

## Food Security and Sustainability: Investing in human infrastructure for digital transformation at scale

At Digital Green, we are optimistic about the capabilities of farmers and their supporters to use data and technology to build more prosperous, food secure, and resilient communities. Evidence supports that view, as merely owning a cell phone has been shown to expand and strengthen rural social networks, increase rural people's ability to deal with emergencies, cut down travel costs, and result in more competition in the marketplace.<sup>1,2</sup>

We build and share digital solutions that amplify a farmer's natural capabilities to solve problems. Disconnected rural communities are rapidly getting access to mobile phones and the internet, and with this access comes enormous opportunities. Although the gender gap has begun to close, still half of all women globally are offline, leaving much work to do.<sup>3</sup> There is a wealth of agricultural research on practices that can boost food security, reduce water scarcity and increase overall sustainability, as well as volumes of data about weather patterns and soil. Yet, we fall short on both improving farmers' access to this information, and on designing new research and advisory systems that incorporate farmers' feedback about what is working, what isn't, and why they have chosen to adopt new practices or not. We possess the capability to do this at scale, despite technological innovations that can enable this.<sup>4</sup> Generative artificial intelligence (AI) is just starting to demonstrate its power to transform this incredible wealth of information into useful advice that responds to the highly localized nature of an individual farmer's needs, and learning over time as the climate worsens and issues like water scarcity become more dire. This kind of breakthrough has shown potential to be responsive to feedback and even self-test and self-correct in real-time.<sup>5</sup> We should experiment, but remain aware of the biases in the existing knowledge base so that the exclusion of women and marginalized communities are not reinforced by the training of AI, but rather disrupted.<sup>6</sup>

Despite the power of digital technology, climate change is a significant force working against farmers and their achievement of food and water security for all. Extreme climate events are

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<sup>1</sup> Alfred Said Sife, Elizabeth Kiondo, and Joyce G. Lyimo-Macha, "Contribution of Mobile Phones to Rural Livelihoods and Poverty Reduction in Morogoro Region, Tanzania."

<sup>2</sup> Janet Dzator et al., "Leveraging Digital Technology for Development: Does ICT Contribute to Poverty Reduction?"

<sup>3</sup> GSMA, "Connected Women - The Mobile Gender Gap Report 2020."

<sup>4</sup> Carlo Fadda et al., "Integrating Conventional and Participatory Crop Improvement for Smallholder Agriculture Using the Seeds for Needs Approach: A Review."

<sup>5</sup> <https://www.youtube.com/watch?v=5SgJKZLBrmg&feature=youtu.be>

<sup>6</sup> Smith, Eric M., and Adina Williams. "Hi, my name is Martha: Using names to measure and mitigate bias in generative dialogue models."

causing more droughts, floods, and extreme pest and disease outbreaks, slowing the productivity gains of the last 50 years and threatening to reverse food security and poverty gains.<sup>7</sup> And it particularly threatens women as the burden of climate falls most sharply on them as they continue to lag in their access to land, finance, and quality agricultural information, resulting in lower yields and incomes, especially among women-headed households.<sup>8 9</sup>

Digital Green began serving farmers alongside our government and other partners in 2008, and we have now reached over four million smallholder farmers across India, Ethiopia, and more than a dozen other countries. Our core solution began with a simple idea: videos for farmers, by farmers, explaining good agricultural practices that could help them farm better. Today, our library of over 7000 videos in 50+ languages has been viewed more than 80 million times on YouTube.<sup>10</sup> Videos have been screened to millions of farmers groups in small, local viewing sessions facilitated by a trusted local frontline worker with remarkable results. We have seen income increases of up to 17%. The cost has been shown to be up to 8x less costly than traditional extension.<sup>11</sup> And we have seen that, unlike traditional extension, this approach can include women – as more than 70% of the 4 million farmers we’ve reached are women. We are now building new innovations alongside farmers, particularly focused on enabling farmer organizations to better understand members’ priorities and to manage members’ information in order to access better services and market opportunities. By doing so, farmer organizations increase the market power of individual farmers so that better yields on-farm leads to more money in farmers’ pockets; something farmers often struggle to achieve on their own.

