seeds are conducted by Aagewans and Sankalit Sathis. While Aagewans are tasked with approaching farmers both at the time of the survey and at the time of sale, Sankalit Sathis conduct needs-assessment surveys, assess the stock needs post survey, as well as set prices for the seeds and other inputs being sold.

During the sale of seeds, the Aagewans and Sankalit Sathis return to all the farmers they had initially surveyed, selling the requested quantities and varieties. The 'sell' feature on the app allows frontline workers to input a date on which the farmer wants their order delivered, allowing the Mandli to

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[26] KoboToolbox. (n.d.). *Powerful and intuitive data collection tools to make an impact.* https://www.kobotoolbox.org/

optimize when to send seeds to the Aagewans' homes or to the Uchchhal Farmer Facilitation Centre (FFC).

As this app was primarily designed as a B2C app, it does not possess a separate survey feature. Instead, the Mandli uses the selling functionality for both generation and for actual seed sales. For the seed survey, all inventory is listed as 'out of stock' and the frontline workers use the 'new order' functionality for each user in the database to record a request for seeds. The data generated from this exercise will provide an estimate for the Mandli to place a wholesale order with seed suppliers. Once these seeds are procured, the Mandli staff update the app with stock availability and the frontline worker then uses the 'sell' entry option to log each actual sale.

As Megha Mandli experiments with digitalizing parts of its agrarian supply chain, with existing models of centralized FPO digitalization being retrofitted into a federated cooperative model, efficiencies as well as dissonances emerge. In the sections that follow, we unpack the functioning of the SEWA Federation's experiment, paying attention to how different imaginations, institutional contexts, data practices and flows, and socio-economic realities sometimes collide in its path to a model of data cooperativism that works for all.

Figure 1. Illustrated depiction of the application's user interface
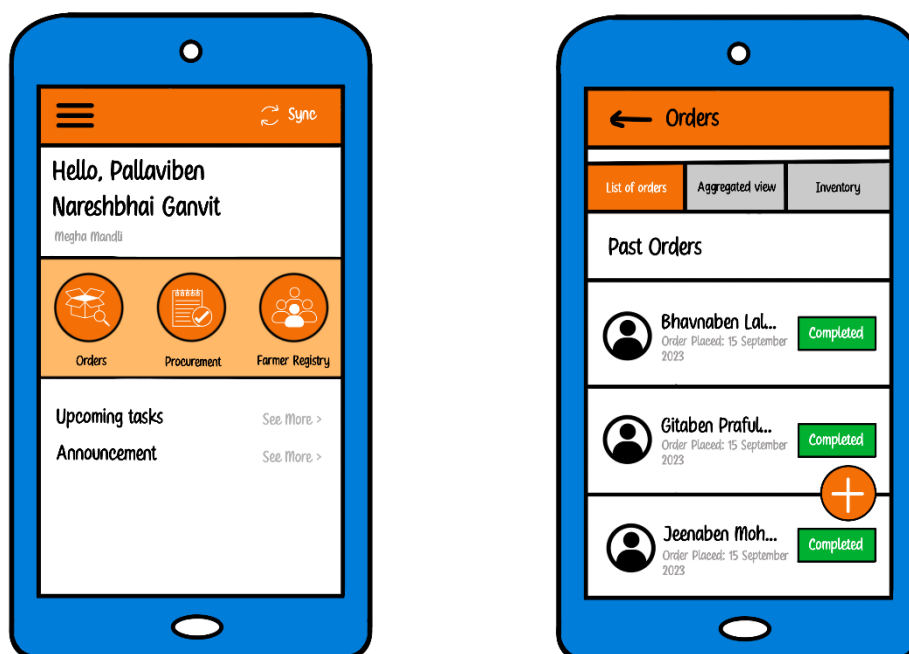
4. Methodology

Given the applied nature of our research to effectively capture human interactions with an embedding technological ecosystem that is emerging rapidly at our field site, a traditional ethnographic method of prolonged and informal immersion to gather data may not engage with core principles of co-design: engagement, reciprocity, and sustainability.[27]

Our orientation towards embedding a functional techno-institutional blueprint within the rural agrarian socio-polity of Vyara necessitated a methodology that "accepts at the outset the impossibility of gathering a complete and detailed understanding of the setting at hand";[28] the technological blueprint in its ideal form would be one that will be in a consistent state of evolution in response to changing dialectics of the agrarian context.

In an attempt to ensure co-design and cooperative principles of reciprocity and sustainability shape our previously-suggested techno-institutional blueprint,[29] our research method is focused on zooming in on challenges surrounding the agriculture supply chain, and digitalization with our interlocutors through interviews with various stakeholders, and observations of the supply chain in Vyara. This

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[27] Brereton et al. (2014). Beyond ethnography: engagement and reciprocity as foundations for design research out here. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 1183-1186.
[28] Hughes et al. (1995). The role of ethnography in interactive systems design. *Interactions, 2*(2), pp. 56-65.
[29] IT for Change. (2023). *Examining Approaches to Worker-led Governance of Data and AI Technologies.* https://itforchange.net/node/2425

approach allowed us to glean specific knowledge from multiple perspectives and uncover specific challenges quickly.

We specifically spoke with our interlocutors on the challenges they face in agriculture, challenges encountered in the workings of the cooperative, as well as challenges of digitalization. In addition, we observed some of our interlocutors to gain an experiential understanding of some of the above challenges. These methods have provided us multiple, often fractal, perspectives of certain touchpoints in the cooperative's digitalization.

Our primary qualitative research for this project comprised semi-structured interviews, focus group discussions, and participant observation. Our field research took place over a span of 10 days towards the end of September 2023. As mentioned previously, our research is based in the Vyara, Uchchhal, and Nizar blocks of Megha Mandli's reach. As part of our semi-structured interviews, we interviewed six Aagewans who belonged to five different villages spread across two villages in Vyara block, and three villages in the Uchchhal-Nizar region. Almost all these semi-structured interviews took place at the houses of these frontline workers. We also spoke to three other Aagewans and five Sankalit Sathis as part of two separate focus group discussions. These discussions were held in the Mandli's central farmer facilitation center in Vyara. In addition, we also spoke with two staff members who work for the Mandli. In order to understand the supply chain issues affecting the Mandli, we spoke with two agro-traders based around Vyara's APMC, a manager at the Gujarat State Seeds Corporation, and spent time at the APMC observing the structure of the market, how it works, and current digitalization efforts, such as the implementation of e-NAM.[30]

All our focus group discussions and interviews usually lasted one hour with some variation, depending on existing responsibilities of the participants and researchers. Our field research team consisted of two researchers, and our interviews were recorded with informed consent for the purpose of coding and analysis. Though our interviews took place primarily in Gujarati, we also employed the use of live translation as one member of the research team did not understand and speak Gujarati.

This round of fieldwork was part of a larger four-year project between the SEWA Federation and IT for Change,[31] where data collected across multiple rounds of online and offline field work has been used to triangulate our current findings. These interactions include online and offline interviews with members of the EDT, as well as multiple in-person and virtual interviews with the SEWA Federation's technology partners on this project. The insights we've gained through these interviews and our fieldwork are built

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[30] Press Information Bureau. (2023). *National Agriculture Market (e-NAM).* Government of India. https://static.pib.gov.in/WriteReadData/specificdocs/documents/2023/apr/doc2023414181301.pdf
[31] IT for Change. (2020). *Re-wiring India's Digitalising Economy for Women's Rights and Well-being.* https://itforchange.net/digital-economy-womens-rights-wellbeing-india

upon earlier field visits we conducted in April 2023 and ongoing conversations we've had with the multiple stakeholders mentioned through the course of our partnership.

