

POLICY BRIEF

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Co-creation applied to digital innovations for smallholder farmers

An example from Brazil

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KEY MESSAGES

- The integration of local traditional wisdom with academic-scientific knowledge has the potential to generate innovative and more effective solutions to challenges faced by farmers.
- Adopting co-creation in digital innovations can support digital tool development that better meets the needs and expectations of farmers and extension agents, fostering a sense of ownership and increasing adoption.
- The experience of Solidaridad in the state of Pará, Brazil, illustrates how applying co-creation principles to the development of digital tools allows for the emergence of new innovations rooted in the needs of farming communities.
- This example illustrates the dilemmas that may arise in the practical application of the [Principles for socially inclusive digital tools for smallholder farmers](#) and brings to light the limitations of developing co-creation through digital technology.

This policy brief summarizes key learnings derived from the initial phase of a project carried out by the [Alliance of Biodiversity and CIAT](#) and [Solidaridad](#) in the Brazilian Amazon. The project as part of the Agroecological TRANSITIONS program's Inclusive Digital Tools ([ATDT](#)) project. ATDT aims to promote innovations related to digital tools that enhance inclusiveness, integrate climate change resilience and mitigation with agroecological aims, and enable climate-informed agroecological transitions at scale. Drawing insights from this experience, this brief shares reflections on the success factors and dilemmas encountered, as well as practical solutions to overcome them.

Co-creation as an alternative to the conventional model of agricultural extension

Agricultural extension is centered on the idea of applying scientific research to agricultural practices through farmer education, aiming to empower farmers in improving their management, production, and marketing practices (Leite et al., 2021). Agricultural extension programs often rely on the transmission of technical content generated in academic environments with little or no direct connection to the reality experienced by farmers. These programs typically adhere to the conventional approach of technology transfer and knowledge diffusion, wherein the only valid knowledge is generated in academic settings or derived from the market. Information is imposed from the top down onto the farmers and local rural extension agents, who are expected to assume a passive position in relation to the "holders of information."

While such hierarchical knowledge structures have been predominant within industrial agricultural research and

extension, the agroecology movement recognizes that incorporating localized expertise and traditional tacit knowledge from rural communities into academic-scientific environments is central to transforming food systems ([Utter et al., 2021](#)). The concept of co-creation has been consolidating as an alternative to the conventional model of knowledge diffusion for promoting the necessary changes in food production systems, especially in low-income regions and countries (Utter et al., 2021). Knowledge co-creation is understood here as the interaction among different actors who intentionally seek to integrate their knowledge, learning, and experiences in the pursuit of

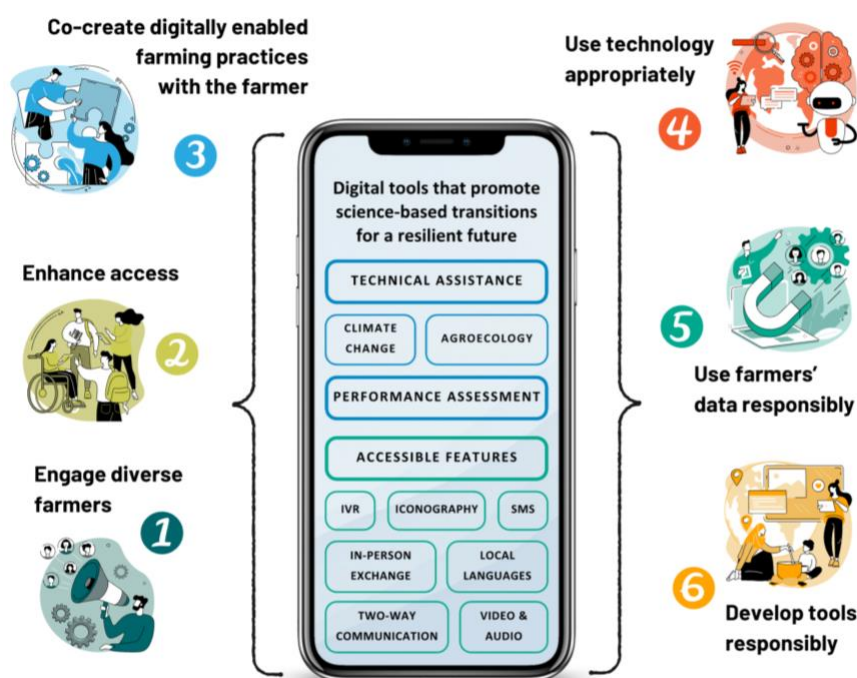
solutions to common problems. Applied specifically to agricultural practices, it refers to the collaborative development of farm practices among farmers, researchers, technical advisors, and others. It is framed as an approach of social inclusion to support farmers' agency, ability to express their needs and perspectives, and to make informed decisions ([Dittmer et al., 2022](#)).