While we are confident believers in the power of digital technology, it is far from a silver bullet. Our impact is enabled by important and significant investments by our government partners in the human infrastructure that enables digital transformation. Digital technology needs human mediation to be useful and inclusive. Innovation needs to be guided by principled policies and public investments that ensure that emerging data governance ecosystems place individual agency and control over one’s own sensitive and valuable information at the center. This means enabling farmers, both women and men, and the farmer organizations they trust, to control, steward, and consent to share their data to the greatest possible benefit. Only if we do these things will digital technology lead to more equity and resilience—not less.

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<sup>7</sup> Hans Pörtner et al., “Climate Change 2022: Impacts, Adaptation and Vulnerability Technical Summary.”

<sup>8</sup> Abid, Z., Abid, M., Zafar, Q. et al. “Detrimental Effects of Climate Change on Women.”

<sup>9</sup> Sophia Huyer, “Closing the Gender Gap in Agriculture.”

<sup>10</sup> Digital Green. YouTube (2023)

<sup>11</sup> R. Gandhi, et al, "Digital Green: Participatory video for agricultural extension,"

Our partnerships with the Governments of India and Ethiopia, supported by significant collaboration with the World Bank, inspire us with the impact they have already achieved and with the potential that exists to enable additional impact at scale. In India, where we began our work, our original community video model was layered on top of women's self-help groups, which have enjoyed significant public investment. Today, more than 67 million women participate in over 6 million SHGs across India.<sup>12</sup> With support from the government, many of these SHGs are now being aggregated into larger Farmer Producer Organizations (FPOs) to increase their negotiating power under an ambitious plan to establish 10,000 new FPOs in a five year period.<sup>13,14</sup> These groups are supported by more than 200,000 frontline workers. This human capital investment enables the potential for digital technology to scale quickly and impactfully. It also ensures that farmers' voices and priorities can be efficiently channeled back to the institutions implementing products and policies aiming to serve them.

In February this year, we signed an MOU with the Ministry of Agriculture to build a national-level digital extension platform to serve India's 150M+ farmers.<sup>15</sup> The platform will host a digital library of advisory content in a multitude of formats and languages. The design will make it easy for frontline workers, and ultimately farmers, to query, access and share curated content. In addition, novel online courseware and training approaches will upskill the vast network of extension workers for agriculture, horticulture, fisheries, livestock. We are undertaking early experiments to use generative AI to tailor agronomic advice and opportunities, using farmer input to improve the quality of recommendations based on highly localized peer farmer feedback, rapidly changing weather information, and crop responsiveness to various practices.

We are excited by this example of government leadership and fortunate to work with government leaders in Ethiopia, Kenya, Nigeria and elsewhere on similar initiatives. Recently, we've participated in exchanges between our government partners as they take on ambitious digital transformation agendas and look for solutions to climate change in other smallholder contexts. However, to support the triple challenge of ensuring enough food is produced for everyone, that it is done in a way that is resilient to climate change, and that it is done sustainably, *the practices of the world's 570M farmers will need to continuously evolve*. That is a staggering undertaking. Take the example of reversing water scarcity trends. 70% of freshwater is used in agriculture. To reduce usage, farmers will need to adopt a variety of practices, including improving soil management, adopting drip irrigation or even shifting

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<sup>12</sup>. The World Bank, "In India, Women's Self-Help Groups Combat the COVID-19 (Coronavirus) Pandemic."

<sup>13</sup> Government of India, Ministry of Agriculture & Farmers Welfare, "Central Sector Scheme 'Formation and Promotion of 10,000 New Farmer Producer Organizations (FPOs)' of Rs. 6865 Crore."