As part of our research protocol, each of our interviewees was provided with a formal informed consent document in Gujarati. We also explained our protocol to interviewees. We asked for consent to record the conversations on a phone, for the explicit purposes of transcription. Names of the interviewee and their villages were not recorded to minimize tracing of our sources. We asked for consent to take photos of the interviewees, their houses, and their farms. We informed all interviewees that photos might be used for report writing, and for other project-related outputs. All interviewees were informed that they could refuse to answer and end the interview at any point. All interviewees also have the option to have any and all data on them culled at any point. All data is stored on our own server, in a folder only accessible to the researchers on this project, to ensure the data collected from this field research is not used for purposes outside our stated protocols.

In our interviews with Aagewans, we discussed structural issues with Megha Mandli, and the challenges faced while using the application at length. We recognize that our research undeniably impacts existing relationships between the SEWA Federation, the Mandli, and its members. These tensions can lead to reprisals, exclusions, and even the loss of position for our interlocutors. Our attempts at minimizing any negative fallout are also located at the level of access to data. In addition to storing interview transcripts in a restricted fashion, all data collected from our fieldwork has been pseudonymized. In this report, we refrain from naming specific villages and interviewees where possible, using pseudonyms otherwise.

5. Reckoning with Data Centralization within the FPO Digitalization Model

Megha Mandli's pilot to digitize parts of its functioning for supply chain efficiencies has also presented the unique challenge of choosing and co-designing the appropriate application. The plethora of applications available for cooperatives and collectives that are developed through a variety of financing models – from social enterprises to for-profit financing – are often created to serve collectives that are registered and conglomerate as Farmer Producer Companies/Organizations (FPC/FPO).

Producer Organizations are legal entities formed by 'primary producers' – farmers, milk producers, fishermen, weavers, rural artisans and craftsmen.[32] As there is a concerted push towards the FPO model by the state,[33] private for- and not-for-profit ventures in agricultural value chain digitization

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[32] National Bank for Agriculture and Rural Development. (2015). *Frequently Asked Questions.* https://www.nabard.org/demo/auth/writereaddata/File/FARMER%20PRODUCER%20ORGANISATIONS.pdf

[33] Prasad, C. S. (2019). Farming as an Enterprise: Ten years of FPO Movement in India. In *State of India's Livelihood Report.* Access Development Services, pp. 37-48.

widely model their application design and functioning on the assumption that most collectives function in the same manner as FPOs. These models of digitization, though varied depending on the software and developing company, have some common goals: (i) improve predictive capabilities of FPOs/cooperatives by providing accurate data on agricultural input demands of shareholders; (ii) create individual-level farmer profiles – often overlaid on land registration/Aadhar – that can help FPOs to predict individual and aggregated farmer behavior for upcoming agricultural seasons; and (iii) connect farmers to customers or wholesale buyers either through a physical or digital market.

This digitalization model can offer FPOs capacity to engage in predictive decision-making, enabling them to engage in better stock management and use data-driven insights in order to increase profits of the FPO. However, these models of digitalization are often based on centralization of data and unfederated data systems, where the FPO becomes in itself a singular, typified unit of functioning, with unilateral decisions being made for farmers from various socio-economic contexts at the level of the FPO. In this section, we outline five sets of insights deriving from our specific study of Megha Mandli's digitalization model.

Insight #1: There are cohesions and frictions between stakeholders in their notions of digitalization.

"What can digitalization do for the Mandli?" While on the surface this seems like a straightforward entry into our inquiry, in the course of our iterative research, the parameters, expansions, and limits of this question were ever-shifting. While the imagination of digitalization, in general, is often that of efficiency, transparency, and economic gains, especially as envisioned by FPCs, means of operationalizing the same vary. An overlap in the desires and goals of our three concerned stakeholders – the SEWA Federation, the shareholder farmers, and the technology partners/intermediaries – cannot be necessarily situated in one assumed paradigm that imagines distributive justice in the same manner. Friction is bound to exist, despite cohesive goals.

1.1 The role of farmers as agentic stakeholders in digitalization has to be constantly negotiated.

Our three scoping conversations with each stakeholder gave us comprehensive insights on the intentions, goals, and historical precedents that have determined their approaches to building out Megha Mandli's digital layer.

> *Change with time is essential; the Covid-19 situation taught us the importance of digitalization. Within agriculture, there are emerging challenges such as climate change… also there is a need to improve business of farmers and the Mandli by matching demand and supply with lesser labor. Part of our goal is to explore how platform cooperatives will be useful for the informal sector; without being part of digitalization itself, we won't understand the process. Our role [as the Federation] is to design the digital layer and ensure that it [the digital layer] doesn't become the reason for exploitation.*
>
> -Managing Director, SEWA Federation

The SEWA Federation's Managing Director articulated the real goals of digitalization as one that can accelerate economic gains made by the women of the Mandli, mostly Adivasi marginal landowners. She delineated a series of goals and principles of the data cooperative that the SEWA Federation aims to build:

> *Whenever we are collecting data, it has to be useful for farmers and women, not just for research. Primary services should include improved agricultural opportunities for women, including timely updates on input services, and [information on] where to sell their produce and when to sell their produce…Whatever data is there, it should be in the control of the women. And the data should be easily accessible. The goal ultimately, is to increase income opportunities for farmers and the cooperative. We wish to use this experiment to also boost learnings on policy and advocacy, which may be useful for other FPOs.*
>
> -Managing Director, SEWA Federation

Concurrently, our conversations with the Kaarobaris on the possibilities of digitalization in Megha Mandli unearthed similar goals: the potential for the app to provide the Mandli itself with information about stakeholders and non-stakeholders who access the Mandli's services. A centralized history of each farmer's transactions with the Mandli would highlight how farmers were utilizing the services of the Mandli and how frequently certain non-shareholders were coming up to the Mandli as well. The nature of a centralized history of each person – a farmer profile – was also articulated by the SEWA Federation's digital intermediary, referred to as SEWA's tech partners.

A common thread that was observed among Mandli staff members and the larger SEWA Federation was the understanding that the ultimate objective of digitalization was to comprehend not just the farmers' demands, enabling the Mandli to provide more tailored services, but also to manage supply and demand issues and create better market linkages.

When we looked at the considerations of using our app for Megha Mandli, we thought about what data the FPC should have. Basically, they should have individual farmer profiles. They should know their members. Very rarely do FPCs have visibility to the exact demand – like getting visibility of input demand, production details, etc. – and they definitely do not have easy access to advisories. [In the future] FPCs will be linked with other platforms for insurance and advisories. We want to see people start using data to make decisions.

-Program Team, SEWA's tech partners

A senior tech program team member also reported the possibility of cooperatives selling aggregated data to third-party players on behalf of farmers, indicating a digitalization scheme centered around the economic gains being made from seamlessly connecting with third-party-players such as in markets.