Concurrently, with a wider interest for co-creation approach, traditional agricultural extension methods are undergoing transformation driven by the proliferation of digital tools for advisory services. Digital tools are framed as a way to overcome challenges of rural extension in accessing farmers in remote areas and are disrupting the way knowledge is transferred to farmers. Digital technologies are reshaping how information about practices, processes, and work organization is disseminated ([Schnebelin et al., 2021](#)). The widespread availability and affordability of mobile phones and internet access, even in isolated regions and low-income countries, is making it possible to break the longstanding isolation from knowledge, information, and connections experienced by farmers ([Fabregas et al., 2019](#)).

However, the positive impacts of using digital tools for agricultural extension are still modest ([Coggins et al., 2022](#)). In a study by the Global Forum for Rural Advisory Services (GFRAS) on the status of digital advisory services across Africa, Latin America, and Southeast Asia, a very low number of digital rural advisory services manage to effectively onboard and retain users over time and survive beyond the pilot phase ([Larsen and Keller, 2023](#)). One of the factors that may explain this scenario is that many digital solutions designed to facilitate rural advisory services often lack an attractive value proposition for the end user, whether it be the farmer or the extension agent. The most common business model among digital tool developers relies on delivering services in exchange for the information provided by the user. This tends to bias the value proposition of the product or service toward favoring data collection over delivering services and benefits to the end user. As a result, it is common that the farmer or extension agent struggle to use the tool or simply do not derive value from its use, discontinuing using the tool after one experience.

In this context, applying co-creation principles to the development of digital tools emerges as a potential avenue to address these limitations and genuinely provide value to farmers as they strive for more productive, profitable, and climate-resilient production systems.

The approach and methodology adopted at each stage of the ATDT project carried out by the Alliance of Biodiversity and CIAT and Solidaridad in the Brazilian Amazon were grounded in the *Principles for digital development* ([2022](#)) and the *Principles for socially inclusive digital tools for smallholder farmers* ([Dittmer et al., 2022](#)), providing a practical example of the application of these principles and the challenges and trade-offs it entails (Figure 1).



Credit: Sadie Shelton, 2024

Figure 1. Principles for socially inclusive digital tools for smallholder farmers to scale informed-agroecological transitions for agriculture

Approach adopted in the context of the ATDT project in Brazil and results

Situated in the heart of the legal Amazon region, the state of Pará stands out as one of Brazil's major cattle hubs. The deforestation rate is still alarmingly high due to agricultural expansion, despite significant progress in recent years. With 95% of smallholder-farms in the region not receiving any type of technical assistance service, it is a pivotal area for the development of a low-carbon beef cattle production system. Solidaridad has been working in the Southeast and Southwest Pará, in the municipalities of Novo Repartimento, Pacajá and Anapu, for over 10 years, focusing on developing and implementing with farmers a production model that promotes an increase in family income, while ensuring a reduction in carbon emissions and deforestation.

The rural extension model developed by Solidaridad incorporates the use of digital tools to systematize information and facilitate the dissemination of technical content, following a conventional model of knowledge and technology diffusion. The approach taken within the framework of the ATDT project involved a fundamental reconsideration of this conventional top-down approach to the use of digital tools for agricultural extension. The framework aims to combine top-down (expert-to-farmer) with bottom-up (farmer-to-expert) and peer-to-peer (farmer-to-farmer) modes of communication to increase farmers' agency and create practical conditions for the co-creation of locally relevant practices.

The first step was to engage a diverse group of farmers and local extension agents. The next step was to foster an environment conducive to farmers expressing their needs and perceptions of the challenges to dissemination and adoption of low-carbon practices and to the emergence of new ideas for practical solutions and strategies, including digital tools, to overcome these challenges. For that purpose, a round of in-person participatory workshops was carried out in the territories, involving in total 90 people, including 15 Solidaridad's extension staff, five digital tool developers and 70 farmers with diverse profiles. Farmers raised a significant number of challenges centered around the accessibility of pertinent and locally tailored information. This extends beyond technical and productive aspects to encompass crucial sociocultural considerations and the importance for farmers to identify with the information sender. The significance of local influencers and success stories within the community emerged as pivotal in building trust and guaranteeing that action is taken towards the adoption of new practices.