<sup>14</sup> Small Farmers' Agribusiness Consortium (SFAC), "Strategy Paper for Promotion of 10,000 Producer Organisations (FPOs)."

<sup>15</sup>. The Times of India, "Agri Ministry Signs MoU with Digital Green to Build National-Level Digital Extension Platform."

away from ‘thirsty’ crops.<sup>16</sup> To achieve that scale of rapid and broad change among millions of farmers, digital technology must be part of the solution. We need to be able to capture and utilize the wisdom of farmers at scale, combine that with the best available information on weather, pests and disease, and agricultural best practices, and ultimately return useful information to farmers. To do this, we see three actions that all national governments should take. They are:

- (1) Invest in maintaining or creating a frontline agricultural extension workforce and farmer organization infrastructure that is robust and inclusive of women.** Studies of agricultural extension program show rates of return between 13-500%,<sup>17</sup> yet many countries have deprioritized extension programs completely. Similarly, public support for farmer organizations is relatively low in most parts of the world, yet they hold tremendous value. In both extension and farmer organizations, women are generally underrepresented in relation to their roles as farmers. A recent rigorous review of 239 farmer organization studies from around the world found that 60% of the time, membership in these groups contributed positively to farmers’ incomes. Roughly a quarter of those same rigorous studies also found significant positive impacts on climate resilience and natural resource management.<sup>18</sup> But to make these inclusive, there need to be investments that specifically target financial capital for rural women’s groups, including philanthropic capital, to support group priorities such as solar powered cold storage and weather-durable greenhouses that will increase collective resilience. The size of such human infrastructure investments and wrap-around capital for groups will vary by country, and the design should learn from the best models we have. Without this necessary capacity, the power of digital technology will not be realized.
- (2) Adopt coordinated, intentional policies, software, and guidelines for how data about your farmers, farms, natural resource base and agricultural markets is exchanged.** Governments, private sector, and researchers want the same kinds of farmer profile information: e.g., farmer bio, location, crops and livestock under cultivation, and practices adopted. We believe that farmers and the organizations that represent them should consent and manage that data, and have a prominent seat at the table as the agricultural data ecosystem evolves. Digital Green and many other global institutions have developed open-source software designed to help governments play a significant guiding role in stewarding a vibrant agricultural data ecosystem. We encourage you to prioritize this now. It is not often that farmers have an entirely new asset to help them, and it should be protected, even as its value emerges over time.

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<sup>16</sup>“Water in Agriculture,” World Bank, accessed April 5, 2023, <https://www.worldbank.org/en/topic/water-in-agriculture>.

<sup>17</sup> Global Forum for Rural Advisory Services (GFRAS), “Fact Sheet on Extension Services.”

<sup>18</sup> Bizikova et al., “A Scoping Review of the Contributions of Farmers’ Organizations to Smallholder Agriculture.”

- (3) **Make concerted efforts to close the gender gap in digital technology for agricultural transformation.** In the least developed countries, two out of three women are involved in farming.<sup>19</sup> And yet, they continue to face major inequity across the major resources required to farm: land, labor, credit, information, extension, and technology—which explains the productivity gap between women and men. FAO estimates that if we could close the gender gap for agricultural inputs alone it would lift 100-150M people out of poverty.<sup>20</sup> We cannot achieve food security, climate resilience or any other major global goal by leaving women behind. For digital transformation of rural areas this starts with schemes to increase access to mobile phones and data, training on digital competency but it must go beyond. The innovators and funders leveraging technology to improve access to information, credit, and other agricultural assets must design for women in mind and deeply listen to their needs, else we will continue to drive greater inequity and miss the transformative opportunity before us.

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<sup>19</sup> Food and Agriculture Organization of the United Nations, “Women in Agriculture Closing the Gender Gap for Development.”

<sup>20</sup> Food and Agriculture Organization of the United Nations

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