Coherences in observations on the role of digitalization for the SEWA Federation are complicated by the ability of both farmers and the SEWA Federation members to meaningfully engage with it to meet their goals.

We see, across the three stakeholders, the central position of farmer data in our scoping conversations on digitalization. All stakeholders envision it as a meaningful component to meeting their stated goals. However, each stakeholder's goal requires farmer data to be conceived and used slightly differently. The Managing Director of the SEWA Federation provides a narrow imagination of the potential of the data, as her imagination is tied inherently to the women in the FPO and how they can avail agricultural opportunities specifically. For the Kaarobaris, farmer data is vital to build historical profiles that can help the Mandli fortify its membership. Though the tech program team advisor's imagination explicates that granular data should be collected by the app to aggregate input demand, his vision has wider future implications, and the imagination which follows expands to understand how data can be rejigged beyond its ability to improve reaching the market.

These overlaps in the differing imaginations cohere uneasily into one of the application's features being a database of individual farmer data. The application has a farmer profile database with individual farmer profiles with their name, their village's name, and their phone number. A frontline worker can peg a sale to the profile to keep track of ordered items, but we were unable to ascertain how or if sale history can be easily accessible. However, the provision for providing pictures of Aadhaar cards, ration cards, and passbooks exists in other versions of the app. These overlapping visions have resulted in an app that centers individual farmers but is controlled by the frontline workers and the Mandli. While the SEWA Federation imagines the Mandli mediation to act as a shield, safeguarding farmers from external influences, including exploitative market practices, the technology partner's imagination of a Mandli-facing app, however, is hinged on the imagination of the farmer as slow learners. Frontline workers present a more agile population to train to capture individual farmer data.

None of the stakeholders envision a farmer-facing application. Farmer agency, either through the lens of protectionism or efficiency, is executed by proxy.

A member of the EDT at the SEWA Federation highlighted one of the issues with many current initiatives to digitize cooperatives as being that "the process of digitalization is top down. […] Additionally, they (Mandlis) do not have people who can analyze data even if we can collect data".

These complements and frictions live uneasily in the digitalization of Megha Mandli, both through the app and through the dynamic economic and social relations between farmers, shareholders, frontline workers, and the SEWA Federation.

Insight #2: Vyara's agrarian supply-chain inefficiencies limit the scope of digitalization, bringing both relief and challenges.

The app's capabilities to meet the Mandli's supply chain requirements are interconnected with the longstanding agricultural institutional and supply-chain challenges in Vyara. With the roll out of an incomplete, work-in-progress application, frontline workers and FPO staff have documented the emergence of better practices of data collection and prediction within the Mandli, while at the same time, they are cognizant of the barriers that the app cannot solve.

The year-on-year market fluctuations particularly affect marginal farmers who have to calculate the pressing financial needs of their household with their position as subsistence farmers. Farmers make different seed choices every year based on their past experiences, their community's shared knowledge, climatic fluctuations, and their own shifting desires for their output. Often, this process takes place right at the start of a new planting season, a challenge for the SEWA Federation to gauge demand and forecast farmers' seed requirement.

Accurate prediction requires a large pool of granular data on land size, land type, past history of seed sales, and success of seed types on that land. The Mandli only had one previous year's worth of data on the types of paddy that they sold in Vyara block. This quantity of data doesn't allow for the creation of a precise prediction mechanism, and information from the paddy survey does not directly impact the ability of the Mandli to use predictive seed demand for their seed purchases. In order to build a useful database of information, frontline workers will have to collect information on seed sales for many seasons to come.

2.1 Digitalization can only partially address Mandli's needs for prediction given the volatility of input markets, lack of transparency, and inefficient price-discovery mechanisms.

Despite embarking on a month-long survey on seed requirements, frontline workers and Mandli staff are often not privy to the prices of the seeds being sold. Paddy seeds – especially hybrid seeds – sold in Vyara private markers fluctuate significantly in price every day, as reported to us by Paatidhar Agro, as well as Mandli staff. Prices of seeds fluctuate daily based on demand and supply, as well as any announcement of sales or lines of credit provided by seed companies. The Mandli, as a result, struggles to estimate the price at which they will be able to procure seeds months down the line.

Prices of paddy also increase in the lead-up to the prime planting season, with a drop once planting has begun. This has led to a scenario where the rate at which the Mandli has procured seeds are higher than the market rates at the time of sale. The composition of Megha Mandli is one of small and marginal farmers, contributing to fluctuating seed needs as well as lesser seed demand, as compared to other FPOs/FPCs that do business with agro-traders. Additionally, the Mandli does not have the capacity to systematically predict seed needs due to the absence of data, relying on surveys every season, with the Mandli unable to access discounts provided to FPOs that bulk order early.

> *The biggest drawback is that SEWA does not get any discount from Paatidhar Agro, except for 10% when booked well in advance. The SEWA Federation gets seeds only at the market rate. For example, rice can be bought for INR 320 from the market, and INR 340 from SEWA. It is more expensive to buy from SEWA. Hence, farmers prefer not to buy from SEWA and directly from Paatidhar Agro. For certain crops like rice, SEWA is kept in the dark about prices up until the point of sale, unlike Okra, where the price is known beforehand.*
>
> -Megha Mandli Staff

The Mandli faces the challenge of collective bargaining with agro-traders for cheaper rates, and is often unable to access steeper, tailor-made discounts. With a limited cash flow, the Mandli is unable to subsidize the sale of its paddy seeds, sometimes even selling at a higher rate than large agro-traders in Vyara.

Similar challenges plague the selling end of the agrarian supply chain in Vyara. Most farmers with the SEWA Federation sell at the APMC Yard – a state-run market for agricultural and livestock produce – with efficient price discovery of APMC rates being one of the primary goals for the SEWA Federation's data cooperative. However, significant infrastructural deficits at the level of the APMC hinder Megha Mandli's capacity to expand their extension services to aid shareholders with the marketing and sale of their produce.

Sale of produce at the APMC continues to seemingly follow an outdated model of open auctioning, based on the observations made by IT for Change's field team. An open auction is where traders (prospective buyers) gather at the shop of each commission agent and after inspecting the quality of produce, announce their bid, where the highest bidder gets the produce. According to the Digital Officer at the SEWA Federation, the open auction system is to be supplemented by the display of prices on blackboards with base prices for each year.

> *APMC blackboards have not been used in 10 years, they should mention the base price for each year. Farmers don't have any idea of prices at the point of sale, and they have no agency to choose a price either. Here, merchants meet before the auction and decide amongst themselves on what prices to offer. It becomes a big challenge for SEWA to ease price discovery because even the Mandli cannot access prices per day.*
>
> -Digital Officer, Megha Mandli

The sale of crops at Minimum Support Price (MSP) at the Vyara APMC also follows an arduous process of vetting and grading – a day's worth of time that most farmers with the SEWA Federation, who travel several kilometers to reach the APMC, cannot afford to sacrifice. Selling fresh produce like okra requires farmers to be at the APMC in a mere few hours post-harvest, with no mechanism of price discovery prior to initiating the harvesting process. Based on observations and insights from the Digital Officer, e-NAM – National Agricultural Market, an online trading platform for agriculture that displays online daily prices of pre-identified crops, including okra – has not been successfully launched in Vyara. The ability of the app used by Megha Mandli to capture accurate pricing for the seed survey, as well as fulfill its eventual goal to connect farmers to the market hinges on an optimized and transparent agrarian supply chain. However, this proves to be a significant challenge in Vyara due to poor public digital and physical infrastructures, limiting the capabilities of the emerging data cooperative.