These insights shaped the requirements and specifications for new digital innovations developed by Solidaridad. The first step of the co-creation process resulted in the design and prototyping of a new digital tool, Solis, that builds on applications and social media widely used by producers and extension agents and on an existing Solidaridad mobile application to support extension staff in their daily routine, called Extension Solution. Solis encourages two-way interaction between extensionists and farmers and fosters the co-creation and sharing of audiovisual content on locally relevant practices among farmers and local agents ([see this presentation on the development of Solis](#), 2023). On Solis, farmers can access the list of priority practices and individual guidance provided by their extension officer, update status of tasks, upload evidence and request validation from the extensionist. The most innovative part of the app is the social and gamified experience to encourage users to create their own videos, upload them on existing video platform (such as YouTube, Kwai, TikTok), interact and cooperate with other users online and offline. The end goal is to create and sustain a community-driven repository and social mechanisms to foster and sustain the generation and sharing of knowledge.

Three months after the co-creation workshops, Solidaridad's team went back to the field to share a beta version of Solis with the farmers, get their feedback and start the second phase of the co-creation process, consisting in producing collaborative audiovisual content about production practices for publication on Solis. The feedback from the farmers and extension agents who participated in the session were incorporated in the 1.0 version of the app, which was launched one month later. During the activation sessions, the farmers were invited to access Solis, share their feedback on the product and to volunteer to record the first videos to be published on Solis.

The next steps, planned for 2024, will focus on organizing dissemination and activation activities to scale the use of the tool, provide user support, and monitor the uptake and usage of the tool.

Dilemmas in applying co-creation to digital innovations and example of practical solutions

Building on trusted relationships while acknowledging and addressing potential social desirability bias

There is no co-creation without trust, and building trust with farming communities takes time. A key success factor in creating the conditions for a genuine engagement and co-creation process with farmers has been the diversity of the skills and perspectives from the members of the Solidaridad team involved in this project, combined with the existence of a long-standing trust relationship between the organization and the farmers community. The multidisciplinary team, composed of developers, UX/UI specialists, product analyst and rural development professionals with field experience in the region, made it possible to build an approach that resonated with the language and mindset of farmers while following the process for digital product development. However, the team acknowledged that farmers engaged in the co-creation process were already beneficiaries of Solidaridad's technical assistance and could inhibit the expression of challenges or unmet needs, either due to a fear of displeasing Solidaridad's technical staff or a desire to be positively perceived by the Solidaridad team.

Researchers are aware of this kind of social desirability bias: the desire to be viewed positively or avoid criticism can influence people to present themselves in a more favorable light, potentially distorting the true picture of

their attitudes, beliefs, or behaviors. Attempting to minimize this potential bias, a limited number of Solidaridad staff attended each session, participating as unobtrusive observers during the discussions. While the existing trust relationship remains the key factor for successful, enduring, and high-quality engagement in an authentic co-creation process, it is crucial to be mindful of the impact of social desirability mechanisms and to adopt measures to try to limit them.

Ensuring inclusion of diverse farmers while harnessing the enthusiasm of early adopters

Engage diverse farmers is the first [*Principle for digital tool use and co-creation of best practices with farmers*](#) and a well-established pre-requirement for designing inclusive digital products. This requires gathering baseline data to understand the types of diversity among the targeted population (e.g., gender, age, language, ethnicity, land tenure, etc.), define subgroups relevant to the local context, and plan activities to enable genuine participation of individuals from these various subgroups.

In any collaborative project, existing social relations and power relations may affect actors' willingness to share their opinion or advocate for their own needs and priorities or even inhibit participation of specific groups. Observations from previous interventions in farming communities indicated that women and young men and women often tend to be inhibited in the presence of older male producers. Conversely, older producers may experience discomfort discussing about digital tools in the presence of younger individuals, who are generally more acquainted and at ease with technology. To minimize the biases that may arise from existing or perceived power dynamics, the workshops with farmers were organized in non-mixed groups (respectively composed of women, young men and women, and men farmers) and in small settings, so that each participant could feel comfortable sharing their perspective.

In this farming community, women tend to be more involved in administrative and farm management activities, sometimes having a higher level of education than men, and are generally more accustomed to using digital tools. In this context, it proved to be more effective to prioritize the engagement of young people and women in the design of the digital innovations and in the co-creation of practices as they tended to be more comfortable with the use of digital tools and the production of audiovisual content in the workshops.