2.2 Accurate demand prediction requires a standardization of seed quantities and types, with the potential risk of obscuring the complexity of subsistence farming.

The farmers of Megha Mandli practice diverse types of agriculture. Interviews with farmers document past and present experimentation with local varieties of seeds, often based on the successes of their neighbors' farms, as well as organic advisory from the SEWA Federation. The Mandli has also, in the past, encouraged the production of certain hardy paddy varieties such as *gar-13*, a government-certified paddy variety known to provide reliably high yields. As one Aagewan recounted, if one year's variety produces a good yield, the same seed will be planted next year for sale.

It is important to note that seed-type selection has historically involved bringing in agrarian experts through the Krishi Vigyan Kendra Knowledge Network (KVK)[34] and frontline workers at the SEWA Federation. Seed varieties are shortlisted based on data on soil and yield and are vetted by the frontline workers, taking into account their past experiences. As Megha Mandli enters a new paradigm of digitalization, decisions on selecting seeds and their procurement support through the application are now being made by numerous stakeholders, including and not limited to the EDT. When asked about the Mandli's focus on primarily supporting paddy and okra, this is what a member of the EDT had to say:

> *There is some rationale behind the push towards certain crops, this decision was taken in conjunction with the Sankalit Sathis and the EDT on behalf of the SEWA Federation. The Mandli wants to move towards financial independence and this is also something that SEWA wants. The focus on certain crops was, in a way, a trial run for the Mandli to understand the different requirements, needs, and processes required to support these crops. When our tech partners came in, this also became a trial run for them to understand the different requirements of the app.*
>
> -EDT member

The Digital Officer at Megha Mandli indicated that farmers are encouraged to buy from the market when the Mandli is unable to stock a particular variety. This is either because the quantity demanded is so little, or because they're difficult to procure. The Mandli staff have to juggle the desires of individual farmers with the small upfront capital they have, and the specific relationships they have with suppliers. Though the Mandli staff try to stock every requested variety, the Digital Officer also mentioned that shareholders are also encouraged to grow varieties that are "reputed and have good social reviews".

The current process of seed selection at the Mandli for stocking is more deliberate, signaling a departure from an advisory relationship the Mandli has had with its shareholders, to one where the entity of the Mandli plays a more active role in determining the farming futures of its stakeholders. Actioning this through the emerging digital layer, the SEWA Federation has imagined digitalization to engender new connections with suppliers and relationships with traders. Consequently, this could also change the composition of seed varieties available through the Mandli. With newly designed choices and restrictions on seed varieties and other inputs such as bio-fertilizers, there is a risk of crop homogenization, directly driven by decisions the Mandli makes on stocks. As new avenues rise through

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[34] A Krishi Vigyan Kendra Knowledge Network (KVK) is an agricultural extension center of the National Agricultural Research System. KVKs provide technological and vocational support to improve the agricultural economy of a specific region. See, https://kvk.icar.gov.in/

digital linkages to markets, there may be retroactive effects on what crops are grown based on which varieties, traders, and regions get efficiently incorporated into the digital layer. In fact, the introduction of okra to Vyara's agrarian supply chain – which happened in the last two decades – has had significant ecological consequences, with our interlocutors reporting an increased reliance on pesticide and fertilizers to maintain the fertility of farmland across crop cycles. Hence, special attention must be paid to addressing how new technologies further the risk of crop homogenization and its attendant dangers.

> *We had to do an orientation on the application. Cooperatives are old school so they don't understand the value of data. We can induce that behavioral change in them. When we conducted capacity building [sessions] for them, we understood that they didn't have any idea of the types of paddy. Through demand assessment, they gained an understanding of where to build market linkages, and they got about 6x their income.*
>
> -Program Team, SEWA's tech partners

This flattening of variance is also observed across multitudes of digitalized systems; the digitization of land has been documented to impact the tenure rights[35] of marginal land owners and communities with non-traditional claim to land, such as sharecroppers. Introducing such precarious digitalization into the lives of marginal farmers also significantly affects the labor of the Mandli, as delineated in the following section. As the pilot progresses in Megha Mandli, it is imperative to ensure the data stack that is being built as alternatives does not replicate the logics of Big Data systems that emphasize market efficiency, but instead act as transformative potentials to archive and promote agroecological practices, key to agrarian and climate equity.

Insight #3: The introduction of an incomplete digital layer is not only changing workflows, but is modifying the taxonomy of labor and social relations within Megha Mandli.

While one imagination of digitalization – as articulated by the SEWA Federation and the frontline workers – is of reduced labor and easier workflows, the introduction of digitalization in its current iteration has intensified labor requirements of frontline workers and Megha Mandli staff. This intensification is unaccounted for as additional labor, invisible to farmers and tech partners.

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[35] Gurumurthy, A., Chami, N., & Kumar, R. (2022). *Recasting Land Tenure Rights in the Data Epoch: Insights from a Country Case Study of India.* IT for Change. https://itforchange.net/recasting-land-tenure-rights-data-epoch-insights-from-a-country-case-study-of-india

3.1 The pilot application is a work-in-progress, and current inefficiencies burden frontline workers.

The current pilot to digitize parts of the agrarian supply chain management at the Mandli was launched in early 2023. However, during the course of the pilot spanning a few months, several digital infrastructural challenges emerged, affecting the ability of frontline workers to use the application to resolve pre-identified inefficiencies at the level of the Mandli.

The application adopted by the SEWA Federation was developed in Telangana, a southern state in India. As this application was not previously launched in Gujarat, much of the early process of tailoring the application for the SEWA Federation's context involved translating the app from English to Gujarati. The lack of embedment of the product development team from the local context – a common issue with technological innovation and development within market-driven approaches – resulted in the team reportedly using Google Translate for language localization. Describing the initial translation issues that emerged in March 2023 when the app was launched to complete a needs-assessment of paddy seeds amongst shareholders, this is what a Mandli staff member had to say:

> *They used Google Translate for the process […] they picked the top most option, but ended up using the wrong words. We (eventually) spoke to the women in the Mandli on the words to include; based on the initial options, there was a mix-up of language. The older women using the app (Aagewans) didn't even know which contact to choose, and because of this… they took help from family. Now there's improvement after feedback, about 95% of Gujarati words are correct.*
>
> -Mandli staff member

Introduced to Megha Mandli as being 'digital-lite', i.e., capable of being used offline, the app's data syncs with the server once the device has internet connectivity. However, various key informants, including Mandli staff members and Aagewans, revealed that this function is not without defects. Delayed and faulty syncing, even with eventual internet connectivity were frequently reported to the Data Officer and the product development team. The delayed and faulty syncing can affect stock updates on seed sales, where Aagewans reported logging sales for seed varieties that were already sold out, potentially resulting in insufficient quantity of seeds being delivered to an Aagewan's house. Aagewans might have to make additional visits to farmers to modify their order, or even travel to the Mandli's central KSK in Vyara to pick up more seeds, and in some reported cases, return extra stock.

Aagewans from villages that have limited internet connectivity and signal – often from the resettlement villages such as in Ucchhal – have had to work entirely without internet connectivity for needs-assessment surveys and the sale of seeds. Syncing of entered data on the app only takes place when these Aagewans visit the Mandli, many of them traveling to Vyara for this very purpose. Though the app

is digital-lite, crucial elements of the needs-assessment work cannot be completed effectively without local internet infrastructures. The digital-lite model then, is designed based on the assumed availability of internet for Aagewans, community leaders who very much occupy similar social and physical locations as their fellow shareholders.

The app, developed for the Android operating system, also does not run on older versions of Android, making it difficult for some frontline workers to use on their phones. These issues may get exacerbated as both the application and operating systems are constantly upgraded, with the onus of software and hardware updates lying on frontline workers.

Digitalization is a slow, incremental process. In fact, digital extension systems such as the application piloted by Megha Mandli necessitate a public infrastructural backbone – such as the availability of internet connectivity in rural India – and burgeoning public-private infrastructures, such India's Unified Payments Interface (UPI). Technical hurdles and their impact on workflows are expected issues within for and non-profit technology development cycles. However, there exists an externalization of these transpiring problems, where informal women workers inadvertently bear the consequences of such trial and error. A collaborative process of addressing these challenges and co-creating the inherent value of digitalization will require patience and forbearance from all actors, particularly so from technology partners.

3.2 The application in its current form increases labor efforts through duplication of work, with frontline workers bearing the brunt.

Digitization efforts often result from multiple pilot initiatives which furnish contextual data to product development teams to refine and modify applications/protocols. In the course of this pilot, Aagewans and Sankalit Sathis – the bearers of data collection – have become crucial in providing timely feedback, including design aspects, to their technology partner. However, this additional layer of work, emerging against the backdrop of an in-progress application with infrastructural glitches, is often unaccounted.

The Mandli's pilot application was adopted and re-designed to ensure that the manual seed survey Aagewans have historically conducted is now a digital process. However, this shift has not been seamless. During the paddy seed survey which was conducted in the first quarter of 2023, most Aagewans did not directly input information on the app due to "security and safety reasons", arising from the struggles they had previously faced using the app. Instead, Aagewans continued to collect data in their physical notebooks. They would periodically transfer this information onto the application, doing this at the Mandli's center or their homes. This extraneous effort provided some Aagewan's relief as they had physical backups of the transactions that they could rely on.

However, this duplication of work is unnoticed in transaction records in the app – leading to a facet of women's labor being invisibilized – but it is also an inherent part of application design and development, where the unpaid labor of users becomes key in improving the UI/UX of the app, as well as its predictive capability. Frontline workers, hence, serve the needs of the application development process, as opposed to gaining from the pilot, in the form of increased working hours and manual labor. During our field work, we interviewed a group of frontline workers, discussing their experience with Megha Mandli's digitalizing experiment:

> *They (Aagewans) need to go door to door to collect information from individual farmers. Most farmers do not have the ability to forecast how many seeds they want. The first time they go, they write the values in a notebook. But almost all times, multiple visits are needed to confirm the final amount. They write the values in the notebook and continue to revise it, and then later, they upload it to the application.*
>
> -Frontline workers

Furthermore, due to the fluctuating nature of the price of paddy seeds, Aagewans could not share a fixed price with the farmers during the survey, leading to back-and-forth talks with the Mandli and the FPO staff, and the shareholders expressed their frustration to the frontline workers. It was rightfully assumed that the launch of an application would ultimately result in transparent flow of information to the farmers directly due to the formalization (through digitization) of information flows.

3.3 Digitalization has modified existing workflows and created new taxonomies of labor and labor relations in Megha Mandli, eroding trust.

In order to incentivize Aagewans to complete the needs-assessment survey of crops, frontline workers are paid a nominal amount of money per bag of rice they sell. Across interviews, it was discovered that there was no fixed price, and the honorarium depended on the location of the frontline worker's village, and the type of seed sold.

As community leaders who represent their villages in board meetings at Megha Mandli, Aagewans have largely been seen as leaders, who volunteer their time to ensure that the Mandli is functioning smoothly. As the Mandli changes its strategy on how to conduct business with shareholders – driven by recommendations from their tech partners as well as the EDT – the role of an Aagewan in the Mandli's cooperative ecosystem changes, modifying from community leaders to extension workers, perceived as those who serve the Mandli and the SEWA Federation, versus the community they represent.

The inability to provide complete price and sale information to their fellow shareholders not only inadvertently increased the amount of labor, but also affected the existing social relations Aagewans share with shareholders from their villages. Frontline workers, in agrarian contexts, are usually

embedded in the communities they serve, they are often residents of these villages and are neighbors and/or family members. Their roles as frontline workers rest on pre-existing social relationships. In fact, their selection as frontline workers in the Mandli is dependent on their ability to hold trust in their community.

The introduction of new dynamics where Aagewans are seen as service providers, even as they continue to be shareholders in the same cooperative, has created specific instances of mistrust. Some shareholders, upon knowing that Aagewans are incentivized to sell seeds, assume Aagewans are now capable of earning a living entirely through selling seeds, despite the fact that they merely receive a nominal incentive/honorarium for each bag sold. This process of digitalization disrupts existing social dynamics, and creates new relationships of power and hierarchy.

In addition, frontline workers also emerge as gatekeepers to applications and digital circuits of information. For example, Aagewans are instructed to collect Aadhar details to sell seeds to shareholders, and provide this as an option for non-shareholders, effectively marking the inception of individual farmer profiling. They are also the point of decision-making with regards to what seed quantities are being communicated to the Mandli, as well as information on which farmers refuse to purchase from the SEWA Federation. Their position as gatekeepers is also a function of their intermediary role. The frontline worker is the only user who is privy to information that affects the functionality of the app on the field. It is through this vantage point that they have to intervene on an institutional level. In one instance, an Aagewan's timely intervention of informing the Mandli of the SEWA Federation's seed prices being more expensive than the market price compelled the Mandli to offer a steep discount to shareholders.

It is important to note that despite these concerns, Aagewans and Sankalit Sathis have voiced the usefulness of the application, and hope for an updated version. In their articulation of an ideal application, all levels of frontline workers indicated the application's potential to privilege the farmer by creating transparent information flows that farmers can easily access while in conversation with them.

In fact, they already see this transformative potential in the way they are employing the app on the field today. Despite significant glitches, many frontline workers indicated that fellow shareholders approached them in order to know the price of paddy and poultry stock on the app, and the workers did not have to call the Mandli staff members for the price and communicate the same to the shareholders, saving them time, as well as giving them an opportunity to see an official list of prices, enhancing trust amongst their community members. In future iterations of the app, frontline workers hope that the price for all seeds, especially paddy, will be fixed prior to the time of survey. This will

require the Mandli to be in a position to bargain with agro-traders and potentially absorb losses due to steep fluctuation between the price of paddy at the time of survey versus at the time of sale.

Insight #4 Limited digital and physical infrastructural access and ownership continue to be significant barriers to digitization in rural Global South.

As the SEWA Federation embarks on a journey to digitalize through the governance principles of a data cooperative, the Mandl's ability to support and sustain the physical and digital infrastructures needed for running a digital ecosystem must be assessed with primary and equal consideration. Existing frameworks on data cooperatives draw from experiments of collectives from the Global North, where access to key digital infrastructures – from access to the internet to physical and digital public infrastructures supported by the state – do not pose as barriers of entry. The relatively lower financial barrier for access to private digital devices and infrastructures, such as smartphones and private broadband services, must also be considered when transliterating such experiments to the context of the Global South.