The proactivity of these individuals identified as "digital early-adopters" has been strategic for initiating the process of collaborative content creation, but it also poses challenges in terms of inclusivity as their ownership of the process may influence the format and type of content and result in an unintentional exclusion of older farmers that may not identify with the tool. Meeting high standards of inclusivity is crucial to ensure that nobody is left behind, but it is also important to recognize that some profiles of producers do not have an affinity for technology. In these cases, seeking solutions for their inclusion in the process should extend beyond digital innovations, involving the creation of alternative forms of participation not directly reliant on digital tool usage. In the case of Solis, encouraging younger producers to capture video and conduct interviews with their more experienced counterparts, valuing their knowledge and enabling them to contribute to the co-creation of practices without being direct users of the tool is an approach to be tested.

Building on existing digital resources while mitigating secondary negative impacts

In addition to collecting data on users' profile to understand diversity of profiles and socio-cultural norms, it is essential that the baseline for the development or scaling of digital tools includes a deep dive into the existing digital infrastructure and the determining factors associated with the use of digital technology. This encompasses factors such as the availability, coverage, and quality of broadband, as well as the affordability, type of devices (e.g., feature phones or smartphones) and digital services utilized by the target group. In the context of this project, nearly all farmers have a smartphone and use WhatsApp for farming activities and daily communication. While mobile internet coverage is relatively limited in the region, the overwhelming majority of farmers have a stable on-farm internet connection facilitated by satellite technology.

One noteworthy insight shared by young farmers and women regarding their actual use of digital tools was their reliance on social media, such as WhatsApp, TikTok, Instagram, and Kwai, to access information about production, despite the challenges they may encounter in accessing the internet, including cost and poor signal quality. Building upon this insight, the development team made two decisions:

- **Use WhatsApp as the point of entry to Solis:** A valuable lesson from Solidaridad's past experiences developing digital solutions is the process of downloading, installing, and creating an account is a challenge for older

farmers compared to their younger counterparts. Therefore, it is essential for the initial access and registration process to be extremely simple and tailored to this audience. To address the difficulties faced by producers less familiar with using applications, Solis employs a technology that eliminates app store search, download, and registration hassles. Producers can access Solis through a link shared by extensionists on WhatsApp, requiring internet for automatic download only before offline use.

- **Use existing social media as the service to upload and publish content:** once the video is published on these platforms, this content can be embedded and shared on Solis.

While capitalizing on the current high engagement level of producers on these applications and reducing storage costs, this approach has a downside, which is the dependency on external platforms that may not adhere to the principles of digital development. The lack of control over external platforms raises concerns about privacy and potential misuse of content shared on these platforms, as farmers may inadvertently expose sensitive data or compromise privacy when sharing information on these platforms. It is therefore essential to consider these risks and implement measures to ensure that farmers have a comprehensive understanding of the potential consequences associated with sharing data on such platforms.

Navigating diverse needs and prioritize ideas within budget and time constraints, while avoiding user frustration and maintaining their engagement

Applying the principles of co-creation concept to the development of digital innovations starts with the creation of a conducive environment for the emergence of new ideas generated by the farmers themselves. This engagement of farmers from the early stage of ideation is crucial for creating tools that fit local needs and context, and for ensuring ownership, facilitating greater tool adoption and continued use. However, this also creates the challenge of managing expectations to prevent frustrations that could lead to disengagement. Prioritizing ideas based on time and budget constraints is inevitable and must occur early enough in the process, with clear communication.

In this project, farmers proposed numerous solutions to address specific challenges in farm and livestock management. These suggestions encompassed tools for expense and income management, access to meteorological and market information, or health and animal weight management tools. When prioritizing the design of digital innovation, the development team thoroughly considered all these ideas, considering feasibility within time and budget constraints, potential for scalability and the versatility of the proposed solutions to address a wide range of needs expressed by farmers. While tools focused on digitizing specific aspects of the production or farm management process would bring significant benefits to producers, they would be confined to very specific value propositions with limited scaling potential. Moreover, solutions to fulfill these needs are already available in the market and could be introduced to farmers with proper support and training. The development team therefore opted to prioritize the primary overarching challenge identified by farmers: the absence of locally relevant and customized information on low-carbon practices.

When the development team returned to the field to present the first version of Solis to the farmers and get their feedback, particular attention was given to communication to explain why this idea was prioritized over other needs and avoid creating frustrations. As stated in the “design with the user” principle of *The Principles for digital development*, it is critical to maintain a strong proximity to users and embrace an iterative process, that allows for incorporating feedback and adapting the tool after the initial testing and launch. Transparent communication regarding budget and time constraints and the logic of prioritization is also crucial for maintaining trust in the process and sustaining engagement.