4.1 Megha Mandli's proposed physical infrastructures are needed to execute their envisioned decentralized system, but remain underdeveloped due to financial constraints.

The SEWA Federation's model of decentralization arose out of a need to ensure villages that are poorly connected to Vyara and the Mandli are not disadvantaged by the centralization of decision-making and extension services that are offered by the Mandli. To this end, the system of Farmer Facilitation Centers (FFC) was introduced: hyperlocal centers that offer agricultural services and products to a handful of nearby villages. Often headed by an Aagewan or a board member, FFCs are touch points for women to approach for specific input-related services (such as access to seeds, fertilizers, etc.), as well as farming advice. However, the operational costs of running an FFC are borne by the Mandli, and it is unsustainable to maintain them at the Mandli's current rate of revenue.

> *FFCs are not profitable. In order for expansion of the model, the Uchchhal FFC needs to become profitable. Due to this, we didn't use the FFC model for paddy survey, except in Uchchhal where seeds were available for purchase at the FFC. However, traveling to the Mandli (for seeds) is a big issue.*
>
> -Mandli staff member

Additionally, key informant interviews with farmers have revealed that one is inevitably forced to travel to the Mandli and Vyara town to access KVKs for any farming-related concern, exposing a variety of infrastructural challenges women face to avail their services as shareholders.

The support we receive from the KVK is, in many ways, similar to the support we receive from the Mandli: subsidized seeds, access to advisories on new methods of pest management, new methods of farming, and also the ability for us (farmers) to go to the KVK and to ask about diseased looking crops on their fields, etc. However, the time it takes to get an expert opinion as well as the distance required to travel to the Mandli or the KVK (their center is just down the road from the Mandli) is often untenable for us, so we rely on the agros more frequently to diagnose problems and sell us the required medicine.

-Shareholder farmer

4.2 The Mandli's lack of computing power poses a threat to data localization and ownership of aggregated agricultural data.

In the era of data capitalism, concentrations of power and its capture are determined by the ownership of computing power and digital infrastructure, often determining rules of data governance of data ecosystems. The voluntary pooling of personal and non-personal information in agricultural data cooperatives is often posed as an alternative governance mechanism where people with similar goals collectively steward their data and gain bargaining power while interacting with the capitalist market. However, as Big Tech continues to make the largest investments in server space, data centers, supercomputers, and cloud computing, where and how data is stored in experiments of a data cooperative may determine rules of governance, impacting the cooperative's ability to redistribute profits.

Despite plans to digitize parts of their supply chain, the Mandli does not possess the kind of computing power needed to run data-driven analytics of the farmers' personal and non-personal data they collect, lacking both technical expertise and digital infrastructure to do the same. Though the Mandli has created individual farmer profiles with potential for predictive capabilities, they continue to rely on manually analyzing large-scale data across years before deciding which seed to focus on during the following season and stock information from the existing survey.

In the Mandli's case, the proprietary software being piloted is owned by their tech partners and the information collected through this FPO digitization application also seem to be housed in servers owned/rented by the tech partners, with the SEWA Federation lacking funds to develop its own software. Key informants from the EDT and the SEWA Federation indicated that the Terms of Reference, Licensing Agreement, and Data Sharing Agreement with their tech partners are still under review, with not enough clarity on ownership and usage of already collected information, including individual farmer profiles built on top of Aadhar information of each shareholder. As Mandlis and FPOs take on the role of data stewardships on behalf of their shareholders, their capabilities to negotiate

with technology middlemen, such as the SEWA Federation's tech partners, must be strengthened in order to prevent inadvertent misuse or even sale of farmer data.

Insight #5 The realities of innovation and app development in the Indian CSR/social enterprise model have implications for data ownership for data cooperatives.

Digitalization efforts are time-consuming given the multiple iterations required in the app development process. These digitalization iterations are shaped by preferences, contextual specificities, workflows, errors in language, errors in code, and issues of uptake and stickiness.[36] Unlike top-down application development where design is retrofitted into context, the social enterprises must ideally execute a model where the context determines the design of digital flows. This lengthens the process and budget needed for a well-functioning application. Cooperatives looking to digitalize do not have access to in-house technical expertise, and must work with for-profit or paid non-profit institutions, who do not necessarily espouse values of co-design, sustainability, and engagement while building digital infrastructures.

5.1 Social enterprise-led models are dependent on CSR funding, posing challenges to sustainability for data and platform cooperatives.

The exercise of app development by the SEWA Federation's tech partners requires access to funds; this is achieved either through corporate social responsibility (CSR) funds or through grants offered to non-profits.

The imperative of constant access to external funds poses serious challenges to the sustainability of digital platforms. Funder-determined limitations around the use of grants and funds dictate the nature of relationships and payment practices that cooperatives may engage in, and limit the duration of technical support and research received by cooperatives, many of whom do not possess technical capabilities to steer complex funding relationships. While the SEWA Federation's tech partners have committed to engage in handholding for a few years, given their own stated commitment to poverty alleviation in rural areas, other lesser-placed cooperatives may not be able to seek out and liaison with similarly oriented tech/digital partners.

Many of these contractual agreements between small collectives and technology partners imagine an end-point to their partnership, where the former is expected to have built scalable and sustainable digital ecosystems and infrastructures by the end of the intervention, either self-supported by additional funding, or through the sustenance through a profit-oriented economic model governing the digital layer. Technology partners, if isolated from the local context and understanding of the

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[36] Brewer, R. S. (2014). Three Shifts for Sustainable HCI: Scalable, Sticky, and Multidisciplinary. In *A SIGCHI HCI & Sustainability community workshop.*

specific collective's financial and institutional structures, may end up building digital infrastructures which are financially untenable for the cooperative to maintain. Collectives often have no capacity to hire or absorb external human resource staff for periodic updates and maintenance. In dire circumstances, adopted digital systems are then dropped in subsequent years after making significant changes to supply chains and social relations.

At the SEWA Federation, usage practices of the app and issues with it are communicated between the Mandli and the technical intermediary through a Digital Officer. The Digital Officer is on the payroll of the technical intermediary, but their functions are rooted in the local SEWA context, where they are located.

> *We have a three-year contract with the SEWA Federation. Megha Mandli is the first cooperative we have worked with and we are eager to collaborate with more cooperatives under the SEWA Federation's umbrella. For the app in the Mandli, the Federation will financially support Data Officers till March 2024, after which they will be supported by the cooperative itself. For the next two years, we will provide tech support. The app is basically free. We are funded as a non-profit. We receive funds to provide our work for free.*
>
> -Program Team (SEWA Federation's tech partner)

5.2 Tech partners may function as technology intermediaries, clarity must exist in terms of the relationships between different actors.

The vesting of technical skills in allied technology partners also had the potential to modify the functioning of the cooperative. While the evaluation of end needs and overall objectives of a digital effort may initially be prompted by the cooperative, demands for data in specific granularity and structure dictate the design mandate of the application. This mandate determines a variety of factors: in Megha Mandli, we see this happen with the manner in which the corresponding platform or app is designed, which features receive prominence, and what elements are developed on priority, inadvertently creating new workflows, as previously documented.

Existing apps may be modified to not only meet the needs of primary stakeholders, but that of the partners as well. Tensions may exist between the fit with different cooperative structures, the agro-ecological and socio-economic contexts within which they are located, and existing workflows with newly introduced apps. On the other hand, with app development being an expensive proposition, in the absence of basic existing protocols, access to digitalization may be untenable for resource-poor cooperatives. Hence, challenges will persist in terms of recognizing and addressing the granular needs of specific cooperatives.

This app was not meant for the SEWA Federation. We wanted to pilot it with five-six FPCs with different structures. Cooperatives have a different structure, although they basically function the same. First, we organized the profile data of the shareholder farmers. Our question primarily was to address how to increase the participation of shareholders in the FPCs' activities. We chose a partner who has multiple FPCs. They are our customers. The extension worker is the person who collects data. A farmer-facing app was never in question because it's too expensive. We digitized the journey of an FPC, essentially expanding its input services. Building business acumen is essential for our app to succeed.

-Program Team (SEWA Federation's tech partner)

In Megha Mandli, decision-making about what types of seeds to promote, procure, and how many seeds to stock involves employees at the technical intermediary, the EDT, and Sankalit Sathis. In this formulation, with external (but deeply embedded) organizations participating in key decisions, the nature of the relationships that end up determining purchase and selling practices may eventually be determined outside of the cooperative process.

Apart from addressing the issue of unfamiliarity with software design on the part of the cooperative, the important role that technical intermediaries play in hosting platforms, usually may mean that the data resides with them, and the data governance principles they adopt (however defined) shape the maintenance and access to this data. In the SEWA Federation's case, the various pilots proceeded without a Data Sharing Agreement, with no clarity on what happens to the extensive data already collected in the year-long process.

During an interview with a member of the tech program team, they noted that "because we know all the information (sic), we can also give them information they need", denoting a functional role of intermediating downstream data flows to the Mandli, crucial for the digital functioning of the cooperative.

In the absence of a Terms of Reference and a User License Agreement where data usage and monetization by technology intermediaries can be limited, the mandate of the application's ability to intensify data collection and improve app functionality can, in some instances, replace the original imagination of digitalization. In our conversations with key informants from the SEWA Federation, they indicated that their original plan was to circumvent mandatory Aadhar collection from farmers as part of their digital pilot. This decision was made in part due to farmers' concerns about security and safety, but was also largely driven by the fact that the SEWA Federation's vision of a digital intervention did not involve individual farmer profiling. But in today's iteration of the app, a farmer profile is the 'base' of

the data stack being created, with the app part of a larger digital ecosystem and protocol. It is important to note that current individual farmer profiles are built on Aadhar – India's government-backed unique identity. The work-in-progress Agri Stack, a government-developed agricultural data exchange for personal and non-personal farmer data, is also built on the backbone of Aadhar identity. There is then, imminent risk of any technology partner integrating data collected through pilots such as these with Agri Stack without explicit consent; such possibilities must be deliberated upon and potentially delimited through licensing agreements.

Data needs, driven by the inherent logics of principles of centralization, often end up dictating application design and governance. To this end, it is not valuable to cast aspersions on any singular digital intermediary, or highlight this as a failure of the cooperative. Rather, these relations that dominate application development within data capitalism must be brought to the fore, enabling cooperatives and FPOs to negotiate equitable contracts with their digital intermediaries, and for intermediaries to expand on avenues for critical co-design with stakeholders going forward.

6. Reflections

Data cooperatives are envisioned as alternative digital ecosystems that can effectively lead to the creation of a digital commons, with the means and governance to withstand the attempts of digital enclosures in today's food systems by data capitalism. With multiple successful small-scale pilots in the Global North, there is significant potential for realizing the transformative pathways of data cooperatives in the Global South, with many small and large agricultural cooperatives attempting to overcome roadblocks in the agricultural value chain through equitable digital solutions.

Despite their potential, experiments in data cooperativism, particularly in India, face challenges in a rapidly privatizing techno-political ecosystem.[37] We document some of these challenges in this research report, as we collaborate with the SEWA Federation to build a contextually-informed federated techno-institutional model that emphasizes a ground-up digitization process.

We document the Megha Mandli's efforts to engage in a slower-paced strategy of digitalizing parts of its operations, while working with a unique set of knowledge partners as well as technology partners, all well-intentioned in creating a digital-lite solutions system for the shareholders of the Mandli. On this journey, the Mandli and the SEWA Federation encounter several techno-design realities, some in the form of roadblocks and others in the form of complex choices. These narratives are underlined by the political landscape of data capitalism, where technology development takes place within the silos of

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[37] Gurumurthy, A., Chami, N., & Bharthur, D. (2016). *Democratic accountability in the digital age.* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3875297

Silicon Valley, but is deployed across a variety of contexts – the cost of which is borne most heavily by women frontline workers.

Our report argues that any attempt to digitalize must take into account the unique objectives and needs of those most affected by digitalization – imagined end users and beneficiaries, through meaningful iterative co-design processes that take place on the field.

Our research reveals the reach and limits of digitalization, and the importance of safeguarding data creators, as well as the need to recognize them as data owners. Locating small and marginal women farmers within the complex agricultural landscape, flanked by caste-class rural relations, as well as the self-organization within a state-promoted system of FPOs/FPCs bring in a variety of top-down variables that determine the nature, strength, and sustainability of digitalization. Driven by the evidence of our research, we present the following reflections.

1. **The potential for SEWA's federated techno-institutional model to act as a shield:** SEWA's federated governance model – the basis for a techno-institutional model that proposes federated data-sharing, embedding principles of data provenance through a rights-based data governance framework – can act as a shield against the co-option of data by third-party users. In that case, if any third-party user were to be integrated into the app, they would only be able to access aggregated FPO-level data, rather than individual farmer-level data. The federated nature of the SEWA Federation's model also allows for better bargaining power, as is the imperative of the cooperative model.

2. **Slow, thoughtful digitalization allows for the safeguarding of member interests:** While the digital transformation and expansion of the SEWA Federation's model has been slow to develop, this slowness is a radical act in the current context of rapid digitalization. Rather than assume that an overarching digital platform will replace its original one, the SEWA Federation has engaged with multiple partners to test and explore different kinds of digitalization. In doing so, they have accounted for diverse imaginations of data governance espousing a commitment to a model that meets the Mandli's members own needs by staying model and partner-agnostic. While this could mean that they may not be able to reap the benefits of digitalization quickly, it also means that they are cognizant of, and attempting to safeguard the interests of Mandli members.

3. **The cost of inefficiencies of cooperatives, digital protocols, as well as infrastructures may be borne most heavily by frontline workers:** Inefficiencies in the functioning of small parts of agricultural value chains, such as the non-availability of price information, create ruptures in workflows, trust, and data practices, with cascading effects. The cost is borne most heavily by frontline workers. For continued sustainability of such experiments, we posit that intentional

and deeper practices of collaboration, or rather, co-design, can attend to some of these dissonances.

4. **State infrastructures create enabling and boundary conditions within which data cooperatives can function**: Without access to meaningfully designed protocols, basic infrastructures such as the internet, market infrastructures, and publicly developed and commonly owned digital infrastructures, limits are placed on the gains that platforms can offer.