Facilitating information flows among farmers while ensuring quality of content and easy access

Facilitating information flows among farmers, and between farmers and advisors is a sub-principle for digital tool use and co-creation of best practices with farmers ([Dittmer et al., 2022](#)). It also forms the core value proposition of Solis, stemming from the recognition that farmers are eager to share their own experiences and learn from “familiar faces.” The content quality and technical validity of co-created practices is key to ensure that Solis effectively helps farmers transition to low-carbon and climate-resilient production models. Developing cost-efficient mechanisms for the curation and classification of content becomes an essential requirement to ensure the tool’s credibility while facilitating access and retaining users. However, to expand access to tens or hundreds of thousands of users, the publication, curation, and classification of content cannot be managed manually. This brings forth a dilemma: while co-creation inherently entails direct and human interaction among farmers,

researchers, extension staff and other custodians of knowledge, the scalability imperative dictates the automation of certain facets of the process.

In the case of Solis, the development team is exploring how to incorporate Machine Learning and Artificial Intelligence technologies—already widely utilized by platforms like YouTube and Instagram for content management — to support the curation of co-created content. However, it is also clear that sustaining a genuine process of co-creation of practices requires ongoing in-person support activities in the field. Solis is not intended to replace face-to-face interactions among or between farmers and extension staff. Instead, its purpose is to complement and enhance spontaneous exchange within communities and during rural extension events. In essence, Solis was conceived as a social technology, harnessing the power of a digital tool to facilitate the establishment of an "informational solidarity network" aimed at supporting individual and collective capacity-building and decision-making by using content generated by the community. For this reason, the deployment strategy of Solis will involve the formation of a specialized team for content creation and social media management, as well as a specialist in agroecology to provide individualized assistance in the field and coordinate engagement actions for producers and other extension technicians with the new digital tool. Local agents will also be trained to as ambassadors for agroecology and the digitization of their communities.

Although the use of digital technology is the enabler of this new format of exchange between farmers, extension workers and other specialists, the challenge of content curation also highlights the limitations of developing co-creation through digital tools.

Creating the support ecosystem needed for adoption and retention while ensuring a sustainable business model

The need to provide support through human intermediaries to help farmers adopt the tool also poses a financial challenge: how to develop a sound business model that facilitates affordable farmer access while covering the costs of maintaining a digital tool and the support system?

Developing and maintaining a support infrastructure for the use of digital tools by smallholder farmers includes dissemination and activation campaigns, training and user support activities, and complementary engagement activities to enable continuous creation and updating of content and co-creation of practices. These activities incur a high cost that, unlike maintenance costs of a digital tool, does not decrease significantly with scale. One of the most common business models in the space of digital solutions for small-scale producers is to monetize the data collected from farmers to provide intelligence services to other stakeholders in the value chain. This model may require making trade-offs with the principles of using farmers' data responsibly and its implementation requires caution to preserve producers' privacy and ensure they provide informed consent for all type of uses of their data.

At this stage of the process, Solidaridad is still refining the business model for Solis, in complementarity with other digital solutions in its portfolio and is considering moving towards a hybrid business model, combining grants, government support and fees for services derived from the use of Solis, while keeping Solis fully free for farmers and extension staff.

Conclusions

The experience of The Alliance of Biodiversity and CIAT and Solidaridad illustrates the transformative potential of applying co-creation principles to the development of digital tools within the context of agricultural extension, but also provides a practical example of the dilemmas and challenges this entails. Leveraging digital tools to enable co-creation of practices requires a paradigm shift in how rural extension programs are conceived and executed, as well as a different approach to digital product development to ensure the needs and expectations of intended users are, and remain, at the forefront of the process.

Initial findings and reactions to the new digital development suggest that the co-creation approach, coupled with local capacity building, holds significant potential for uncovering solutions aligned with farmers' expectations, provided that all actors remain aware that digital technology will not replace human interactions.

Further reading

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The Agroecological Transitions for Building Resilient, Inclusive, Agricultural and Food Systems (TRANSITIONS) Program aims to enable agroecological transitions. The TRANSITIONS Inclusive Digital Tools (ATDT) project aims to support the use of digital resources and citizen science to empower farmers to co-create, adapt, and innovate practices for climate-resilient and low-emission agroecological outcomes at large scales. Find other ATDT outputs here: <https://bit.ly/AqLEDxATDT>

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