7. Recommendations

On the basis of our analyses of the SEWA Federation's efforts to digitalize, we offer the following set of recommendations. We have split our recommendations to address institutional, technological, and wider policy interventions which we believe are crucial to build equitable, worker owned data cooperatives. We recognize fully, the limited nature of their scope, given the circumscribed and the relative novelty of the application we studied.

For cooperatives, collectives, and other institutions seeking to digitalize:

1. **Cooperatives must institutionalize key principles of technology co-design, involving stakeholders and actors at all stages**. Any attempt to digitalize must take into account the stated objectives and needs of those most affected by digitalization: imagined end users and beneficiaries. This may include farmers and workers, but also those tasked with carrying out the digitalization process.

2. **Institutions should act as the central intermediary in collective bargaining with technology partners.** This can shield members and provide necessary resource support for them to engage with technology companies. This includes, but is not limited to, capacity building with all institutional stakeholders, including farmers and frontline workers, to bolster their knowledge of digital ecosystems. Institutions must be proactive in addressing how digitalization changes labor needs and workflows of its workers, and must institute feedback mechanisms both with technology partners and its own stakeholders in order to enable necessary modifications of institutional practices.

3. **Data governance measures must be enacted to safeguard the profiling of farmers by cooperatives and FPOs.** Though we see the value in identifying FPOs as data stewards, their role as custodians of data must come with fail-safe mechanisms. FPOs – depending on their local context, power distributions, and stakeholder configurations – are susceptible to market pressures, with the potential to profile their own shareholders to meet the demands of buyers. In the case of FPOs, the gains of collectivization can still be maintained, without exposing

farmer data through federated models of data sharing that prevent profiling of farmers using anonymized data.[38] It is crucial for farmer data to remain federated, and decision-making about data sharing and data governance to be meaningfully vested in its owners.

4. **Institutions should engage in parallel capacity and network building to resolve gaps in inefficiencies in the FPO's supply chain.** Significant gaps, frictions, and inefficiencies within the FPO's supply chain cannot be resolved through digitalization**.** Challenges, such as the inability to bargain effectively for higher prices of produce with merchants, or lower prices on inputs with agro-traders, point towards the need for cooperatives to enhance their ability to bargain with market forces. Digital infrastructures can only supplement the strength of physical infrastructures. However, we must also be cognizant of the fact that within the current landscape of the agrarian economy and policy, cooperatives face a number of financial and economic roadblocks in competing with large agro-businesses, often unable to establish linkages and accrue profits despite best efforts.

For technology partners engaging in alternative and 'right' digitalization:

1. **Technology providers should recognize the substantial labor challenges faced by tech intermediaries and frontline workers during digitalization efforts.** This encompasses the need for continuous upskilling, particularly in the initial stages and when applications are updated. Moreover, the app infrastructure and its affiliated institutional workflows should address the labor-intensive aspects related to data entry and processes ensuring timely updates, both on applications and with beneficiaries/proxy users. Care must be taken to see that the ostensible ease of digitality should not be predicated on bodily taxing and time-intensive work performed by (often poorly paid) frontline workers. App design should not just make data collection and access to data easier, but should also enhance and simplify existing workflows.

2. **Design briefs must be developed with key stakeholders of the application.** This should be coupled with evidence-based UI/UX research that recognizes users as both data creators and data owners. Technology partners must co-develop the application with the target audience from the stage of conceptualization through to major app updates.

3. **Technology partners must be transparent about the governance of the data they collect.** Any exercise in data collection should only take place once governance models have been determined in tandem with their partner institutions/cooperatives. Third-party sharing of data with private players must be done only after informed consent from stakeholders, outside of

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[38] Gurumurthy, A., Chami, N., & Kumar, R. (2022). *Recasting Land Tenure Rights in the Data Epoch: Insights from a Country Case Study of India.* IT for Change. https://itforchange.net/recasting-land-tenure-rights-data-epoch-insights-from-a-country-case-study-of-india

the application ecosystem. When meaningful user participation is unattainable, or user onboarding is incompatible within certain open data infrastructures lacking sufficient user data protection, or when users are exposed to unequal and inequitable relationships with other actors in a data chain (whether within an institutional framework or a third-party context), it is prudent to restrict the integration of data at a federated level. For example, providing buyers the option to access specific types of farmers (e.g., large farmers) may result in informational asymmetries and profiling when it comes to accessing farmer information.

Wider policy interventions that protect farmers, cooperatives, and FPOs from exploitative technology and free-riding:

1. **Data protection must be instituted for all types of farmer data: personal, anonymized, and non-human data.** FPOs looking to digitalize have a variety of primary uses for data (such as offering extension services based on individual farmer profiles), as well as secondary uses, where aggregated farmer datasets are used to make input purchasing decisions and market linkages. FPOs and cooperatives must be recognized as data fiduciaries in accordance with the Digital Personal Data Protection (DPDP) Act, 2023, and must institute necessary protections and guidelines as dictated by the Act. Technology partners, when brought in by FPOs to aid the development of digital ecosystems, must be recognized as data processors.

2. **The policy landscape must recognize farmer group profiling that arises from the processing of anonymized and non-human agricultural data.** Currently, India does not possess governance frameworks for non-personal data, such as the size of land holdings or the location of land holdings. Such an act should include safeguards against group profiling of farmers, especially based on region and caste, in the form of penalties levied on data fiduciaries, and all downstream and upstream data processors, especially if there is evidence of de-anonymization.

3. **Envisioning an Agri Stack[39] that recognizes FPOs and cooperatives as data stewards.** A solution to the privatization of vital digital infrastructures comes through the imaginations of co-designed digital public infrastructures (DPIs). In particular, the provisions for India's emerging Agri Stack must protect farmers against profiling of individual farmers by Big Tech and Big Agri. There must be a recognition of FPOs/cooperatives as data fiduciaries and data stewards by Agri Stack. Rules, regulations, and limits to which FPOs and subsequent public and private technology partners can process both personal and non-personal, aggregated and

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[39] Press Information Bureau. (2022). *Agristack Project.* Government of India. https://pib.gov.in/PressReleasePage.aspx?PRID=1883173

anonymized farmer data must be established in consultation with farmers and informal workers in agriculture.

4. **Farmer data rights must be enshrined through a sector-specific data protection act.** Here, farmers should have the right to access and audit their data held in databases of fiduciaries and data processors, either at the level of the FPO or the state. Farmers must be able to access their individual profiles, with the ability to opt out of centralized databases without consequences. The question of how farmers may engage with their data on these digital infrastructures meaningfully remains open, and is outside the scope of this research brief.

5. **Free-riding by both trusted and new private actors – including and not limited to FPOs, technology partners and emerging third parties – must be prevented by provisions of an agriculture sector-specific data protection act.** Data fiduciaries, especially FPOs must not be able to sell personal and anonymized farmer data without prior informed consent from data generators. Private technology partners often also control the infrastructural services, such as server space, computing power and application ownership. In such cases, provisions to prevent lock-ins must be enacted, through the legal recognition of data creators/generators as data owners, providing farmers the ability to port their data to their digital ecosystems of choice. Third-party data sharing by data processors must be restricted by default, and must require additional informed consent mechanisms.